This report documents the environmental impact assessment (EIA) and public participation activities conducted for the ECC application of the proposed road project of Department of Public Works. The Project is a 65.6 km high standard highway with a 60 m road-right of way that will traverse 2 cities and 4 municipalities of Misamis Oriental and Bukidnon

ENVIRONMENTAL IMPACT STATEMENT May 2024

CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT

Misamis Oriental and Bukidnon, Region X

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
AAQ	ambient air quality
AAQMP	Ambient Air Quality Monitoring Plan
AASHTO	American Association of the State Highway and Transportation Officials
AD	Ancestral Domain
ADP	Abandonment and Decommissioning Plan
ADSDPP	Ancestral Domains Sustainable Development and Protection Plan
AET	Actual evapotranspiration
Afs	Affected Families
AL	Ancestral Land
ALDP	Alternative Livelihood Development Program
ALS	Advance Learning System
AOC	area of concern
AOR	area of responsibility
Apr	April
AQ	air quality
As	Arsenic
Aug	August
AWFP	Annual Work and Financial Plan
BCP	Biodiversity Conservation Plan
BEMONC	Basic emergency obstetric and newborn care
BF	Bukidnon Formation
BFAR	Bureau of Fisheries and Aquatic Resources
BHC	Barangay Health Centers
BHS	Barangay Health Station
BJMP	Bureau of Jail Management and Penology
BLGF	Bureau of Local Government Finance
BPC	Bubunawan Power Company's
BPSO	Barangay Public Safety Officer
BUHITA	Bukidnon-Higaonon Tribal Association
BUSECO	Bukidnon Electric Cooperative
BZP	Buffer Zone Plan
CAA	Clean Air Act of the Philippines
CADT	Certificate of Ancestral Domain Title
CALT	Certificate of Ancestral Land Title
CBD	Central Business District
CBMS	Community Based Monitoring
CBP	Capacity Building Program
Cd	cadmium
CDF	Controlled Dump Facility
CDO	Cagayan De Oro
CDOCJ-MD	Cagayan De Oro City Jail - Mail Dormitory
CENRO	City Environment and Natural Resources Office
CEPALCO	Cagayan Electric Power and Light Co.
CFMP	Chance Find Management Plan

CFS	Central Fire Station
CGSO	City General Services Office
CH4	methane
CHO	City Health Office
CICL	Children in Conflict with the Law
CLENRO	City Local Environment and Natural resources Office
CLRD	Chronic Lower Respiratory Disease
CLS	Core Labor Standards
CLUP	Comprehensive Land Use Plan
CMH	Central Mindanao High Standard Highway Project
CMR	Compliance Monitoring Report
CMTS	cellular mobile telecommunication system
CO	carbon monoxide
CO2	carbon dioxide
COWD	Cagayan de Oro Water District
CPSO	the City Public Services Office
CSE	crime solution efficiency
CVRP	Construction Vegetation Removal Plan
CVTPP	Construction Vegetation and Tree Planting Program
CWMP	Construction Waste Management Plan
DAO	DENR Administrative Order
DCCs	Development Centers/Day Care Centers
DEARBC	Del Monte Philippines Inc. Employees Agrarian Reform Beneficiaries Cooperative
Dec	December
DED	Detailed Engineering Design
DEM	Digital Elevation Model
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DGCS	Design Guidelines, Criteria and Standards
DIA	Direct Impact Areas
DMPI	DEL MONTE PHILIPPINES INC.
DO	Dissolved Oxygen
DOF	Department of Finance
DOH	Department of Health
DOLE	Department of Labor and Employment
DOT	Department of Transportation
DOTS	Directly Observed Therapy
DPWH	Department of Public Works and Highways
DRO	Direct Runoff
DSWD	Department of Social Welfare and Development
DTTB	Doctors to the Barrios
ECA	Environmentally Critical Area
ECC	Environmental Compliance Certificate
ECCD	Early Childhood Care Development
ECM	Environmental Compliance Monitoring
ECPs	Environmentally Critical Projects
EGF	Environmental Guarantee Fund
EGGA	Engineering Geological and Geohazard Assessment
EGGAR	Engineering Geological and Geohazard Assessment Report

EHIA	Environmental Health Impact Assessment
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EMB	Environmental Management Bureau
EMF	Environmental Monitoring Plan
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EMVMP	Equipment and Motor Vehicle Maintenance Plan
EQPL	Environmental Quality Performance Levels
ERA	Environmental Risk Assessment
ESH	Environment Safety and Health
ESS	Environmental and Safeguards Section
ESSD	Environmental and Social Safeguards Division
FDF	Final Disposal Facility
Feb	February
FEMA	Federal Emergency Management Agency
FHA	Family Health Associates
FIES	Family Income and Expenditures Survey
FPIC	Free, Prior and Informed Consent
GA	Government Agencies
GAA	General Appropriations Act
GFA	Gross Floor Area
GHG	greenhouse gas
GLA	Gross Leasable Area
GLC	ground-level concentration
GWP	Global Warming Potential
ha	hectare
HEC-RAS	Hydrologic Engineering Center's - river analysis system
HF	Hindfoot Length
Hg	Mercury
HH	Household
HSH	High Standard Highway
IBA	Important Bird Area
IBBA	Important Bird and Biodiversity Area
ICC	Indigenous Cultural Communities
IEC	Information, Education and Communication
IIA	Indirect Impact Area
ILO	International Labor Organization
	IMP Impacts Management Plan
IP	Institutional Plan
IPs	Indigenous People
IPCC	Intergovernmental Panel on Climate Change
IPDF	Indigenous peoples Development Framework
IPO	Indigenous People's Organotin
IRA	Internal Revenue Allotment
IRR	Implementing Rules and Regulations
ISMP	Informal Settler Monitoring Plan
IUCN	International Union for the Conservation of Nature
IVSS	Impasug-ong Village Sites and services
Jan	January

JICA	Japan International Cooperation Agency
K	Potassium
KADIMADC	Kitanglad Alihuton Danao Inalad Manegay Ancestral Domain Claim
KII	Key Informant Interview
KRP	Kindergarten Regular Program
KSP	Kindergarten Summer Program
KVP	Kindergarten Volunteer Program
L90	background sound levels
Laeq	24h averaged sound levels
LCE	Local Chief Executive
LEP	Local Employment Plan
LGSF	Local Government Support Fund
LGU	Local Government Unit
Lmax	peak sound levels
Lmin	lowest sound levels
LOS	Level of Service
LPA	Low pressure area
LTNG	Lightning
MAO	Municipal Agricultural Office
Mar	March
max	maximum
May	May
mbs	millibars
MC	Memorandum Circular
MEEDO	Municipal Economic Enterprise Development Office
MENRO	Municipal Environment & Natural Resource Office
MFWD	Manolo Fortich Water District
MGB	Mines and Geosciences Bureau
min	minimum
MISS	Malaybalay Integrated Survey System
MLSP	mean sea level pressure
mm	millimeter
MMT	Multi-partite Monitoring Team
MOA	Memorandum of Agreement
MOGCHS	Misamis Oriental General Comprehensive High School
MOO	Manual of Operations
MPSC	Mindanao Polytechnic State College
MRF	Material Recovery Facilities
MSWDO	Municipal Social Welfare and Development Office
MSWM	Municipal Solid Waste Management
N	Nitrogen
NAAQGV	National Ambient Air Quality Guideline Values
NAPOCOR	National Power Corporation
NCCA	National Commission for Culture and the Arts
NCTS	National Center for Transportation Studies
NE	northeast
NEDA	National Economic and Development Authority
NGO	Non-Government Organization
NHA	National Housing Authority

NIPAS	National Integrated Protected Areas System
NMP	Noise Monitoring Plan
NNW	north-northwest
NO2	Nitrogen Dioxide
Nov	November
NPAAAD	Network of Protected Areas for Agricultural and Agro-industrial Development
NPCC	National Pollution Control Commission
NSCB	National Statistical Coordination Board
NSSMP	National Sewerage and Septage Management Program Section
NW	northwest
NWRB	National Water Resources Board
Oct	October
OWMP	Operation Waste Management Plan
P	Phosphorus
PAGASA	Philippine Atmospheric, Geophysical, and Astronomical Services Administration
PAR	Philippine area of responsibility
Pb	Lead
PBCPP	Philippine Biodiversity Conservation Prioritization Process
PCE	Passenger Car Equivalent
PCO	Pollution Control Officer
PEMAPS	Project Environmental Monitoring And Audit Prioritization Scheme
PFZ	Philippine fault zone
PGA	Peak ground acceleration
PGR	Philippine Growth Rate
PhilCom	Philippine Communications
PHIVOLCS	Philippine Institute of volcanology seismology
PHP	Philippine Peso
PIA	PHIVIDEC Industrial Authority
PLDT	Philippine Long-Distance Telecommunication
PM10	particulate matter with aerodynamic diameter of 10 microns or less
PMO	Project Management Office
PNP	Philippine National Police
PO	Public offices
PSA	Philippine Statistic Authority
PTA	Parent - Teacher Association
PWD	persons with disability
RA	Republic Act
RAP	Resettlement Action Plan
RCA	Residual Containment Area
RD	rainy days
RH	relative humidity
RHU	Rural Health Unit
RIC	Resettlement Implementation Committee
ROW	Right of way
RPM	Revised Procedural Manual
RROW	Road Right-of-Way
SAFDZ	Strategic Agriculture and Fisheries Development Zone
SDA	Strategic Development Area
SDP	Social Development Program

SE	Southeast
SEC	Security and Exchange Commission
SEMP	Soil Erosion Management Plan
Sep	September
SEP	Socioeconomic Program
SMP	Self-Monitoring Plan
SMR	Self-Monitoring Report
SO_2	sulfur dioxide
SOGI	sexual orientation and gender identities
SOTELCO	Southern Telecommunications Company Inc
SPD	wind speed in meter per second
SPL	sound pressure level
SRO	Surplus Runoff
SSE	south-southeast
SSROW	Social Safeguards and Right-of-Way Section
ST	Soil Moisture Storage
STDs	sexually transmitted diseases
STW	Soil-moisture storage withdrawal
SW	Solid Waste
SWM	Solid Waste Management
T	Temperature
TCC	Tagoloan Community College
TD	tropical depression
TESDA	Technical Education and Skills Development Authority
TIA	Traffic Impact Assessment
TL	Total Length
TMP	Traffic Management Plan
TNA	Training Needs Assessment
TS	tropical storm
TSMP	Tree Survival and Monitoring Plan
TSP	total suspended particulates
TTBP	Tree Transfer and Balling Plan
TV	Tail-vent Length
TY	tropical typhoon
UC	Ultramafic Complex
UDHA	Urban Development and Housing Act
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPMO	Unified Project Management Office
USEPA	United States Environmental Protection Agency
VTPPO	Vegetation and Tree Planting Program during Operations
WC	Wing Cord
WMP	Wildlife Monitoring Plan
WQG	Water Quality Guidelines
WT	Weight

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EXECUTIVE SUMMARY

PROJECT FACT SHEET

Name of Project	Central Mindanao High Standard Highway Project (CDO - Malaybalay Section)			
Project location	Barangay	Municipality/City	Province	Region
	Bugo, Puerto, Balubal	Cagayan de Oro	Misamis Oriental	X (Northern Mindanao)
	Casinglot, Natumolan	Tagoloan	Misamis Oriental	X (Northern Mindanao)
	Alae, San Miguel, Damilag, Dicklum, Sankanan, Tankulan, Ticala, Mambatangan	Manolo Fortich	Bukidnon	X (Northern Mindanao)
	Puntian, Vista Villa, Culasi, Poblacion, Kisolon, San Roque, Kisolon	Sumilao	Bukidnon	X (Northern Mindanao)
	Poblacion, La Fortuna, Capitan Bayong, Cawayan, Impalutao	Impasug-ong	Bukidnon	X (Northern Mindanao)
	Patpat, Kalasungay, Dalwangan, Barangay 10	Malaybalay	Bukidnon	X (Northern Mindanao)
Project type*	Roads and bridges Category A: ECP (3.4.1 Roads, new construction, NATIONAL ROAD: ≥20.0 km (length with no critical slope) OR ≥10.0 km (length with critical slope))			
Proponent	Department of Public Works and Highways Central Office			
Office address:	Bonifacio Drive Port Area, 652 Zone 068, Manila, Metro Manila			
Contact Person:	Constante A. Llanes, Jr. Assistant Secretary, Planning Service			
Project status	Proposed			
Project duration	Construction (3.5 years)			

Project Components

	Tagoloan	CDO	Manolo Fortich	Sumilao	Impasug-ong	Malaybalay	Total
Interchanges	0	1	1	1	1	1	5
Overpass	1	0	6	6	5	4	22
Underpass	2	1	15	4	5	5	32
Bridge	3	1	12	9	14	12	51
Viaduct	2	0	0	6	0	0	8

Project length	65.6 km
Project cost	Approximately Php 96,312,065,917.34
Authorized Representative for ECC application:	Julio Cesar Caculba- Authorized Representative Amet-Asia, Inc. Unit 303 One Corporate Center, J. Vargas Ave., corner Meralco Ave., Ortigas, Pasig City, Metro Manila info@maet-asia.com +0945 723 8195 | 0923 614 8431

*Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System (EMB Memorandum Circular 005 July 2014)

PROJECT DESCRIPTION

The proposed Central Mindanao High Standard Highway Project (Cagayan de Oro - Malaybalay Section) ("Project", "alignment") is part of the Phase II of the Master Plan on High Standard Highway Network Development. The objectives of the plan were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area. The proposed Project will be spearheaded by the Department of Public Works and Highways (DPWH) with the assistance of the Japan International Cooperation Agency (JICA).

Location, Project area, accessibility - The Project with a length of 65.6 kilometers will traverse 28 barangays of four municipalities and two cities in the Provinces of Misamis Oriental and Bukidnon in Region X-Northern Mindanao. The Project is accessible through Butuan-Cagayan de Oro- Iligan Rd. from the north and Sayre Highway from the south.

Project rationale - The proposed Project is expected to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.

Project components - The alignment will have a 60-meter road right of way (RROW) with five interchanges constructed near urban centers. The Project will also compose of 32 AASHTO Girders, 3 Steel Bridges, 6 Steel Box Girders, 13 Underpasses, and 14 Overpasses.

Table ES-1. Length and width of the Project sections

Sections	Length (km)	Width (m)
Section 1	11.9	60
Section 2	14.9	60
Section 3	14.9	60
Section 4	12.6	60
Section 5	11.3	60
Total	**65.6**	

Table ES-2. Number of Project components per municipality

Components	Tagoloan	CDO	Manolo Fortich	Sumilao	Impasug-ong	Malaybalay	Total
Interchanges	0	1	1	1	1	1	5
Overpass	1	0	6	6	5	4	22
Underpass	2	1	15	4	5	5	32
Bridges	3	1	12	9	14	12	51
Viaduct	2	0	0	6	0	0	8

Project alternatives
This section presents the different selection criteria for siting, selection of technology, resources, and contextualization of hazards based on available hazard maps from relevant institutions.

Project development phases

1. Pre-construction - This phase mainly involves conducting studies at the site, e.g., geotechnical surveys, Right-of-Way Action Plan (RAP) Survey and possible relocation, preparation of the detailed engineering design, procurement of relevant permits and clearances from government entities, and

contractor prequalification, tendering & awarding.

2. *Construction* – These activities include site clearing, construction of temporary facilities, excavation works, construction of viaduct, bridges and superstructure and road pavement.

3. *Operation* - The operation of the project will include the following activities:

- Operation of toll gates;
- Regular inspection of road structures;
- Regular maintenance of facilities such as traffic signals, signages, and markings;
- Regular cleaning of roadways, and maintenance of toilet septic tanks;
- Preventive maintenance, monitoring and reporting; and
- Upgrade of structures and facilities, if necessary.

4. *Abandonment phase*- This phase implied as dismantling of the temporary facilities used during the construction phase. Dismantling of the temporary facilities will be phased according to the completion of each road section.

The construction contractor is responsible for the following activities:

- Dismantling of temporary facilities.
- All construction wastes and spoil materials will be hauled out from the site.
- Recyclable construction spoils will be sold to interested buyers
- Solid wastes disposed in the municipal sanitary landfill or controlled dumps, and spoils containing hazardous materials, including contaminated soils, will be hauled by a DENR- registered TSD facility.

Manpower - The indicative manpower requirement during the construction phase is ***48,154***.

Indicative construction timetable - The construction of the Project will take about ***42 months or 3.5 years.***

Indicative project investment cost - The Project will cost approximately ***Php 96,312,065,917.34***

PROCESS DOCUMENTATION

The EIA study commenced with pre-scoping IEC followed by the technical scoping, baseline characterization, impact assessment, and environmental management planning. site visit, geological survey, ambient air quality sampling, sound level measurements, flora and fauna sampling, water quality sampling, key informant interviews, perception survey) secondary data, information, literature, and expert judgment.

All public participation activities required by the ECC application process were conducted following the current COVID-19 quarantine guidelines. The documentation of the public consultation activities is attached in **Annex 10.**

Terms of reference of the EIA - The TOR of the EIA was based the pre-scoping IEC activities and the Technical Scoping Checklist signed by the proponent, EMB CO, and preparer (Amet Asia). The technical scoping was conducted with EMB CO on July 9, 2020. The outline and content of the EIS report, baseline information required for each identified impact, and impact assessment methods were specified in the said checklist (**Appendix 44**).**EIS team**

The key members of the EIA team are enumerated below.

Table ES-3. EIS Team

Specialization/Module	Name
Team Leader, Pedology, Water Quality, Climate and Air Quality	Engr. Jethro Alden C. Hipe, MSc, MA Patricia Erika Lim, EnP
Geology	Samuel Sendon
Flora and Fauna (Terrestrial and Freshwater)	Jaime Namocatcat, PhD Lorelaine Geografo
Hydrology/Hydrogeology	Engr. Emiterio Hernandez, MSc.
People	Nimfa Bracamonte Ph.D Amabelle Embornas, MSc.
Project Manager	Jan Heidel Bautista Julio Cesar

EIA study area and schedule

The activities for the EIA study started in January to December 2021. Activities included IEC, Key Informant Interviews, Focused Group Discussions, EIA perception survey, fieldwork, laboratory analysis, and impact assessment, and report writing. The EIA was conducted at the Project area, its vicinities, and 28 host barangays.

Table ES-4. EIS Schedule

Activity	2021												2022												2023												2024											
	J	F	M	A	M	Jn	Jl	A	S	O	N	D	J	F	M	A	M	Jn	Jl	A	S	O	N	D	J	F	M	A	M	Jn	Jl	A	S	O	N	D	J	F	M	A	M	Jn	Jl	A	S	O	N	D
Kick-off																																																
Site Visit																																																
IEC Meeting																																																
Public Scoping																																																
Technical scoping																																																
Data gathering																																																
EIS Report preparation																																																

Table ES-5. EIS study area

Province	City/Municipality	No. of Barangays
Misamis Oriental	Tagoloan	2
	Cagayan de Oro	3
Bukidnon	Manolo Fortich	8
	Sumilao	6
	Impasug-ong	5
	Malaybalay	3
Total		**27**

EIS SUMMARY

Table ES-6. Baseline Environmental Conditions

No.	Item	Survey Item and Methodology	Forecast Methodology
1	The Land		
1.1	Land use and classification	- Review of Comprehensive Land Use Plan of affected LGUs - Review on the list and maps of ECAs near the Project - Review on the current status of the proposed Protected Areas near the Project	Qualitative
1.2	Geology/ Geomorphology	- Observation on geological and geo-structural characteristics - Observation on geohazards - Literature review	Qualitative
1.3	Pedology	Observation on geohazards Literature review Soil sampling on 3 stations Soil analysis on the following parameters: <u>Soil Fertility:</u> Nitrogen, Organic Matter, pH, Phosphorus, Potassium, <u>Soil quality</u> – Molybdenum, zinc, Manganese, Iron, Nickel, Boron, Chlorine Literature review Sediment sampling on 10 surface water sampling points Parameters: Arsenic, Cadmium, Cyanide, Chromium, Copper, Mercury, Lead, Selenium	Qualitative and Quantitative
1.4	Terrestrial ecology	<u>Flora</u> Survey on the tree along the 20 transects within the alignment Quadrat method survey on the understory vegetation Low and high rainfall period <u>Fauna</u> 20 transect counts, 13 stations for traps and mist nets, incidental surveys, opportunistic sampling for mammals, birds, and herpetofauna respectively Low and high rainfall period Interview with three experts with regards to the Philippine Eagle, regional vegetation and remarkable point for field survey.	Qualitative and Quantitative
2	The Water		
2.1	Hydrology/hydrogeology	Direct rainfall flood modeling Literature review	Quantitative
2.3	Oceanography	Not applicable	

2.4	Water Quality	- Surface water sampling on 10 points traversing the alignment - Groundwater water sampling on 10 points near the alignment - Parameters: Arsenic, BOD, Cadmium, Chromium, Chlorine, COD, Coliform, Color, Cyanide, Lead, Mercury, Nitrate, Oil and Grease, pH, Phosphate, Sulfate, Surfactants, TSS	Quantitative
2.5	Freshwater ecology	13 stations for the survey of plankton, macrobenthos and fishes	Qualitative
3	The Air		
3.1	Meteorology/Climatology	Literature review	Quantitative
3.2	Air Quality and Noise	- Air quality and Noise sampling points on 10 points - Parameters: Nitrogen dioxide, sulfur dioxide, TSP, PM10, Pb, O3, CO, wind speed and wind direction - Air dispersion modelling based on the traffic volume prediction - Noise modelling	Quantitative
4	The People		
4.1	The People	Literature review Utilization on the results of the stakeholder meetings and perception survey Interviews with the IP members	Qualitative

<u>Environmental Impact Assessment and Mitigating Measures</u>

The summary of the significant impacts, mitigation options, and expected residual effects for the land, water, air, and people components is shown in Table ES-7. Summary of key impacts, mitigation options, and residual effects (Land Component)**Table ES-7** to **Table ES-11.**

Table ES-7. Summary of key impacts, mitigation options, and residual effects (Land Component)

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
Topography and geological features	Change/Inconsistency in land use	-A	D	D	D	- Confirm classification of the other Project areas to the zoning regulation of the host cities and municipalities (P) - Proper implementation of buffer zone area (C) - Strict implementation of Construction Plan specifications for each Project component (C) - Maintain the construction site/ yards tidy and clean and rehabilitate after construction. (C) - Provision for temporary screens/ walls to minimize the visual clatter. (C) - Restore RROW to its state prior to Project implementation if possible or the current land use/zoning of the LGU where a road section is located. (A)	Issuance of the Zoning Clearance
	Impairment of visual aesthetics	D	-B	-B	-B	- Include susceptibility of the Project area to natural hazards in the Detailed Engineering Design (DED) (P) - Formulation of Buffer Zone Plan (BZP) during construction and operations - Design and installation of facilities to harmonize with the surrounding environment - Proper implementation of buffer zone area (C) - Strict implementation of Construction Plan specifications for each Project component (C) - Maintain the construction site/ yards tidy and clean and rehabilitate after construction. (C) - Provision for temporary screens/ walls to minimize the visual clatter. (C) - Sustained implementation of buffer zone areas(O) - Regular maintenance of the highway(O) - Proper demolition of the road, structures, and other ancillaries(A) - Proper disposal of demolition wastes(A)	Minimal impairment of visual aesthetics
	Encroachment in Environmentally Critical Areas (ECA)	D	D	D	D	Include susceptibility of the Project area to natural hazards in the Detailed Engineering Design (DED) (P)	n/a

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
	and protected areas						
	Existing land tenure issue/s	-A	D	D	D	-Conduct parcellary survey (P) -Secure documents showing authority to develop the Project RROW (P)	Land issues resolved
	Devaluation of land value as a result of improper solid waste management and other related impacts	D	-A	-A	-A	- Identify the final disposal site for solid waste, excavated soil, and hazard waste at each LGU (P) - Strict implementation of Construction Plan specifications for each Project component (C) - Regular maintenance of the highway (O,A) - Best housekeeping practices (O,A)	Insignificant devaluation of land value due to improper solid waste management
	Change in surface landform/ topography/ terrain/ slope	D	-A	D	D	- Employ appropriate erosion control and slope protection measures. (C) - Designate a spoils storage area and optimize re-use of spoils. (C) - Increase vegetation and construction drainage canals at the break-of-slope (between the gentle to moderate slopes. (C) - Slope re-contouring, benching or lowering the slope gradient (C) - Drainage system includes drain construction and anchored structures. (C) - Strict implementation of Construction Plan specifications for each Project component (C) - Regular monitoring of slope conditions and slope stabilization measures constructed with focus on landform change. (O) - Check RROW with destabilized slopes and implement slope stabilization measures (A)	Unnecessary changes in surface landform, su-Bsurface geomorphology, and inducement of geohazards minimized
	Change in sub-surface/ underground geomorphology	D	D	D	D	- Conduct of factual Geological mapping with focus on the following: geology, geomorphology, geohazards, areas that may be prone to settlement or subsidence (P) - Field assessment in active construction sites especially after heavy and prolonged rains and after earthquakes (if it occurs) (C) - Regular monitoring of identified areas prone to subsidence particularly those underlain by the limestone (O). - Follow recommendations of the geotechnical / civil engineer / geologist to address any adverse geological and geomorphological conditions (O)	n/a

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
	Inducement of subsidence, liquefaction, landslides, mud/debris flow	D	-A	-A	D	- Conduct of EGGA and factual geological mapping focusing on geology, geomorphology, and geohazards (P) - Apply appropriate slope protection and other engineered structures (C) - Increase vegetation cover particularly at the vicinity of the break-of-slope (C) - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes) (C) - Slope re-contouring, benching or lowering the slope gradient - Good drainage system including under drain constructions and anchored structures. (C) - Strict implementation of Construction Plan specifications for each Project component (C) - Regular monitoring of slope condition and slope stabilization measures especially after prolonged rains and earthquakes. (O). a) Regular monitoring of the slope conditions and slopes stabilization measures especially after prolong heavy rains and earthquakes. (O). b) Regular monitoring of areas with identified geological hazards, their current condition and the degree of the effects of hazards previously identified. (O). c) Recommend applicable solutions depending on the existing geological and geomorphological conditions. (O).	Inducement of subsidence, liquefaction, landslides, mud/debris flow are minimized
	Susceptibility from geo- and hydrological hazards	D	-B	-B	D	- Conduct of EGGA (P) - Strict implementation of Construction Plan specifications for each Project component. - Install sufficient protection measures such as soil improvements during excavation activities and implement appropriate materials handling program or a site protection and rehabilitation program. - Proper inspection of all installed and constructed / ongoing construction structures and facilities. - Coordinate with the PHIVOLCS during earthquake and volcanic events to adjust construction schedule. Conduct earthquake drills for workers	Susceptibility of the Project components from geo- and hydrological hazards minimized

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
						- Strict implementation of Construction Plan specifications for each Project component (C) - Regular monitoring of areas with identified geological hazards, its current condition and the degree of the effects of hazards previously identified (O)	
Pedology	Soil erosion / Loss of topsoil/ overburden	D	-A	-B	D	- Prepare a plan to minimize cut and fill operations during construction and operation(P) - Implementation the recommendations of geotechnical engineer and EGGA Report in areas of steep slopes and traversed by surface water channels (C) - Strict implementation of Construction Plan specifications for each Project component. (C) - Immediate removal of excavated soil stockpiles(C) - Optimize re-use of spoils(C) - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes). (C) - Construct perimeter sediment barriers; (C) - Divert upstream drainage away from the stockpiles(C) - Install drainage canals and settling pond. (C) - Regular monitoring of areas previously identified as erosion prone. Focus on sections with steep slopes, areas transected by river and creek channels, and exposed areas prone to soil erosion. (O)	Soil erosion controlled and minimized
	Change in soil quality/fertility and soil contamination	D	-B	-B	-B	- Identify staging areas (P) - Include a buffer zone during construction and operations (P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Proper inspection and maintenance of machines and equipment. (C) - Strictly implement solid waste management plan and proper disposal by contractor in accordance with RA 9003, hazardous waste disposal in accordance with RA 6969. (C) - Conduct soil quality monitoring in case of any possible contamination events occur. (C)	Changes in existing soil quality and fertility controlled and minimized

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
						- Semi-annual monitoring of soil quality and fertility at identified stations (O)	
	Vegetation removal and loss of habitat	D	-A	-B	D	- Conduct a census of flora along the RROW; (P) - Consider the locations of significant flora and fauna during Project design. (P)If possible, avoid removal of trees along the RROW and include them in the visual design. If not possible, trees will be balled and planted in areas that will not be affected by the project; - Secure a Tree Cutting Permit from the DENR; (P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Proper implementation of Tree Cutting Permit conditions (C) - Limit the development activities within the planned structure or component footprint. (C) - Establish on site nurseries in accessible locations (C) - Transplant saplings to affected areas especially riparian zones(C)	Vegetation removal and loss of habitat are minimized
	- Threat to existence of important local species - Threat to abundance, frequency and distribution of important species	D	-A	-B	D	- Conduct a census of flora along the RROW; (P) - Consider the locations of significant flora and fauna during Project design. (P)If possible, avoid removal of trees along the RROW and include them in the visual design. If not possible, trees will be balled and planted in areas that will not be affected by the project; - Secure a Tree Cutting Permit from the DENR; (P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Strict implementation of a “No Hunting and No Collecting” policy (C) - Collect saplings of endangered, vulnerable and other threatened species and harden in nurseries for eventual transplanting to target areas, particularly riparian zones (C) - Adoption of lower noise and vibration construction method and machines (C) - Sustained implementation of buffer zones (O) - Regular maintenance of the highway (O) - Revegetate areas occupied by the demolished road sections, structures,	Existence of important local species will be conserved

Sub-component	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
						and other ancillaries. (A)	
	Hindrance to wildlife access					- Sustained implementation of buffer zones (O) - Regular maintenance of the highway (O) - Revegetate areas occupied by the demolished road sections, structures, and other ancillaries. (A)	n/a

Table ES-8. Summary of key impacts, mitigation options, and residual effects (Water Component)

Sub-ccomponent	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
Hydrology/Hydro geology	Change in drainage morphology/ Inducement of flooding/ Reduction in stream volumetric flow	D	-B	D	D	- Design adequate drainage system (P); - Road design must be compatible with existing slopes, infrastructures, environmental condition (P); - Installation of silt fences (C) - Establishment of no intrusion areas during road construction (C) - Rapid re-vegetation of side slopes with anti-erosion cover, and the use of appropriate anti-erosion technologies. (C) - Strict implementation of Construction Plan specifications for each Project component. (C) - All earthworks for site preparation and trench excavation implemented during the low rainfall period if possible (C) - Reuse excavated earth material for backfilling whenever feasible (C) - Backfilling and leveling of the borrow pits to prevent water ponding (C) - Provide adequate drainage systems to minimize the impact downstream of active construction sites - Limit the area of project activities within the RROW (C) - Regular checking of temporary drainage canals to ensure adequate storm - Regular maintenance of drainage canals, pipe culvert, cross drains. (O)	- Minimized changes in the existing drainage morphology - Inducement of flooding controlled and minimized
	Change in stream depth	D	-B	D	D	- Locate staging areas far from surface stream as possible (P)	Change in stream

Sub-ccomponent	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
						- Strict implementation of Construction Plan specifications for each Project component. - Restoration and maintenance of natural drainage traversed by the alignment.(O)	depth is minimized
	Depletion of water resources / competition in water use	D	-B	D	D	- Plan water conservation program during the construction phase (P) - Use of any open water body or natural water source that are being used by the general populace must not be permitted (C) - Construction of wells as source of potable water shall not be allowed (C) - No mitigation recommended. Groundwater will not be extracted during construction. (C) - Sustained implementation of the Water Conservation Plan (O)	Water depletion controlled and minimized
Water Quality	Degradation of surface water quality	D	-A	-A	-A	- Prepare plans for drainage and sediment ponds at the staging areas. (P) - Prepare a Water Quality Monitoring Plan which will include quarterly monitoring of relevant parameters during construction and operation phase(P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Best housekeeping practices(C) - Provide onsite sanitary facilities(C) - Adequate drainage leading to siltation ponds(C) - Implement the Water Quality Monitoring Plan during construction phase(C) - Best housekeeping practices(O) - Provision of sanitation facilities(O) - Maintain drainage system leading to siltation ponds(O) - Implement the Water Quality Monitoring Plan for operation phase (O)	Water pollution of waterbodies controlled and minimized
Aquatic Ecology	Threat to existence and/or loss species of important local and habitat	D	-A	-A	D	- Strict implementation of Construction Plan specifications for each Project component. - Best housekeeping practices (O)	Impacts to the freshwater ecology

Sub-ccomponent	Key Potential Impact	P	C	O	A	Options for Prevention, Mitigation, Enhancement	Residual Impact
	Threat to abundance, frequency and distribution of species					- Proper implementation of the SEMP - Bunded area for tanked fuels, lubricants, etc., with drainage leading to oil-water separator. (O) - Proper implementation of the Operation Waste Management Plan (O) - Provide onsite sanitation facilities (O) - No wastewater discharges into rivers or streams (O) - Implement the Water Quality Monitoring Plan for operation phase (O)	controlled and minimized

NOTES - P = preconstruction; C= construction, O = operation; A = abandonment or closure; +/-: Positive/Adverse A= Significant impact is expected. B= Some impact is expected. C= Impact is unknown. D= No impact is expected , NPI –No perceived impact

Table ES-9 Summary of key impacts, mitigation options, and residual effect (Air Component)

Sub-component	Key Potential Impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
Air quality	Contribution in terms of greenhouse gas emissions	D	-B	-B	D	- Allocating unused portions of the RROW for tree planting(P) - Strict implementation of Construction Plan specifications for each Project component.(P) - Replacement of vegetation in non-structure areas to minimize wind erosion of topsoil(C) - Apply dust suppression measures, e.g., water application, in active construction areas; (C) - Compact exposed soil surfaces; (C) - Provide tarpaulin cover on trucks loaded with construction materials; (C) - Haul spoils/excavated earth materials immediately after excavation and stockpiled in a safe place and disposed in designated disposal sites. (C) - Prohibit idling in parking areas and emergency curb (O) - Impose speed restrictions (O)	Insignificant greenhouse gas emissions
	Degradation of air quality	D	-A	-A	D	- Prepare an Ambient Air Quality Monitoring Plan (AAQMP) which will include quarterly monitoring of relevant parameters during construction and operation phase at sensitive receptors identified in the baseline study of this EIS.	Air pollution controlled and minimized

Sub-component	Key Potential Impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
						- Strict implementation of Construction Plan specifications for each Project component. (C) - Implement the Motor Vehicle Maintenance Plan including: ・PMS of construction equipment and machineries, and vehicles will be strictly complied with (C) ・Daily routine check-up of construction vehicles, equipment, and machineries must be strictly complied with (C) ・Implement the Ambient Air Quality Monitoring Plan (AAQMP) during construction phase (C) ・Monitor air quality at identified nearby sensitive receptors regularly and evaluate effectiveness of the air pollution reduction measures provided. (C) - Use of low-sulfur gasoline (C) - Proper installation, and maintenance of selected option, e.g., vegetation barrier.(O) - Impose speed limits	
Noise and Vibrations	Noise pollution	D	-A	-A	D	- Prepare a Noise Monitoring Plan (NMP) which will include quarterly monitoring of noise at different periods of the day during construction and operation phase at sensitive receptors identified in the baseline study of this EIS.(P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Maintenance of motor vehicle mufflers; (C) - Provision of barriers and shielding stationary vibrating equipment; and (C) - Scheduling of noisy activities during daytime. (C) - Implement the Noise Monitoring Plan (C) ・Monitor noise levels at identified nearby sensitive receptors (residential, school and hospital areas) including ecologically significant area/s (if any) likely to be affected and evaluate effectiveness of the noise reduction measures provided. (C) - Implement the Motor Vehicle Maintenance Plan including: ・Install noise control devices such as mufflers and noise	Excessive sound levels attenuated

Sub-component	Key Potential Impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
						suppressors on all construction equipment and machinery. Use of electric instead of diesel-powered equipment, hydraulic tools instead of pneumatic tools. (C) ・ Daily routine check-up of construction vehicles, equipment, and machineries must be strictly complied with(C) ・ Conduct regular inspection and preventive maintenance of heavy equipment, machineries, and ・ Impose a muffler sound limit - Proper design installation and maintenance of selected sound attenuation barriers option, e.g., vegetation barrier.service vehicles to meet the DENR Emission Standard(O)	

NOTES - P = preconstruction; C= construction, O = operation; A = abandonment or closure; +/ -: Positive/Adverse A= Significant impact is expected. B= Some impact is expected. C= Impact is unknown. D= No impact is expected, NPI –No Perceived Impact

Table ES-10 Summary of key impacts, mitigation options, and residual effect (People Component)

Sub-component	Key potential impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
People	- Displacement of settler/s or involuntary resettlement - Displacement / disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way Impact on Public Access	-A	D	D	D	- Authority document over RROW (P) - Conduct census of properties and land affected by the staging areas and RROW (P) - implement the Resettlement Action Plan (RAP) (P) - Undergo the FPIC process as prescribed under RA 8371. (P) - Secured the authority document of the RROW (C) - Strict implementation of Construction Plan specifications for each Project component. (C) - Proper implementation of the RAP(C)- Prepare detailed Right-of-Way Action Plan; Fair and just compensations to affected families; budget allocation and resources to PAFs and properties.	None
	Impacts on IPs/Cultures/Lifestyle	D	-A	-A	D	- Proper conduct of the FPIC process as prescribed under RA 8371. (A) - Strict implementation of Construction Plan specifications for each Project component.(C) - Proper orientation of migrant workers on culture oriented on	Impacts on IP group, culture, and lifestyle minimized

Sub-component	Key potential impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
						the culture and ways of living in the city/municipality (C)	
	Impacts on physical cultural resources	S	-A	-B	D	- Conduct survey of physical cultural resources (P) - Stop all works in the vicinity of the find, until a solution is found for the preservation of these artefacts, or advice from the relevant authorities is obtained. (C) - Decisions on how to handle the find shall be taken by the responsible authorities, including changes in the layout conservation, preservation, restoration and salvage. (C) - Construction works could only resume only after permission is granted from the responsible authorities. (C)	Physical cultural resources preserved
	Threat to public health and safety	D	-A	-A	-B	- Implement the Construction Waste Management Plan (C) including: ・ Temporary stockpiles of excavated materials from foundation works must be properly covered and regularly hauled to DENR approved disposal sites. ・ Litter and other types of domestic garbage from construction sites and camps must be properly kept in trash bins and regularly disposed through LGU garbage collectors. - Implement the Operation Waste Management Plan (OWMP) (O) including: ・ Regular maintenance of highway to reduce visual impact due to expected wear and tear. ・ Implementation of best housekeeping practices and continue the regularly disposed through LGU garbage collectors. - Formulate Occupational Health and Safety Protocols during construction and operation phases. - Grievance Redress Mechanism(P) - Strict implementation of Construction Plan specifications for each Project component. (C) - Implement the Motor Vehicle Maintenance Plan (C) - Proper implementation of the CWMP (C) - Conduct sensitization campaigns both for workers and local communities about illicit behavior and crime. (C)	Threat to public health and safety controlled and minimized

Sub-component	Key potential impact	P	C	O	A	Options for prevention, mitigation, and enhancement	Residual impact
						- Coordination with local law enforcement (C) - Maintain sanitary facilities (O) - Maintenance of traffic signs (O) - Proper implementation of the Traffic Management Plan (O)	
	Enhancement for the Local Benefits/Economies of the Project - *Generation of Local Employment*	D	+A	+A	+A	- Conduct skills training at the host LGUs (P) - Prioritize local hires (P) - Enhance the opportunity for new businesses and innovation (C) - Implement the Local Employment Plan (C) - Purchase supplies from local sources (C) - Provide livelihood opportunities if possible (C) - Prompt payment of taxes and other legal fees (C) - Prioritize hiring of qualified residents from host LGUs (O) - Purchase supplies from local sources (O) - Provide livelihood opportunities if available (O) - Prompt payment of fees and taxes (O)	Local benefits from the Project maximized
	Traffic contribution along impact roads	D	-B	+A	D	- Prepare a workable Traffic Management Plan (TMP) for all affected public roads (P) - Predetermined routes of construction materials (P) - Strict implementation of Construction Plan specifications for each Project component.(C) - Implement the Traffic Management Plan (C) - Proper implementation of the Traffic Management Plan	Traffic congestion and accidents controlled and minimized

NOTES - P = pre-aconstruction; C= construction, O = operation; A = abandonment or closure; +/-: Positive/Adverse A= Significant impact is expected. B= Some impact is expected. C= Impact is unknown. D= No impact is expected, NPI- No perceived impact

Table ES-11 Integrated summary of impacts and target efficiencies

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
Pre-construction[1]	(LAND) Land use and classification	- Compatibility with existing land use - Compatibility with classification as an Environmentally Critical Area (ECA) - Existing land tenure issue/s - Impairment of visual aesthetics - Devaluation of land value as a result of improper solid waste management and other related impacts	- Confirm classification of the other Project areas to the zoning regulation of the host cities and municipalities - Include susceptibility of the Project area to natural hazards in the Detailed Engineering Design - Documents showing authority to develop the Project RROW - Formulation and proper implementation of BZP, CWMP, and OWMP	All measures implemented (100%)
	(LAND) Geology	- Change in surface landform/geomorphology/topography/terrain/slope - Change in sub-surface geology/underground conditions - Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	- Conduct Geotechnical Investigation and EGGA and consider its recommendations in the DED - Conduct of Factual Geological mapping focusing on the geology, geomorphology, and geohazards, areas that may be prone to settlement or subsidence. - Prioritization scheme on rehabilitation of existing roads, landslide areas, and drainage canals.	100% compliance with the recommended mitigation measures
	(LAND) Pedology	Soil erosion / Loss of topsoil/overburden Change in soil quality/fertility	- Formulate a Soil Erosion Management Plan (SEMP) including: ・ Minimize the modified area to prevent soil erosion of new surface soil by cut and filling, ・ Ensure the slope protection after cut and filling as soon as possible. ・ Establish the adequate drainage system in the construction area" ・ Identify staging areas to prevent extensive development. ・ Formulate BZP	100% compliance with the recommended mitigation measures

[1] Although not expected to occur, inclusion of key impacts were included to indicate the recommended plans and studies for implementation during the Construction and Operation phases as due diligence.

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
	(LAND) Terrestrial biology	Impacts on terrestrial flora and fauna	- Conduct a census of flora along the RROW; - If possible, avoid removal of trees along the RROW and include them in the visual design. If not possible, trees will be balled and planted in areas that will not be affected by the project; - Secure a Tree Cutting Permit from the DENR; - Prepare CVRP, CVTPP, TTBP, TSMP, VTPPO, BCP, WMP	100% compliance with the recommended mitigation measures
	(WATER) Hydrology/ Hydrogeology	Change in drainage morphology/ Inducement of flooding/ Reduction in stream volumetric flow Change in stream depth Water resource use and competition Degradation of surface water quality	- Design adequate drainage system - Road design must be compatible with existing slopes, infrastructures, environmental condition. - Locate staging areas far from surface stream as possible - Formulate a Spoils Management Plan - Formulate WCP for the construction phase - Prepare plans for drainage and sediment ponds at the staging areas. - Prepare a Water Quality Monitoring Plan during construction and operation phases	100% compliance with the recommended mitigation measures
	(AIR) Air quality and Noise	- Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) - Degradation of air quality - Increase in ambient noise level	- Prepare an EMVMP during construction - Prepare AAQMP during construction and operation phases - Prepare a Noise Monitoring Plan (NMP) during construction and operation phases	100% compliance with the recommended mitigation measures
	PEOPLE	- Displacement of settler/s - Displacement / disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on Public Access - In-migration (proliferation of informal settlers) - Cultural/Lifestyle change (especially on Indigenous	- Authority document over RROW - Conduct census of properties and land affected by the staging areas and RROW - Prepare detailed Right-of-Way Action Plan; Fair and just compensations to affected families; budget allocation and resources to PAFs and properties. - Undergo the FPIC process - Conduct consultations with the stakeholders and formulate mutually agreed schemes - Review Journal of Assessment Transactions on Market and Assessed Land Values to ensure fair compensation	100% compliance with the recommended mitigation measures

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
		People, if any) - Impacts on physical cultural resources - Threat to public health and safety - Enhancement for the Local Benefits of the Project - *Generation of Local Employment* - Traffic congestion	- Prepare ISMP - Conduct survey of physical cultural resources - Prepare CFMP - Prepare CWMP and OWMP - Formulate Occupational Health and Safety Protocols during construction and operation phases - Grievance Redress Mechanism - Conduct skills training at the host LGUs - Prepare a LEP - Prepare a workable TMP for all affected public roads - Predetermined routes of construction materials	
Construction	(LAND) Land use and classification	- Compatibility with existing land use - Compatibility with classification as an Environmentally Critical Area (ECA) - Existing land tenure issue/s - Impairment of visual aesthetics - Devaluation of land value as a result of improper solid waste management and other related impacts	- Proper implementation of the BZP - Strict implementation of Construction Plan specifications for each Project component - Proper implementation of the CWMP	100% compliance with the recommended mitigation measures
	(LAND) Geology /Geomorphology	- Change in surface landform/geomorphology/topography/terrain/slope - Change in sub-surface geology/underground conditions - Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	- Employ appropriate erosion control and slope protection measures. - Designate a spoils storage area and optimize re-use of spoils. - Construction drainage canals at the break-of-slope (between the gentle to moderate slopes). - Slope re-contouring, benching or lowering the slope gradient - Good drainage system including under drain construction and anchored structures. - Field assessment in active construction sites especially after heavy and prolonged rains and after earthquakes (if it occurs).	100% compliance with the recommended mitigation measures

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
			- Apply appropriate slope protection and other engineered structures - Increase vegetation cover particularly at the vicinity of the breakof-slope - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes) - Slope re-contouring, benching or lowering the slope gradient - Good drainage system including under drain constructions and anchored structures. - Strict implementation of Construction Plan specifications for each Project component.	
	(LAND) Pedology	- Soil erosion or loss of topsoil - Change in soil quality/fertility	- Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the SEMP - Immediate removal of excavated soil, stockpiled in a safe place and disposed in the designated disposal site. - Optimize re-use of spoils - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes). - Cover stockpiles with plastic sheeting; construct perimeter sediment barriers; - Divert upstream drainage away from the stockpiles - Install drainage canals and settling pond. - Proper implementation of the BZP and CWMP	- Minimize (85-99%) or avoid (100%) soil erosion and contamination
	(LAND) Terrestrial Ecology	- Vegetation removal and loss of habitat - Threat to existence of important local species - Threat to abundance, frequency and distribution of important species - Hindrance to wildlife access	- Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the CVRP, CVTPP, BZP, TTBP, and comply with the DENR requirements to remove and replace affected trees within the Road Right-of-Way (RROW) in coordination with EMB X, concerned PENROs and CENROs. Limit the development activities within the planned structure or component footprint.	-100% compliance with the recommended mitigation measures in accordance to RA 9147

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
			- Establish on site nurseries in accessible locations - Transplant saplings to affected areas especially riparian zones - Strict implementation of Construction Plan specifications for each Project component. - Strict implementation of a "*No Hunting and No Collecting*" policy - Collect saplings of endangered, vulnerable and other threatened species and harden in nurseries for eventual transplanting to target areas, particularly riparian zones	
	(WATER) Hydrology/ Hydrogeology	- Change in drainage morphology - Inducement of flooding - Reduction in stream volumetric flow Change in stream depth	- Strict implementation of Construction Plan specifications for each Project component. - All earthworks for site preparation and trench excavation implemented during the low rainfall period if possible - Reuse excavated earth material for backfilling whenever feasible - Backfilling and leveling of the borrow pits to prevent water ponding - Provide adequate drainage systems to minimize the impact downstream of active construction sites - Limit the area of project activities within the RROW - Regular checking of temporary drainage canals to ensure adequate storm water flow. - Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the SEMP and Spoils Management Plan - Installation of sedimentation basins where applicable - Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the Water Conservation Plan.	- Minimize (85-99%) or avoid siltation (100%) - 100% compliance with the recommended mitigation measures in accordance to RA 9275
	(WATER) Water Quality	Degradation of surface water quality	- Strict implementation of Construction Plan specifications for each Project component. - Best housekeeping practices - Provide onsite sanitary facilities	- Provide sufficient onsite sanitary facilities (100%) - 100% compliance with the recommended

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
			- Adequate drainage leading to siltation ponds - Implement the Water Quality Monitoring Plan during construction phase ;Engage the services of the accredited third-party water treatment companies to ensure the treatment of the wastewater coming from different sources in compliance with the DENR standards and shall comply with all the provisions of RA 9275, the Philippine Clean Water Act of 2004 and its Implementing Rules and Regulations;	mitigation measures in accordance to RA 9275 - 100% compliance with the recommended mitigation measures
	(WATER) Freshwater Ecology	- Threat to existence and/or loss species of important local and habitat - Threat to abundance, frequency and distribution of species	- Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the SEMP - Bunded area for tanked fuels, lubricants, etc., at the staging areas with drainage leading to oil-water separator. - Proper implementation of the CWMP - Provide onsite sanitation facilities - Provide cover on vehicles carrying construction materials - No wastewater discharges into rivers or streams - Contain runoff from construction areas with silt traps or curtains - Maintain water quality of the Project Site according to minimum standards or better, particularly on Total Suspended Solids, Dissolved Oxygen, and Phosphate	100% compliance with the recommended mitigation measures in accordance to RA 9275
	(AIR) Air Quality and Noise	- Degradation of air quality - Increase in ambient noise level	- Strict implementation of Construction Plan specifications for each Project component. - Divide active construction sites into smaller areas if possible; - Apply dust suppression measures, e.g., water application, in active construction areas; - Replace vegetation in non-structure areas to minimize wind erosion of topsoil; - Compact exposed soil surfaces; - Provide tarpaulin cover on trucks loaded with construction materials;	- Compliance to the Clean Air Act (100%) - 100% compliance with the recommended mitigation measures in accordance to RA 9275

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
			- . Impose speed restrictions minimize (15-20 kph). - Component for Hazardous waste, mitigation measures and target efficiency in accordance with RA 6969 - Strict implementation of Construction Plan specifications for each Project component. - Implement the Motor Vehicle Maintenance Plan - Use of low-sulfur fuel - Implement the Ambient Air Quality Monitoring Plan (AAQMP) during construction phase - Maintenance of motor vehicle mufflers; - Provision of barriers and shielding stationary vibrating equipment; and - If possible, scheduling of noisy activities during day time. - Implement the Noise Monitoring Plan - Implement the Motor Vehicle Maintenance Plan	
	PEOPLE	- Displacement of settlers - Displacement/disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on Public Access	- Secured the authority document of the RROW - Strict implementation of Construction Plan specifications for each Project component. - Proper implementation of the RAP - Prepare detailed Right-of-Way Action Plan; Fair and just compensations to affected families; budget allocation and resources to PAFs and properties.	-100% compliance with the recommended mitigation measures in accordance to all applicable provisions of RA 7279 (UDHA) , JICA Guidelines for environmental and social considerations and the ADB resettlement policy (100%) -100% compliance with the proposed mitigation measures
	PEOPLE	In-Migration	- Implement the Informal Settler Monitoring Plan - Prioritize local hiring	100% compliance with the recommended mitigation measures

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
	PEOPLE	Cultural/Lifestyle change (especially on Indigenous People, if any)	- Strict implementation of Construction Plan specifications for each Project component. - Proper orientation of migrant workers on culture oriented on the culture and ways of living in the city/municipality	100% compliance with the recommended mitigation measures in close coordination with NCIP and tribal leaders and communities
		Threat to delivery of basic services /resource competition	- Strict implementation of Construction Plan specifications for each Project component. - Implement the Informal Settler Monitoring Plan - Coordination of DPWH/contractor with the host LGUs regarding needs of the migrants and residents of the community	100% compliance with the recommended mitigation measures in accordance to RA 10066 in coordination with LGU.
		Threat to public health and safety	- Strict implementation of Construction Plan specifications for each Project component. - Implement the Construction Waste Management Plan - Implement the Motor Vehicle Maintenance Plan - Proper implementation of the CWMP - Conduct sensitization campaigns both for workers and local communities about illicit behavior and crime. - Coordination with local law enforcement	100% compliance with the recommended mitigation measures in coordination with LGU.
		Generation of local benefits from the Project (BENEFICIAL IMPACT)	- Increased LGU revenues resulting from the purchase of locally available materials and equipment for construction, translating to additional taxes. - Business establishments should be properly registered and payment of the required taxes shall be monitored. - Alleviate economy and generation of employment income to hosts, nearby barangays, and the two provinces as a whole pursuant to DPWH Department Order No. 130, Series of 2016, "Guidelines for the Implementation of the Provisions of Republic Act No. 66885 and Republic Act No. 9710 or the Magna Carta of Women which Specify the following: - Mandatory minimum percentage of 50% of the unskilled labor	100% compliance with the recommended mitigation measures in coordination with LGU.

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
			requirements shall be recruited in the Barangay where the project is located. - Mandatory 30% of the skilled labor requirement shall be recruited in the Barangay where the project is located. - Purchase supplies from local sources - Provide livelihood opportunities if possible - Prompt payment of taxes and other legal fees	
		Traffic congestion	- Strict implementation of Construction Plan specifications for each Project component. - Implement the Traffic Management Plan	100% com100% compliance with the recommended mitigation measures in accordance to RA 6685 and RA 9710 in coordination with DOLE, LGUs and Industry Sectors.
Opening of the CMH to traffic	(LAND) Land use and classification	. ▪ Devaluation of land value as a result of improper solid waste management and other related impacts	- Sustained implementation of the BZP - Regular operation and maintenance of the highway - Implementation of the OWMP - Best housekeeping practices	100% compliance with the recommended mitigation measures in accordance to RA 6685 and RA 9710 in coordination with DOLE, LGUs and Industry Sectors.
	(LAND) Geology	▪ Change in surface landform/ geomorphology/ topography/terrain/slope ▪ Change in sub-surface geology/underground conditions. ▪ Effects of geohazards to the Project	- Regular monitoring of slope conditions and slope stabilization measures constructed with focus on landform change. - Regular monitoring of identified areas prone to subsidence particularly those underlain by the limestone. - Follow recommendations of the geotechnical / civil engineer / geologist to address any adverse geological and geomorphological conditions. - Regular monitoring of slope condition and slope stabilization measures especially after prolonged rains and earthquakes. - Regular monitoring of areas with identified geological hazards, its current condition and the degree of the effects of hazards previously identified.	All measures implemented (100%)

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
	(LAND) Pedology	- Soil erosion / Loss of topsoil/overburden - Change in soil quality/fertility	- Regular monitoring of areas previously identified as erosion prone. Focus on sections with steep slopes, areas transected by river and creek channels, and exposed areas prone to soil erosion. - Sustained implementation of the Soil Erosion Management Plan - LGU/and or toll operators should have provision of emergency preparedness and response plan from implementation and strict compliance of national disaster risk reduction measures	- Minimize (85-99%) or avoid siltation (100%) - 100% compliance with the recommended mitigation measures in accordance with RA 9275
	(LAND) Terrestrial Ecology	- Vegetation removal - Threat to existence of important indigenous species - Threat to Abundance, Frequency, and Distribution of Important Species - Hindrance to Wildlife Access	- Sustained implementation of the BZP - Proper implementation of the CVRP, CVTPP, BZP, TTBP, and Tree Cutting Permit conditions - Regular maintenance of the highway	100% compliance with the recommended mitigation measures
	(WATER) Hydrology/ Hydrogeology	- Change in drainage morphology/ Inducement of flooding/ Reduction in stream flow - Change in stream depth - Water resource use and competition	- Regular maintenance of drainage canals, pipe culvert, cross drains. - Restoration and maintenance of natural drainage traversed by the alignment. - Sustained implementation of the Water Conservation Plan	100% compliance with the recommended mitigation measures
	(WATER) Water quality	Degradation of surface water quality	- Best housekeeping practices - Provision of sanitation facilities - Maintain drainage system leading to siltation ponds - Implement the Water Quality Monitoring Plan for operation phase	- Provide sufficient sanitary facilities (100%) - Compliance to the Clean Water Act (100%) - All other measures implemented (100%)
	(WATER) Freshwater Ecology	- Threat to existence and/or loss species of important local and habitat - Threat to abundance, frequency	- Sustained implementation of the SEMP and BZP - Bunded area for tanked fuels, lubricants, etc., with drainage leading to oil-water separator. - Proper implementation of the Operation Waste Management	100 % compliant to RA 9275 and other applicable regulations

Project activity	Component (Sub-component)	Key potential impact	Options for Prevention, Mitigation, Enhancement	Target efficiency
		and distribution of species	Plan - Provide onsite sanitation facilities - No wastewater discharges into rivers or streams - Implement the Water Quality Monitoring Plan for operation phase	
	(AIR) Meteorology/ Climatology	Contribution in terms of greenhouse gas emissions (or GHG mitigation potential).	- Impose speed restrictions - Prohibit idling in parking areas and emergency curbs	100% compliance with the recommended mitigation measures
	(WATER) Air Quality and Noise	Air pollution from motor vehicles	- Proper installation, and maintenance of selected option, e.g., vegetation barrier. - Impose speed limits - Impose a muffler sound limit - Proper design installation and maintenance of selected sound attenuation barriers option, e.g., vegetation barrier.	100% compliance with the recommended mitigation measures
	PEOPLE	Threat to public health and safety	- Maintain sanitary facilities - Maintenance of traffic signs - Proper implementation of the Traffic Management Plan	100% compliance with the recommended mitigation measures
	PEOPLE	Generation of local benefits from the Project (BENEFICIAL IMPACT)	- Prioritize hiring of qualified residents from host LGUs - Purchase supplies from local sources - Provide livelihood opportunities if available - Prompt payment of fees and taxes	100% compliance with the recommended mitigation measures
	PEOPLE	Traffic congestion	Proper implementation of the Traffic Management Plan	100% compliance with the recommended mitigation measures

CHAPTER 1 - PROJECT DESCRIPTION

1.1 Project location and area

1.1.1 General location and area

The proposed Central Mindanao High Standard Highway Project (Cagayan de Oro - Malaybalay Section) ("***Project***" or "***alignment***") is part of the Master Plan on High Standard Highway Network Development, Phase II. The Project is a new alignment that will supplement the existing road network in Region X. The objectives of the plan were to improve transport efficiency in the region, contribute to improving connectivity between the cities of Cagayan de Oro and Malaybalay, as well as the economic development of the surrounding areas.

The Project with a length of 65.6 kilometers will traverse 27 barangays of four municipalities and two cities in the Provinces of Misamis Oriental and Bukidnon in Region X-Northern Mindanao (**Table 1-1**). The general location and jurisdiction maps and the host barangays are shown in **Figure 1-1.**

The boundaries of the Project are defined by the geographic coordinates under WGS 89 are shown in **Table 1-2** based on points shown in **Figure 1-1.**

The proposed Project will be spearheaded by the Department of Public Works and Highways (DPWH) with the assistance of the Japan International Cooperation Agency (JICA).

Table 1-1. Jurisdictions of the Project alignment

Province	City/Municipality	Barangay	Province	City/Municipality	Barangay
Misamis Oriental	Cagayan de Oro City	Bugo	Bukidnon	Impasug-ong	Poblacion
		Puerto			La Fortuna
		Balubal			Cawayan
	Tagoloan	Casinglot			Capitan Bayong
		Natumolan			Impalutao
Bukidnon	Manolo Fortich	Alae		Malaybalay	Dalwangan
		San Miguel			Patpat
		Damilag			Kalasungay
		Dicklum	**Total: 2**	**Total: 6**	**Total: 27**
		Sankanan	Source: JICA Study Team		
		Tankulan			
		Ticala			
		Mambatangan			
	Sumilao	Puntian			
		Vista Villa			
		Culasi			
		Poblacion			
		Kisolon			
		San Roque			

Table 1-2. Point coordinates of the proposed CMH Project

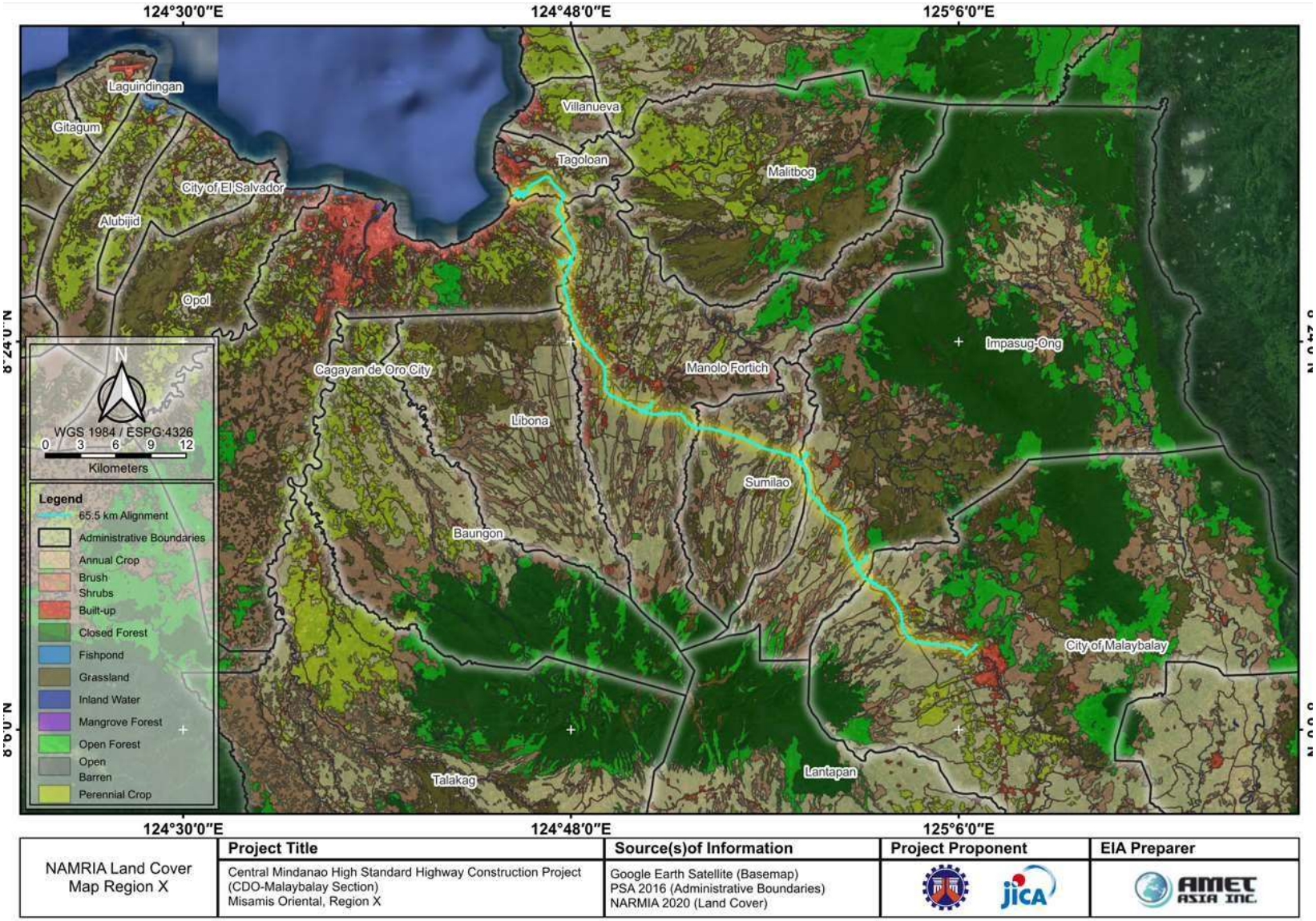
Pt	Longitude	Latitude	Pt	Longitude	Latitude	Pt	Longitude	Latitude
START -1	124.7576	8.5140	171	124.7943	8.4888	341	124.8975	8.3333
2	124.7609	8.5128	172	124.7944	8.4885	342	124.8981	8.3332
3	124.7657	8.5150	173	124.7945	8.4883	343	124.8987	8.3332
4	124.7670	8.5187	174	124.7946	8.4881	344	124.9066	8.3329
5	124.7693	8.5212	175	124.7980	8.4819	345	124.9069	8.3329
6	124.7732	8.5231	176	124.7980	8.4818	346	124.9074	8.3328
7	124.7753	8.5243	177	124.7981	8.4816	347	124.9076	8.3328
8	124.7791	8.5267	178	124.7982	8.4814	348	124.9078	8.3328
9	124.7844	8.5252	179	124.7983	8.4813	349	124.9081	8.3327
10	124.7850	8.5238	180	124.7984	8.4812	350	124.9083	8.3327
11	124.7870	8.5210	181	124.7984	8.4811	351	124.9085	8.3326
12	124.7937	8.5147	182	124.7985	8.4810	352	124.9088	8.3325
13	124.7942	8.5107	183	124.7986	8.4810	353	124.9316	8.3260
14	124.7899	8.5040	184	124.7986	8.4810	354	124.9322	8.3259
15	124.7897	8.5004	185	124.7987	8.4808	355	124.9332	8.3255
16	124.7916	8.4967	186	124.7989	8.4806	356	124.9337	8.3253
17	124.7923	8.4957	187	124.7990	8.4805	357	124.9342	8.3251
18	124.7932	8.4944	188	124.7990	8.4804	358	124.9347	8.3248
19	124.7940	8.4919	189	124.7991	8.4803	359	124.9352	8.3246
20	124.7940	8.4902	190	124.7992	8.4802	360	124.9357	8.3243
21	124.7946	8.4881	191	124.7993	8.4801	361	124.9361	8.3240
22	124.7980	8.4819	192	124.7993	8.4799	362	124.9396	8.3219
23	124.8023	8.4695	193	124.8019	8.4750	363	124.9409	8.3212
24	124.7986	8.4581	194	124.8021	8.4744	364	124.9437	8.3197
25	124.7979	8.4565	195	124.8025	8.4732	365	124.9451	8.3191
26	124.7964	8.4529	196	124.8026	8.4726	366	124.9465	8.3185
27	124.7950	8.4481	197	124.8027	8.4720	367	124.9479	8.3179
28	124.7946	8.4454	198	124.8027	8.4713	368	124.9494	8.3174
29	124.7956	8.4383	199	124.8026	8.4707	369	124.9509	8.3170
30	124.7963	8.4365	200	124.8025	8.4701	370	124.9524	8.3166
31	124.7977	8.4311	201	124.8023	8.4695	371	124.9698	8.3123
32	124.7980	8.4277	202	124.7986	8.4581	372	124.9703	8.3121
33	124.7988	8.4236	203	124.7985	8.4579	373	124.9714	8.3117
34	124.8012	8.4163	204	124.7984	8.4576	374	124.9719	8.3114
35	124.8028	8.4127	205	124.7983	8.4574	375	124.9724	8.3112
36	124.8092	8.4000	206	124.7982	8.4572	376	124.9729	8.3108
37	124.8114	8.3972	207	124.7982	8.4570	377	124.9734	8.3105
38	124.8159	8.3933	208	124.7981	8.4568	378	124.9738	8.3101
39	124.8179	8.3909	209	124.7980	8.4566	379	124.9742	8.3097
40	124.8198	8.3876	210	124.7979	8.4565	380	124.9795	8.3040
41	124.8264	8.3750	211	124.7964	8.4529	381	124.9802	8.3032
42	124.8263	8.3662	212	124.7962	8.4524	382	124.9814	8.3015
43	124.8315	8.3579	213	124.7958	8.4514	383	124.9818	8.3006
44	124.8590	8.3451	214	124.7956	8.4508	384	124.9823	8.2996
45	124.8657	8.3438	215	124.7955	8.4503	385	124.9826	8.2987
46	124.8710	8.3442	216	124.7953	8.4498	386	124.9829	8.2977
47	124.8742	8.3443	217	124.7952	8.4492	387	124.9830	8.2966
48	124.8828	8.3442	218	124.7951	8.4487	388	124.9831	8.2956
49	124.8865	8.3424	219	124.7950	8.4481	389	124.9836	8.2886
50	124.8881	8.3401	220	124.7946	8.4454	390	124.9837	8.2875
51	124.8922	8.3360	221	124.7945	8.4446	391	124.9842	8.2854
52	124.8937	8.3349	222	124.7945	8.4430	392	124.9845	8.2844
53	124.8987	8.3332	223	124.7946	8.4422	393	124.9850	8.2834
54	124.9066	8.3329	224	124.7947	8.4414	394	124.9855	8.2824
55	124.9088	8.3325	225	124.7948	8.4406	395	124.9861	8.2815
56	124.9316	8.3260	226	124.7950	8.4398	396	124.9868	8.2807
57	124.9361	8.3240	227	124.7953	8.4390	397	124.9875	8.2799
58	124.9396	8.3219	228	124.7956	8.4383	398	124.9910	8.2764
59	124.9524	8.3166	229	124.7963	8.4365	399	124.9913	8.2761
60	124.9698	8.3123	230	124.7966	8.4359	400	124.9918	8.2756
61	124.9742	8.3097	231	124.7970	8.4347	401	124.9920	8.2753
62	124.9795	8.3040	232	124.7971	8.4341	402	124.9922	8.2750

Pt	Longitude	Latitude	Pt	Longitude	Latitude	Pt	Longitude	Latitude
63	124.9831	8.2956	233	124.7973	8.4335	403	124.9924	8.2747
64	124.9836	8.2886	234	124.7974	8.4329	404	124.9926	8.2744
65	124.9875	8.2799	235	124.7975	8.4323	405	124.9928	8.2741
66	124.9910	8.2764	236	124.7976	8.4317	406	124.9930	8.2738
67	124.9930	8.2738	237	124.7977	8.4311	407	124.9954	8.2699
68	124.9954	8.2699	238	124.7980	8.4277	408	124.9956	8.2695
69	124.9983	8.2669	239	124.7980	8.4272	409	124.9962	8.2688
70	125.0074	8.2612	240	124.7981	8.4263	410	124.9965	8.2684
71	125.0124	8.2528	241	124.7982	8.4259	411	124.9968	8.2681
72	125.0130	8.2440	242	124.7983	8.4254	412	124.9972	8.2678
73	125.0147	8.2383	243	124.7984	8.4249	413	124.9975	8.2675
74	125.0233	8.2229	244	124.7985	8.4245	414	124.9979	8.2672
75	125.0325	8.2139	245	124.7987	8.4240	415	124.9983	8.2669
76	125.0428	8.2085	246	124.7988	8.4236	416	125.0074	8.2612
77	125.0463	8.2053	247	124.8012	8.4163	417	125.0083	8.2605
78	125.0541	8.1928	248	124.8014	8.4159	418	125.0099	8.2590
79	125.0554	8.1891	249	124.8017	8.4151	419	125.0106	8.2581
80	125.0564	8.1808	250	124.8018	8.4147	420	125.0112	8.2571
81	125.0702	8.1673	251	124.8020	8.4143	421	125.0116	8.2561
82	125.0863	8.1657	252	124.8022	8.4139	422	125.0120	8.2550
83	125.0910	8.1650	253	124.8024	8.4135	423	125.0122	8.2539
84	125.1003	8.1631	254	124.8026	8.4131	424	125.0124	8.2528
85	124.7609	8.5128	255	124.8028	8.4127	425	125.0130	8.2440
86	124.7616	8.5126	256	124.8092	8.4000	426	125.0130	8.2433
87	124.7628	8.5126	257	124.8094	8.3996	427	125.0133	8.2420
88	124.7635	8.5128	258	124.8098	8.3990	428	125.0134	8.2414
89	124.7640	8.5130	259	124.8100	8.3986	429	125.0136	8.2407
90	124.7646	8.5134	260	124.8102	8.3983	430	125.0138	8.2401
91	124.7650	8.5138	261	124.8105	8.3980	431	125.0141	8.2395
92	124.7654	8.5144	262	124.8108	8.3977	432	125.0144	8.2389
93	124.7657	8.5150	263	124.8111	8.3975	433	125.0147	8.2383
94	124.7670	8.5187	264	124.8114	8.3972	434	125.0233	8.2229
95	124.7671	8.5190	265	124.8159	8.3933	435	125.0240	8.2217
96	124.7675	8.5197	266	124.8162	8.3931	436	125.0258	8.2193
97	124.7677	8.5200	267	124.8166	8.3926	437	125.0267	8.2183
98	124.7680	8.5203	268	124.8169	8.3923	438	125.0278	8.2173
99	124.7683	8.5206	269	124.8171	8.3921	439	125.0289	8.2163
100	124.7686	8.5208	270	124.8173	8.3918	440	125.0300	8.2154
101	124.7689	8.5211	271	124.8175	8.3915	441	125.0313	8.2146
102	124.7693	8.5212	272	124.8177	8.3912	442	125.0325	8.2139
103	124.7732	8.5231	273	124.8179	8.3909	443	125.0428	8.2085
104	124.7734	8.5232	274	124.8198	8.3876	444	125.0433	8.2082
105	124.7739	8.5235	275	124.8199	8.3873	445	125.0442	8.2076
106	124.7741	8.5236	276	124.8202	8.3869	446	125.0446	8.2073
107	124.7744	8.5237	277	124.8204	8.3867	447	125.0450	8.2069
108	124.7746	8.5238	278	124.8206	8.3865	448	125.0453	8.2065
109	124.7748	8.5240	279	124.8207	8.3863	449	125.0457	8.2061
110	124.7751	8.5241	280	124.8209	8.3861	450	125.0460	8.2057
111	124.7753	8.5243	281	124.8211	8.3859	451	125.0463	8.2053
112	124.7791	8.5267	282	124.8213	8.3858	452	125.0541	8.1928
113	124.7797	8.5270	283	124.8224	8.3848	453	125.0543	8.1924
114	124.7811	8.5273	284	124.8241	8.3827	454	125.0547	8.1916
115	124.7818	8.5272	285	124.8248	8.3816	455	125.0549	8.1912
116	124.7824	8.5270	286	124.8254	8.3803	456	125.0550	8.1908
117	124.7830	8.5267	287	124.8259	8.3790	457	125.0551	8.1904
118	124.7836	8.5263	288	124.8262	8.3777	458	125.0552	8.1899
119	124.7840	8.5258	289	124.8264	8.3764	459	125.0553	8.1895
120	124.7844	8.5252	290	124.8264	8.3750	460	125.0554	8.1891
121	124.7850	8.5238	291	124.8264	8.3651	461	125.0564	8.1808
122	124.7852	8.5235	292	124.8269	8.3628	462	125.0568	8.1785
123	124.7855	8.5228	293	124.8274	8.3618	463	125.0587	8.1743
124	124.7858	8.5225	294	124.8280	8.3608	464	125.0601	8.1725
125	124.7860	8.5222	295	124.8287	8.3599	465	125.0618	8.1709
126	124.7862	8.5219	296	124.8296	8.3591	466	125.0636	8.1695

Pt	Longitude	Latitude	Pt	Longitude	Latitude	Pt	Longitude	Latitude
127	124.7865	8.5216	297	124.8305	8.3585	467	125.0657	8.1685
128	124.7867	8.5213	298	124.8315	8.3579	468	125.0679	8.1677
129	124.7870	8.5210	299	124.8590	8.3451	469	125.0702	8.1673
130	124.7937	8.5147	300	124.8597	8.3448	470	125.0863	8.1657
131	124.7940	8.5144	301	124.8611	8.3443	471	125.0868	8.1657
132	124.7945	8.5135	302	124.8619	8.3441	472	125.0879	8.1656
133	124.7946	8.5131	303	124.8626	8.3440	473	125.0884	8.1655
134	124.7947	8.5126	304	124.8634	8.3439	474	125.0889	8.1654
135	124.7946	8.5121	305	124.8642	8.3438	475	125.0894	8.1653
136	124.7946	8.5116	306	124.8649	8.3438	476	125.0899	8.1652
137	124.7944	8.5112	307	124.8657	8.3438	477	125.0905	8.1651
138	124.7942	8.5107	308	124.8710	8.3442	478	125.0910	8.1650
139	124.7899	8.5040	309	124.8714	8.3442	479	125.1003	8.1631
140	124.7897	8.5037	310	124.8721	8.3442	480	125.1009	8.1629
141	124.7894	8.5029	311	124.8724	8.3443	481	125.1022	8.1624
142	124.7893	8.5024	312	124.8728	8.3443	482	125.1028	8.1620
143	124.7893	8.5020	313	124.8732	8.3443	483	125.1034	8.1616
144	124.7893	8.5016	314	124.8735	8.3443	484	125.1039	8.1612
145	124.7894	8.5012	315	124.8739	8.3443	485	125.1044	8.1606
146	124.7895	8.5008	316	124.8742	8.3443	486	125.1048	8.1601
147	124.7897	8.5004	317	124.8828	8.3442	487	125.1052	8.1595
148	124.7916	8.4967	318	124.8833	8.3442	488	124.7993	8.4799
149	124.7917	8.4966	319	124.8842	8.3440	489	124.8019	8.4750
150	124.7918	8.4964	320	124.8847	8.3438	490	125.1093	8.1611
151	124.7919	8.4962	321	124.8851	8.3436	491	125.1096	8.1613
152	124.7920	8.4961	322	124.8855	8.3434	492	125.1099	8.1614
153	124.7920	8.4960	323	124.8859	8.3431	493	125.1101	8.1616
154	124.7921	8.4959	324	124.8862	8.3427	494	125.1104	8.1619
155	124.7922	8.4958	325	124.8865	8.3424	495	125.1106	8.1621
156	124.7923	8.4957	326	124.8881	8.3401	496	125.1109	8.1623
157	124.7932	8.4944	327	124.8885	8.3396	497	125.1111	8.1625
158	124.7933	8.4942	328	124.8893	8.3386	498	125.1113	8.1628
159	124.7936	8.4936	329	124.8898	8.3381	499	125.1090	8.1611
160	124.7937	8.4933	330	124.8902	8.3376	500	125.1093	8.1613
161	124.7938	8.4931	331	124.8907	8.3372	501	125.1096	8.1614
162	124.7939	8.4928	332	124.8912	8.3368	502	125.1099	8.1616
163	124.7940	8.4925	333	124.8917	8.3364	503	125.1101	8.1619
164	124.7940	8.4922	334	124.8922	8.3360	504	125.1104	8.1621
165	124.7940	8.4919	335	124.8937	8.3349	505	125.1106	8.1623
166	124.7940	8.4902	336	124.8942	8.3346	506	125.1109	8.1625
167	124.7940	8.4900	337	124.8953	8.3340	507	125.1111	8.1628
168	124.7941	8.4895	338	124.8958	8.3338	END - 508	125.1113	8.1630
169	124.7941	8.4892	339	124.8964	8.3336			
170	124.7942	8.4890	340	124.8969	8.3334			

Source: derived from Google Earth

Figure 1-1. General location map of the Project



1.1.2 Initial impact areas

The **Revised Procedural Manual (RPM) of DAO 2003-30** defined the Direct Impact Area (DIA) at the pre-EIA stage as the extent where all "*Project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken*".
The **Direct Impact Area (DIA)** is the RROW of the 65.6-kilometer alignment following Annex 2-2 of the Revised Procedural Manual of DAO 2003-30 (**Figure 1-2**). Based on the definitions provided, Direct Impact Areas (DIA) are areas directly affected by the Project's ROW where acquisition of properties and displacement of structures will be required. The host cities, municipalities and barangays are listed in **Table 1-1.** The direct initial impact areas in the municipal and barangay levels are shown in **Figure 1-3** and **Figure 1-4** respectively. The **Indirect Impact Area (IIA)** was initially assumed as areas within one kilometer (1km) from the center of the alignment. In addition, barangays adjacent to the Direct Impact Barangays (DIB) will be considered as Indirect Impact Barangays (IIB). The IIA is arbitrarily at the pre-EIA stage, clearly delineated after the study is completed, and is more accurately established during post-ECC monitoring (**Table 1-3**).

The Project is mostly surrounded by dense agricultural areas with some residential and forest patches. The Significant environmental features areas are shown in **Figure 1-5**. Photographs of Project alignment and interchanges are shown in **Figure 1-6** and **Figure 1-7**. The NAMRIA topographic map showing the Project site is shown in **Figure 1-8**.

Table 1-3. Guide for delineating post-EIA impact areas

Components	Details
Air	Areas where maximum ground level concentrations (GLC) of particulates are predicted to occur.
Water	Rivers and streams along the road alignment and RROW
Land	Staging areas, road alignment and RROW
Socioeconomics	Impacts in terms of relevant socioeconomic parameters

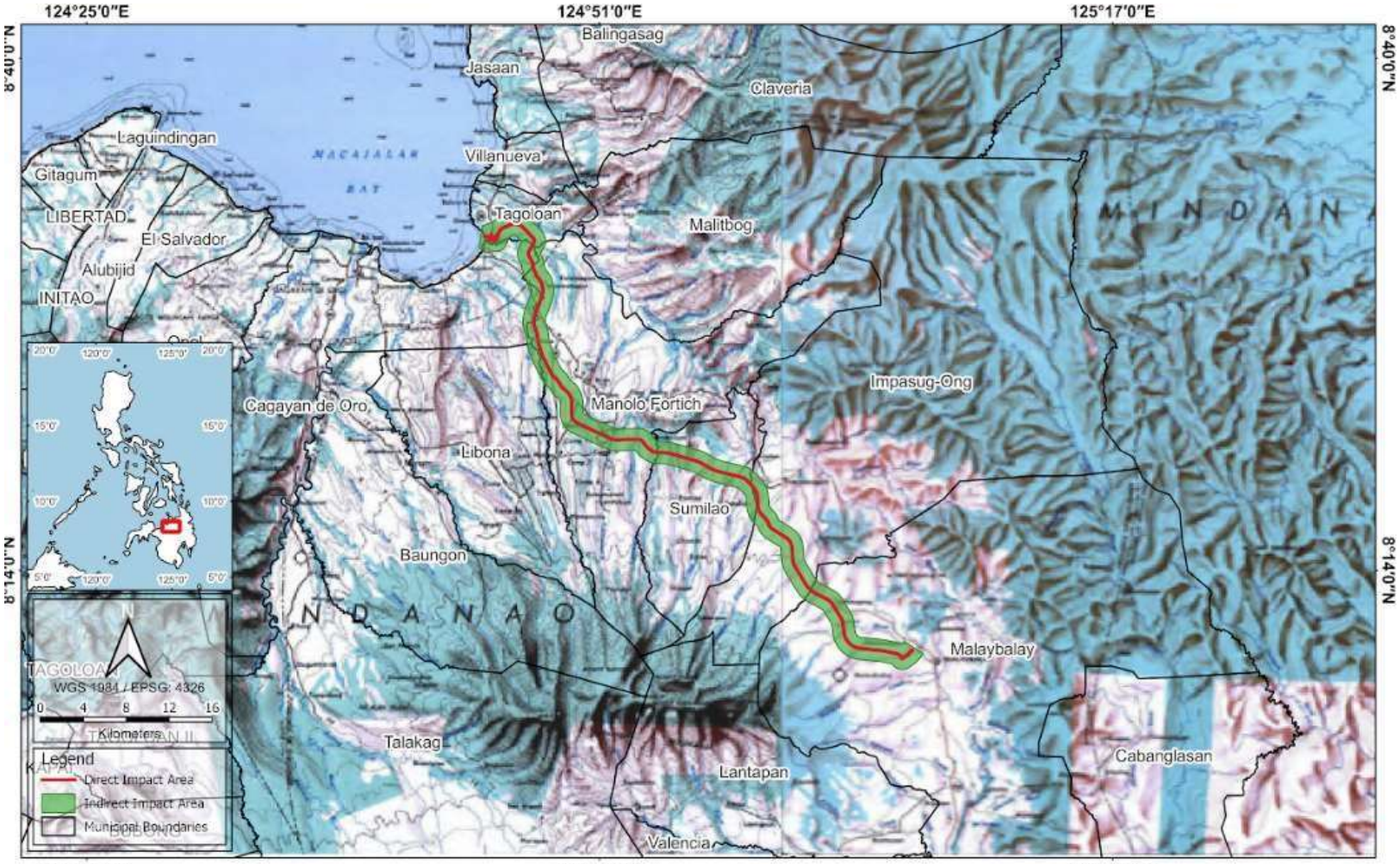
1.1.3 Site accessibility

The objective of the Project is to contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay. The Project is accessible via the Butuan-Cagayan de Oro - Iligan Road in the north and the Sayre Highway in the south (**Table 1-4**).

Table 1-4. Regional access to the Project site

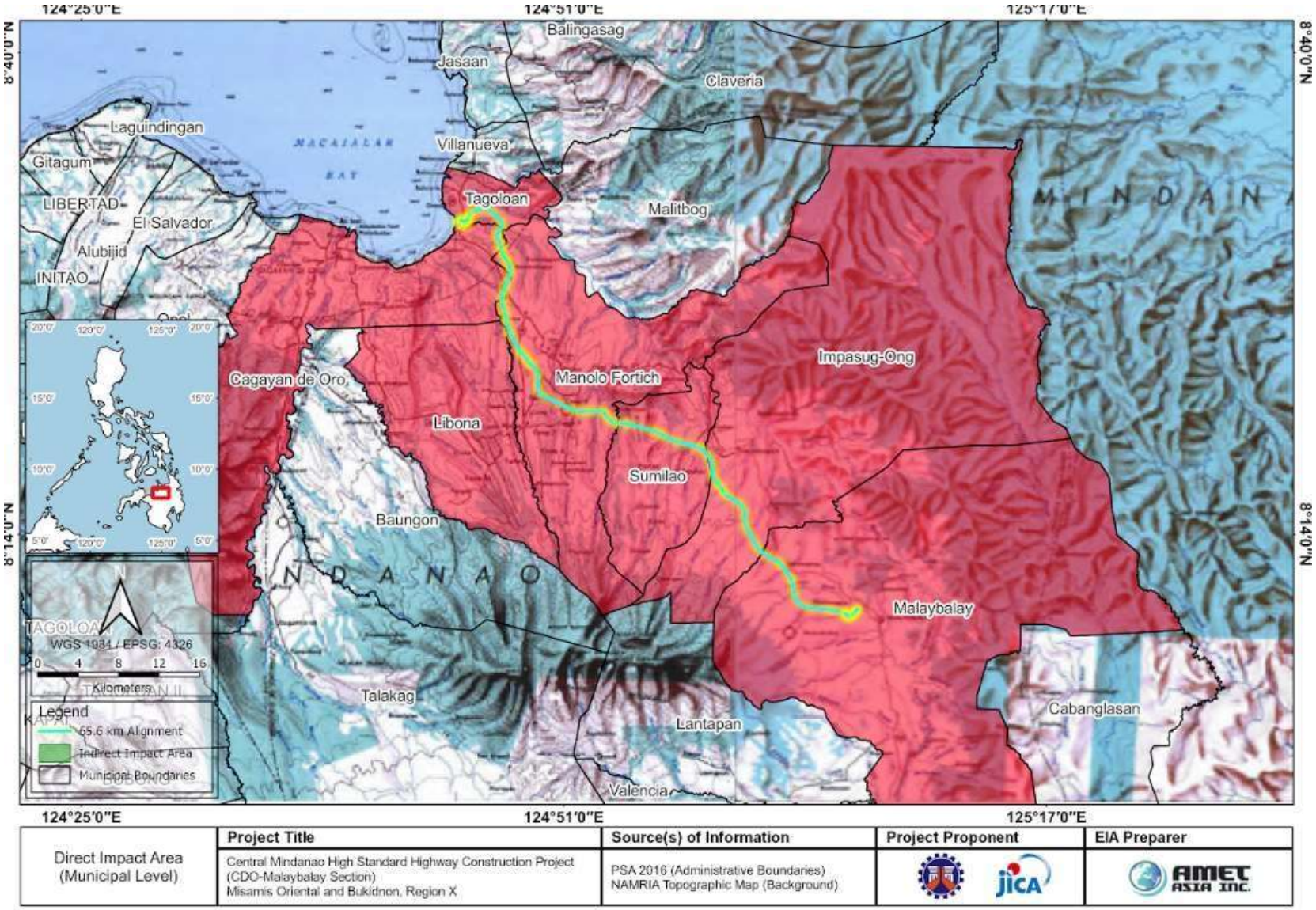
Direction	Origin	Route
North	Iligan City Lanao del Norte and Butuan, Agusan del Norte	Butuan-Cagayan de Oro – Iligan Road
South	Valencia, Bukidnon	Sayre Highway

Figure 1-2. Direct and indirect impact areas map



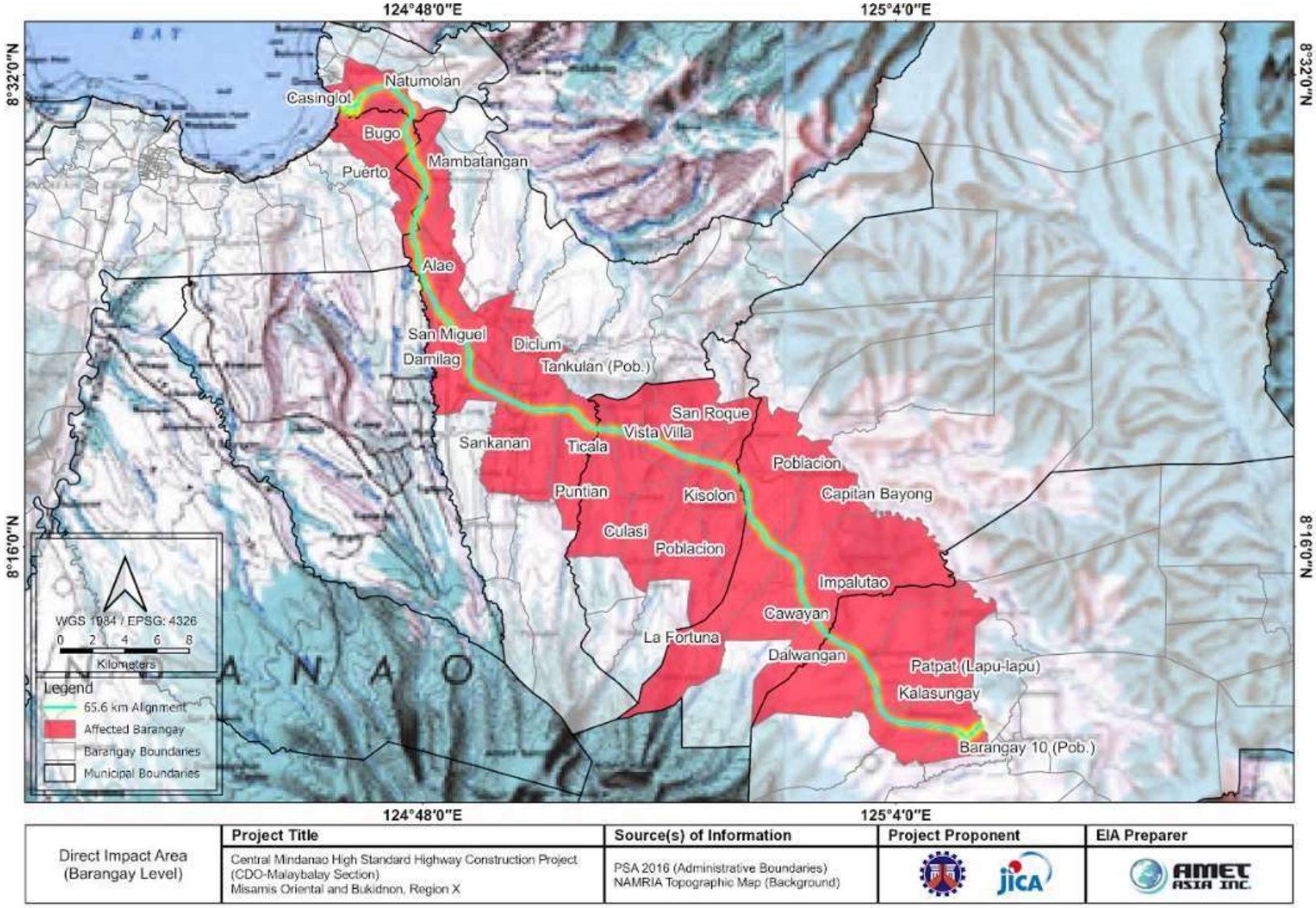
Direct and Indirect Impact Areas Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	PSA 2016 (Administrative Boundaries) NAMRIA Topographic Map (Background)	JICA	AMET ASIA INC.

Figure 1-3. Direct Impact LGUs Area (Municipal and City levels)



Direct Impact Area (Municipal Level)	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	PSA 2016 (Administrative Boundaries) NAMRIA Topographic Map (Background)	JICA	AMET ASIA INC.

Figure 1-4. Direct Impact Barangays



Direct Impact Area (Barangay Level)	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	PSA 2016 (Administrative Boundaries) NAMRIA Topographic Map (Background)	JICA	AMET ASIA INC.

Figure 1-5. Significant environmental features near the Project site

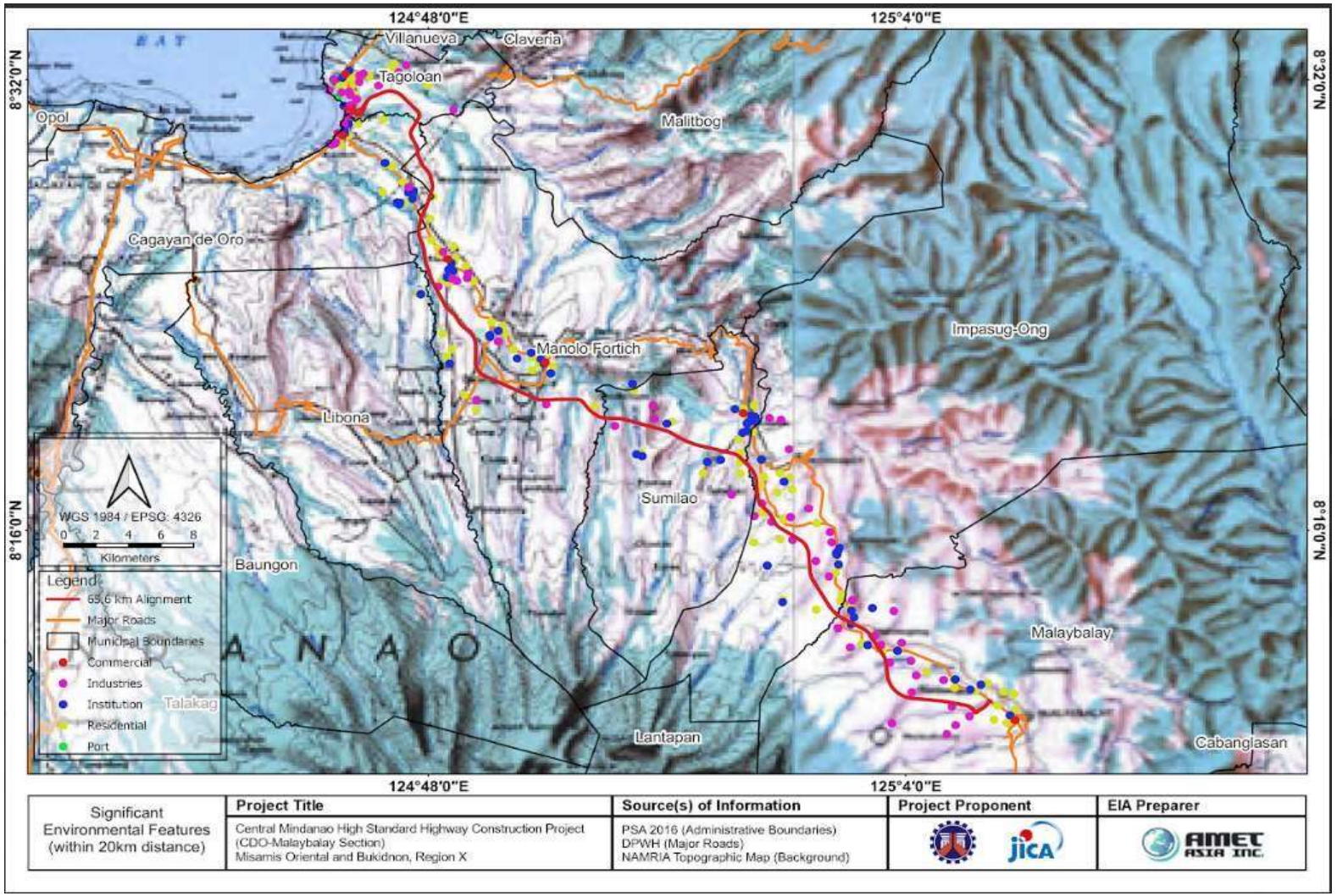


Figure 1-6. Photographs of selected points along the CMH alignment

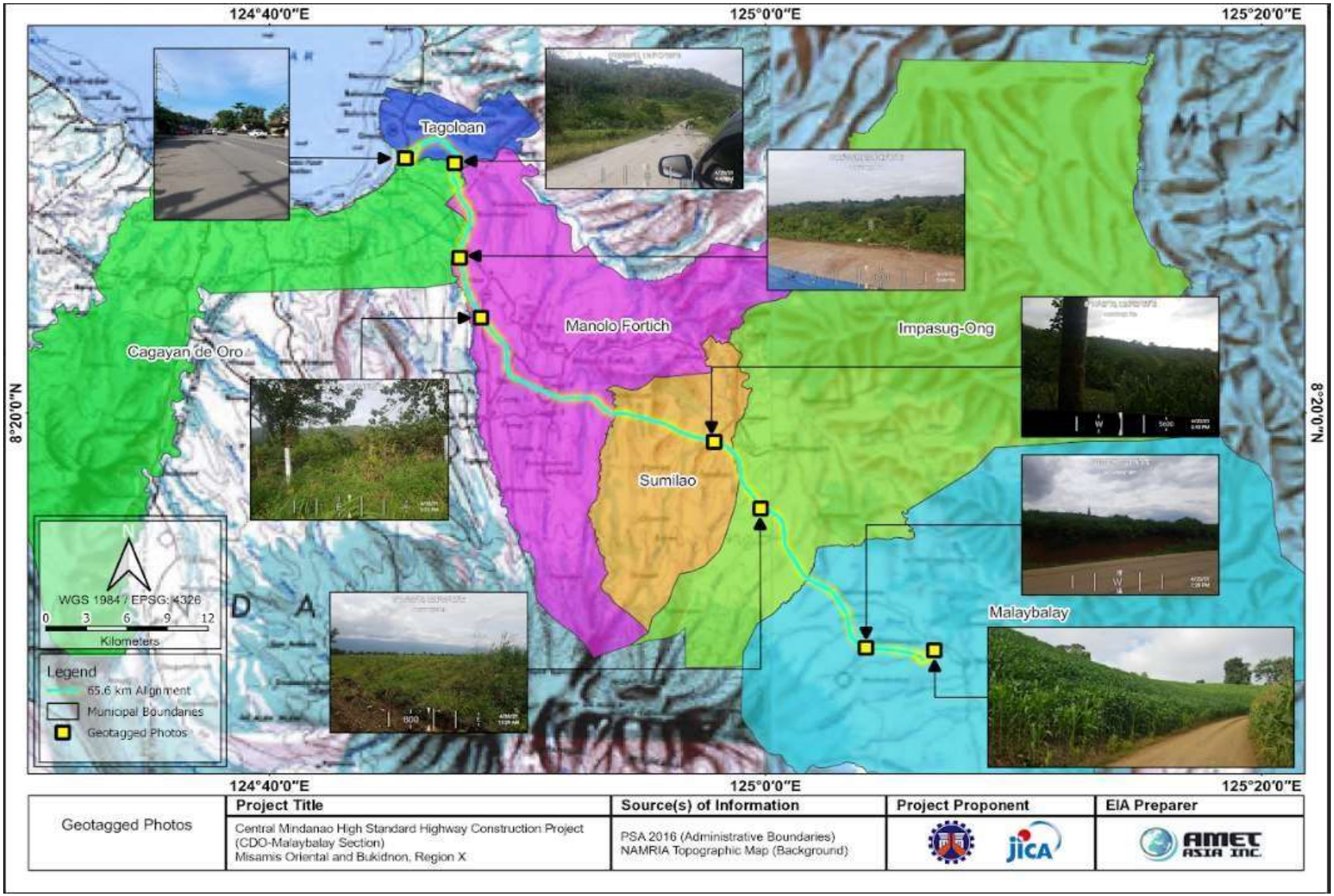


Figure 1-7. Photographs of intersections with the alignment

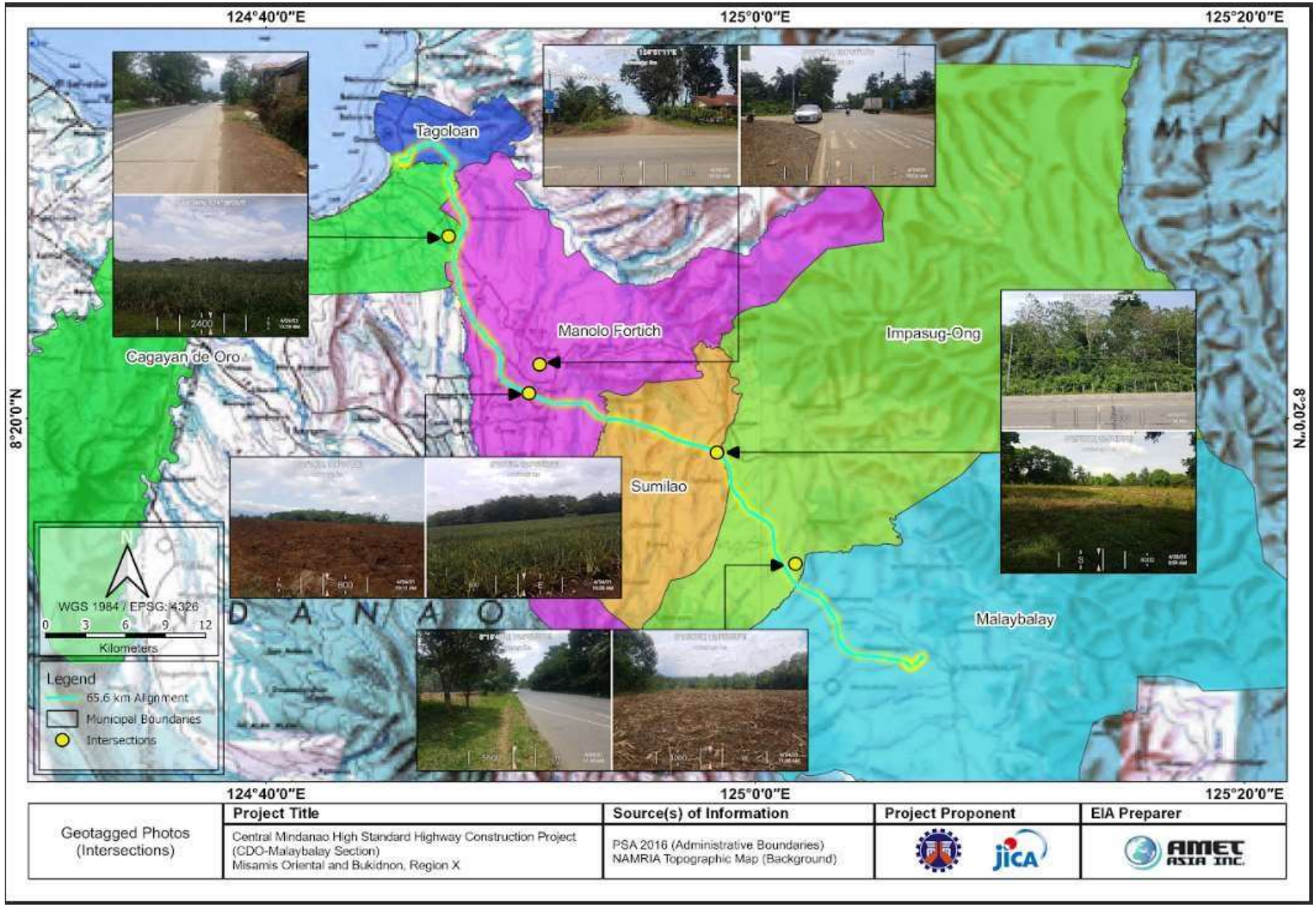
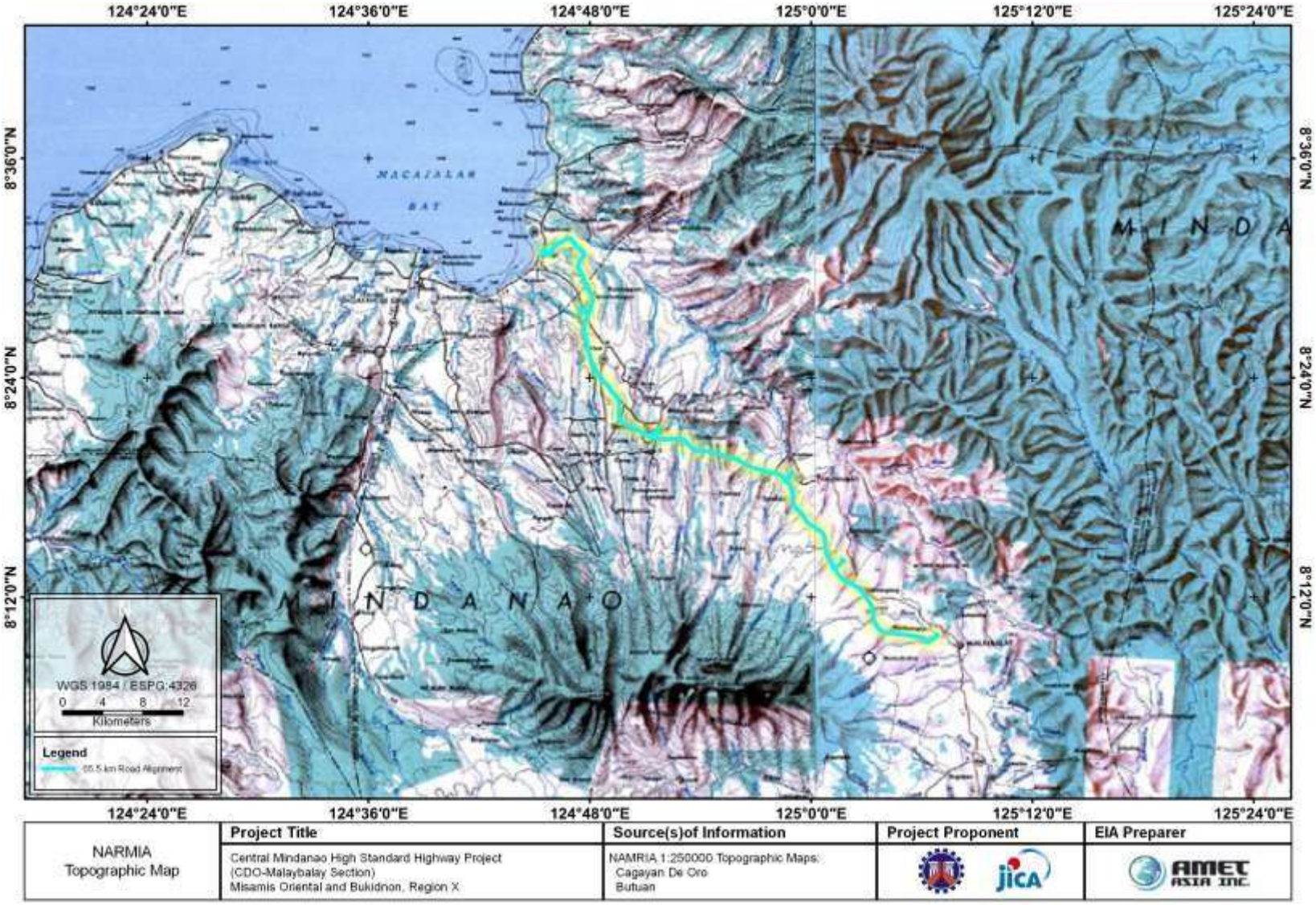


Figure 1-8. NAMRIA map showing the Project site



1.2 Project rationale

Connectivity, mobility, and safety were the three elements identified in the Northern Mindanao Regional Development Plan 2017-2022 in developing the transport infrastructure in the region. The region's connectivity resulted in increased gains in the trade and services sectors and intra-and inter-regional efficiency of the movement of people, goods, and services.

The region, however, faces major challenges in the transport sector which primarily result in traffic congestion in key cities and poor connectivity in rural production and lagging areas. Traffic congestion is a primary problem in main thoroughfares in urban areas due to the concentration of motor vehicles and narrow road networks. Unpaved local roads cause slow growth in rural areas due to poor linkage of production areas to market centers.

The proposed Project is expected to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.

<u>Contribution to development plans</u>

Contribution to the National Development Plan - Transport infrastructure, such as high standard highways, is envisioned to facilitate national development, in line with the objectives of the Philippine Development Plan (2017-2022). The Central Mindanao High Standard Highway (CMH) will contribute to the enhancement of security in Mindanao, reduction of economic disparities, and increase in the growth potential of inland areas.

Contribution to the Regional Development Plan - The Mindanao Spatial Strategy/ Development Framework 2015-2045 identified the Cagayan de Oro City-Malaybalay City-Valencia City-Davao City axis as a major development axis in Mindanao. Once completed, the CMH will traverse Malaybalay City and Valencia City, which are identified as sub-regional centers featuring agribusiness and eco-tourism.

Contribution to the DPWH Highway Development Policy - The Government of the Philippines, through DPWH, pursues the development of land-based transportation projects to sustain the expansion of strategic corridors. The Master Plan for the High Standard Highway Network Development (Phase 2) identified the CMH (Cagayan de Oro-Malaybalay section) as a high priority project for short-term implementation. Once realized, the project will be part of a nationwide program that will add about 1,044.6 kilometers of high standard national roads and expressways.

<u>Improvement of quality of life of the residents</u>

Better access to urban services - In addition to an international airport and a container port, Cagayan de Oro City, as a metropolitan center, features a high concentration of urban services (e.g., health care, education, cultural facilities, etc.). The project will provide inland inhabitants in Central Mindanao an equitable access to employment opportunities and other essential services, generally available in highly urbanized cities.

Enhanced manufacturing and logistics - According to the survey conducted by the JICA Study Team, the perceived benefits of manufacturing and logistics companies from the completion of the CMH include the following: (1) faster delivery of goods, (2) minimized damage on cargoes, (3) reduced transport cost, and (4) increased access to source of materials.

<u>Improvement of quality of life of the residents</u>

Enhanced linkage of metropolitan centers - The Project will connect Cagayan de Oro City and Davao City, two important metropolitan centers in Mindanao. Once realized, travel time between the two cities will be reduced from six hours and thirty minutes to three hours and thirty minutes.
Development of industrial and trade corridor - NEDA Regional Office X envisions the Iligan City – Cagayan de

Oro corridor as a Strategic Development Area (SDA) for industry and trade. The CMH will enhance access to the businesses and shipping ports in Northern Mindanao, which serves as a major gateway to growth areas of Luzon and Visayas.

Development of agribusiness and eco-tourism - Bukidnon is envisioned to serve as an SDA for agribusiness ventures and eco-tourism. With large-scale plantations and fertile land along the road alignment, the project has the capacity to develop the untapped potential of agriculture, forestry, and livestock industries in Bukidnon.

Solving current road traffic problems

Additional road capacity - The existing Sayre Highway carries approximately 9,000 vehicles/ day. The capacity will imminently be surpassed by the traffic volume, and a new 4-lane highway would be needed. The Project offers an alternate route that is designed to carry a significant traffic load within the corridor.

Increased travel speed - The existing alignment of the Sayre Highway poses vertical (steep slopes) and horizontal (sharp curves) challenges to road users. This prevents smooth travel, especially of large vehicles (buses and trucks), which comprise a combined 55% of the existing traffic. As a result, travel speed along sharp curves was observed to be less than 20 km/hr. The project is expected to facilitate faster travel within the corridor, with a design speed of 80 km/hr.

Safer travel option - The zigzag sections of the existing national highway also pose traffic safety issues. From January 2018 to March 2019, a total of 130 accidents occurred along the Sayre Highway. The project, as a high standard highway, will be designed with gentle gradients (both horizontally and vertically) to ensure smooth and safe travel of road users.

1.3 Current situation of road network and traffic

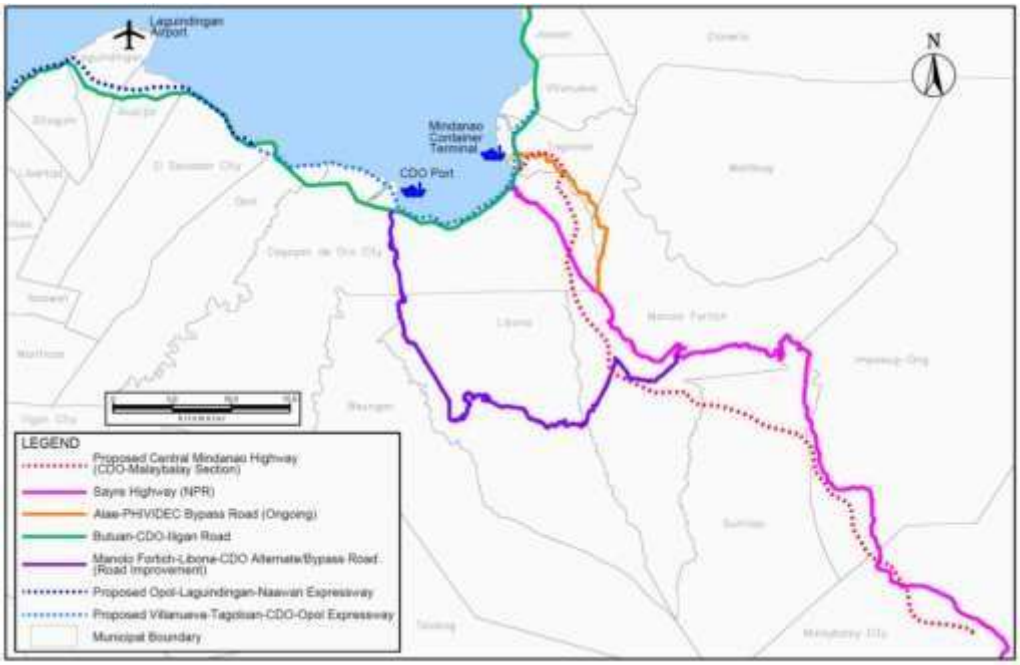
1.3.1 Current Road network

The total length of the existing major road network in the area is 115.66 km while 32.9 km are still in proposal. Most roads are generally narrow with two (2) lanes and a few of the roads are four to six (4 to 6) lanes.

The following existing and planned roads, major ports and airport are illustrated in **Figure 1-9.**

- Sayre Highway
- Alae-PHIVIDEC Bypass Road (under construction)
- Butuan City-Cagayan de Oro City-Iligan City Road
- Manolo-Fortich- Libona-CDO Bypass/Alternate Road (road improvement)
- Proposed Villanueva-Cagayan de Oro City-Opol Expressway
- CDO Port/Mindanao Container Terminal/Laguindingan Airport

Figure 1-9. Location of existing/planned roads and port/airport



Source: JICA Study Team

1.3.2 Current Road traffic situation

Traffic study along Sayre and Coastal Highway was conducted by the JICA Study Team last 2020. The traffic volume trend is observed to be different along the Cagayan de Oro to Manolo Fortich section, as compared to the section between Manolo Fortich and Malaybalay. The traffic volume along the Coastal Road is approximately 15,000 vehicles/day. The traffic volume along Sayre Highway from Cagayan de Oro to Manolo Fortich is approximately 9,000-10,000 vehicles/day while along the Manolo Fortich to Malaybalay section is approximately 6,000-6,500 vehicles/day.

Along Sayre Highway, passenger cars, taxis, and HOVs occupied more than 50% of the traffic. The survey also found out that a significant number of trucks pass through Sayre Highway. Trucks comprised approximately 40% of the traffic volume. Large trucks accounted for 25-30% of the traffic volume. This suggests that Sayre Highway plays an important role in logistics within the region.

1.4 Project alternatives

This section presents the different selection criteria for siting, selection of technology, resources, and contextualization of hazards based on available hazard maps from relevant institutions.

1.4.1 Interchange Location

In selecting the alignment, the interchange locations were first considered based on the following criteria.

- The interchange should be located the road near the center of the city/municipality (Tagoloan; Manolo Fortrich; Impasug-ong; Sumilao; and City of Malaybalay).
- The interchanges in mountainous areas should be placed at an average interval of 10-15 km as per Japan standard (No standard for interchange intervals in the Philippines).

Based on the above criteria, the detailed conditions of interchanges are stated as follows. The interchange location should:

- have an easy to access from/to the national road (Sayre Highway),
- have a smooth terrain that is approximately 500m to 1km away from the national road to allow space for an IC and a toll gate,
- not be a deformed intersection when intersecting with the national road, and

- avoid direct connection to city center and high-density residential areas.

As a special case, the Manolo Fortich IC in Sections 2 and 3 is located near the existing access roads in Manolo Fortich due to the difficulty of connecting directly to the national road in a configuration that meets the above conditions (see **Figure 1-10**).

1.4.2 Selection criteria of Alignment

1.4.2.1 Siting

The Project alignment for the study is divided into five sections based on major interchange locations. Each section has three alternatives (**Figure 1-10**) that were assessed according to the following criteria established by the JICA Study Team: road performance, project cost, environmental and social impacts, and project constructability (**Table 1-5**). The priority considerations as basic prerequisites for the design of the alignment are enumerated below.

1. Road performance comprises of four sub items, namely: drivability, detour rate, traffic demand and time. These items are used to quantify road performance corresponding to the level of High Standard Highway Class 1. Drivability is normally affected by vertical curves used to change the elevations of highways, and horizontal circular curves which can be specified by the radius. To keep drivability requirement for High Standard Highway Class-1, vertical gradient is limited up to 4% and radii of horizontal curves should be as large as possible. Detour rate is also calculated to see how much longer or shorter a new route would be compared with the existing road. Traffic demand and travel time can indicate the design capacity that the highway can handle.
2. Project cost consists of construction cost like earthwork, medium-sized and long-span bridges which are more than 100 m of span length, and compensation expenses related to ROW. In order to make the Project economically feasible, cost estimate should be shown and reviewed to determine if the required function can be accomplished in a less expensive way.
3. Environmental and social impacts are divided into length of high cutting section, number of river crossings, lengths of passages through forest and agricultural areas, and number of affected houses. High cutting section may involve massive soil excavation work causing topographical and geographical change to some extent, which should be minimized as much as possible. Constructing river crossing structures as well as underpass/overpass may also affect the environment. When the alignment may pass through the existing forest and agricultural areas, not only landscape but cultivated land or local pathway would be disturbed. Involuntary resettlement may cause a conflict and force local communities to be divided physically and socially. To consider these kinds of impacts, their quantities are surveyed, calculated and used in the evaluation process.
4. Project constructability is taken as one of criteria items since the project anticipates the construction of a long bridge with a long span length and high piers in a mountainous valley, there are constraints on the choice of construction method and the application of appropriate construction machinery. Therefore, project constructability is one of the criterion items.

Scores allocation was set up considering the level of importance of each item in the criteria through the discussion with relevant departments of DPWH.
The criteria of the project cost and the environmental and social impacts are 35 points as the most important item in this project. Twenty points are allocated to the road performance criteria as the next most important items. The rest comes to constructability 10 points.
The criteria item and score allocation are defined and established with reference to the past FS by DPWH and based on a result of discussion and agreement with technical working group and relevant departments of DPWH, such as Planning Service (PS), Roads Management Cluster I (RMC-I), Bureau of Design (BOD), and Environmental and Social Safeguards Division (ESSD) and others.

Table 1-5. Criteria description of the selection of final alignment

Criteria		Highest Probable Score	Description
Road Performance (20)	Drivability (Comfort, Safety)	5	Road geometric features about planar and vertical alignments decide drivability. When a route has many sections with vertical gradient of more than 4%, it has a low drivability. As section becomes less rough and linear, the score increases.
	Detour rate	5	When a new route detours far away from the existing road and its length becomes longer, traveling vehicles would take more gasoline cost and transportation cost increases. Detour rate is defined as new route length / existing road length. As detour rate decreases, the score increases.
	Traffic demand (2040)	5	A new route that could accommodate the large number of traffic volume and future traffic demand anticipated in 2040 is highly scored.
	Travel Time	5	As travel time is taken shorter, the score increases.
Cost (35)	Cost of Construction, Land Acquisition, Compensation	35	The total cost including construction, land acquisition and relocation compensation is estimated. As the cost decreases, the score increases.
Environmental and Social Impacts (35)	Length of High Cut section	5	High cut section (H>10m) causes massive soil excavation work and large-scale topographical change. As the section becomes longer, the score decreases.
	No. of river crossing	5	As the number of river crossings increases, the score decreases.
	Length of passage through forest areas	5	Part of the forest area would be affected by the planned route. As the forest section to be affected becomes longer, the score decreases.
	Length of passage through agricultural areas	5	Some existing farmlands decrease when interfered with route planning and farmer's living may be affected. As farmland to be acquired becomes longer, the score decreases.
	Number of affected houses	15	How many houses would be affected and relocated on the route. As the number of houses to be relocated increases, the score decreases.
	Constructability (10)	10	As the length of bridge increases, the score decreases.
Total		100	—

Source: JICA Study Team

Road Performance has sub-items of drivability, detour rate, traffic demand and travel time, they are allocated equally with five points. Environmental and Social Impacts includes sub-items of length of high cut section, number of river crossing, length of passage through forest and agricultural areas, and number of affected houses, to which five points are also equally allocated to each sub-item, except for the sub-item number of affected houses. The number of affected houses is given 15 points because it is considered highly important. Table 1-6 shows the calculation and scoring for each of the above criteria items. Scoring is done in two ways. One is to score the maximum to the best and the rest is simply scored by multiplying the ratio with the given point. Another is to score within a range frame as defined, based on data obtained, because data are scattered. For example, the number of affected houses varies widely from a minimum of 8 to a maximum of 72, as a result of this study – estimated about 170 in the Pre-F/S. These data have been estimated from digital files and need to be refined more accurately through site survey. To make a buffer of accommodating some variation of the data as a result of the site survey, a range scoring is used.

Table 1-6. Calculation and Scoring

Item		Score	Criteria	Evaluation
Road	Drivability	5	Horizontal curve radius: not less than 400m, Vertical gradient: not more than 4%	5-point is given when the curve length is 10% or less per total length. 1-point is subtracted for every 10% increase.
	Detour Rate (r)*	5	r=Alignment length / Existing road length	Refer to the score calculation sheet (see Table 1-7).
Traffic	Traffic Volume	5	Future traffic demand forecast	5-point is given when traffic volume is maximum. The rest is scored by multiplying the ratio with 5-point.
	Travel Time	5	Alignment length / Travel speed	5-point is given when travel time is minimum. The rest is scored by multiplying the ratio with 5-point.
Project Cost	Construction Cost, ROW Cost	35	Construction cost = Structure length x Unit price per structure type. ROW cost = Affected section length x Unit price per section type. Relocation cost = No. of affected houses x unit price per house.	35-point is given when Project Cost is minimum. The rest is scored by multiplying the ratio with 35-point.
Environmental	High Cutting Section*	5	Total length of soil cutting section with the height over 10m	L < 0.1 km: 5 ~0.3 km: 4 ~0.6 km: 3 ~0.9 km: 2 ~1.2 km: 1 L > 1.2 km: 0
	River Crossing	5	Number of river crossings	5-point is given to the minimum number. The rest is scored by multiplying the ratio with 5-point.
	Affected Forest Section*	5	e=Affected forest length / Route length	Refer to the score calculation sheet (see Table 1-7).
Social	Affected Agriculture Section*	5	e=Affected agricultural length / Route length	Refer to the score calculation sheet (see Table 1-7).
	No. of Affected Houses*	15	Number of houses required for relocation (n)	n <= 10: 15 ~20: 14 ~30: 13 ~40: 12 ~50: 11 ~60: 10 ~70: 9 ~80: 8 ~90: 7 ~100: 6 ~110: 5 ~120: 4 ~130: 3 ~140: 2 ~150: 1 n > 150: 0
Construction	Constructability*	10	Bridge section length (km)	Refer to the score calculation sheet (see Table 1-7).
Total		100	-	-

Note:* Scoring is by a range set for each item, based on data range obtained from the survey.
Source: JICA Study Team

Table 1-7. Score Calculation Sheet

Detour Rate (r)	Score	Forest and Agricultural Section Length / Route Length (e)	Score	Bridge Length (km)	Score
r<0.6	5.0	e<0.1	5.0	0.0≦L≦0.5	10
0.6≦r<0.7	4.5	0.1≦e<0.2	4.5	0.5<L≦1.0	9
0.7≦r<0.8	4.0	0.2≦e<0.3	4.0	1.0<L≦1.5	8
0.8≦r<0.9	3.5	0.3≦e<0.4	3.5	1.5<L≦2.0	7
0.9≦r<1.0	3.0	0.4≦e<0.5	3.0	2.0<L≦2.5	6
1.0	2.5	0.5≦e<0.6	2.5	2.5<L≦3.0	5
1.0<r≦1.1	2.0	0.6≦e<0.7	2.0	3.0<L≦3.5	4
1.1<r≦1.2	1.5	0.7≦e<0.8	1.5	3.5<L≦4.0	3
1.2<r≦1.3	1.0	0.8≦e<0.9	1.0	4.0<L≦4.5	2
1.3<r≦1.4	0.5	0.9≦e<1	0.5	4.5<L≦5.0	1
1.4<r	0	1.0=e	0	5.0<L	0

Note: Scoring range is framed, based on data obtained.
Source: JICA Study Team

Figure 1-10. Alternatives prior to selection of Project alignment

Source: JICA Study Team

1.4.2.2 Technology selection

There were no alternative technologies, operation processes, or measures to minimize wastes have been identified at this stage. The construction technology used, type of structures erected, and pollution control measures are standard to typical road projects. The measures for minimizing adverse impacts of residuals during Project implementation are discussed in *Section 1.5.2*.

1.4.2.3 Resources

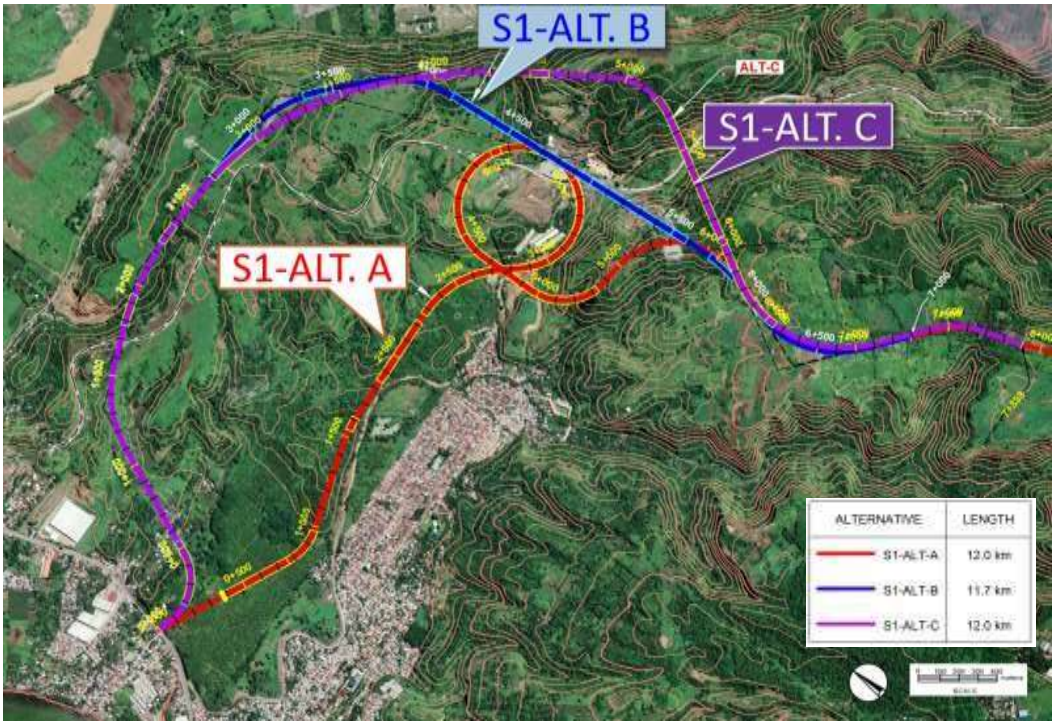
Resources in this context mean water, power, manpower, and material requirements during Project implementation. The potable water requirement of the Project will be sourced from existing water systems in active construction sites. The potential sources of power for the temporary facilities are the Cagayan Electric Power & Light Company, Inc. (CEPALCO), Bukidnon Power Corporation (BPC), and power generators for construction site far from the CEPALCO and BPC power lines. The generator sets will also be used as standby power sources during power outages. Construction materials will be sourced locally when available.

1.4.2.4 Rationale for the chosen option

1.4.2.4.1 Section 1

As a result of the Pre-F/S in the Master Plan, two alternative alignments were recommended – Alternative C, consisting of a continuous loop bridge, and Alternative A, detouring to avoid steep slopes with a relatively straight bridge – within a distance of about 8 km from the beginning point. In the Pre-F/S in the Master Plan with desk-based study, there was no difference from environmental and social aspects of each alternative, because the alternatives were almost same on the slope and hilly area and land was used as cultivated and bush area in section 1, and there were not so many structures. Although Alternative C was preferentially selected and its preliminary design was developed by the JICA Study Team at that time, it was concluded that it would be necessary to conduct a comparative study by adding more alternatives and select the best one through discussion with DPWH and related stakeholders. In this study, including Alternative C selected in the Pre-F/S, two more new alternative routes are added and compared with it. The outline of them is shown in **Figure 1-11**.

Figure 1-11. Alignments in Section 1



Source: JICA Study Team

- S1-ALT. A is making a detour north and climbing up gradually toward mountainous areas, like S1-ALT. B, and then going further and turning back slightly to cross a deep valley, which will lead to long-span bridge construction.

- S1-ALT. B is making a detour north and climbing up gradually toward mountainous areas, and then turning right to cross a deep valley, which will lead to long-span bridge construction.

- S1-ALT. C, renamed and proposed in the Pre-F/S, is passing through a flat terrain before hilly area comes out near where a loop bridge is situated about 100m high or higher above the ground, as shown in **Figure 1-12**.

Figure 1-12. Image of Loop Bridge Proposed in the Pre-F/S (Alt.C)

Source: JICA Study Team

The evaluation result is listed in **Table 1-8**.

Table 1-8. Evaluation of Section 1

Criteria		Unit	Score	S1-ALT. A		S1-ALT. B		S1-ALT. C	
				Result	Score	Result	Score	Result	Score
Road	Drivability	-	5	**No sharp curve**	**5.0**	0.5 km long curve (R=500m)	5.0	1.8 km long curve (R=320m)	3.0
	Detour rate	-	5	**1.403**	**0.0**	1.368	0.5	1.403	0.0
	Sub total		10	**-**	**5.0**	-	5.5	-	3.0
Traffic	Traffic volume	veh./ day	5	**16,500**	**5.0**	16,500	5.0	16,500	5.0
	Travel time	min	5	**9.0**	**5.0**	8.78	5.0	9.0	5.0
	Sub total		10	**-**	**10.0**	-	10.0	-	10.0
PJT Cost	Earthwork	mil. peso		**3,071 (9.2 km)**		2,951 (8.9 km)		2,560 (7.7 km)	
	Medium-sized Bridge	mil. peso		**5,551 (1.1 km)**		6,736 (1.2 km)		7,905 (1.2 km)	
	Long-span Bridge	mil. peso		**15,713 (1.6 km)**		18,647 (1.6 km)		27,620 (3.1 km)	
	Construction	mil. peso		**24,335**		28,334		38,085	
	ROW	mil. peso		**426.5**		419.5		607.9	
	Sub total (mil. peso)		35	**24,761**	**35.0**	28,754	30.1	38,693	22.4
Environmental	High Cut Section	km	5	**1.2**	**1.0**	1.1	1.0	1.0	1.0
	River Crossing	ea	5	**1**	**5.0**	1	5.0	1	5.0

	Aff. Forest	%	5	**58**	**2.5**	56	2.5	53	2.5
	Sub total		15	**-**	**8.5**	-	8.5	-	8.5
Social	Aff. Agriculture	%	5	**25**	**4.0**	27	4.0	28	4.0
	Aff. Houses	ea	15	**32**	**12.0**	32	12.0	54	10.0
	Sub total		20	**-**	**16.0**	-	16.0	-	14.0
Constructability		-	10	**Bridge L=2.7 km**	**5.0**	Bridge L=2.8 km	5.0	Bridge L=4.3 km	2.0
Total			100	**1**	**79.5**	2	75.1	3	59.9

Source: JICA Study Team

The above evaluation results are as follows.

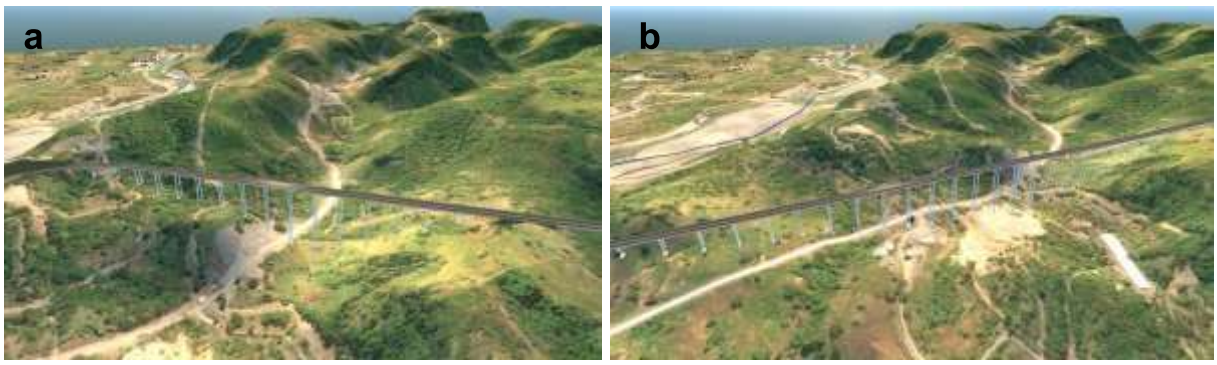
- S1-ALT. A, like S1-ALT. B, is the route to ascend gradually toward mountainous areas and go further and turn back slightly to cross a deep valley through a long-span bridge. The long-span bridge has the superstructure made of steel box girder in the length of about 0.8 km and pre- stressed concrete girder or rigid frame in the length of about 0.8 km, respectively. The bridge construction costs less than that of S1-ALT. B despite of the same total length. Regarding environmental and social impacts, no difference is shown between S1-ALT. B and C.

- S1-ALT. B is the route to ascend gradually toward mountainous areas and then turn right to cross a deep valley through a long-span bridge. The long-span bridge has the superstructure made of steel box girder with the length of about 1.4 km and prestressed concrete box girder in the length of about 0.2 km. Constructing steel-type bridge may generally cost higher compared to prestressed concrete bridge, and steel box girder bridge accounts for over 80% of the total bridge length. Therefore, it may give a negative impact to the construction cost. The number of affected houses is 32, which is similar to the S1-ALT-A and less impactful than the S1-ALT-C. More than half of the proposed route passes through forests and other vegetated areas, but the other alternatives are almost identical and have comparable environmental impact.

- S1-ALT. C is consisting of a loop bridge that turns its direction around and goes up slowly about 100m high from the ground, attempting not to stay over vertical gradient to the maximum of 4%. The longitudinal line is curved at a radius of 320 m including relatively small curves on a carriageway. This may make drivability low. The superstructure of the bridge comprises largely of steel elements, and the superstructure needs to be supported on 100m high or taller piers, which implies that this may be less cost-effective and technically difficult. There are fifty-four (54) houses affected and required to be relocated, greater than those in other two alternatives. More than half of the proposed route passes through forests and other vegetated areas, but the other alternatives are almost identical and have comparable environmental impact.

As a result of the evaluation shown in table above, there is comprehensive perspective, <u>S1-ALT. A is recommended for Section 1</u>.

Figure 1-13. Steel Box Bridges on (a) S1-ALT. A (b) S1-ALT. B and in Section 1



Long-span Bridge on **S1-ALT. A**
L=813 m (Steel Narrow Box Girder)
Max. High Pier 140 m

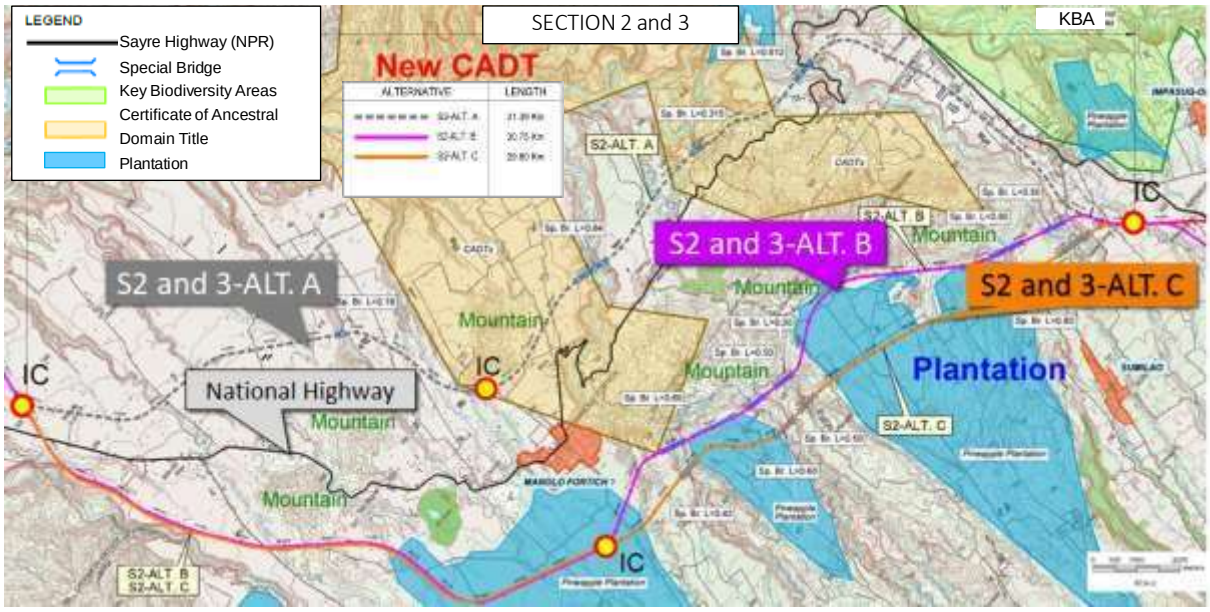
Long-span Bridge on **S1-ALT. B**
L=1,440 m (Steel Narrow Box Girder)
Max. High Pier 135 m

Source: JICA Study Team

1.4.2.4.2 Section 2 and 3

The geographical features, such as mountains, hills, urban areas, plantations, farmlands, and golf courses near the existing road, are widely distributed in Section 2 and 3, and they put constraints on the alternative route planning. The outline of the alternative routes is shown in **Figure 1-14**.

Figure 1-14. Alignments in Section 2 and 3



Source: JICA Study Team

- S2 and 3-ALT. A is the south route going rather straighter on the flat terrain and avoiding mountains and urban areas, as well as the CADT but needs to pass through some plantation areas and CADT under application. However, passing through the CADT under application is unavoidable because of surrounding topographic conditions.
- S2 and 3-ALT. B is also the south route relatively stretching far away from the existing road and avoiding mountains and urban areas, as well as the CADT but needs to pass through some plantation areas and CADT under application. However, passing through the CADT under application is unavoidable because of surrounding topographic conditions.

- S2 and 3-ALT. C is the north route less far from the existing road, avoiding mountains and urban areas. During this study, it has been found that the new CADT is widely distributed in the northern part and S2 and 3-ALT. C is passing through parts of the CADT that consists of mostly mountainous and agricultural lands. This CADT was under review to see if it will be designated as development restriction and protection area in the time of this alignment selection study.

The evaluation result is listed in **Table 1-9**.

Table 1-9. Evaluation of Section 2 and 3

Criteria		Unit	Score	Route					
				S2 and 3-ALT. A		S2 and 3-ALT. B		S2 and 3-ALT. C	
				Result	Score	Result	Score	Result	Score
Road	Drivability	-	5	**Flat**	**4.0**	Flat	4.0	-	-
	Detour rate	-	5	**0.694**	**4.5**	0.714	4.0	-	-
	Sub total		10	-	**8.5**	-	8.0	-	-
Traffic	Traffic volume	veh./ day	5	**18,500**	**5.0**	18,000	4.9	-	-
	Travel time	min	5	**22.72**	**5.0**	23.35	4.9	-	-
	Sub total		10	-	**10.0**	-	9.8	-	-
PJT Cost	Earthwork	mil. peso		**8,776 (24.0 km)**		9,097 (24.8 km)		-	
	Medium-sized Bridge	mil. peso		**4,566 (2.6 km)**		5,227 (3.0 km)		-	
	Long-span Bridge	mil. peso		**10,764 (3.2 km)**		9,694 (2.9 km)		-	
	Construction	mil. peso		**24,106**		24,017		-	
	ROW	mil. peso		**1,358 (29.8 km)**		1,448 (30.7 km)		-	
	Sub total (mil.peso)		35	**25,464**	**30.9**	25,466	30.9	-	-
Environmental	High Cut Section	km	5	**0.8**	**2.0**	2.2	0.0	-	-
	River Crossing	ea	5	**18**	**4.2**	18	4.2	-	-
	Aff. Forest	%	5	**21**	**4.0**	23	4.0	-	-
	Sub total		15	-	**10.2**	-	8.2	-	-
Social	Aff. Agriculture	%	5	**74**	**1.5**	72	1.5	-	-
	Aff. Houses	ea	15	**72**	**8.0**	61	9.0	-	-
	Sub total		20	-	**9.5**	-	10.5	-	-
Constructability		-	10	**Bridge L=5.8 km**	**0.0**	Bridge L=5.9 km	0.0	-	-
Total			100	**1**	**69.1**	2	67.4	-	-

Source: JICA Study Team

The above evaluation results are as follows.

- S2 and 3-ALT. A is the south route going rather straighter on the flat terrain, showing a good drivability, and avoiding mountains and the CADT. The high cutting section is about 0.8km long, shorter than that of S2 and 3-ALT. B, and causes relatively less environmental change. The number of affected houses is 72, and is slightly higher than in S2 and 3-ALT-Proposal B.

- S2 and 3-ALT. B is also the south route going on the relatively flat terrain, showing a good drivability, and avoiding the mountainous areas and the CADT. However, there are about 2.2km long high cutting section that requires massive soil cutting work and may cause a radical change in environment and topography. The natural environment impact is high due to the major topographical changes with large scale cutting section. The number of affected houses is 61 and is slightly lower than in S2 and 3-ALT A.

- As both S2 and 3-ALT. B and S2 and 3-ALT. A require crossing deep valleys, both alternatives require the construction of long bridges: 2.9 km for S2 and 3-ALT. B and 3.2 km for S2 and 3-ALT. A. Although S2 and 3-ALT. A is slightly longer and has higher bridge costs, the project costs are the same for S2 and 3-ALT. A due to the shorter road length.

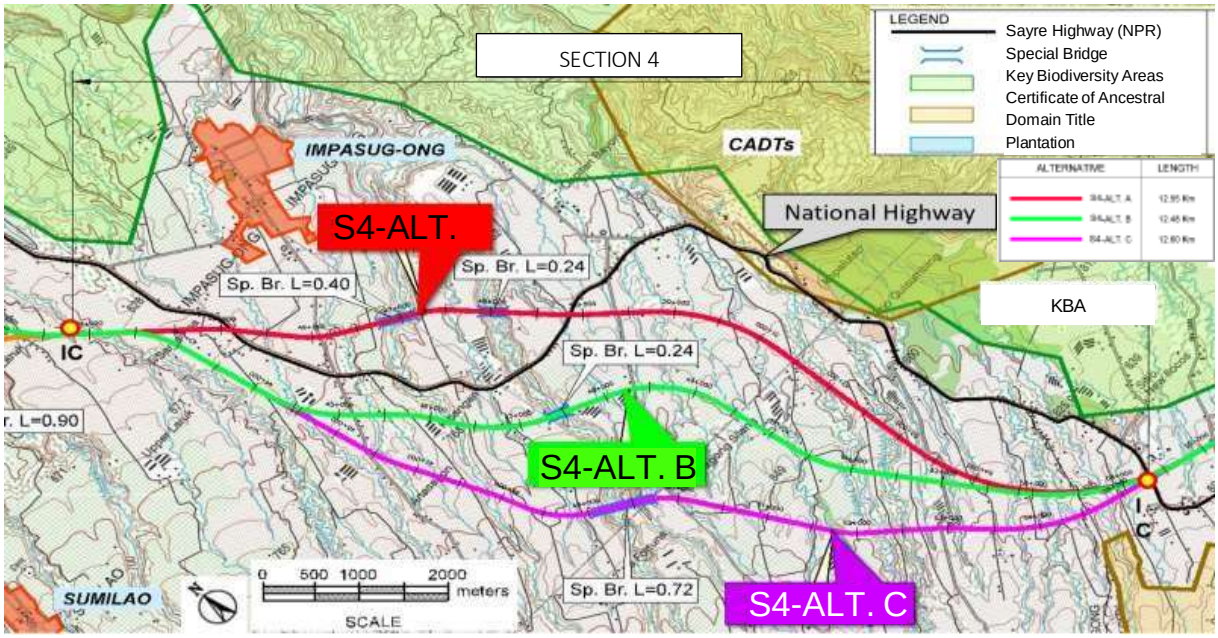
- S2 and 3-ALT. C, proposed in the Pre-F/S, is decided to be excluded from the route evaluation in this study, in order to avoid negative social impact to the people who live in the CADT.

As a result of evaluation shown in table above, there is comprehensive perspective, S2 and 3-ALT. A is recommended in Section 2 and 3.

1.4.2.4.3 Section 4

In Section 4, the existing road is located close to the environmental preservation areas, Key Biodiversity Areas (KBA) and CADT – which is provisional and being applied for designation – so the alternative routes are laid out to go to the south, as shown in **Figure 1-15**.

Figure 1-15. Alignments in Section 4



Source: JICA Study Team

- S4-ALT. A is moving to the south from the existing road, as presented in the Pre-F/S with the purpose of improving the accessibility from the southern region.

- S4-ALT. B is going through the existing road and laid out in less curved direction, avoiding KBA and CADT areas.

- S4-ALT. C is laid out to go further southbound from the existing road and improve the accessibility to the southern region.

The evaluation result is listed in **Table 1-10**.

Table 1-10. Evaluation of Section 4

Criteria	Unit	Score	Route		
			S4-ALT. A	S4-ALT. B	S4-ALT. C

				Result	Score	Result	Score	Result	Score
Road	Drivability	-	5	**Flat**	**5.0**	Flat	5.0	Flat	5.0
	Detour rate	%	5	**0.795**	**4.0**	0.799	4.0	0.803	3.5
	Sub total		10	-	**9.0**	-	9.0	-	8.5
Traffic	Traffic volume	veh./ day	5	**17,400**	**5.0**	17,400	5.0	17,400	5.0
	Travel time	min	5	**9.48**	**5.0**	9.53	5.0	9.57	5.0
	Sub total		10	-	**10.0**	-	10.0	-	10.0
PJT Cost	Earthwork	mil. peso		**3,642 (9.9 km)**		4,253 (9.9 km)		2,657 (8.2 km)	
	Medium-sized Bridge	mil. peso		**4,079 (2.4 km)**		3,470 (2.0 km)		6,453 (3.7 km)	
	Long-span Bridge	mil. peso		**802 (0.2 km)**		2,139 (0.6 km)		2,407 (0.7 km)	
	Construction	mil. peso		**8,523**		9,862		11,517	
	ROW	mil. peso		**548 (12.5 km)**		472 (12.6 km)		364 (12.6 km)	
	Sub total (mil.peso)		35	**9,072**	**35.0**	10,334	30.7	11,881	26.8
Environmental	High Cut Section	km	5	**0.0**	**5.0**	2.0	0.0	0.0	5.0
	River Crossing	ea	5	**22**	**3.6**	16.0	5.0	21	3.8
	Aff. Forest	%	5	**11**	**4.5**	22.0	4.0	17	4.5
	Sub total		15		**13.1**	-	9.0		13.3
Social	Aff. Agriculture	%	5	**84**	**1.0**	75.0	1.5	82	1.0
	Aff. Houses	ea	15	**49**	**11.0**	16.0	14.0	25	13.0
	Sub total		20		**12.0**	-	15.5		14.0
Constructability		-	10	**Bridge L=2.6 km**	**5.0**	Bridge L=2.6 km	5.0	Bridge L=4.4 km	2.0
Total			100	**1**	**84.1**	2	79.2	3	74.6

Source: JICA Study Team

The above evaluation results are as follows.

- S4-ALT. A has the total bridge length of 2.6 km, the same as S4-ALT. B has, and a long-span bridge which accounts for only 0.2 km. The project cost is less than those of both S4-ALT. B and S4-ALT. C. There is no high cutting section distributed, which gives less impact to the surroundings. The forest section to be affected is the shortest of the three alternatives. There are 49 houses affected and required to be relocated, and over 80% of agricultural land to be cultivated. The number is greater than those in other routes and its score is lowest but can be traded off with scores of project cost and environment.

- S4-ALT. B is going relatively along the existing road and crossing two long-span bridges in the length of 0.64 km and medium-sized bridge in the total length of 2.0 km. It has about 2.0 km long high cutting section that requires massive soil cutting work which may give a negative impact on the environment. There are 16 houses required to be relocated and 75% of agricultural land to be cultivated, the minimum compared to those of other two alternatives.

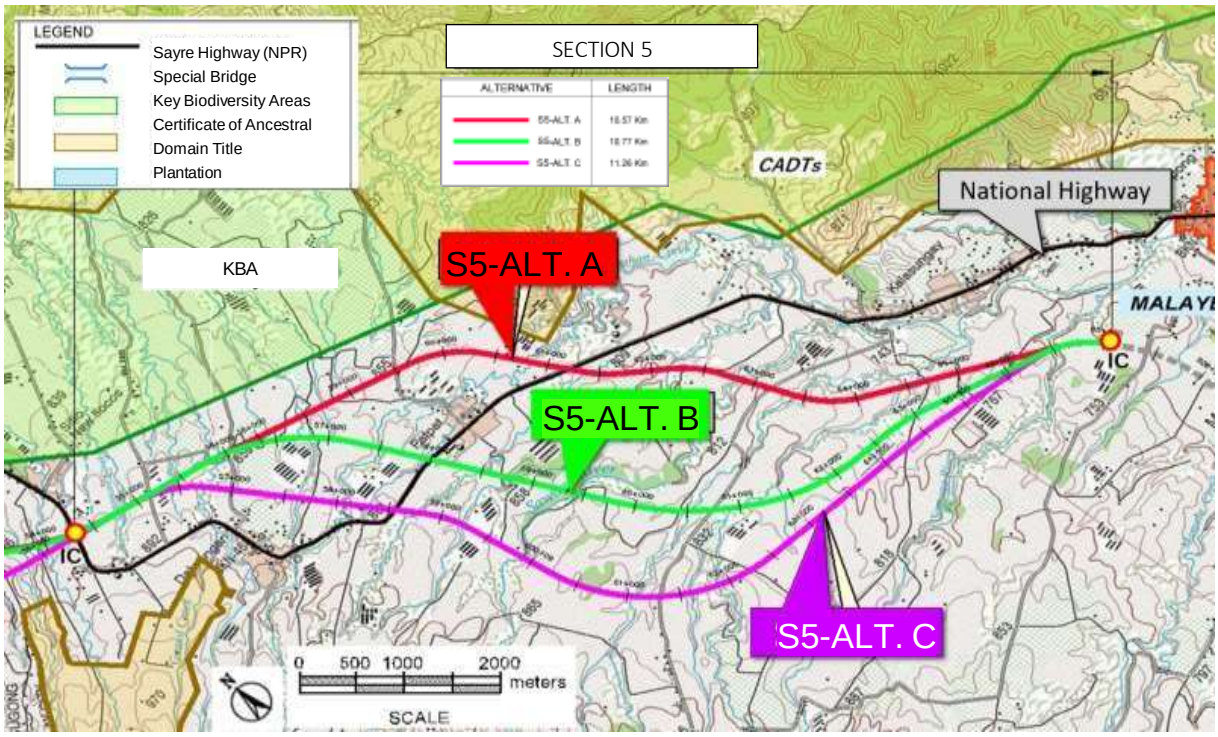
- S4-ALT. C detours the existing road far to the southward and no high cutting section is distributed like S4-ALT. A. The total bridge length reaches up to 4.4 km, the longest among the alternative routes, hence, the bridge construction becomes less cost-effective. The environmental impact is expected to be less than that of S4-ALT-B and about the same as that of S4-ALT-A. There are 25 houses affected and required to be relocated, which is intermediate compared to the other two proposals. More than 80% of the route is agricultural land and is expected to have about the same social impact as the S4-ALT-A. proposal.

As a result of evaluation shown in Table 1-10, there is a comprehensive perspective, S4-ALT. A is recommended for Section 4.

1.4.2.4.4 Section 5

In Section 5, the environmental preservation areas, KBA and CADT, are distributed on the north, and the alternative routes are laid out to cross the existing road, as shown in **Figure 1-16**.

Figure 1-16. Alignments in Section 5



Source: JICA Study Team

- S5-ALT. A is making a detour south further and curving down to the terrain.
- S5-ALT. B, proposed in the Pre-F/S, is making a detour south and going through the existing road.
- S5-ALT. C is going straight along with the boundary of KBA and CADT and then crossing the existing road.

The evaluation result is listed in **Table 1-11**.

Table 1-11. Evaluation of Section 5

Criteria		Unit	Score	Route					
				S5-ALT.A		S5-ALT.B		S5-ALT.C	
				Result	Score	Result	Score	Result	Score
Road	Drivability	-	5	**Flat**	**5.0**	Flat	5.0	Flat	5.0
	Detour rate	-	5	**0.84**	**3.5**	0.804	3.5	0.789	4.0
	Sub total		10		**8.5**	-	8.5	-	9.0
Traffic	Traffic volume	veh./ day	5	**16,800**	**4.9**	17,000	5.0	17,100	5.0
	Travel time	min	5	**8.56**	**4.7**	8.17	4.9	8.06	5.0
	Sub total		10		**9.6**	-	9.9	-	10.0
PJT Cost	Earthwork	mil. peso		**3,669 (9.4 km)**		2,876 (7.9 km)		2,782 (6.9 km)	
	Medium-sized Bridge	mil. peso		**3,287 (1.9 km)**		4,992 (2.9 km)		6,461 (3.7 km)	
	Long-span Bridge	mil.		**-**		-		-	

		peso							
	Construction	mil. peso		**6,956**		7,867		9,244	
	ROW	mil. peso		**691 (11.3 km)**		488 (10.8km)		434 (10.6km)	
	Sub total (mil.peso)		35	**7,647**	**35.0**	8,355	32.0	9,678	27.7
Environmental	High Cut Section	km	5	**0.2**	**4.0**	0.0	5.0	0	5.0
	River Crossing	ea	5	**15**	**4.7**	14	5.0	22	3.2
	Aff. Forest	%	5	**15**	**4.5**	18	4.5	13	4.5
	Sub total		15	**-**	**13.2**	-	14.5	-	12.7
Social	Aff. Agriculture	%	5	**77**	**1.5**	78	1.5	84	1.0
	Aff. Houses	ea	15	**8**	**15.0**	12	14.0	15	14.0
	Sub total		20	**-**	**16.5**	-	15.5	-	15.0
Constructability		-	10	**Bridge L=1.9 km**	**7.0**	Bridge L=2.9km	5.0	Bridge L=3.7 km	3.0
Total			100	**1**	**89.8**	2	85.4	3	77.4

Source: JICA Study Team

The above evaluation results are as follows.

- S5-ALT. A has medium-sized bridges in the total length of 1.9km and the bridge construction cost is the least among the three routes. As for the natural environment, there is no high cuttings sections, this route is assessed as average of three alternatives. As for the social aspect, more than 80% of the route is agricultural land and the social impact is expected to be about the same as the S5-ALT-B, but the number of affected houses (8) is the lowest of the alternatives.

- S5-ALT. B has medium-sized bridges in the total length of 2.9 km and the bridge construction cost is the second largest, compared with those of other two alternatives. As for the natural environment, this plan is the highest evaluation of the three proposals, as there are few river crossings and no high cuttings. As for the social aspect, more than 80% of the route is agricultural land and the social impact is expected to be about the same as the S5-ALT-A proposal, and the number of affected houses (12) is about the average of the three alternatives.

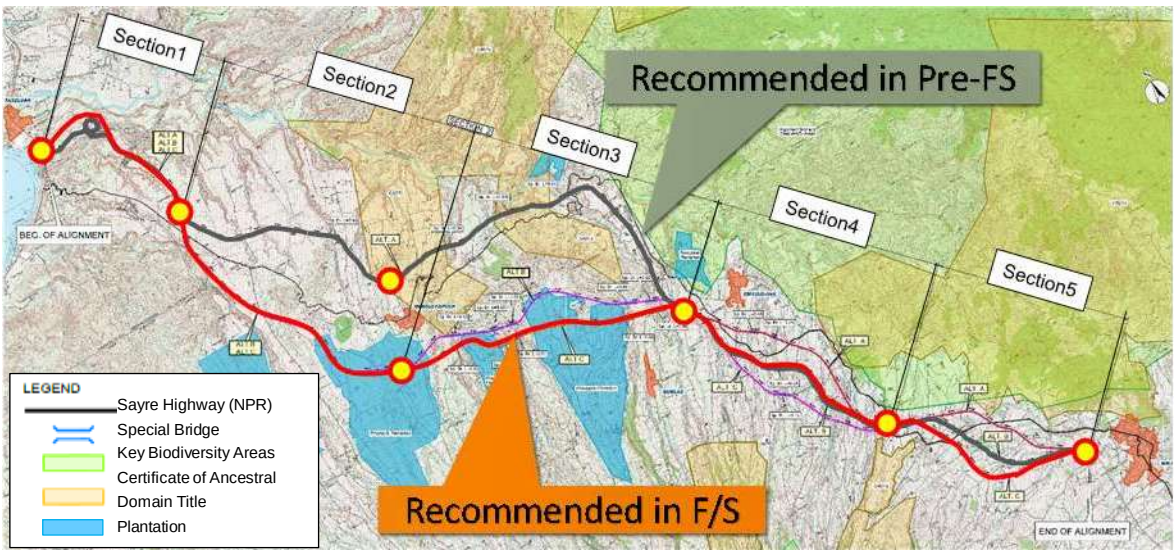
- S5-ALT. C has medium-sized bridges in the total length of 3.7 km and the bridge construction cost is the largest, compared with those of other two alternatives. As for the natural environment, the forest affected section is the shortest, but there are more river crossings, which is the lowest rated of the three alternatives. The impact on agricultural land and the number of affected houses (15) are the highest among the three alternatives.

As a result of evaluation shown in **Figure 1-14**, there is a comprehensive perspective, S5-ALT. A is recommended for Section 5.

1.4.2.4.5 Summary of Alignment

The selected alternative route under this F/S is passing toward south direction with a total length of 65.6 km and having a total of 161 houses affected to be relocated.

Figure 1-17. Recommended Alignment



Source: JICA Study Team

1.4.3 Hazard contextualization

The geological profiling, factual field geological mapping and hazard maps showed that Project implementation is not expected to induce natural hazards, e.g., liquefaction, subsidence, landslides. The Project however may be affected by the following natural hazards: ground shaking, ground rupture, earthquake and rain-induced landslides, and flooding (**Table 1-12**). The reader is referred to *Section 3.1.2.3.2* for the detailed discussion on the hazards.

Table 1-12. Hazard contextualization of the Project

Natural hazard	Hazard assessment
Liquefaction	Safe
Ground Shaking	Prone
Ground Rupture	High Susceptibility
Earthquake-induced landslides	High Susceptibility
Subsidence	Safe
Volcanic eruptions	Safe
Tsunami	Safe
Rain-Induced Landslide	High Susceptibility
Flooding	Susceptible to Moderate to High Flooding Hazard
Storm surge	Safe

1.4.4 The "No Project" option

The existing national highway (Sayre Highway) is classified as a primary two-lane national highway. At present, many sections of the road are in poor condition, a situation which becomes big problems for road users. Particularly, many zigzag paths with a series of sharp curves have been found along the 3- km stretch section near Cagayan de Oro and two canyons where serious traffic troubles often happen. Due to above road traffic problems on the Sayre Highway, the Alae-PHIVIDEC Link Road is under construction, but the design speed is 20 km/h based on the bypass road design drawing' grade and curve elements, and this traffic problem has not been fully solved.

Heavy trucks and vehicles driving at low speed along this zigzag and steep slopes in Sayre Highway often cause traffic accidents that are approximately four times higher than accidents occurring at other road sections.

The present daily traffic volume of 4-wheeled or more vehicles account for around 8,000 vehicles. Hence, the road is getting into full capacity. Just in case this road happened to be closed for certain reasons like traffic accidents, natural disasters, etc., many road users would have no choice but finding another path and forced to detour through a longer route which would also take longer travel time.

Moreover, there are some agri-business places with very high development potentials located near the project site. The NEDA Regional Office X is now planning to make the province of Bukidnon a strategic development area. The proposed CMH project could certainly provide strong infrastructure support and provide opportunities related to the following development plans of Region X:
Agri-business ventures and Eco-tourism (Bukidnon)

- Build factories to process agricultural products and raw materials,
- Revitalize eco-tourism and recreation,
- Increase productivity of food crops, industrial crops, high value crops, poultry, piggery and large livestock, and
- Develop production of high value-added crops and vegetables.

The project through high-speed mobility, is envisioned to provide a safe and comfortable travel of people and goods and propel the socio-economic development activities in Mindanao regions. From the foregoing, it could be deduced that the project implementation is therefore inevitable.

1.5 Project components

This section presents the Project's layout, site development plan, and major components as well as the processes, facilities (support and material handling), and pollution control and waste management system of the Project.

1.5.1 General layout of the facilities

The design of the structures will conform to the DPWH Design Standard Guidelines and other specifications of, where necessary. These design standards contain principles and requirements for road safety, serviceability, and durability. The locations of major structures of the Project are located **in Figure 1-18, Figure 1-19** and **Figure 1-20.** The location of the support facilities will be updated along with the Feasibility Study and Preliminary Design as the design and studies progress to subsequent stages.

1.5.2 Major components

The major components of the Project are the 65.6-km road with a 60-meter road right of way (RROW) and six interchanges constructed near urban centers. The presence of toll booths will be updated along with the Feasibility Study and Preliminary Design as the design and studies progress to subsequent stages. Other components of the Project are shown in **Table 1-13.**

Table 1-13. Major Project components

Component	Tagoloan	CDO	Manolo Fortich	Sumilao	Impasug-ong	Malaybalay	Total
Interchanges	0	1	1	1	1	1	5
Overpass	1	0	6	6	5	4	22
Underpass	2	1	15	4	5	5	32
Bridges	3	1	12	9	14	12	51
Viaduct	2	0	0	6	0	0	8

Source: JICA Study Team

1.5.2.1 Preliminary designs

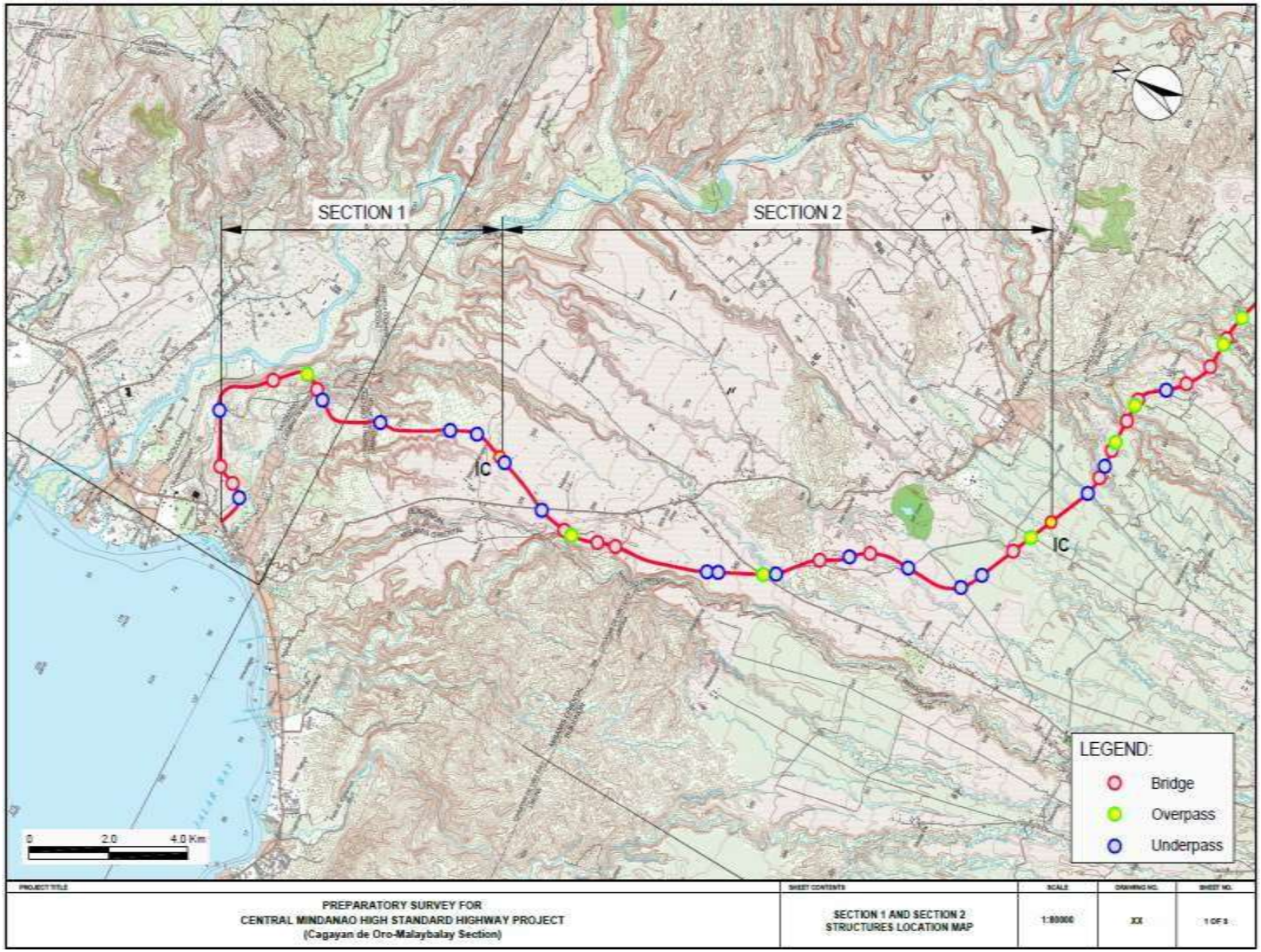
Geometric design standard - The standard references used for the Central Mindanao High Standard Highway are a) Policy on Geometric Design of Highways and Streets, AASHTO 2011, 6th Edition, b) Design Guidelines, Criteria & Standards, volume 4 Highway Design, 2015, DPWH, and c) Japan Road Association, Road Structure Ordinance, 2019.

Design speed - The recommended design speed of 80 kph taken from the previous pre-feasibility study (HSH MP Phase-2 report) was used for the main alignment. The design speed was selected considering moderate topographic conditions at the proposed alignment and traffic safety.

Interchange ramps - The interchange ramp design speed is 40 kph which is half of the highway design speed. It is also the identified minimum design speed in AASHTO 2011.

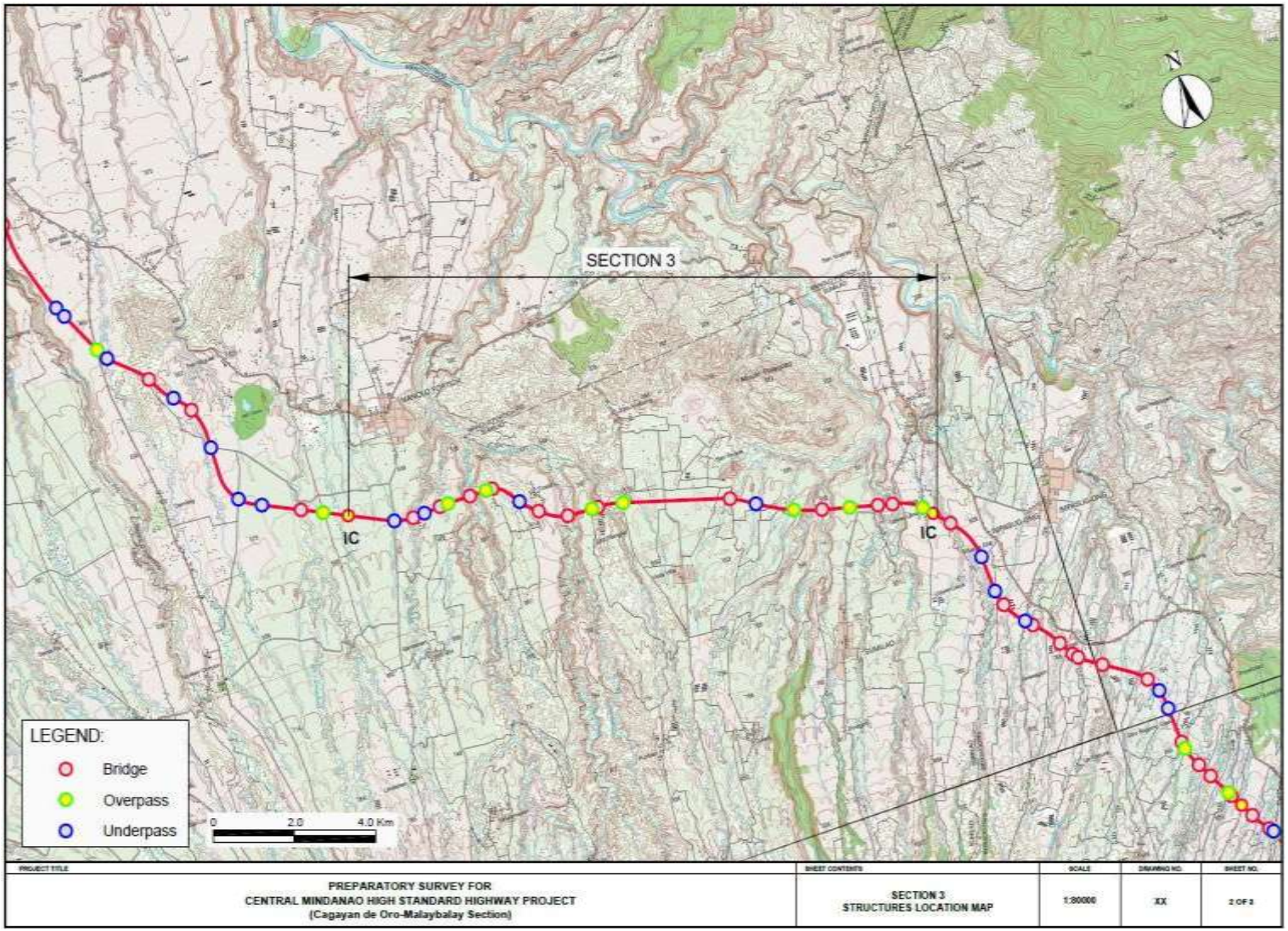
High Standard Highway geometry - The geometry applied to the design of main alignment and ramp is summarized in **Table 1-14** and **Table 1-15.**

Figure 1-18. Sections 1 and 2 Structural Map



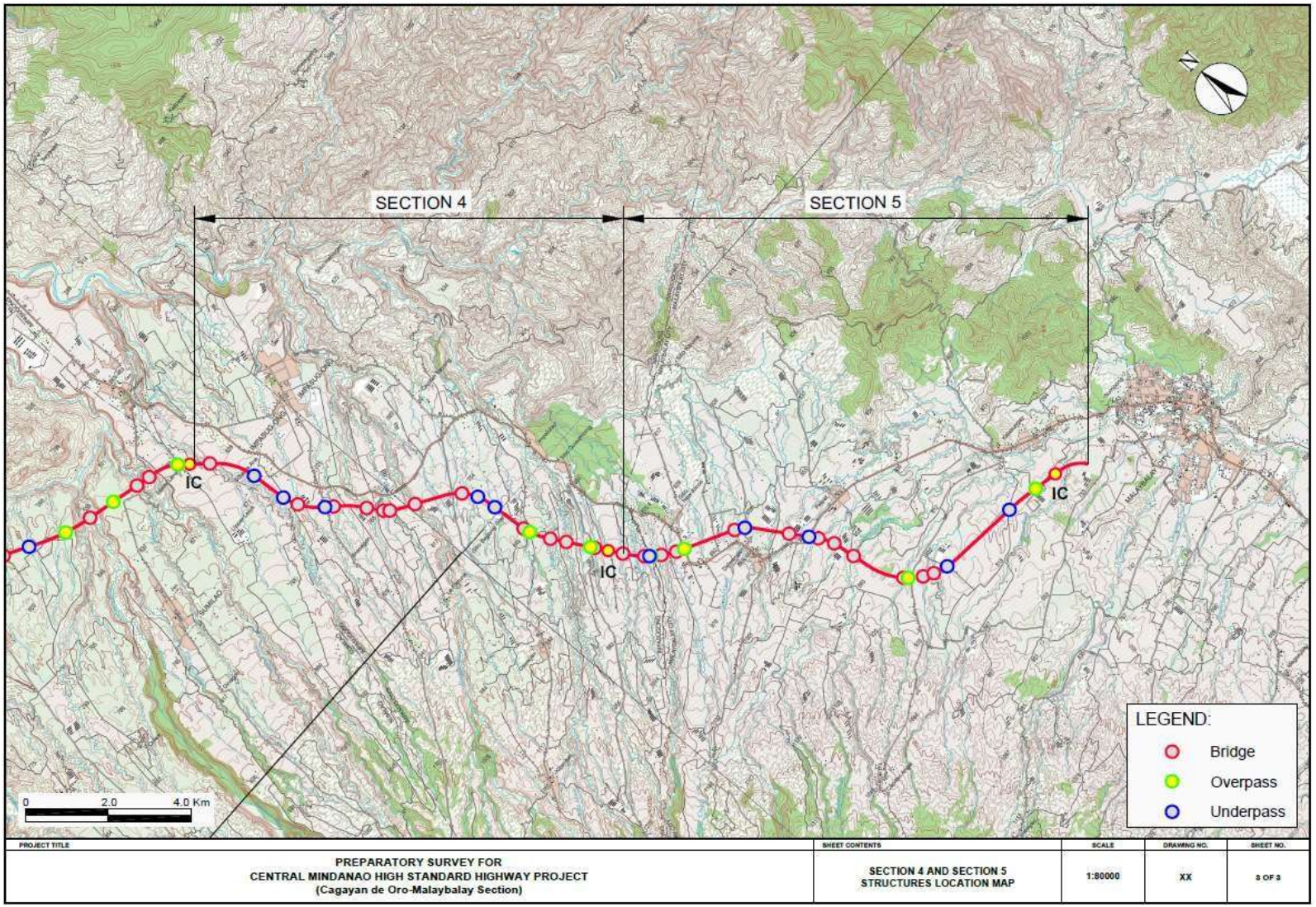
Source: JICA Study Team

Figure 1-19. Section 3 Structural Map



Source: JICA Study Team

Figure 1-20. Section 4 and 5 Structural Map



Source: JICA Study Team

Table 1-14. Road geometric design standard for main alignment (80kph design speed)

Item		Unit	Standard	Absolute minimum
Design Speed		kph	80	
Design Vehicle		-	WB-19	
Stopping Sight Distance		m	130	
Passing Sight Distance		m	245	
ROW		m	60	
Terrain Condition			Rolling	
Cross Section Elements				
Pavement				
Lane Width		m	3.65	
Median Width		m	3.0	
Inner shoulder Strip		m	0.75	
Outer shoulder Strip		m	3.0	2.5
Number of Lanes		Nos	5	
Normal Cross Slope		%	2	
Horizontal Alignment				
Minimum Radius		m	252	
Min. Transition Curve Length		m	70	
Min. Radius not requiring Transition Curve		m	379	
Min. Radius not requiring Super		m	3,500	
elevation		m	2,000	
Max. Relative Slope			1/200	
Vertical Alignment				
Maximum Vertical Gradient		%	4	5
Minimum K value	Sag		30	
	Crest		26	
Minimum Radius	Sag	m	2,000	
	Crest	m	3,000	
Min Vertical Curve Length		m	70	
Max. Composition Grade		m	10.5	
Vertical Clearance				
Road		m	5.2	

Source: JICA Study Team

Table 1-15. Road geometric design standard for ramp (40kph design speed)

Item	Unit	Standard	Absolute minimum
Design Speed	kph	40	
Design Vehicle	-	WB-15	
Stopping Sight Distance	m	50	
Passing Sight Distance	m	140	
ROW	m	60	
Terrain Condition		Rolling	
Cross Section Elements			
Pavement			
Lane Width	m	4.5	
Median Width	m	0	
Inner shoulder Strip	m	0.75	
Outer shoulder Strip	m	3.0	2.50
Number of Lanes	Nos	1	
Normal Cross Slope	%	2	
Horizontal Alignment			
Minimum Radius	m	43	
Min. Transition Curve Length	m	50	
Min. Radius not requiring	m	95	

Item		Unit	Standard	Absolute minimum
Transition Curve				
Superelevation Runoff			1/143	
Vertical Alignment				
Maximum Vertical Gradient		%	6	8
Minimum K value	Sag		9	
	Crest		4	
Min Vertical Curve Length		m	35	
Max. Composition Grade		m	11.5	
Vertical Clearance				
Road		m	5.2	

Source: JICA Study Team

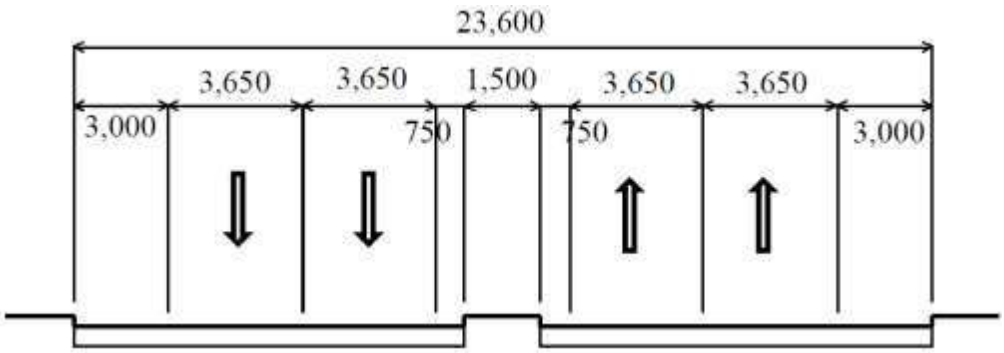
Vertical clearance - The design vertical clearances of the highway and crossing road is 4.0 to 5.2 meters.

Number of lanes - The alignment is a dual 2-lane (2x2) road in accordance with the traffic demand.

Carriageway, Shoulder, and Median widths - The recommended cross-section configurations are presented in the succeeding paragraphs.

a) *Main Alignment* - The carriageway of the main alignment is 3.65 m in accordance with HSH MP Phase-2 Report The deign widths of the inner and outer shoulders are 0.75 meter (using median island) and 3.00 meters respectively. The design widths will allow emergency stops at the shoulder without serious conflict to traffic on the main lanes. The design width of median is 3.00 m with a guard rail post on median island or a New Jersey Barrier that includes the inner shoulder as a lateral clearance (**Figure 1-21**).

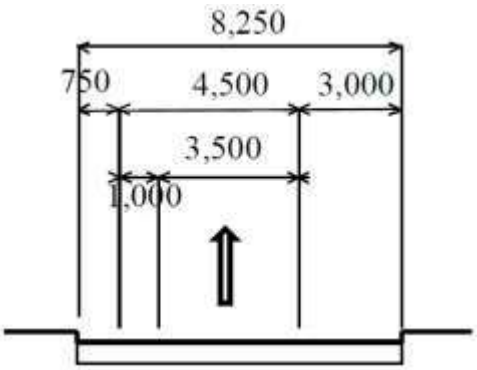
Figure 1-21. Cross-sectional Configuration (4 Lanes) Main Expressway



Source: JICA Study Team

b) *Ramp* - The design width of the carriageway of the 1-lane ramp is 4.5 meters. A 3.5-m lane width and a widening of 1.0 meter is added to the carriageway at inner lateral clearance. The inner and outer shoulders have design widths of 0.75 and 3.0 meters with provision for passing a stalled vehicles with consideration for semi-trailers (**Figure 1-22**).

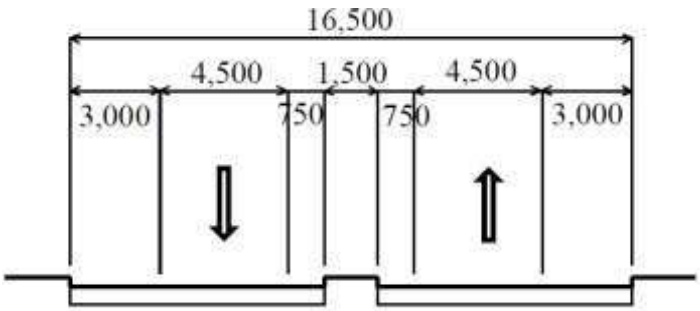
Figure 1-22. Cross-sectional Configuration (1 Lane Ramp)



Source: JICA Study Team

c) *Medium/ Small size bridge (L=<100m)* – the cross-sectional configuration of small and medium sized bridges (L=<100m) is the same as embankment roadway section (**Figure 1-23**).

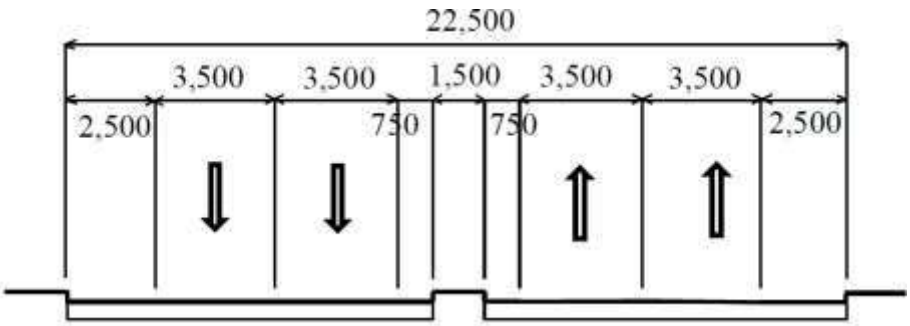
Figure 1-23. Cross-sectional Configuration (1 Lane Ramp)



Source: JICA Study Team

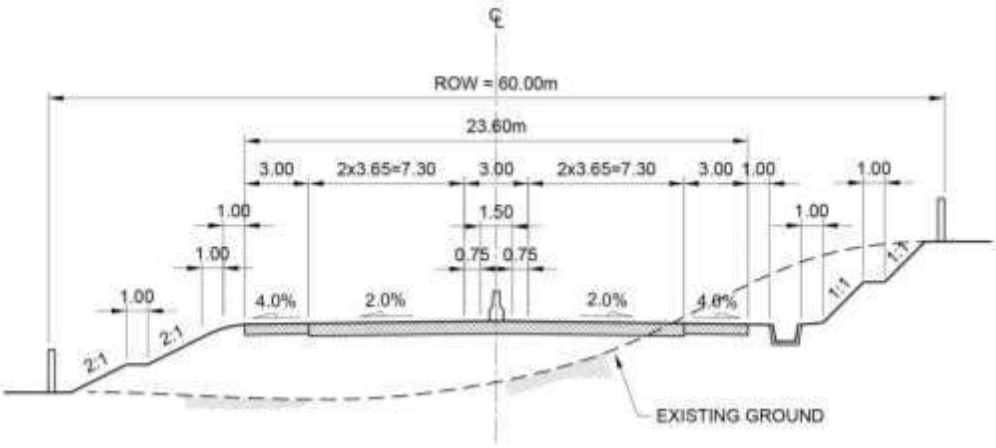
d) *Viaduct Bridge (L>100m)* – The inner and outer shoulder widths of viaduct bridges are 0.5 and 1.5m for economic reasons (**Figure 1-24**).

Figure 1-24. Cross-sectional Configuration (2 Direction 5 Lane Main Ramp Approaching Intersection)



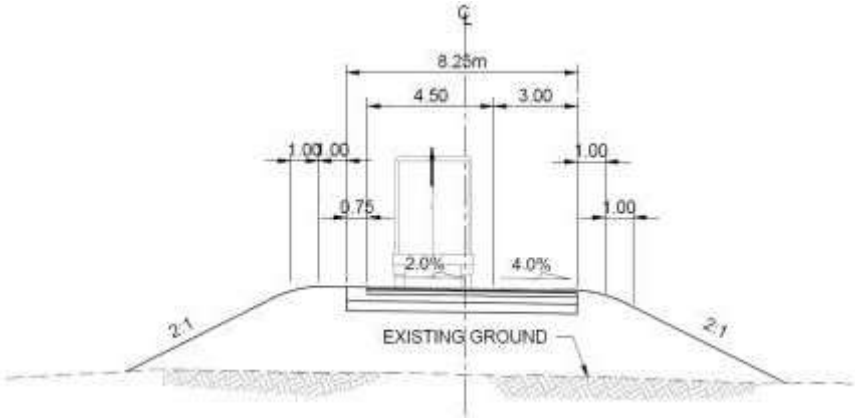
Source: JICA Study Team

Figure 1-25. Typical Cross Section Embankment and Cut: Row=60m



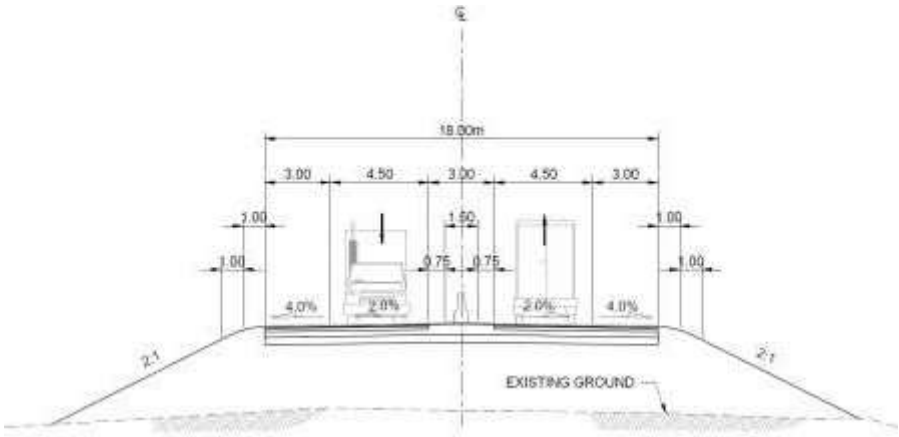
Source: JICA Study Team

Figure 1-26. Typical Cross Section at Interchange: One-Lane Ramp



Source: JICA Study Team

Figure 1-27. Typical Cross Section at Interchange: Two-Lane, Two-Direction Ramp



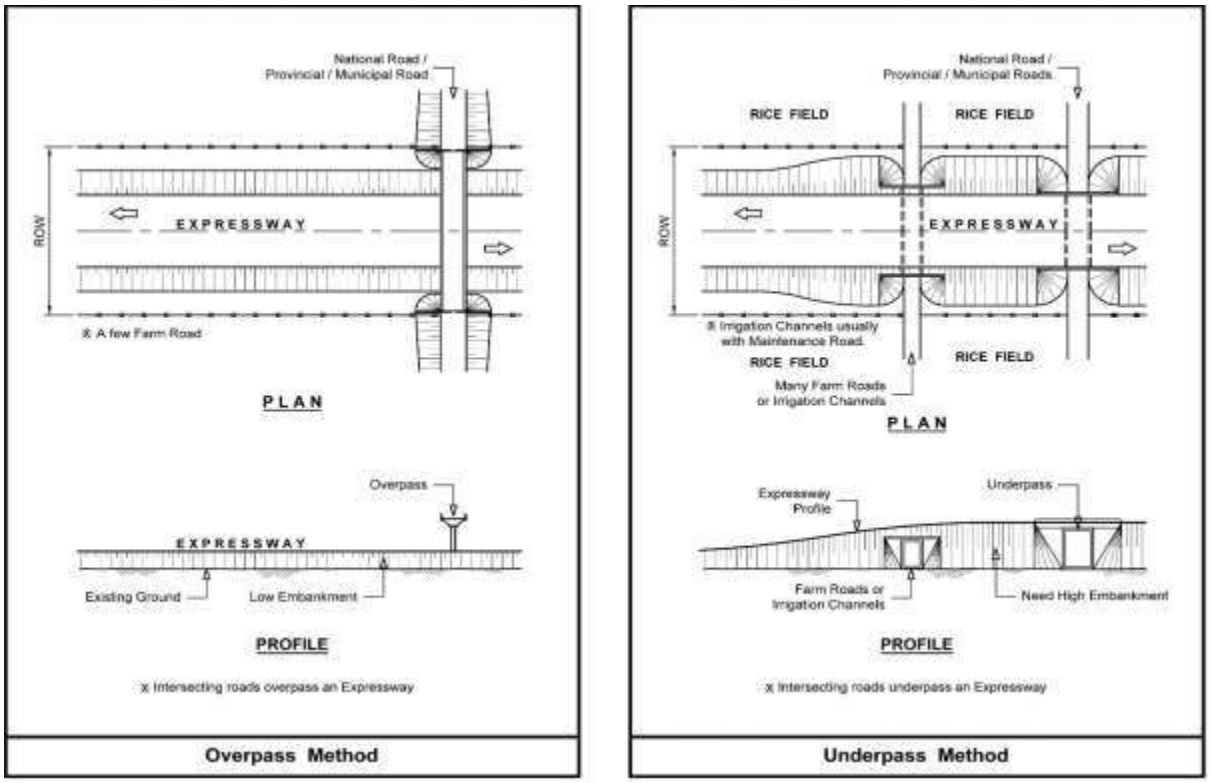
Source: JICA Study Team

1.5.2.2 Expressway design

Crossing road design - Crossing roads (under or over the highway) and service roads are included in the designed to maintain the accessibility of the Sayre Highway after the construction of the CMH alignment. while **Table 1-17** shows the lists and types of road crossings of the alignment.

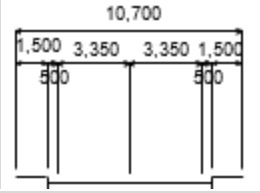
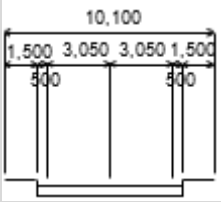
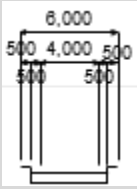
Figure 1-28 and Table 1-16 show the typical design of the under- and overpasses and their cross-sectional configuration respectively while **Table 1-17** shows the lists and types of road crossings of the alignment.

Figure 1-28. Typical Crossing Road of Expressway



Source: JICA Study Team

Table 1-16. Cross-sectional configuration of crossing road

No.	Road category	Road width (m)	Cross sectional configuration	Vertical clearance (m)	Remark
1	National Road	10.7 m		Vertical clearance (4.9 m) + overlay (0.3m) = 5.2 m 5.2 m	According to the DPWH Highway Design Guidelines, Criteria and Standards, the width of lane for Philippines's roads are dependent which classification of highways according to system the particular crossing road is subjected. For National Roads, the minimum width of 2-lane travelled way is 6.7m or 3.35m each direction. For other road crossings which constitute as Provincial, City, Municipal, Tourism roads require a minimum standard of 6.10m for 2-lane. Barangay and Farm to Market roads is provided with minimum 4.0m width of travelled way.
2	Provincial, City, Municipality Road	10.1 m		Vertical clearance (4.9 m) + overlay (0.3 m) = 5.2 m	
3	Barangay Road (1 lane)	6.0 m		Vertical clearance (4.9 m) + overlay (0.3 m) = 5.2 m	

Source: JICA Study Team

Table 1-17. Road Crossing List (underpass, overpass and interchanges)

No.	Station	Road Classification	Crossing Type	Type of Crossing Structure	Vertical Clearance
1	0+520	Trail	R.C. Box	Underpass	4
2	2+736	Tertiary	R.C. Box	Underpass	6
3	5+419	Trail	Bridge	Overpass	5.2
4	6+140	Farm	R.C. Box	Underpass	3.5
5	7+870	Trail	R.C. Box	Underpass	4
6	9+679	Trail	R.C. Box	Underpass	4
7	10+367	Farm	R.C. Box	Underpass	4
8	11+147.23	Interchange 1	R.C. Box	Underpass	0
9	INT 1 (0+873.871)	Farm	R.C. Box	Underpass	4
10	INT 1 (0+406.073)	Farm	R.C. Box	Underpass	4
11	11+340	Farm	R.C. Box	Underpass	4
12	13+800	Tertiary	Bridge	Overpass	5.2
13	17+309	Farm	R.C. Box	Underpass	4
14	17+596	Trail	R.C. Box	Underpass	4
15	18+732	Tertiary	Bridge	Overpass	5.2
16	19+060	Farm	R.C. Box	Underpass	4
17	20+980	Farm	R.C. Box	Underpass	4
18	22+546	Farm	R.C. Box	Underpass	4
19	23+999	Secondary	R.C. Box	Underpass	6
20	24+606	Trail	R.C. Box	Underpass	4
21	26+130	Farm	Bridge	Overpass	5.2
22	26+750.00	Interchange 2	Bridge	Overpass	0
23	27+902	Farm	R.C. Box	Underpass	4
24	28+677	Farm	R.C. Box	Underpass	4
25	29+300	Trail	Bridge	Overpass	5.2

No.	Station	Road Classification	Crossing Type	Type of Crossing Structure	Vertical Clearance
26	30+278	Trail	Bridge	Overpass	5.2
27	31+218	Trail	R.C. Box	Underpass	4
28	33+110	Trail	Bridge	Overpass	5.2
29	33+893	Farm	Bridge	Overpass	5.2
30	37+200	Trail	R.C. Box	Underpass	4
31	38+154	Farm	Bridge	Overpass	5.2
32	39+537	Trail	Bridge	Overpass	5.2
33	41+364	Tertiary	Bridge	Overpass	5.2
34	41+657.27	Interchange 3	Bridge	Overpass	0
35	43+283	Farm	R.C. Box	Underpass	4
36	44+172	Farm	R.C. Box	Underpass	4
37	45+228	Secondary	R.C. Box	Underpass	6
38	49+010	Trail	R.C. Box	Underpass	4
39	49+495	Farm	R.C. Box	Underpass	4
40	50+540	Trail	Bridge	Overpass	5.2
41	52+064	Farm	Bridge	Overpass	5.2
42	52+500.00	Interchange 4	R.C. Box	Underpass	4.5
43	53+511	Farm	R.C. Box	Underpass	5.2
44	53+553	Farm	Bridge	Overpass	4
45	55+940	Farm	R.C. Box	Underpass	5.2
46	60+160	Tertiary	Bridge	Overpass	6
47	61+I65	Tertiary	R.C. Box	Underpass	4
48	63+219	Trail	R.C. Box	Underpass	5.2
49	64+040	Farm	Bridge	Overpass	5.2
50	64+666.10	Interchange 5	R.C. Box	Underpass	0

Source: JICA Study Team

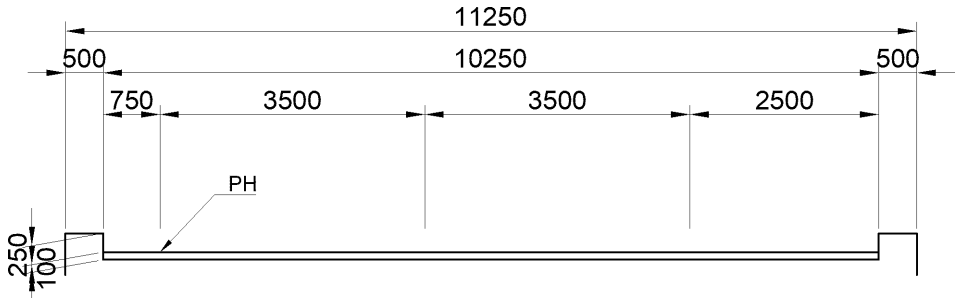
Vertical control – The vertical control design of the proposed alignment will be designed according to the following: a) the embankment and cut height shall be kept minimum while providing sufficient clearance at road crossing points to minimize construction cost; b) the minimum distance between PI point of vertical profile shall be 600m to provide smooth driving; and c) minimum vertical gradient is set as 0.3% to optimize surface drainage.

1.5.2.3 Bridge design

Section 1 can be constructed with piers with heights exceeding 100m using Japanese state-of-the-art technology. The provisionary design flood levels for creeks and rivers are 3m and 5m from the bed respectively.

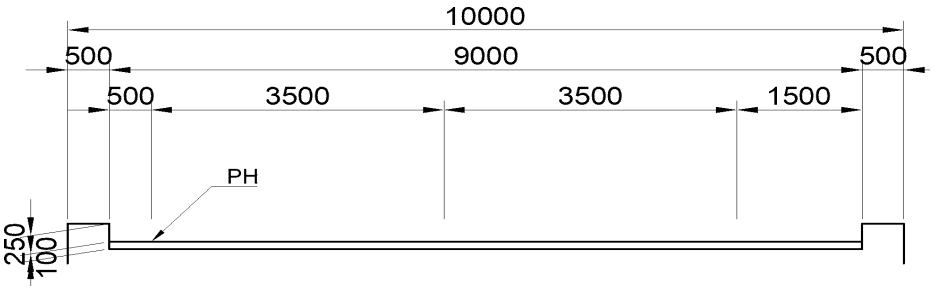
Other sections will be constructed using local technology, bridges with pier heights of 50m or more will be avoided, and instead select long bridges. The typical bridge dimensions are shown in **Figure 1-29** to **Figure 1-31** while **Table 1-18** and **Table 1-19** show the lists of the bridges, their length and type of structure. .

Figure 1-29. Schematic diagram of a medium or small bridge (L<100m)



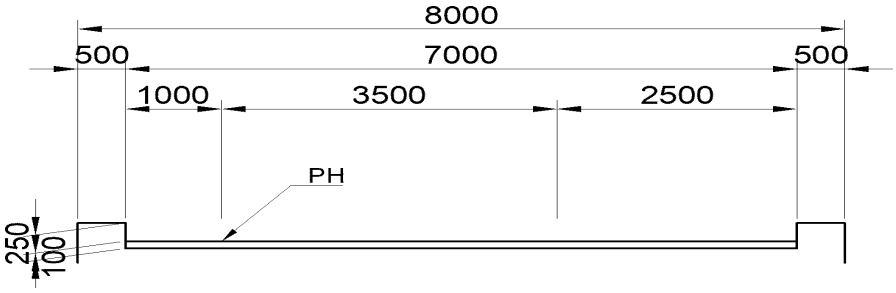
Source: JICA Study Team

Figure 1-30. Schematic diagram of a long bridge (L>100m)



Source: JICA Study Team

Figure 1-31. Schematic diagram of a ramp bridge



Source: JICA Study Team

Table 1-18. Summary of applicable superstructure type for each span

Range of Span	Pre-stressed Concrete	Steel
L≤40 m	AASHTO girder	---
40≤L≤50 m	Box Girder	Plate Girder
50≤L≤150 m		Box Girder
150≤L≤200 m		Truss
200≤L≤240 m	Extra-dosed	Arch
240≤L≤300 m	Cable Stayed	
300≤L≤400 m		Cable Stayed

Source: JICA Study Team

Table 1-19. List of bridges, length and type of structure

Bridge No.	Section	Length of Bridge (m)	Type of Structure
Viaduct-1	1	665	AASHTO Girder
BR-1	1	245	AASHTO Girder
BR-2	1	400	Steel Bridge
BR-3	1	540	Steel Bridge
BR-4	2	335	AASHTO Girder
BR-5	2	140	AASHTO Girder
BR-6	2	175	AASHTO Girder
BR-7	2	560	AASHTO Girder
BR-8	2	140	AASHTO Girder
BR-9	2	315	AASHTO Girder+ Steel
BR-10	3	240	Steel Bridge
BR-11	3	140	AASHTO Girder
BR-12	3	420	Steel Bridge
BR-13	3	175	AASHTO Girder
BR-14	3	210	AASHTO Girder
BR-15	3	540	Steel Bridge

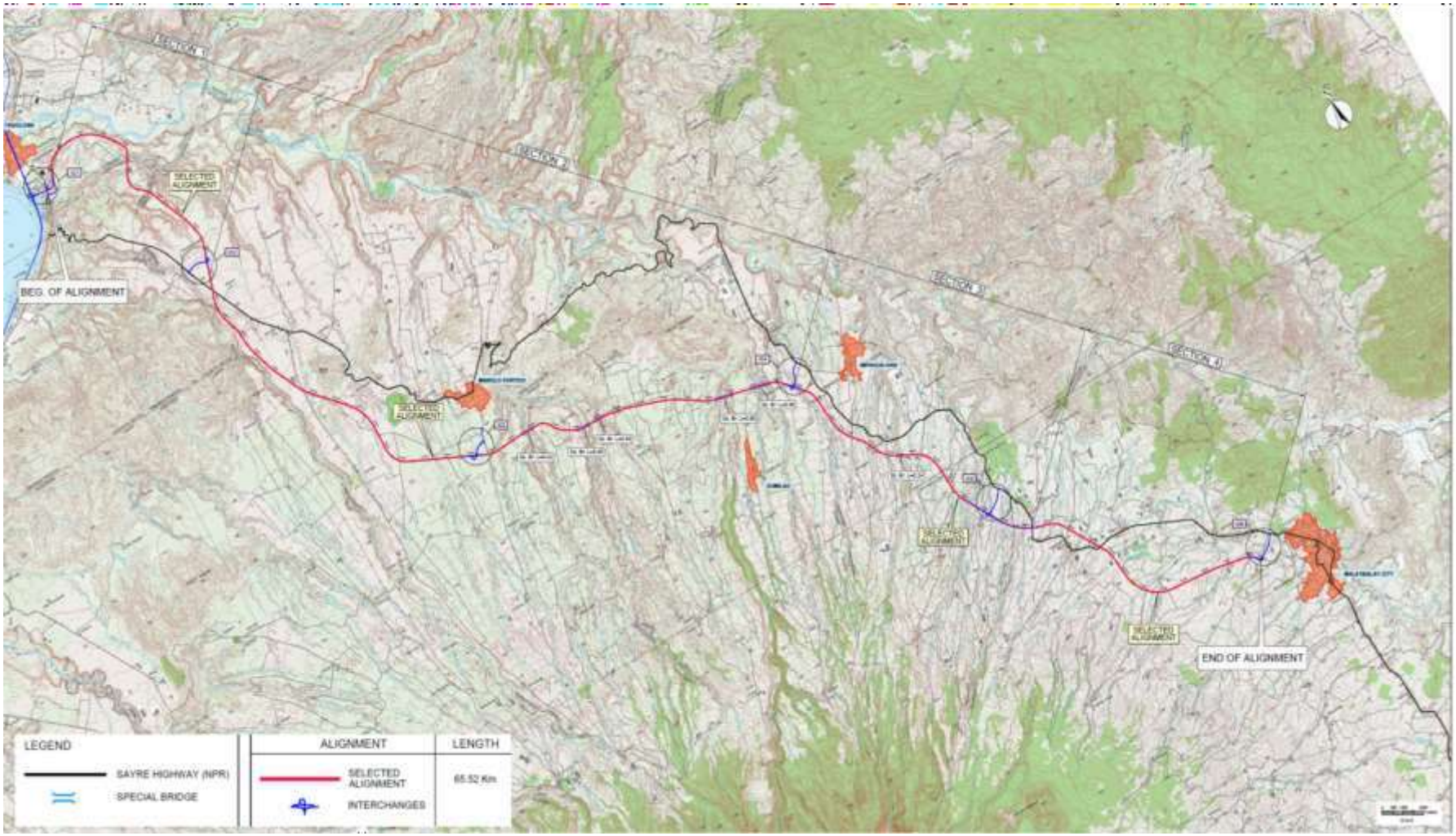
Bridge No.	Section	Length of Bridge (m)	Type of Structure
BR-16	3	210	Steel Bridge
BR-17	3	210	AASHTO Girder
BR-18	3	720	Steel Bridge
BR-19	3	350	Steel Bridge
BR-20	3	240	Steel Bridge
BR-21	4	170	Steel+AASHTO+ Steel
BR-22	4	315	AASHTO Girder
BR-23	4	210	AASHTO Girder
BR-24	4	245	AASHTO Girder
BR-25	4	105	AASHTO Girder
BR-26	4	105	AASHTO Girder
BR-27	4	240	Steel Bridge
BR-28	4	525	AASHTO Girder
BR-29	4	140	AASHTO Girder
BR-30	4	210	Steel+AASHTO+Steel
BR-31	4	175	AASHTO Girder
BR-32	4	140	AASHTO Girder
BR-33	4	280	AASHTO Girder
BR-34	5	210	AASHTO Girder
BR-35	5	245	AASHTO Girder
BR-36	5	400	AASHTO Girder
BR-37	5	175	AASHTO I Girder
BR-38	5	175	AASHTO Girder
BR-39	5	210	AASHTO Girder
BR-40	5	175	AASHTO Girder
BR-41	5	90	AASHTO Girder
BR-42	5	400	AASHTO Girder
BR-43	5	175	AASHTO Girder
BR-44	5	90	AASHTO Girder
BR-45	5	170	Steel+AASHTO+ Steel

Source: JICA Study Team

1.5.2.4 Interchange design

Figure 1-32 shows the location while **Table 1-20** shows the specifications of the interchanges at the proposed CMH alignment. The trumpet type as the most common interchange structure will be adopted for the Project. The schematic diagrams the CMH interchanges are shown in **Figure 1-33** to **Figure 1-38**.

Figure 1-32. Location map of the CMH interchanges



Source: JICA Study Team

Table 1-20. Location and specifications of the interchanges

Station	Road Classification	Crossing Type	TCS	MVC
11+147.23	Interchange 1	R.C. Box	Underpass	5.20
INT 1 (0+873.871)	Farm	R.C. Box	Underpass	4.00
INT 1 (0+406.073)	Farm	R.C. Box	Underpass	4.00
26+750.00	Interchange 2	Bridge	Overpass	5.20
41+657.27	Interchange 3	Bridge	Overpass	5.20
52+500.00	Interchange 4	R.C. Box	Underpass	5.20
64+666.10	Interchange 5	R.C. Box	Underpass	5.20

Source: JICA Study Team; NOTES: TCS – type of crossing structure; MVC – minimum vertical clearance (meters)

Figure 1-33. CDO Interchange

Source: JICA Study Team

Figure 1-34. Mambatangan Interchange

Source: JICA Study Team

Figure 1-35. Manolo Fortich Interchange

Source: JICA Study Team

Figure 1-36. Impasug-ong Interchange

Source: JICA Study Team

Figure 1-37. Dalwangan Interchange

Source: JICA Study Team

Figure 1-38. Malaybalay Interchange

Source: JICA Study Team

1.5.2.5 Pavement design

The pavement design will be conducted according to the Guide for Design of Pavement Structures (1993) by the American Association of the State Highway and Transportation Officials (AASHTO) and the Design Guidelines, Criteria and Standards for Public Works and Highways of the Department of Public Works and Highways (DPWH). The pavement design will be conducted after the traffic demand forecast.

1.5.2.6 Drainage design

Flooding and protection against inundation of a roadway and its facilities are some of the major problems in road design. Adequate flood control and drainage measures reduce damage to a roadway and its facilities resulting to minimal maintenance, operational and even reconstruction cost.

The general references used for the design criteria and standards concerning hydrology and hydraulics in were a) Design Guidelines, Criteria and Standards (DGCS) for DPWH (Department of Public Works and Highways) published in 2015.; b) HEC (Hydraulic Engineering Circular) series, by FHWA (Federal Highway Administration, USA); and c) HEC-HMS, HEC-RAS and HY-8 Manuals and Technical References, by U.S. Army Corps of Engineers, Hydrologic Engineering Center.

These standards will serve as bases for the proposed hydrologic and hydraulic design criteria appropriate for the Project. In addition, these standards will cover a) hydrologic design, b) Design Frequency or Return Period, c) Runoff Computation Methods, Runoff Coefficients, d) Rainfall Intensity, e) Level of Development in the Watersheds, f) Hydraulic Design, g) Manning's Roughness Coefficient, h) Expansion and Contraction Loss Coefficients, and i) Freeboard.

1.5.2.7 Road Markings and Signs and Safety

Besides the warning signs along the expressway, both the rest areas and the service areas should be equipped with road markings and signs for the following purposes; a) to limit speeds to the allowable speed limit; b) to give advance warning of junctions; c) to prevent stopping outside the zones specifically designated for parking; d) to advertise the various services offered by the service area. The proponent will also institute

safety measures such as street lighting. The Project will be designed based on the Road Safety Design Manual of DPWH.

1.5.3 Support facilities

Camp sites which include offices, storage facilities, bunk houses, fabrication yards, and other temporary construction facilities, will be constructed during the duration of the construction phase. The Contractor shall designate camp site/s within the vicinity of active construction sites. Temporary access roads may be also constructed in hard-to-reach areas of the alignment. The support facilities will be updated along with the Feasibility Study and Preliminary Design as the design and studies progress to subsequent stages.

The water and power requirements during Project implementation are existing water systems in the areas and the Cagayan Electric Power & Light Company, Inc. (CEPALCO) and Bukidnon Power Corporation (BPC). Onsite generators will also be provided onsite during power outages.

1.5.4 Pollution control facilities

Construction Phase - Material Recovery Facilities (MRF) will be constructed at the camp sites for segregating recyclable, biodegradable, and hazardous construction wastes. Temporary drainage and sewage facilities will be also constructed and provided. Drainage leading to silt ponds will also be constructed in active construction sites.

Project management will coordinate with the concerned local government units (LGUs) for the use of their existing waste management facilities such MRFs, composting and recycling facilities, and sanitary landfills. Construction spoil materials such as excavated soil, demolition and construction debris, and other spoil materials will be disposed and used as filling materials in nearby reclamation/real estate/land development projects or land cover for as regular maintenance of sanitary landfills.

Operation and Maintenance Phase – Sanitary facilities (comfort rooms, septic vaults) will be provided for employees at the toll gates. The septic vaults will be regularly siphoned and maintained by contracted service providers. Garbage bins will be provided at all toll gates for municipal solid wastes and collected daily.

Noise barriers will be constructed along the alignment near the noise sensitive receptors such as schools, churches, hospitals, and residential areas. Tree planting will be actively conducted to air and noise pollution from vehicles using the CMH highway. Adequate drainage system with grease traps will be constructed to prevent oil and grease and other pollutants drain to the nearby surface waters. The potential wastes, key environmental impacts, and planned mitigations with activities associated in each Project phase are shown in **Table 1-21.**

Table 1-21. Pollution control strategies for the Project

Project phase	Brief description of process/ activities involved	Waste generation information	Key environmental and social issues	Planned mitigation built into design
Pre-construction	Detailed Architectural and Engineering Design, conduct of EIA, and securing of permits and licenses	None expected	None expected	Activities done: - Traffic Impact Assessment - Perception Survey - Public Consultations - Tree Inventory - EIA Formulate the following prior to construction: - Construction Waste Management Plan (CWMP) - Integrated Waste Management Plan

Project phase	Brief description of process/ activities involved	Waste generation information	Key environmental and social issues	Planned mitigation built into design
				(IWMP) during operations - Secure Permit to Cut from DENR (if required) Activities prior to Construction and Operation - Designation and accreditation of a PCO - Apply and secure a HW Generator ID and Permit-To-Operate for the Emission Source Installations, e.g., power generators and Discharge Permit from EMB-RX - Apply and secure surface water permit from NWRB
Construction	Site preparation and development, Erection of structures	- Sewage - Contaminated runoff - Resuspension of sediments during pipe laying and construction of intake structure	Water pollution	- Provision of an oil-water separator and silt ponds - Silt curtains at active pipe laying sites - Onsite sanitary facilities - Good construction practices - Set up adequate toilet facilities, ensure sufficient wash room for workers
		- Emissions of fugitive particulates (TSP, PM10) - Emissions of gaseous pollutants (SO_2, NO_2)	Air pollution	- Dust suppression on exposed soil surfaces - Proper maintenance of vehicles and heavy equipment - Set up adequate toilet facilities, ensure sufficient wash room for workers
		- Construction wastes - Hazardous wastes	Land pollution	- Implement the CWM - Set up adequate toilet facilities, ensure sufficient wash room for workers
Operation	Operation of toll gates and equipment maintenance	- Municipal solid wastes - Hazardous wastes	Land pollution	Implement the IWMP
		- Emissions of fugitive particulates (TSP, PM10) - Emissions of gaseous pollutants (SO_2, NO_2)	Air pollution	- Establishment of noise barriers - Planting of vegetation barriers
		- Sewage - Storm water runoff	Water pollution	- Provision of adequate drainage system - Adequate treatment of process wastewater

1.6 Process/Technology

1.6.1 Technology description

The construction technology used are standard to typical road projects. Regular inspection and maintenance

will be done during the opening of the Project to motorists. Replacement or repair of degraded components will be done as necessary to ensure that the reliability of the structures during its intended service life. Maintenance may be classified as routine, periodic or annual activities depending on the requirements.

1. Routine maintenance activities will include a) Pothole patching, sealing of cracks on pavement, b) grading and patching of shoulders, c) drainage cleaning and clearing, d) roadside and future maintenance; vegetation control, road signs and guardrail cleaning and repainting; and maintenance of other street furniture, e) road marking maintenance, and f) bridge maintenance, structure inspection;
2. Periodic maintenance activities will include resealing of pavement and re-gravelling of shoulders; and
3. Annual preventive maintenance activities will include asphalt concrete overlays and sectional replacement of Portland Cement Concrete pavement and road markings.

1.6.2 Waste management systems

Waste management systems (WMS) in the context of the Project refer to the identification, quantification, collection, treatment, and disposal of residuals during the construction and operation phases. The environmental aspects that generated wastes, corresponding mitigations, and Project timeframe were already presented in **Table 1-21.** In summary, the following mitigating measures earlier presented comprise the WMS for each environmental component:

1. Air Pollution Management System
   - Identification of air pollution sources
   - Regular dust suppression on exposed soil surfaces
   - Proper maintenance of vehicles and heavy equipment
   - Restrict activities during daytime
   - Good housekeeping practices
   -Establishment of vegetation barriers

2. Water pollution management system
   - Identification of water pollution sources
   - Provision of drainage leading to siltation ponds
   - Provision of an oil-water separator
   - Provision of sanitation facilities
   - Provision of silt curtains during pipe installation
   - Proper treatment of process wastewater
   - Proper collection, storage, and disposal of hazardous wastes using DENR- accredited TSDs
   - Good housekeeping practices

3. Noise
   - Identification of noise generators
   - Restrict activities during daytime
   -Establishment of noise barriers

4. Land pollution management system
   - Identification of land pollution sources
   - Proper spoils management
   - Formulate and implement an integrated waste management system
   - Proper collection, storage, and disposal (using DENR- accredited TSDs) of hazardous wastes
   - Good housekeeping practices

1.7 Project size

The proposed Project is a four-lane 65.6 km road with a RROW of 60 meters. Other components include

bridges, underpass, overpass and interchanges as shown in **Table 1-22** to **Table 1-24.**

Table 1-22. Road Crossing List (underpass, overpass and interchanges)

No.	Station	Road Classification	Crossing Type	Type of Crossing Structure	Vertical Clearance
1	0+520	Trail	R.C. Box	Underpass	4
2	2+736	Tertiary	R.C. Box	Underpass	6
3	5+419	Trail	Bridge	Overpass	5.2
4	6+140	Farm	R.C. Box	Underpass	3.5
5	7+870	Trail	R.C. Box	Underpass	4
6	9+679	Trail	R.C. Box	Underpass	4
7	10+367	Farm	R.C. Box	Underpass	4
8	11+147.23	Interchange 1	R.C. Box	Underpass	0
9	INT 1 (0+873.871)	Farm	R.C. Box	Underpass	4
10	INT 1 (0+406.073)	Farm	R.C. Box	Underpass	4
11	11+340	Farm	R.C. Box	Underpass	4
12	13+800	Tertiary	Bridge	Overpass	5.2
13	17+309	Farm	R.C. Box	Underpass	4
14	17+596	Trail	R.C. Box	Underpass	4
15	18+732	Tertiary	Bridge	Overpass	5.2
16	19+060	Farm	R.C. Box	Underpass	4
17	20+980	Farm	R.C. Box	Underpass	4
18	22+546	Farm	R.C. Box	Underpass	4
19	23+999	Secondary	R.C. Box	Underpass	6
20	24+606	Trail	R.C. Box	Underpass	4
21	26+130	Farm	Bridge	Overpass	5.2
22	26+750.00	Interchange 2	Bridge	Overpass	0
23	27+902	Farm	R.C. Box	Underpass	4
24	28+677	Farm	R.C. Box	Underpass	4
25	29+300	Trail	Bridge	Overpass	5.2
26	30+278	Trail	Bridge	Overpass	5.2
27	31+218	Trail	R.C. Box	Underpass	4
28	33+110	Trail	Bridge	Overpass	5.2
29	33+893	Farm	Bridge	Overpass	5.2
30	37+200	Trail	R.C. Box	Underpass	4
31	38+154	Farm	Bridge	Overpass	5.2
32	39+537	Trail	Bridge	Overpass	5.2
33	41+364	Tertiary	Bridge	Overpass	5.2
34	41+657.27	Interchange 3	Bridge	Overpass	0
35	43+283	Farm	R.C. Box	Underpass	4
36	44+172	Farm	R.C. Box	Underpass	4
37	45+228	Secondary	R.C. Box	Underpass	6
38	49+010	Trail	R.C. Box	Underpass	4
39	49+495	Farm	R.C. Box	Underpass	4
40	50+540	Trail	Bridge	Overpass	5.2
41	52+064	Farm	Bridge	Overpass	5.2
42	52+500.00	Interchange 4	R.C. Box	Underpass	4.5
43	53+511	Farm	R.C. Box	Underpass	5.2
44	53+553	Farm	Bridge	Overpass	4
45	55+940	Farm	R.C. Box	Underpass	5.2
46	60+160	Tertiary	Bridge	Overpass	6
47	61+I65	Tertiary	R.C. Box	Underpass	4
48	63+219	Trail	R.C. Box	Underpass	5.2
49	64+040	Farm	Bridge	Overpass	5.2
50	64+666.10	Interchange 5	R.C. Box	Underpass	0

Source: JICA Study Team

Table 1-23. List, length, and type of bridges at the alignment

Bridge	Section	Length, m	Structure type	Bridge	Section	Length, m	Structure type
Viaduct-1	1	665	AASHTO Girder	BR-23	4	210	AASHTO Girder
BR-1	1	245	AASHTO Girder	BR-24	4	245	AASHTO Girder
BR-2	1	400	Steel Bridge	BR-25	4	105	AASHTO Girder
BR-3	1	540	Steel Bridge	BR-26	4	105	AASHTO Girder
BR-4	2	335	AASHTO Girder	BR-27	4	240	Steel Bridge
BR-5	2	140	AASHTO Girder	BR-28	4	525	AASHTO Girder
BR-6	2	175	AASHTO Girder	BR-29	4	140	AASHTO Girder
BR-7	2	560	AASHTO Girder	BR-30	4	210	Steel+AASHTO+Steel
BR-8	2	140	AASHTO Girder	BR-31	4	175	AASHTO Girder
BR-9	2	315	AASHTO Girder+ Steel	BR-32	4	140	AASHTO Girder
BR-10	3	240	Steel Bridge	BR-33	4	280	AASHTO Girder
BR-11	3	140	AASHTO Girder	BR-34	5	210	AASHTO Girder
BR-12	3	420	Steel Bridge	BR-35	5	245	AASHTO Girder
BR-13	3	175	AASHTO Girder	BR-36	5	400	AASHTO Girder
BR-14	3	210	AASHTO Girder	BR-37	5	175	AASHTO I Girder
BR-15	3	540	Steel Bridge	BR-38	5	175	AASHTO Girder
BR-16	3	210	Steel Bridge	BR-39	5	210	AASHTO Girder
BR-17	3	210	AASHTO Girder	BR-40	5	175	AASHTO Girder
BR-18	3	720	Steel Bridge	BR-41	5	90	AASHTO Girder
BR-19	3	350	Steel Bridge	BR-42	5	400	AASHTO Girder
BR-20	3	240	Steel Bridge	BR-43	5	175	AASHTO Girder
BR-21	4	170	Steel+AASHTO+ Steel	BR-44	5	90	AASHTO Girder
BR-22	4	315	AASHTO Girder	BR-45	5	170	Steel+AASHTO+ Steel

Source: JICA Study Team

Table 1-24. Location and specifications of the interchanges

Station	Road classification	Crossing type	Crossing structure	MVC
11+147.23	Interchange 1	R.C. Box	Underpass	5.20
INT 1 (0+873.871)	Farm	R.C. Box	Underpass	4.00
INT 1 (0+406.073)	Farm	R.C. Box	Underpass	4.00
26+750.00	Interchange 2	Bridge	Overpass	5.20
41+657.27	Interchange 3	Bridge	Overpass	5.20
52+500.00	Interchange 4	R.C. Box	Underpass	5.20
64+666.10	Interchange 5	R.C. Box	Underpass	5.20

Source: JICA Study Team; MVC – minimum vertical clearance (meters)

1.8 Development Plan, Description of Project Phases and Corresponding Timeframes

1.8.1 Pre-construction phase

This phase mainly involves conducting studies at the Project site involving the following activities:

a) Pre-Feasibility and Feasibility Studies;
b) Environmental Impact Assessment and Acquisition of Environmental Compliance Certificate (ECC) for the Project;
c) Securing Various Permits and Clearances (i.e., Special Tree Cutting Permit, Project Endorsements, LGU Clearances, etc.);
d) Conduct of Detailed Engineering Design (DED);
e) Implementation of Right-of-Way (ROW) / Land Acquisition and Implementation of the Resettlement Action Plan (RAP) by DPWH;
f) Pre-qualification, Tendering, and Awarding of Contract for the Construction of the Project; and
g) Financing for the Project.

h) Conduct of FPIC and Securing of Certificate Precondition (CP)

1.8.2 Construction phase

This section presents the construction timetable, major construction activities, indicative equipment used, source of construction materials, and support service and availability during the construction.

Indicative project timeline – The construction phase will take about three years after the acquisition of the RROW (**Table 1-25**).

Table 1-25. Indicative Project implementation schedule

Activity	2021				2022				2023				2024				2025			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Feasibility Study																				
Selection of Consultant																				
Detailed Engineering Design																				
ROW Acquisition																				
Construction																				

Activity	2026				2027				2028				2029				2030			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Feasibility Study																				
Selection of Consultant																				
Detailed Engineering Design																				
ROW Acquisition																				
Construction																				

Source: JICA Study Team

Major construction activities – The typical construction activities are enumerated and described below.

1. *Site clearing* - This activity includes cutting of trees and vegetation and removal of affected structures along the RROW. A Tree Cutting Permit, land and ROW acquisition documents, and other necessary permits and clearances related to site clearing will be secured prior to site clearing.

2. *Construction of temporary facilities* – location of temporary facilities is not established as of this time. The temporary facilities will be composed of engineer's site offices, bunk houses for construction workers, warehouse/storage areas, parking area for heavy equipment and vehicles, batching plant, and fabrication yard, among others.

   Wastewater treatment facilities, siltation ponds, materials recovery facility, buffer walls, and other pollution control devices should be constructed in this temporary facility to mitigate adverse environmental impacts.

3. *Excavation works* - all the accessible and fertile topsoil, together with the natural root systems, will be removed to stock piles for later use on cut-and-fill slopes before placing the embankment. The depth of excavation for topsoil stripping will be carefully controlled, on the basis of previously ascertained topsoil thickness and to avoid contamination with subsoils.
   If the excavated soil is not suitable for embankment material, it will be used as soil enhancer in agricultural areas (if the soil is fertile), soil cover for sanitary landfill and dump sites, and other appropriate uses.

4. *Construction of viaduct foundations* - Viaduct foundations will be constructed by excavation/drilling and cleaning of rock formation, installation of pile reinforcements, and concrete pouring. In the cases where

viaduct foundations are located in surface waters, silt traps or curtains will be installed to mitigate siltation of the surface waters.

5. *Construction of superstructure and road pavement* – The roads and interchanges will be paved and facilities such as toll gates and guardrails will be constructed and installed. Ancillaries such as traffic signage, light posts, and other facilities will also be installed.

Types of equipment – The typical equipment during the construction phase are shown in **Table 1-26**

Table 1-26. Major equipment during the construction phase

Equipment	Capacity	No.
Dump Track	11 ton	48
Wheel Loder	1.53 m^3	5
Motor Grader 14G	3m/200HP	1
Vibratory Roller	11 ton, 125 Hp	2
Tired Roller	12.6 ton	2
Crawler Tractor (w/ Bulldozer)	Caterpillar D7G PS	4
Hydraulic Excavator	1.0 m^3	13
Backhoe	0.6 m^3	6
Vibratory Plate Compactor	7 Hp	21
Track Crane	160 ton, 300Hp	1
Crawler Crane	60T/275Hp	10
Drill Rig for Pile	CWV Model TRM35/31	10
Concrete transit Mixer	5 m^3	26
Concrete Pump	60 yd^3	7
Concrete Plant	40m^3/hr	2
Track Mounted Crane	21-25t, 200Hp	5
Concrete Vibrator	Gasoline type	53
Semi-Trailer	20 tons	4
Asphalt Paver	4.7 m, 112 Hp	2
Asphalt Distributor	5 tons	4
Asphalt Plant	60 t/hr	2
Lane Marker	8 ton Track	61
Crane,Hydraulic Tel Boom,	121-140 tons	5
High Bed Trailer	65 tons	1

Source: JICA Study Team

Source of construction materials - Construction materials, equipment, and machinery will be sourced locally according to the design specifications of the Project if available.

Support services, facilities requirements, and availability - Support services and facilities at the site will include a field office, barracks for workers, canteen, warehouse, temporary sanitary facilities, First Aid Team, communication. Water and power requirements will be sourced locally.

1.8.3 Operation phase

The operation of the project will include the following activities:

a) Operation of toll gates, as necessary;
b) Regular inspection of road structures;
c) Regular maintenance of facilities such as traffic signals, signages, and markings;
d) Regular cleaning of roadways, and maintenance of toilet septic tanks;
e) Preventive maintenance, monitoring and reporting; and
f) Upgrading of structures and facilities, if necessary.

1.8.4 Abandonment phase

Abandonment or decommissioning in the context of the Project is implied as dismantling of the temporary facilities used during the construction phase. Dismantling of the temporary facilities will be phased according to the completion of each road section.

The construction contractor is responsible for the dismantling of temporary facilities. All construction wastes and spoil materials will be hauled out from the site. Recyclable construction spoils will be sold to interested buyers, solid wastes disposed in the municipal sanitary landfill or controlled dumps, and spoils containing hazardous materials, including contaminated soils, will be hauled by a DENR-registered TSD facility. It is expected that the modular nature of the temporary facilities will facilitate it dismantling and demobilization. Restoration work will be according to procedures and standards prescribed in the approved civil works contract following DPWH standards.

Most of the proposed locations of temporary facilities are planned to be developed as residential or commercial areas. It is expected that the site of the temporary facilities ready for development once removed.

1.9 Workforce Requirements

Most of the available jobs during the construction phase are masons, laborers, steel men, electricians, plumbers, welders, heavy equipment operators, among others (**Table 1-27**). Office staffs and site engineers, however, can be represented by women. The operation of the Project, on the other hand, will be manned by toll supervisors, tollgate personnel, cashiers, patrol crews, janitors, security staffs, and road maintenance staffs. These jobs can be represented by both men and women.

A percentage of the construction manpower will be provided by the contractor; hence DPWH will require the contractor to adopt strict policy requiring to source workforce from qualified locals and to develop scheme of prioritization in local hiring. In addition, the DPWH will strictly enforce RA 6685 during Project implementation. This Act requires private contractors hire at least 50% of the qualified unskilled and at least 30% of the qualified skilled workers from the host city or municipality. As much as possible, all non-skilled workers will be hired locally. Available local skilled workers will be also be prioritized. The Contractor, with the help of LGU, will be required to post job vacancies needed for the Project in public bulletin boards. Job fairs will be also conducted to enhance local manpower sourcing.

The contractor will also be required to apply labor standards and equal opportunities for both men and women. A target percentage of female workers will be set at the DED stage of the project. Lastly, it will be part of the policy of DPWH to hire qualified applicants including persons with disability (PWD), members of indigenous communities, senior citizens and those any sexual orientation and gender identities (SOGI). These all will be part of the Terms of References (TOR) of the contractor during construction and operations phase.

Table 1-27. Workforce requirements of the Project

Type	Contractor	Consultant	Total
Professional	20	60	80
Skilled Labor	25,159		25,159
Unskilled Labor	21,835		21,835
Technical and Support Staff	40	40	80
Total	47,054	100	48,154

Source: JICA Study Team

1.10 Indicative project cost

The indicative cost of the Project is Php 96,312,065,917.34

CHAPTER 2 - LEGAL AND INSTITUTIONAL FRAMEWORK ON ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Philippines policy of environmental and social considerations

Environmental related laws in the Philippines are composed of under the Presidential Decree (PD) No.1151 as environmental policy and PD No. 1152 as environmental regulation in relation to the national policy and regulation. Other major environmental laws are established for natural resources, protection of wildlife and bio-diversity, forest resources, mining, coastal and marine, ambient air, water quality, waste and disposal, land use and resettlement, conservation of historical and cultural assets, environmental assessment, and national integrated protected area system. Major legislations on environmental and social conservation related to the proposed project are listed in **Table 2-1**, and relevant international treaties, agreements, and protocols that the Government of the Philippines has ratified in **Table 2-2.**

Table 2-1. Environment-related laws and regulations in the Philippines

Category	Law/Regulation	Content
Environmental basis	PD 1151	Philippine environmental policy
	PD 1152	Philippine environmental code
Natural Resource	1987 Constitution Article 12 Section 2	Exploration, development, and utilization of natural resources
	PD 1198	Restoration or rehabilitation of areas affected by the construction of infrastructure projects
Wildlife and Ecosystem	RA 826: An Act Creating the Commission on Parks and Wildlife, Defining its Powers, Functions, and Duties of 1952	Promotion and preservation of national parks
	RA 6147: An Act Declaring the *Pithecophaga jefferyi* Commonly Known as Monkey-Eating Eagle as a Protected Bird in the Philippines of 1970	Preservation of Monkey Eating Eagle
	RA 9147: Wildlife Resources Conservation and Protection Act of 2001	Conservation and protection of wildlife resources and their habitats
	RA 7586: National Integrated Protected Areas System (NIPAS) Act of 1992	Establishment and management of national integrated protected areas
	RA 11038: Expanded National Integrated Protected Areas System (eNIPAS) Act of 2018	Expansion of national integrated protected areas
Forest Resources	PD 331	Regulation on development application for forest resources and forest land development use
	PD 389	Development and conservation of forests
	PD 705	Protection, development, and rehabilitation of forest lands
	PD 865	Regulation on log exportation
	PD 1153	Forest recovery through citizen action
Pollution Control	RA 3931: Act creating the national water and air pollution control commission of 1964	Establishment of national air, water pollution control committee, definition of pollution and penalty

Category	Law/Regulation	Content
	PD 1160	Authority to barangay captains to enforce pollution control and environmental laws
Water Quality	RA 9275: Clean Water Act of 2003	Water Quality Management
	MC 2004-11	Compliance of all wastewater dischargers to upgraded and reclassified water bodies
	MC 2004-13	List of classified/reclassified water bodies in 2003
	PD 856	Sanitation standards
	PD 1067	Utilization and development of water resources
	DAO 1990-34	Water usage and classification, water quality criteria
	DAO 1990-35	Water quality on effluent discharge for industrial and urban drainage
	DAO 2016-08	Updated water quality guidelines and general effluent standards
Air Quality	RA 8749: Clean Air Act of 1999	Air pollution Control
	PD 1181	Control, and abate the emission of air pollution from motor vehicles
	DAO 2003-25	Hydrocarbon emission standards for motorcycle
	DAO 2003-31	Emission standard for motor vehicles
	DAO 2003-45	Designation of the members for the governing board for Metro Cagayan de Oro airshed, Province of Misamis Oriental, Region X
Waste disposal	RA 6969: Toxic Substance and Hazardous and Nuclear Wastes Control Act of 1990	Control of toxic substances and hazardous waste substances disposal
	RA 9003: Ecological Solid Waste Management Act of 2000	Establishment of ecological solid waste management program, creation of national solid waste management committee
	PD 825	Penalties for improper disposal of waste
	DAO 2004-36	Streamline procedures for generation and compliance to RA 6969
	DAO 1998-49	Technical guidelines for municipal solid waste management

NOTES: RA – Republic Act; PD – Presidential Decree; DAO – DENR Administrative Order

Table 2-2. International environmental agreements with the Philippines as signatory

Name of international treaty/agreement	Year
Washington Treaty Convention on the International Trade in Endangered Species of Wild Flora and Fauna	1981
International Tropical Timber Agreement	1983
United Nations Convention on the Law of the Sea	1984
World Heritage Convention Concerning the Protection of the World Cultural and Natural Heritage	1985
Montreal Protocol on Substances that Deplete the Ozone Layer	1991
Vienna Convention for the Protection of the Ozone Layer	1991
Convention on Biological Diversity	1993
Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal	1993
Ramsar Convention on Wetlands of International Importance, Especially as Waterfowl Habitat	1994
Framework Convention on Climate Change	1994
Kyoto Protocol	1998
Cartagena Protocol on Bio-Safety to the Convention on Biological Diversity	2000

Name of international treaty/agreement	Year
Stockholm Convention on Persistent Organic Pollutants	2001

2.2 Laws and Regulations of Environmental Impact Assessment (EIA)

Any Project or activity which are likely to have adverse effects on the environment are required to conduct an environmental impact assessment (EIA) in accordance with the Philippine Environmental Impact System (PEISS). The governing laws and guidelines of the PEISS are shown in Table 2-3**.**

Table 2-3. Important laws and manuals of PEISS

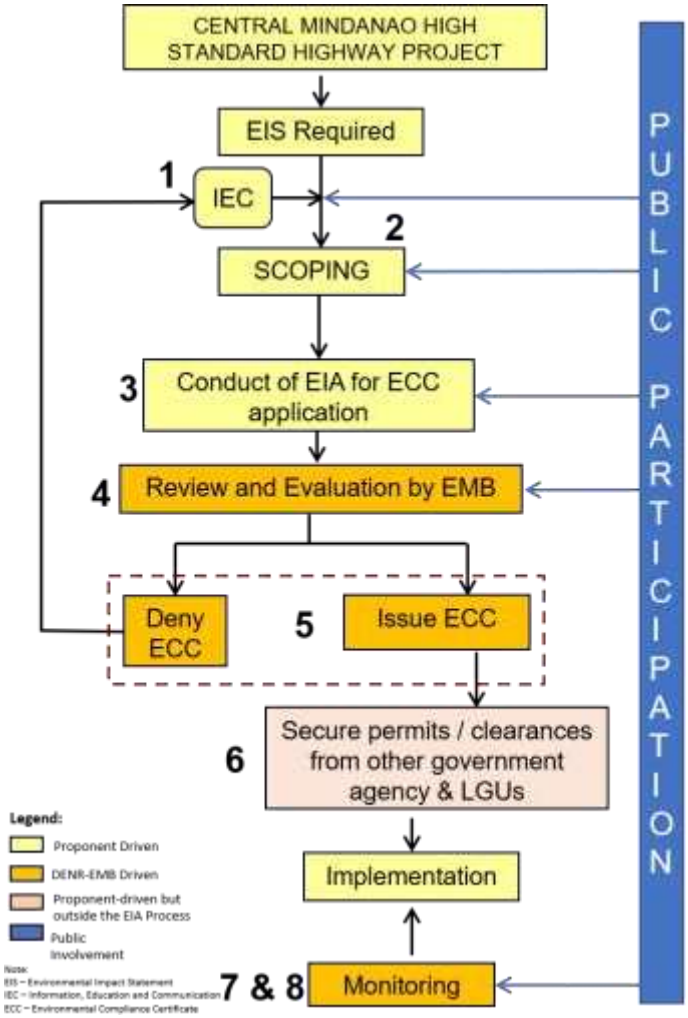
Law/Guideline	Content
PD 1152	Philippine Environmental Code – the concept of environmental impact assessment was introduced for the first time
PD 1586	PEISS was established
PP 2146 and 803	Proclamation of Environmentally Critical Areas and classification of project as Environmentally Critical Projects
DAO 2003-30	Implementing Rules and Regulations for the Philippine Environmental Impact Statement System (PEISS) of PD 1586
DAO 2017-15	Guidelines on Public Participation under PEISS
DAO 2007-002	Revised Procedural Manual for DAO 2003-30
DENR MC 2010-14	Standardization of Requirement and Enhancement of Public Participation in the Streamlined Implementation of the PEISS
EMB MC 2010-004	Guideline for Use of Screening and Environmentally Critical Area (ECA) Mapping Systems
EMB MC 2011-005	Incorporating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) concerns in the PEISS
EMB MC 2014-005	Guidelines of Coverage Screening and Standardized Requirement under the PEISS

NOTES: PD – Presidential Decree; PP – Presidential Proclamation; DAO – DENR Administrative Order; MC – Memorandum Circular

2.3 Environmental Impact Assessment System process in the Philippines (PEISS)

The Philippine EIA Process has six (6) sequential stages 1) Screening, 2) Scoping, 3) EIA Study and Report Preparation, 4) EIA Review and Evaluation, 5) Decision Making, and 6) Post ECC Monitoring, Validation and Evaluation/Audit stage. A summary flowchart of the complete process is presented in **Figure 2-1.**

Figure 2-1. PEISS process



2.3.1 EIA Project Categorization

At the Screening stage, the Project is assessed whether it is subject to go through EIA process. Projects which have been originally declared as ECPs or projects in ECAs presumed to have significant impacts on the quality of the environment are subject to PEISS. The projects have been classified into four (4) major groups as shown in **Table 2-4.**

Table 2-4. Project categories under PEISS

Category	Type and location of the Project
Category A : Environmentally Critical Projects	Projects or undertakings which are classified as ECPs under Presidential Proclamation No. 2146 (1981) Proclamation No. 803 (1996) and any other projects that may later be declared as such by the President of the Philippines. Proponents of these projects implemented from 1982 onwards are required to secure an Environmental Compliance Certificate (ECC)
Category B : Non-Environmentally Critical Projects (NECP) but Located in ECA	Projects or undertakings which are not classified as ECP under Category A but which are likewise deemed to significantly affect the quality of the environment by virtue of being located in Environmentally Critical Area (ECA) as declared under Proclamation 2146 and according to the parameters set forth in the succeeding sections. Proponents of these

Category	Type and location of the Project
	project implemented from 1982 onwards are required to secure an ECC
Category C: Environmental Enhancement or Direct Mitigation Project	Projects or undertakings not falling under Category A or B which are intended to directly enhance the quality of the environment or directly address existing environmental problem
Category D: Non-Covered Project	Projects or undertakings that are deemed unlikely to cause significant adverse impact on the quality of the environment according to the parameters set forth in the Screening Guidelines. These projects are not covered by the Philippine EIS system and are not required to secure an ECC. However, such non-coverage will not be construed as an exemption from compliance with other environmental laws and government permitting requirement

Table 2-5 shows the classification of the project in accordance with the EMB Memorandum Circular 2014-005 or the Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System. The proposed high standard highway is a new national road construction that will have a total length of 65.6 kilometers, with viaducts and bridges. The proposed project is therefore classified under Category A or Environmentally critical projects. As a Category A project, a preparation of an Environmental Impact Statement (EIS) to be submitted to Environmental Management Bureau Central Office (EMB-CO) serves as a requirement for the issuance of the project's Environmental Compliance Certificate (ECC).

Table 2-5. EIA Project type categorization

Project/Description	Category A: ECP	Category B: Non-ECP		Category D: CNC
	EIS	EIS	IEE Checklist	PD
Bridges and viaducts (including elevated roads), new construction	≥10.0 km	≥5.0 km but <10.0 km	≥50 m but <5.0 km	≤50 m
Roads, new construction	National Road ≥ 20.0 km (length with no critical slope) or ≥ 10.0 km (length with critical slope	Provincial road and other types of roads ≥ 20.0 km (length with no critical slope) or ≥ 10.0 km (length with critical slope	All types of roads ≥ 2.0 km but <20.0 km (length with no critical slope) or ≥2 km but <10.0 km (length with critical slope	≤2 km

NOTE: ECP - Environmentally Critical Projects Source, CNC – Certificate of Non-compliance, PD – Project description: EMB Memorandum Circular 2014-005

2.4 Other Permits and Requirements

The proposed Project may require by government agencies to apply for the following permits prior to implementation. These are summarized in **Table 2-6.**

Table 2-6. Required environmental and social permits

Permit Name	Laws/Regulations	Rationale	Issuing Agency	Application Procedure
Zoning Clearance	Republic Act (RA) 7160 Local Government Code	Check the compatibility with the land use plan/ zoning ordinance of LGUs	LGUs (City Planning/ Development Office)	To be obtained in planning/ FS stage
Locational Clearance (if	Republic Act (RA) 7160 Local	Proposed project is allowed in a	LGUs (City Planning/	To be obtained in planning/ FS stage

Permit Name	Laws/Regulations	Rationale	Issuing Agency	Application Procedure
needed)	Government Code	particular zone/ district	Development Office)	
Certificate of non Overlap (CNO)	Republic Act (RA) 8371 Indigenous People Rights Act	The project site is not overlapping with the Ips ancestral domain claim	National Commission for Indigenous Peoples (NCIP)	To be obtained in planning/ FS stage
Certification for non coverage of National Cultural Treasure (NCT)/ Important Cultural Property (ICP)	Republic Act (RA) 10066 National Cultural Heritage Act	The project site is not overlapping other objects which are considered as cultural properties	National Commission for Culture and Arts (NCAA)	To be obtained in planning/ FS stage
Waste Management Plan (WMP)	Republic Act (RA) 6969 Toxic Substance and Hazardous and Nuclear Wastes Control Act Republic Act (RA) 9003 Ecological and Solid Waste Management Act	Plan to manage solid, liquid and hazardous wastes	DENR EMB Regional LGUs	Prior to construction
Tree Cutting and/or Tree Earth Balling Permit	Presidential Decree (PD) 953	Removal, transfer, and planting of trees	DENR EMB Region PENRO CENRO MENRO	
Traffic Impact Assessment (TIA)		Manage and control traffic due to project implementation		To be accomplished after DED stage

2.5 Roles and Responsibilities of the Relevant Agencies

As the Project proponent, DPWH main role is to prepare the EIS and secure the ECC while Environmental Management Bureau Central Office (EMB CO) reviews the EIS and manage the EIA review committee (EIARC). The ECC will is issued by the director of EMB CO and by DENR Secretary, while logistical arrangements in the project area such as arrangement of public consultation are conducted by the EMB Regional Office (RO EMB). Roles of the relevant agencies for EIA in the project are show in **Table 2-7.**

Table 2-7. Roles and responsibilities of concerned government agencies on EIA

Relevant Agency	Roles and Responsibilities
DPWH	● Holding of a meeting for Information, Education and Communication (IEC) ● Holding a meeting for Public Scoping for EIA ● Preparation & submission of project description for scoping (PDS) and Environmental Impact Statement (EIS) ● Payment of EIA review support fund
	● Making the necessary logistical arrangements for public consultation ● Submission of final EIS

Relevant Agency	Roles and Responsibilities
EMB CO	● Facilitating of EIA Review Committee (EIARC) (scoping stage and substantive review stage) ● Procedural screening of EIS ● Conduct of public consultation ● Preparation of decision document
EMB CO and DENR CO	● Approval of ECCs from EMB Director / DENR Secretary
RO EMB	● Supporting of EIA process in the project area; ● Participation of public scoping facilitated by proponent of the project ● Making the necessary arrangements for EIARC site validation and public consultation

2.6 Environmental Monitoring and Management Plan

Under the PEISS, the primary purpose of monitoring, validation and evaluation/audit is to ensure the judicious implementation of sound environmental management within a company/ corporation and its areas of operation as stipulated in the ECC and other related documents. Specifically, it aims to ensure the following:

- Compliance with the conditions set in the ECC;
- Compliance with the EMP commitments;
- Effectiveness of environmental measures on prevention or mitigation of actual project impacts vis-a-vis the predicted impacts used as basis for the EMP design; and
- Continuous updating of the EMP for sustained responsiveness in addressing environmental impacts of undertakings.

2.6.1 Responsible organization for the implementation environmental management and monitoring

Monitoring by Project Proponent

The Proponents with issued ECCs are primarily responsible for monitoring their projects. A proponent is required to submit an ECC Compliance Monitoring Report (CMR) to the designated monitoring EMB office on a semi-annual frequency. The detailed report on compliance to environmental standards specific to environmental laws will be submitted through the Self-Monitoring Report (SMR) on a quarterly basis to the concerned EMB office.

Multi-partite Monitoring Team

The MMT is primarily responsible of validating the proponent's environmental performance and submits findings/recommendations as a Compliance Monitoring and Validation Report (CMVR) to the concerned EMB office.

Environmental Management Bureau

The EMB is primarily responsible for the over-all evaluation/audit of the Proponent's monitoring and the MMT's validation.

2.7 Comparison of PEISS and JICA Guidelines

The results of the gap analysis between current relevant regulations in the Philippines to the JICA Guidelines are shown in **Table 2-8**. Countermeasures are proposed to fill the gap.

Table 2-8. Gap between JICA Environmental Guidelines and Relevant Regulations in the Philippine EIS System

Topic	JICA Guidelines for Environmental and Social Considerations (2010 April)	Relevant Regulations in the Philippines	Main Gap	Countermeasures for Filling Gaps
Principle	Environmental impact must be assessed and examined from the earliest possible planning stage. Alternatives or mitigation measures to avoid or minimize adverse impact must be examined and incorporated into the project plan.	The Philippines Environmental Impact Statement System (PEISS) requires for the project proponent to examine possible impact and to conduct scoping in the pre-feasibility study stage. In addition, PEISS requires to conduct alternative study at the feasibility study stage.	No significant gap	Not Applicable
Information Disclosure	EIA reports (which may be referred to differently in a different system) must be written in the official language or in a language widely used in the country in which the project is to be implemented. When explaining projects to local residents, written materials must be provided in a language and form understandable to them. EIA reports are required to be made available to the local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents and copying must be permitted.	As a form of disclosure of the EIA findings, Public Hearing is required for all new ECPs for which public scoping was undertaken and for PEISS-based applications. EIA report will be disclosed. EIA report is prepared in English which is the common language in the Philippines. In addition, in the EIA report, Project Fact Sheet is prepared by mixing the language which is familiar with the local communities.	No significant gap	Not Applicable
Consultation	For projects with a potentially large environmental impact, sufficient consultations with local stakeholders,	The revised procedural manual (2008) stipulates to conduct below: Information, education and communication	No significant gap	Not Applicable

Topic	JICA Guidelines for Environmental and Social Considerations (2010 April)	Relevant Regulations in the Philippines	Main Gap	Countermeasures for Filling Gaps
	such as local residents, must be conducted via disclosure of information at an early stage, at which time alternatives for project plans may be examined. The outcome of such consultations must be incorporated into contents of project plans. In preparing EIA reports, consultations with stakeholders, such as local residents, must take place after sufficient information has been disclosed. Records of such consultations must be prepared. Consultations with relevant stakeholders, such as local residents, should take place, if necessary, throughout the preparation and implementation stages of a project. Holding consultations is highly desirable, especially when the items to be considered in the EIA are being selected, and when the draft report is being prepared.	(IEC) activities Public scoping Participation of local stakeholders Holding public hearing Sharing ECC and EIA reports Prior to holding public hearing or consultation meetings, the EIA report shall be available at the EMB and the local government offices in which the project is located.		
Impacts to be Assessed	The impacts to be assessed with regard to environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil,	Items below are required to be assessed and to be included in EIS report. Land (land use, geology, topography, soil, land organisms), water (hydrology including groundwater, ocean, water quality, freshwater and marine organisms), air (including climate	No significant gap in the evaluation items and contents. However, environmental standards are not	Internationally recognized standards including Japanese standard for soil, sediment and vibrations shall

Topic	JICA Guidelines for Environmental and Social Considerations (2010 April)	Relevant Regulations in the Philippines	Main Gap	Countermeasures for Filling Gaps
	waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. There also include social impacts. In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the projects are also to be examined and assessed to a reasonable extent. It is also desirable that the impacts that can occur at any time throughout the project cycle should be considered throughout the life cycle of the project.	change, air quality, noise), people (relocation, migration, indigenous people, public health, community contribution, basic services and resource distribution, transportation, regional environmental management, affected regional assets)	established for soil, sediment and vibration.	be referred to as benchmark.
Monitoring	Project proponents should make efforts to make the results of the monitoring process available to local project stakeholders. When third parties point out, in concrete terms, that environmental and social considerations are not being fully undertaken, forums for discussion and examination of countermeasures are established based on sufficient information disclosure, including stakeholders' participation in relevant projects. Project proponents should make efforts to reach an agreement on	The project proponent who obtained the ECC shall submit the Compliance Monitoring Report (CMR) semi-annually and the Self-Monitoring Report (SMR) quarterly to the EMB. In addition, as a monitoring by a third party, Multipartite Monitoring Team (MMT) shall submit the Compliance Monitoring and Validation Report (CMVR) to the EMB semi-annually. These are the targets of information disclosure.	No significant gap	Not Applicable

Topic	JICA Guidelines for Environmental and Social Considerations (2010 April)	Relevant Regulations in the Philippines	Main Gap	Countermeasures for Filling Gaps
	procedures to be adopted with a view to resolving problems.			
Ecosystem and Biota	Projects must not involve significant conversion or significant degradation of critical natural habitats and critical forests. Projects must, in principle, be undertaken outside of protected areas that are specifically designated by laws or ordinances for the conservation of nature or cultural heritage.	All designated, critical habitats shall be protected, in coordination with the local government units and other concerned groups, from any form of exploitation or destruction which may be detrimental to the survival of the threatened species dependent therein. (RA9147) Project in protected areas is subjected to environmental impact assessment and allowed to be implemented only when the ECC is issued. In addition, project proponent shall plan and implement environmental mitigation measures. (RA7586)	There is no precise provision to prohibit a project in an environmentally sensitive area.	Accordingly, JICA Guidelines shall be applied. It is necessary to confirm the location of the protected area and the project alignment to avoid traversing it, in principle.

Source: JICA Study Team

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CHAPTER 3 - ANALYSIS OF KEY ENVIRONMENTAL IMPACTS

3.1 THE LAND

3.1.1 Land use and classification

3.1.1.1 Scope

This section described the existing land uses traversed by the proposed CMH alignment and the protected areas and ancestral domains in its vicinity. The key impacts assessed were compatibility with existing land use, compatibility with classification as an Environmentally Critical Area (ECA), land tenure issues, impairment of visual aesthetics, and devaluation of land value because of improper SWM and other related impacts.

3.1.1.2 Methodology

The existing land use was described using the Comprehensive Land Use Plans and Socio-economic Profiles of the six host municipalities and cities. Assessment of the key impacts was done using site visits, qualitative analysis, and related documents.

3.1.1.3 Assessment of key impacts

3.1.1.3.1 Compatibility with existing land use

The summary of the land uses of the six (6) LGUs traversed by the proposed alignment is shown in **Table 3-1**. Further processing of the data showed that the dominant land use in the host LGUs is forest and agricultural (green cells in **Table 3-1**) occupying 88.36 percent of the total their total land areas.

Table 3-1. Summary of land uses at the six host LGUs

Land use	Total area, ha	% of total
Forest	193,732.39	57.79%
Agricultural	102,486.44	30.57%
Agri-Industrial	10,402.09	3.10%
General Residential	15,340.91	4.58%
Commercial	75.97	0.02%
Parks and Recreation	33.96	0.01%
Institutional Zone	506.75	0.15%
Industrial	449.73	0.13%
Mineral Land (mining and quarry)	130.39	0.04%
Tourism	2,963.77	0.88%
Utilities, Transportation and Services Zone	1,277.87	0.38%
Rivers and creeks	1,660.31	0.50%
Open Land	3,118.04	0.93%
Cemetery	67.49	0.02%
Cockpit	1.49	0.00%
Pasture	3,010.00	0.90%
TOTAL	**335,257.61**	**100.00%**

Source: derived from **Table 3-2**

Interpretation of the land use maps of the LGUs in **Figure 3-1** to **Figure 3-6** shows that the alignment traverses different land uses enumerated below.

a) Cagayan de Oro – Urban, Agricultural
b) Tagoloan – Agricultural (Production, Industrial), Forest (Production)
c) Manolo Fortich – Agricultural, Agricultural (Industrial), Forest
d) Sumilao – Agricultural, Agricultural (Industrial), Waterbodies (rivers, creeks), Tourism
e) Impasug-ong – Agricultural, Forest, Institutional
f) Malaybalay - Agricultural (Production), Agricultural (Plantation), Residential

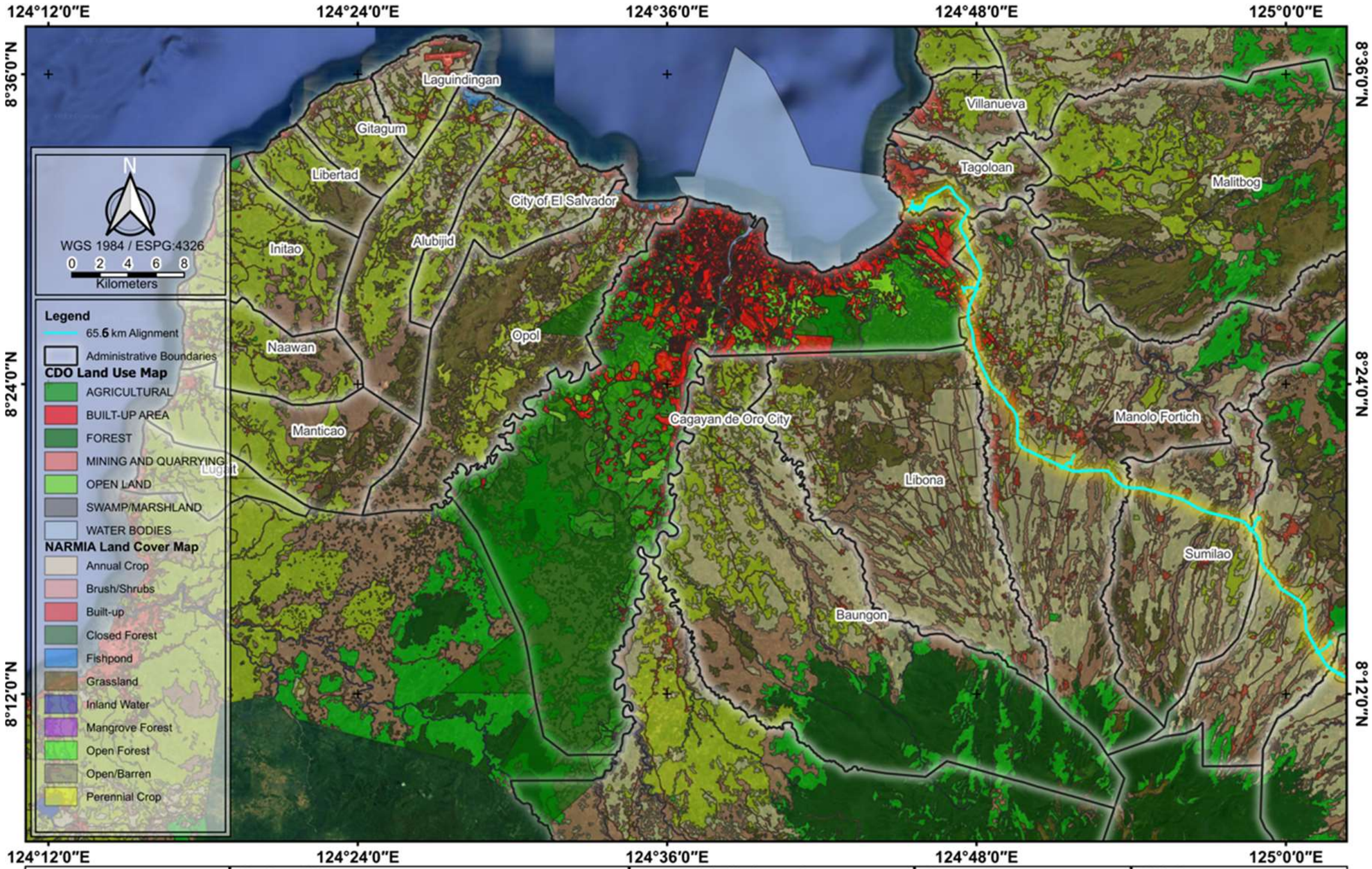
The proposed CMH alignment with a 60-meter RROW is incompatible with the existing land uses and zoning ordinances of the six LGUs it will be traversing. The proper land use compatibility process and corresponding land use certificate should be secured prior to the construction phase.

Table 3-2. Land use distribution at the host LGUs

	CDO (2012)		Malay (2016)		Tagoloan (2017)		Manolo Fortich (2013)		Sumilao (2011)		Impasug-ong (2019)	
Land Use	**Area, ha**	**% of total**	**Area, ha**	**% of total**	**Area, ha**	**% of total**	**Area, ha**	**% of total**	**Area, ha**	**% of total**	**Area, ha**	**% of total**
Forest	24,755.28	43.13%	73,682.03	68.25%	1,530.35	17.93%	16741.21	34.97%	6763.92	32.72%	70259.6	75.69%
Agricultural	16,393.39	28.56%	32,238.16	29.86%	6116.32	71.65%	22888.49	47.82%	10422.03	50.42%	14428.05	15.54%
Agri-Industrial	-	-	67.62	0.06%			5251.07	10.97%	2,343.50	11.34%	2,739.90	2.95%
General Residential	11,977.09	20.86%	1248.52	1.16%	241.44	2.83%	1251	2.61%	449.401	2.17%	173.46	0.19%
Commercial			62.56	0.06%					7.4961	0.04%	5.91	0.01%
Parks and Recreation			19.37	0.02%					11.1847	0.05%	3.41	0.00%
Institutional Zone			260.98	0.24%					105.3638	0.51%	140.41	0.15%
Industrial			-	-	187.43	2.20%	-	-	217.3269	1.05%	44.97	0.05%
Mineral Land (mining and quarry)	31.12	0.05%	-	-			79.27	0.17%	-	-	20	0.02%
Tourism	1,167.34	2.03%	6.38	0.01%	-	-	157.7	0.33%	4.8943	0.02%	1,627.46	1.75%
Utilities, Transportation and Services Zone	-	-	8.54	0.01%	99.4	1.16%	492.7	1.03%	325.3442	1.57%	351.89	0.38%
Rivers and creeks	-	-	298.59	0.28%	354.96	4.16%	1,006.76	2.10%	-	-	-	-
Open Land	3,079.18	5.36%	38.86	0.04%	-	-	-	-	-	-	-	-
Cemetery	-	-	21.3	0.02%	5.89	0.07%	-	-	17.0502	0.08%	23.25	0.03%
Cockpit	-	-			-	-	-	-	1.4893	0.01%	-	-
Pasture	-	-	-	-	-	-	-	-	-	-	3,010.00	3.24%
Total	57,403.40	100.00%	107,952.91	100.00%	8,535.79	100.00%	47,868.20	100.00%	20,669.00	100.00%	92,828.31	100.00%

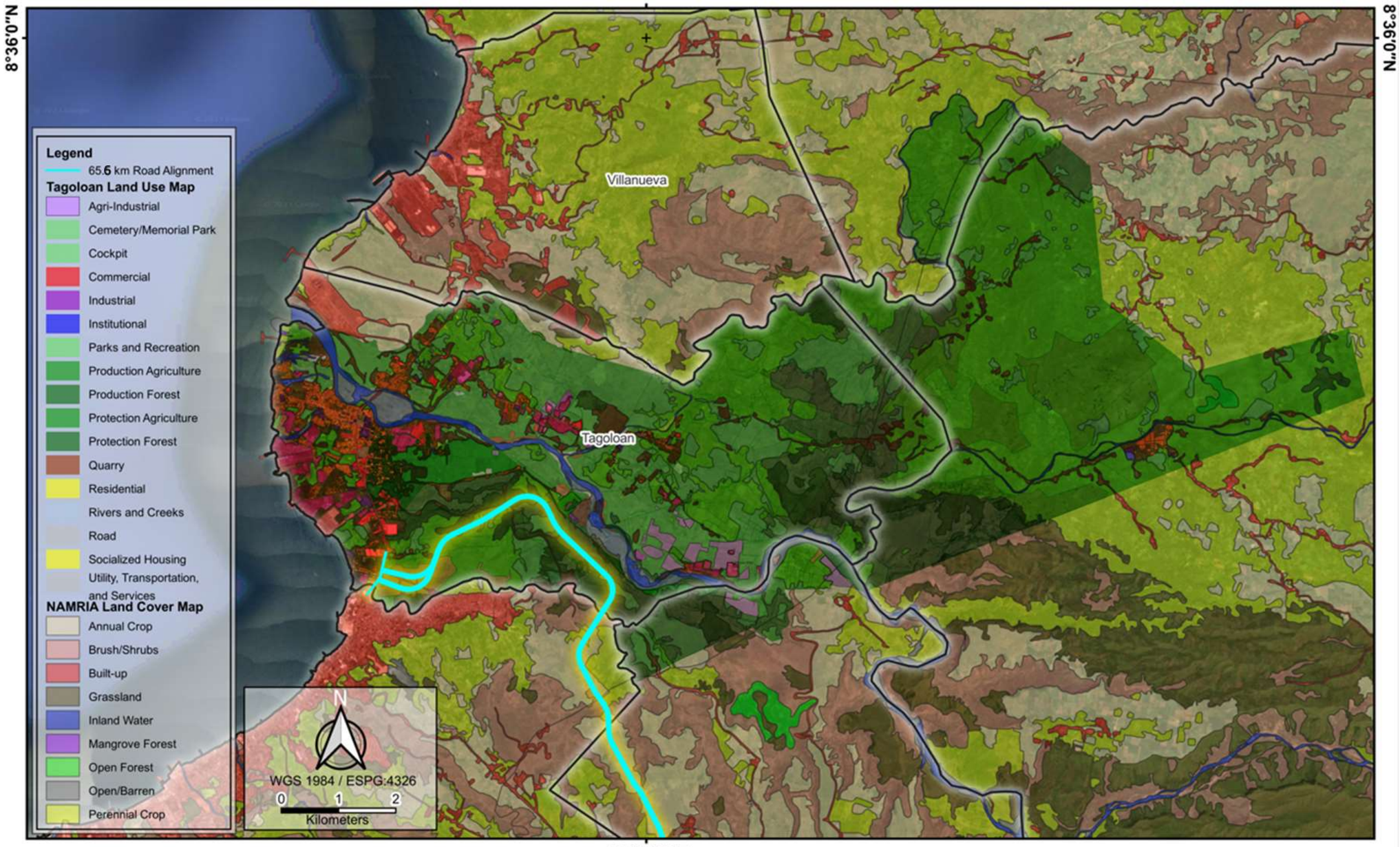
Sources: CLUP of Cagayan de Oro, Tagoloan, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay

Figure 3-1. Existing Land Use Map of Cagayan de Oro City



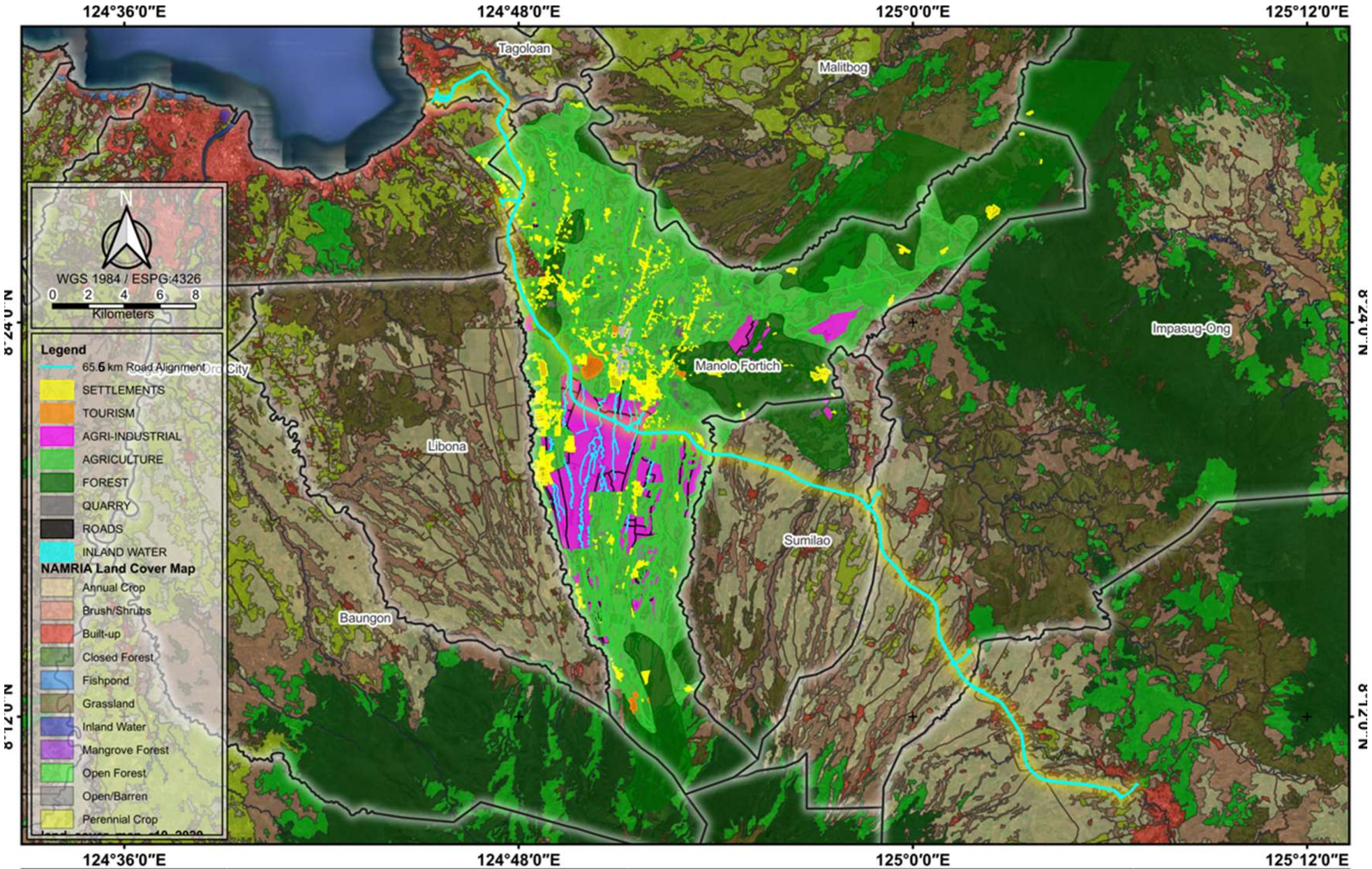
Cagayan de Oro Land Use Map (2012) Overlayed in NAMRIA Land Cover Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) CDO CLUP (2013-2022) NARMIA 2020 (Land Cover Map)		

Figure 3-2. Existing Land Use Map of Tagoloan



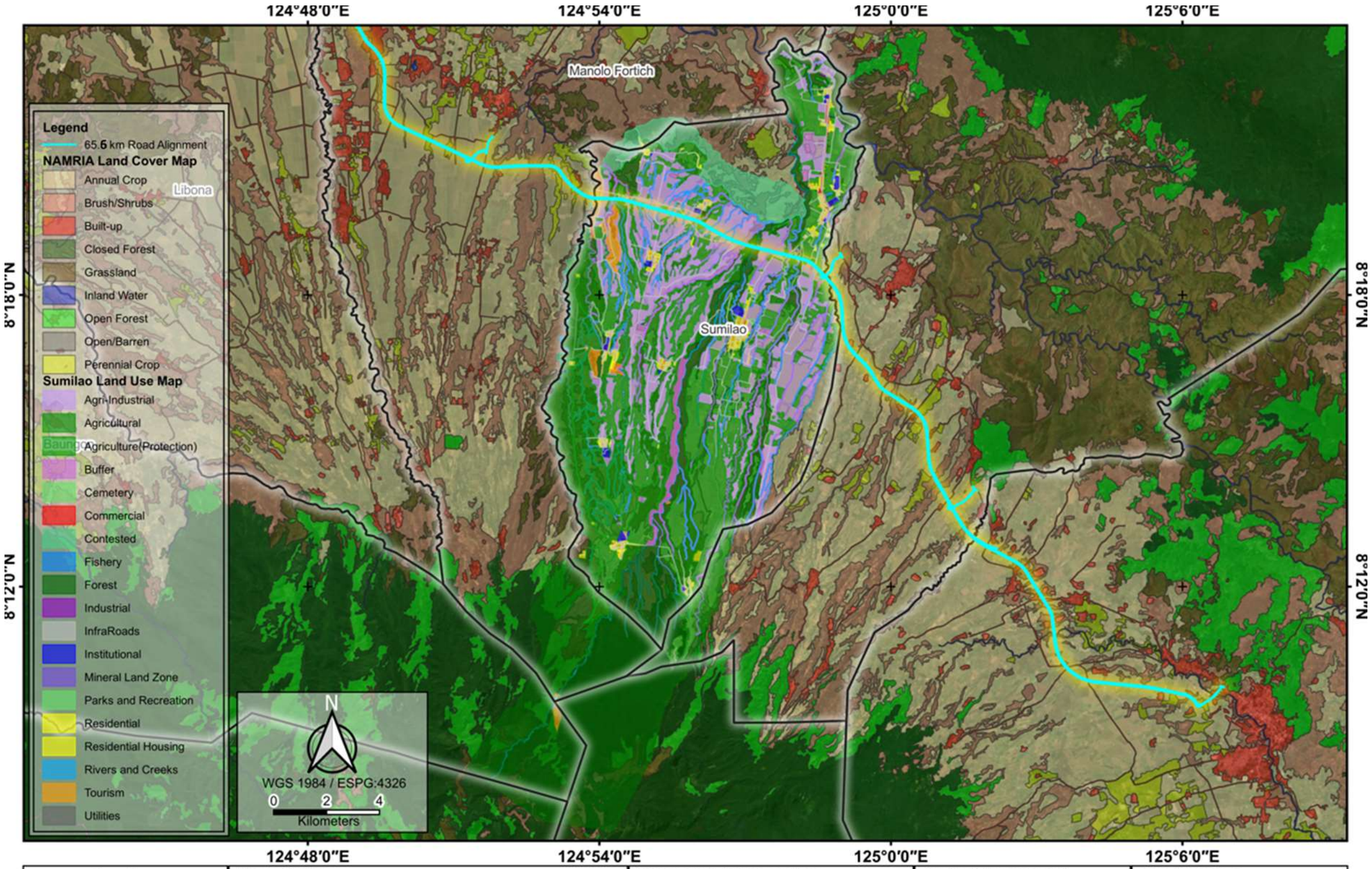
Tagoloan Land Use Map (2017) Overlayed in NAMRIA Land Cover Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) Tagoloan CLUP (2017-2027) NAMRIA 2020 (Land Cover Map)		

Figure 3-3. Existing Land Use Map of Manolo Fortich



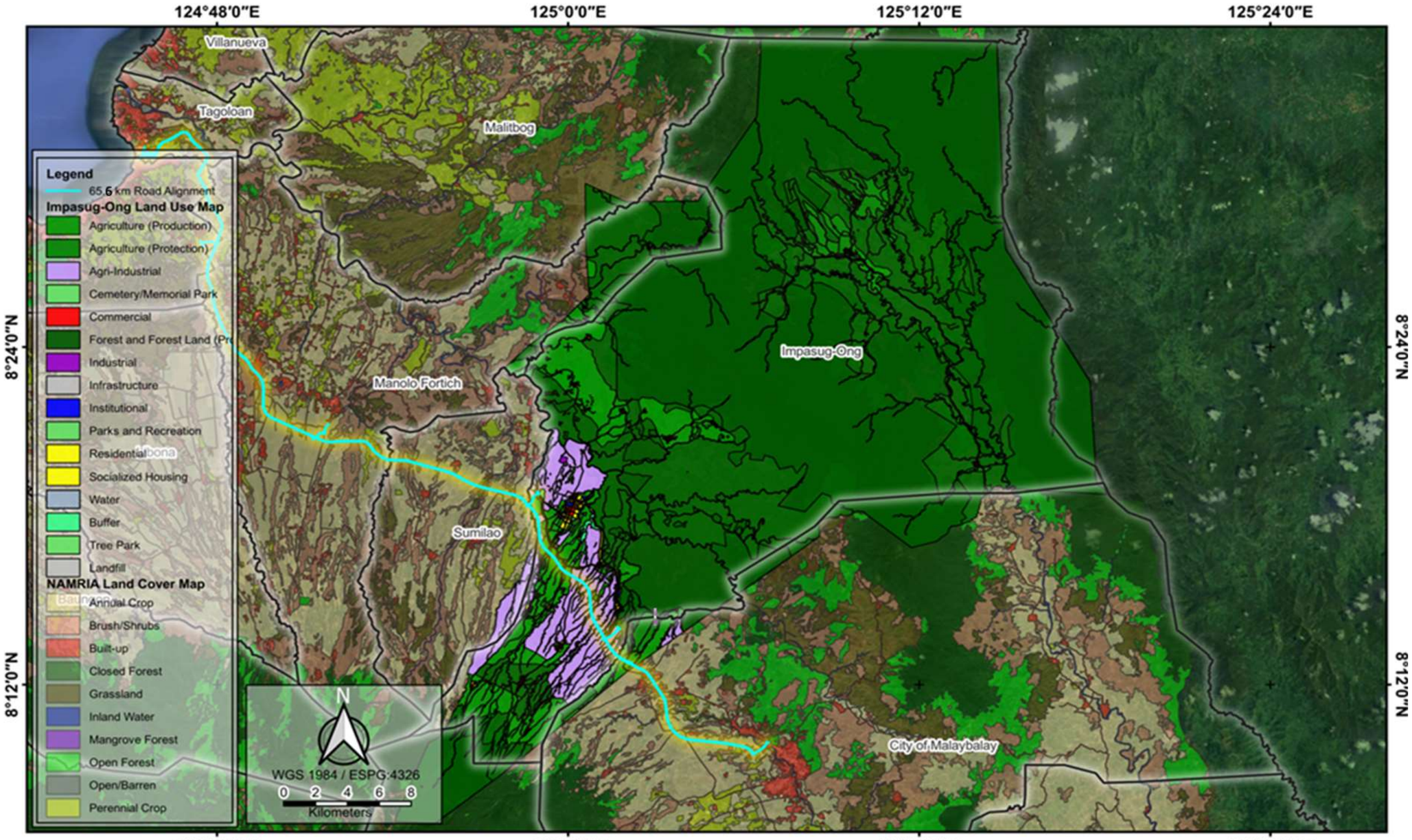
Manolo Fortich Land Use Map (2013) Overlayed in NAMRIA Land Cover Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) Manolo Fortich CLUP (2013-2022) NAMRIA 2020 (Land Cover Map)		

Figure 3-4. Existing Land Use Map of Sumilao



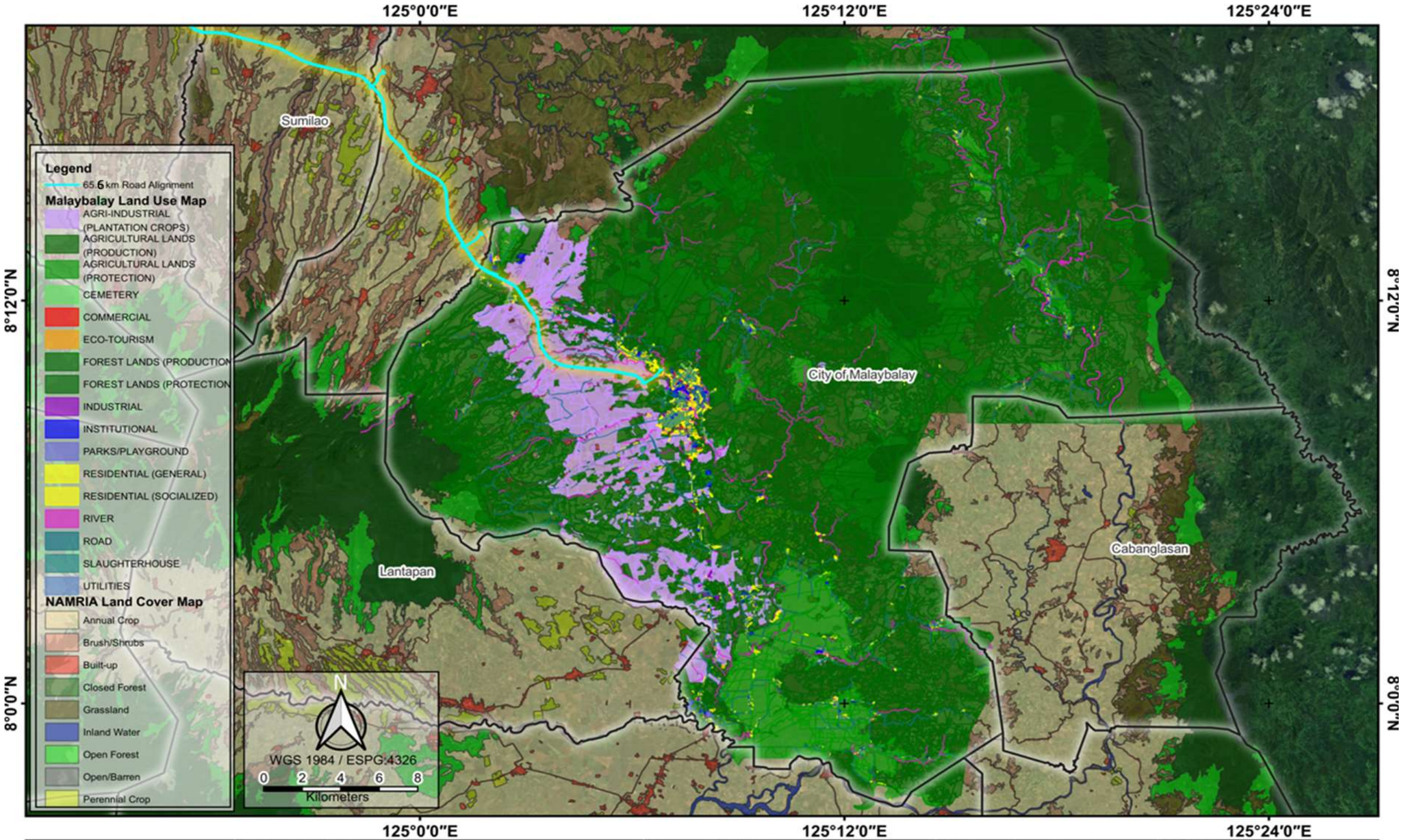
Sumilao Land Use Map (2010) Overlayed in NAMRIA Land Cover Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) Sumilao CLUP (2011-2020) NAMRIA 2020 (Land Cover Map)		

Figure 3-5. Existing Land Use Map of Impasug-ong



Impasug-ong Existing Land Use Map Overlayed in NAMRIA Land Cover Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) Land Use Map Shapefiles (Local Government) NAMRIA 2020 (Land Cover Map)		

Figure 3-6. Existing land use map of Malaybalay City



Malaybalay Land Use Map (2016) Overlayed in NAMRIA Land Cover Map	**Project Title**	**Source(s)of Information**	**Project Proponent**	**EIA Preparer**
	Central Mindanao High Standard Highway Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) Malaybalay CLUP (2016-2025) NAMRIA 2020 (Land Cover Map)		

3.1.1.3.2 Compatibility with classification as an Environmentally Critical Area (ECA)

The evaluation of the proposed CMH alignment with ECAs defined in Table 1 of the Revised Guidelines for Coverage Screening and Standardized Requirements (EMB Memorandum Circular 2014-05) is shown in **Table 3-3**.

Table 3-3. Evaluation of the proposed CMH alignment according to ECAs

No.	ECA Category	Within ECA?	Comments
1	All areas declared by law as national parks, watershed reserves, wildlife preserves and sanctuaries	No	The proposed alignment is outside of any Protected Area (**Table 3-4, Table 3-8** and **Figure 3-7**).
2	Areas set aside as aesthetic, potential tourist spots	Possible	The proposed alignment appeared to traverse tourism areas in Sumilao (**Figure** 3-4)
3	Areas which constitute the habitat for any endangered or threatened species of Indigenous Philippine wildlife (Flora and Fauna)	No	The proposed alignment is outside of any Protected Area (**Table 3-4**) and traverses mostly agricultural lands.
4	Areas of unique historic, archeological, geological, or scientific interests	No	The proposed alignment mostly traverses agricultural lands.
5	Areas which are traditionally occupied by cultural communities or tribes	Yes	The proposed alignment will avoid the approved CADTs or CADC (**Table 3-5** and **Figure 3-9**) but will traverse the AD Applied area (**Figure 3-10**)
6	Areas frequently visited arid or hard hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity)	Yes	The proposed alignment traverse areas prone to natural hazards (subsidence hazard, landslide, creep, flood hazard, erosion/ slope failure, ground rupture (***Section 3.1.2.3.3***)
7	Areas with critical slope. All lands with slope of 50% or more classified as geohazard by Mines and Geosciences Bureau (MGB)	Yes	Some portions of the proposed alignment will traverse the critical slopes (**Figure 3-14**).
8	Areas classified as prime agricultural lands	Possible	Most of the alignment traverse the agricultural lands (**Figure 3-1 to Figure 3-6**)
9	Recharge areas of aquifers	No	The proposed alignment mostly traverses the agricultural lands in the lowlands.
10	Water bodies characterized by one or any combination of the following conditions: tapped for domestic purposes, within the controlled and/or protected areas declared by appropriate authorities, which support wildlife and fishery activities	No	The proposed alignment will traverse water bodies (rivers, creeks) that are not tapped as a source of domestic water or within Protected Areas.
11	Mangrove areas characterized by one or any combination of the following conditions: with primary pristine and dense young growth; adjoining mouth or major river systems; near or adjacent to traditional productive fry or fishing grounds; areas which act as natural buffers against shore erosion, strong winds and storm floods; areas on which people are dependent for their livelihood.	No	The proposed alignment is inland and far from the sea.
12	Coral reefs characterized by one or any combination of the following conditions: with 50% and above live coralline cover; spawning and nursery grounds for fish; act as natural	No	The proposed alignment is inland and far from the sea.

No.	ECA Category	Within ECA?	Comments
	breakwater of coastlines		

3.1.1.3.3 Land tenure issues

The proposed CMH alignment will not traverse the protected areas (**Table 3-4** and **Figure 3-7)**. The nearest is the Mt. Kitanglad Range in Baungon, Sumilao, Malaybalay, and Talakag, which is about seven kilometers to the alignment.

Table 3-4. Protected areas in the vicinity of the proposed CMH alignment

Name	Location	Area, ha	Distance*, km	Type
Mahoganao	Cagayan de Oro, Mis. Oriental	139	11.67	Watershed forest reserve
Mt Kitanglad Range	Baungon, Sumilao, Malaybalay, Talakag, Bukidnon	271.01	7.07	National Park
Manupali	Valencia, Talakag, Lantapan, Bukidnon	376.58	14.78	Watershed forest reserve
Proposed Protected Areas				
Mt. Lumot	Gingoog City and Claveria, Misamis Oriental	6,000	~27.77	Watershed forest reserve
Mt Tago	Manolo Fortich and Impasug-ong, Bukidnon	21409	13.36	Natural Park
Mt. Tangkulan	Quezon, San Fernando and Valencia, Bukidnon	23,803	34.31	Watershed forest reserve
Mt. Pantaron	Cabanglasan, Malaybalay and San Fernando, Bukidnon	17,056	26.42	Watershed forest reserve
Mt. Palaopao Hill Cave	Manolo Fortich and Sumilao, Bukidnon	1,482	~2.23	Watershed forest reserve
Mt. Kimangkil Range	Malitbog and Manolo Fortich	13,341	~36.32	Watershed forest reserve

Source: PENRO Bukidnon, *Distance to the project

Two Key Biodiversity Areas (KBAs) (**Table 3-5** and **Figure 3-8)**, which are also defined as the Important Bird and Biodiversity Areas (IBAs) at same area, named as the Mount Tago Range and the Mount Kitanglad, are found near the project area. For the sake of simplicity, this report uses the term KBA when referring to an IBA cum KBA area. The nearest KBA is the Mt. Tago KBA with 950m distance from the Project (green cells in **Table 3-5**). Although declared as an IBA in 2001[1] and KBA, Mt. Tago Mountain Range is not a declared Critical Habitat under RA 7586; however, it listed as a biodiversity conservation priority area (CPA) by the Philippine Biodiversity Conservation Prioritization Process (PBCPP) in 2002, a second iteration of the National Biodiversity Strategy and Action Plan (NBSAP).

Table 3-5. KBA in the vicinity of the proposed CMH alignment

Name	Location	Area, ha	Distance*
Mt. Tago Range KBA	Manolo, Impasug-ong, Malaybalay	83,416	0.95
Mt. Kaluayan - Mt. Kinabalian Complex	Claveria, Gingoog, Misamis Oriental	80,000	25.76
	Malatbalay, Malitbog, Impasug-ong, Cabanglasan, Bukidnon		
	Las Nieves, Agusan de Norte		
	Esperanza, San Luis, La Paz, Loreto, Veruela, Agusan del sur		
Mt. Kitanglad KBA	Manolo Fortich, Sumilao, Malaybalay, Baungon, Lantapan,	31,015	8.14

[1] http://datazone.birdlife.org/site/factsheet/mount-tago-range-iba-philippines

	Talakag, Bukidnon		

NOTES: KBA - Key Biodiversity Area; IBA - Important Bird and BIodinersity Area
Source: PENRO Bukidnon *to the project in kilometers

The list and location of approved, proposed, and converted CADT and CALT area are shown in **Table 3-7** and **Figure 3-9.** The proposed CMH alignment is not traversing the approved CADTs or CADC. but will traverse the AD Applied area (**Figure 3-8**).
The target barangays of the Indigenous Peoples Plan are Barangay Ticala in the Municipality of Manolo Fortich and the Barangays of Puntian, Vista Villa, San Roque, Kulasi, Poblacion, and Kisolon, all in the Municipality of Sumilao as shown in **Table 3-6**.

On September 18, 2023, the NCIP Region X issued the Certification Precondition (CP) stating that after the conduct of FPIC in accordance with NCIP Administrative Order No. 3, Series of 2012 and CEB Resolution No. 08-083-2021, it is found that the DPWH and JICA have complied with the procedural and documentary requirements of NCIP. The CP was issued after the finalization of Resolution of Consent. Said document is synonymous to the Memorandum of Agreement (MOA) being required by NCIP before they release the CP.

The implementation of FPIC is designated at the barangay level and is not applicable to individual IPs or families. These designated target barangays are not recorded in the Certificate of Non-Overlap (CNO) but have been assigned within the Working Order (WO), except for Barangay Kisolon. Following a subsequent confirmation, Kisolon has been acknowledged as one of the impacted barangays within the Ancestral Domain (AD). Consequently, it is treated as an additional affected barangay, distinct from the six barangays initially listed in the WO.

Table 3-6. Jurisdictions of the Project Alignment and Units within the AD

Province	City/ Municipality	Barangay	Number of IP PAFs	CNO	WO	CP
Misamis Oriental	Cagayan de Oro City	Casinglot	N/A	Issued		
		Natumolan	N/A	Issued		
		Bugo	N/A	Issued		
	Tagoloan	Balubal	N/A	Issued		
		Puerto	N/A	Issued		
Bukidnon	**Manolo Fortich**	Mambatangan	N/A	Issued		
		Alae	N/A	Issued		
		San Miguel	N/A	Issued		
		Damilag	N/A	Issued		
		Diclum	N/A	Issued		
		Tankulan (Poblacion)	N/A	Issued		
		Sankanan	N/A	Issued		
		Ticala (AD Area*)	**6 PAFs**	N/A	**Issued**	**Issued**
	Sumilao	**Puntian (AD Area)**	**N/A**	N/A	**Issued**	**Issued**
		Vista Villa (AD Area)	**N/A**	N/A	**Issued**	**Issued**
		San Roque (AD Area)	**N/A**	N/A	**Issued**	**Issued**
		Kulasi (AD Area)	**N/A**	N/A	**Issued**	**Issued**
		Poblacion (AD Area)	**N/A**	N/A	**Issued**	**Issued**
		Kisolon (AD Area)	**7 PAFs**	N/A	**	**
	Impasug-ong	Poblacion	N/A	Issued		
		La Fortuna	N/A	Issued		
		Capitan Bayong	N/A	Issued		
		Cawayan	N/A	Issued		
		Impalutao	N/A	Issued		

Province	City/ Municipality	Barangay	Number of IP PAFs	CNO	WO	CP
	Malaybalay	Dalwangan	N/A	Issued	**Issued*** **	N/A
		Patpat (Lapu-Lapu)	N/A	Issued		
		Kalasungay	N/A	Issued		

* Names of Seven Barangays in Bold with "AD Area" are located within MPUMUKAD.
**Kisolon is not recorded in the WO, however, it was confirmed by NCIP as the target of FPIC-P (within MPUMUKAD)
*** Dalawangan is falling into another AD with CADT which does not overlap with the project. Therefore, another separated CNO for the project was issued for Dalawangan, 18th September 2023.

Table 3-7. CADT/CALT areas in the vicinity of the proposed CMH alignment

Name	Location	Area (ha)	Distance*	Tribe
Approved CADT/CALT				
Baleteon AD	Portion of Sitio Baleteon, Brgy. Dalwangan, Malaybalay	467.01	1.04	Bukidnon
Kibuwa AD	Sitio Kibuwa, Impalutao, Impasug-ong	2,954.54	1.76	Higao-non
Tagoloan AD	Sumpong, Can-ayan, Malaybalay	991.71	1.86	Higao-non
Kalasungay AD	Portion of Brgy. Kalasungay, Malaybalay Portion of Patpat, Malaybalay Portion of Sumpong, Malaybalay	4,556	2.39	Bukidnon
Dalwangan AD	Sitios Inhandig, Green Valley and Damitan, Dalwangan, Malaybalay	4,205.57	3.62	Higao-non
Dinlayan AL	Portion of Can-ayan, Malaybalay	258.11	3.67	Higao-non
Kitanglad Alituhon Inalad Man-egay ancestral Domain Claimant (KADIMADC) AD	Portion of San Juan, Sumilao Portion of Sumpong, Malaybalay Portion of La Fortuna, Lupiagan, Kisolon, Sumilao, Portion of Poblacion, Sitio Intavas (Including Kibenton), Impasug-ong	3,251	4.14	Higao-non
Ayoc AD	Guinawahan, Bontongan, Impasug-Ong	1,653.28	6.39	Bukidnon
Bukidnon-Higaonon Tribal Association (BUHITA) AD	Upper Pulangi, Malaybalay	36,626	8.51	Bukidnon-Higaonon
Abunda-Berial AL	Siloo, Malitbog	102.8	17.2	Higao-non
Kalanawan AD	Brgy. Hindangon & Balason, Gingoog Portion of Brgy. San Luis, Malitbog Portion of Guilang-Guilang, Manolo Fortich	20,170	20.4	Higao-non
Hagpa AD	Brgy. Hagpa, Impasug-ong Portion of Brgy. Kalabugao, Impasug-ong	258.11	35.53	Higao-non
Proposed CADT/CALT				
Libhigad AD	Brgy. Gango, Libona Sitio Bugsok and Piglintian of Poblacion, Libona	4,367.18	6.82	Higao-non
Santiago AD	Santiago, Manolo Fortich	351.52	11.95	Bukidnon
Linsahay-Edubos AL	Sitio Lapinigan & Kalakala, Kiliog, Libona	351.52	12.21	Bukidnon
CADC to CADT Conversion				
Guilang-guilang AD	Guilang-guilang, Manolo Fortich	19,325	0.6	Bukidnon

Note: Table3-7 shows the recent ADs from NCIP in 2021 while the available figure from NCIP in 2016 swon in Figure 3-9 does not reflect all ADs listed. No available latest GIS/maps.
Source: NCIP Region X, (2021) * distance to the project in kilometers

Table 3-8 shows the DENR land tenures within the vicinity of the Project. The Project alignment may traverse a FLGLA land tenure managed by the Green Acres Agricultural Farm located in Alae, Manolo Fortich which is currently under the provisional agreement with DENR.

- Forest Land Grazing Management Agreement (FLGMA) and Forest Land Grazing Lease Agreement (FLGLA) is a production sharing agreement between a qualified person, association and/or corporation and the government to develop, manage and utilize grazing lands[2].

- Community Based Forest Management Agreement is a production sharing agreement between the Department of Environment Natural Resources and the participating people's organization (POs) for a period of 25 years renewable for another 25 years and shall provide tenurial security and incentives to develop, utilize and manage specific portions of forest lands[3].

- Protected Area Community-Based Resource Management Agreement (PCBRMA) is an agreement entered into by and between the DENR and organized tenured migrant communities or interested indigenous people in protected areas and buffer zones[4].

- Tree Farm Lease Agreement (TFLA) is an agreement between DENR and an organization of which a communal organization may harvest, process, and sell forest products from the area in accordance with a management plan previously submitted to the DENR.

Table 3-8. DENR land tenures in the vicinity of the proposed CMH alignment

Holder's Name	Location	Area, ha	D*, km	Type
Julian Ong	Can-ayan, Malaybalay	203	2.95	FLGLA
Mezi	Damilag, Manolo Fortich	251	4.49	TFLA
Green Acres Agricultural Farm	Alae, Manolo Fortich	255	0	FLGLA
Lunocan Agricultural Development Corp.	Darilig, Manolo Fortich	645	2.45	FLGLA
Romulo T. De Leon	La Fortuna, Impasug-ong	115	4.58	FLGMA
Cosmes Sulogan	Capitan Anghel, Malaybalay	126	4.01	FLGLA
Mantibugao Small Scale Tree Planters Association, Inc.	Bugo and Puerto, CDO and Mambatangan, Manolo Fortich	90.76	0.34	CBFMA
Pulog Hill ISF PKS Farmers Association	Lunocan and San Miguel, Manolo Fortich	256.91	1.51	CBFMA
Diamond Hill Farmers Assn.	Darilig, Manolo Fortich and Vista Villa, Sumilao	153.56	1.56	CBFMA
Sitio Palaopao ISF Farmers Association	Palaopao, Maluko, Manolo Fortich	319.24	1.20	CBFMA
Capitan Bayong ISF Farmers Asso	Capitan Bayong,	140	1.97	CBFMA
Cultural Communities Religious Farmers Assn. Agro Ind. Coop	Habiugan, Dumalaguing, Impasug-ong, Bukidnon	2000	6.20	CBFMA
Dumalaguing Highland Farmers Coop	Dumalaguing, Kalabugao, Impasug-ong	2800	6.60	CBFMA
Gaboc ISF Farmers Assn	Gaboc, Lingion, Manolo	210	4.42	CBFMA

[2] DENR Administrative Order No. 99-36
[3] DENR Administrative Order No. 96-29
[4] DENR Administrative Order N0. 04-32

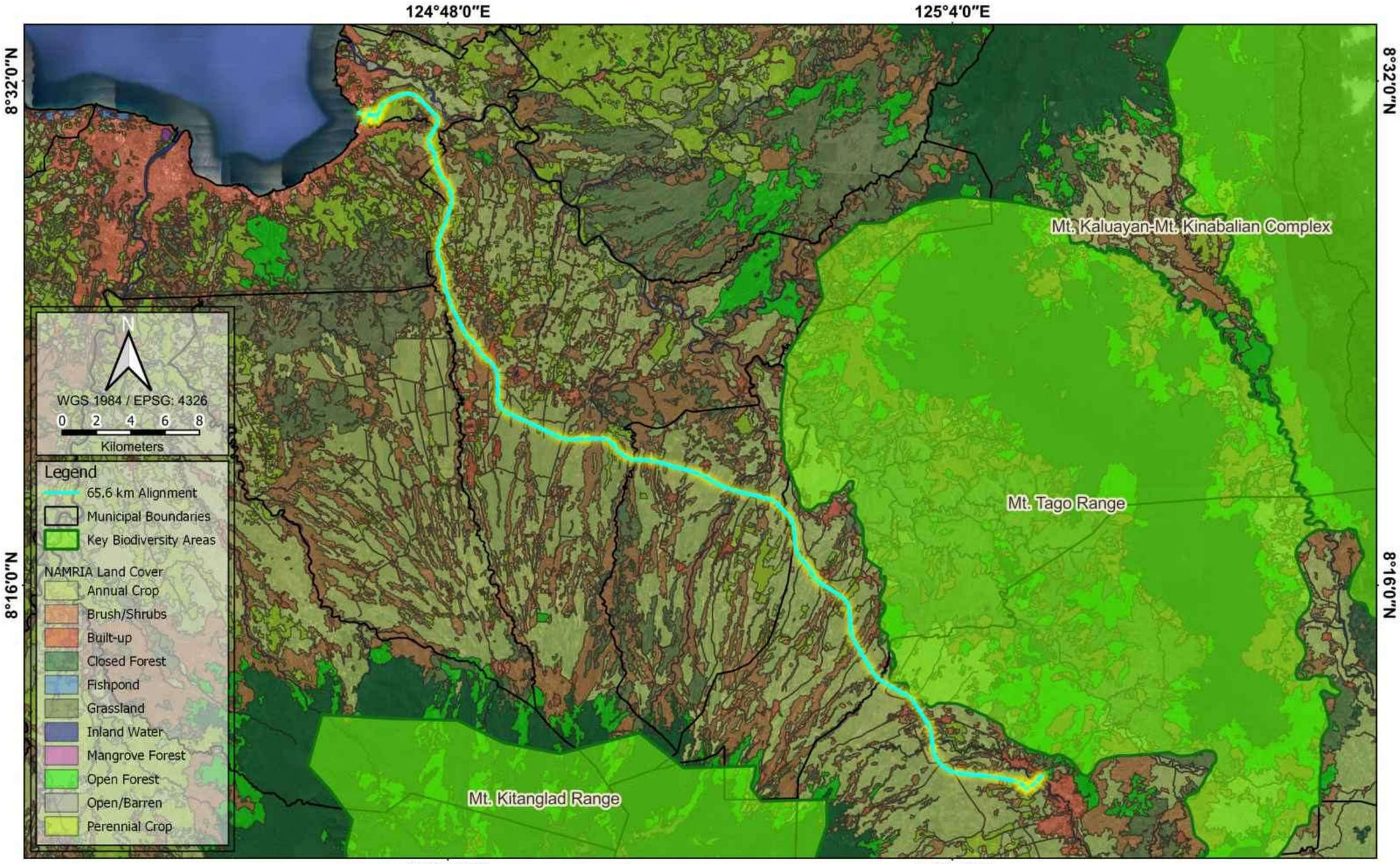
Holder's Name	Location	Area, ha	D*, km	Type
Sagpang Upland Farmers Asso., Inc.	Maluko, Manolo Fortich	390.6	7.59	CBFMA
Ilignan Forest Dev't. Producers Cooperative, Inc.	Guiehan, Manolo Fortich	2626	9.39	CBFMA
Kibenton Forest Occupants Asso.	Kibenton, Impasug-ong	594.96	5.65	CBFMA
Kibenton United Farmers Association		897.3	0.89	CBFMA
Zigzag Upland Dwellers Association	Maluko, Manolo Fortich	58	6.08	CBFMA

NOTE: CBFMA - Community Based Forest Management Agreement, FLGMA – Forest Land Grazing Management Agreement, FLGLA – Forest Land Grazing Lease Agreement; *to the project in kilometers
Source: CENRO

Figure 3-7. Location of the proposed CMH alignment in relation to protected areas

Map of Key Protected Areas with respecet to the CMH Alignment Overlayed in LC Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) NAMRIA 2020 (Land Cover Map)		

Figure 3-8. Location of the proposed CMH alignment in relation to KBA



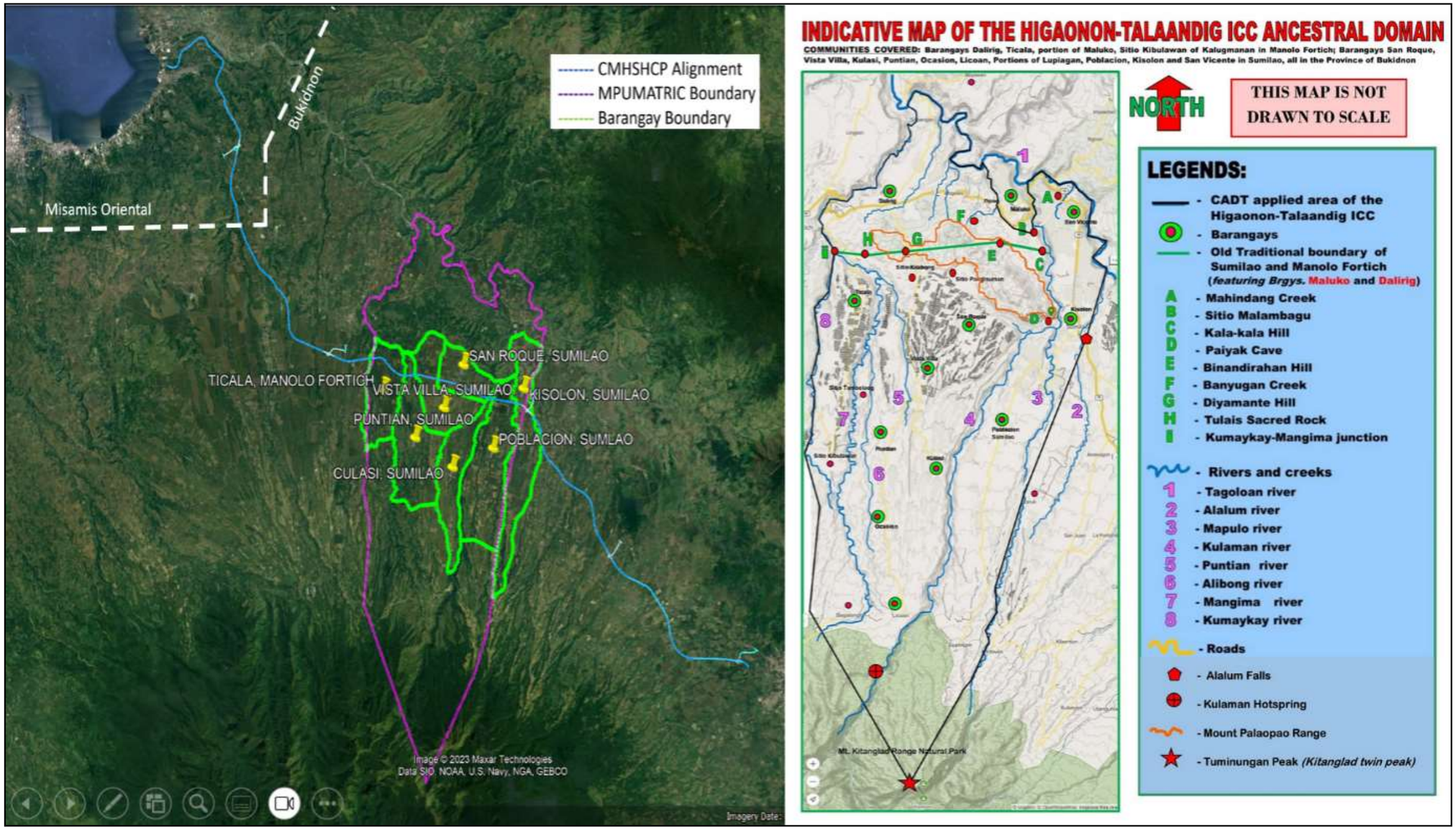
Key Biodeiversity Areas Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	PSA 2016 (Administrative Boundaries) DENR (Key Biodiversity Areas)		

Figure 3-9. Map of ancestral domains showing the proposed CMH alignment

CADT, CADC, and CALT Map Overlayed in the NAMRIA Land Classification Map	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) NCIP Region X (2016) NAMRIA 2020 (Land Cover Map)		

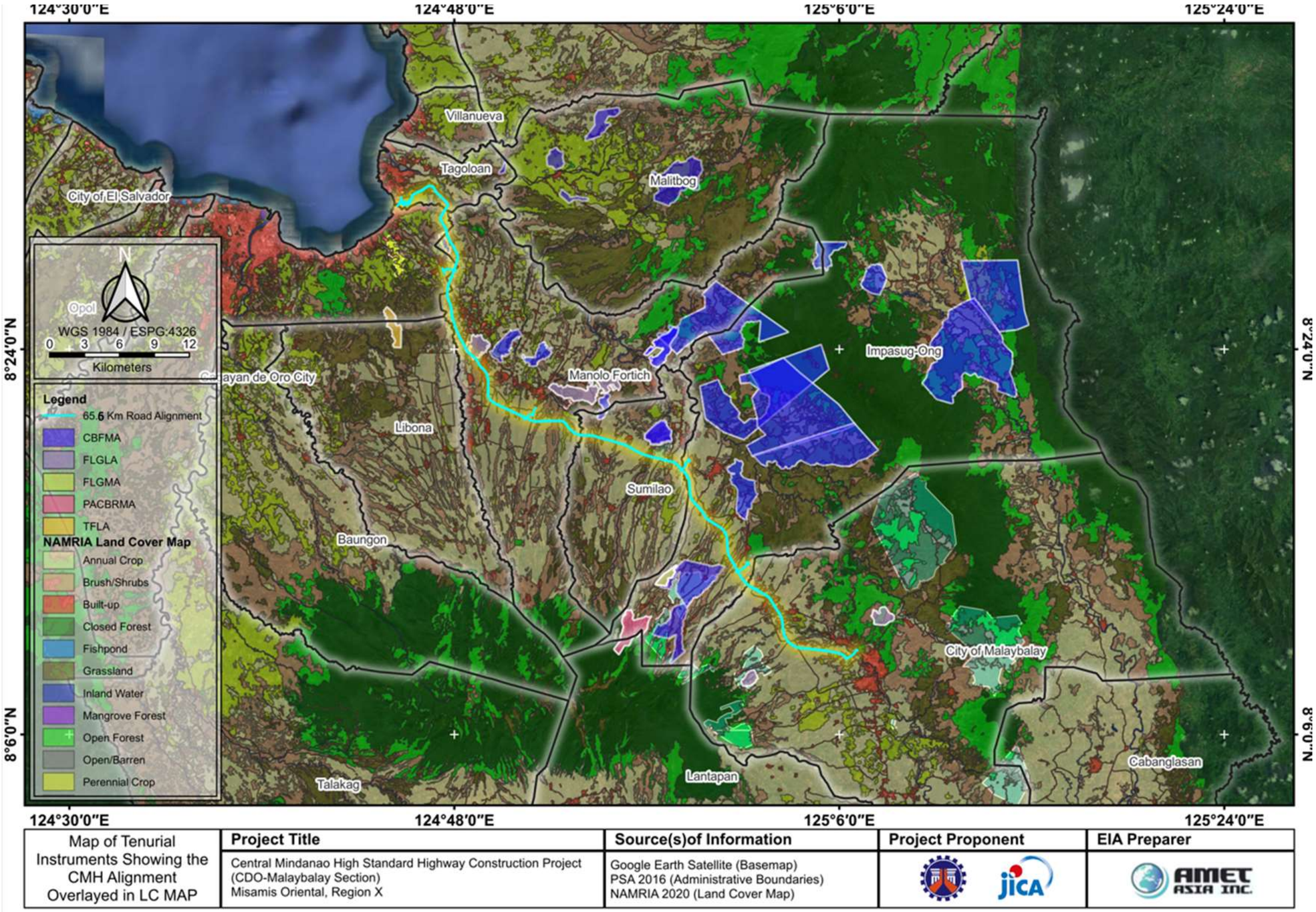
Note: Table3-7 shows the recent ADs from NCIP in 2021 while the available figure from NCIP in 2016 swon in Figure 3-9 does not reflect all ADs listed. No available latest GIS/maps.

Figure 3-10. Indicative Map of the Higaonon- Taalaandig ICC Ancestral Domain Applied Area



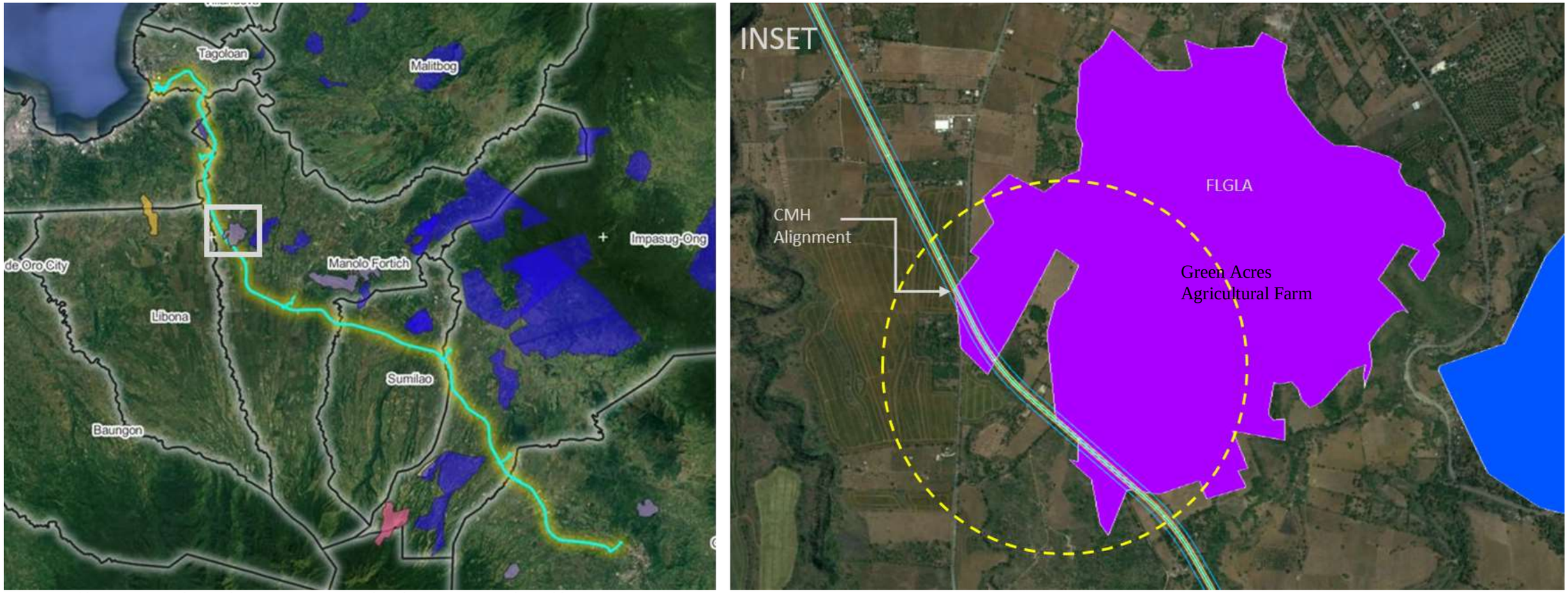
Source: Based on the NCIP Region X data (Right), JICA Study Team prepared

Figure 3-11. Location of the proposed CMH alignment in relation to DENR tenurial instruments



Sources: PSA 2016, NAMRIA 2020.

Figure 3-12. Encroachment of the CMH alignment in the DENR Land Tenure (FLGLA)



Note: Detail location map shows the Green Acres Agricultural Farm mentioned in Table 3-8.
Source: Based on data of City Environment and Natural Resources Office (CENRO) Office DENR Manolo Fortich Bukidnon

3.1.1.3.4 Impairment of visual aesthetics

Visual quality is a measure of the attractiveness of a place that includes the landscape, the architectural features, and historic sites. These are evaluated by three criteria of unity, variety, and vividness (Litton et al., 1974) and provide a basis for determining the visual quality of an object or a combination of objects.

Visual sensitivity describes the ability of a natural or man-made landscape to absorb visual change and is a measure of how readily an area's appearance is affected by the introduction of something new. Areas of low visual sensitivity can easily absorb change, i.e., much alteration would be required to affect overall appearance. Conversely, areas of high visual sensitivity are markedly susceptible to changes in their visual aspects. Visual sensitivity was determined by mapping land use, homogeneity, and topography.

The evaluation of visual quality pertains to the degree and nature of contrast between the proposed Project and its surroundings. The existing visual quality at the Project area is compared to the expected appearance of the site to determine whether the visual character of the area would be degraded. Factors such as changes in the appearance of the Project site from structure configuration, massing, setbacks, landscape buffers and other features are taken into account. The evaluation further considers whether the Project would enhance aesthetic conditions through the creation of new resources and whether the Project includes design features that would offset or mitigate specific impacts.

The Project will be an additional view of development, whether or not visual aesthetics of the area is impaired is subjective to the viewer. Major new visible objects brought about by the Project are the road and its appurtenances, e.g., guardrails, curbs, toll booths, etc., interchanges, under- and overpasses, bridges, RROW fence, and vegetated buffer zones. However, Project objects which will be likely seen by the populace are those located near residential areas. Most of the road and its components will be visible only to motorists using it.

Impairment of visual aesthetics is seen an insignificant in the long term because people will get use to visible Project structures in addition to vegetated buffer zones and other landscaping within the RROW.

3.1.1.3.5 Devaluation of land value because of improper SWM and other related impacts

The six LGUs traversed by the proposed CMH alignment have solid waste management (SWM) systems required by RA 9003. Important components of the SWM system in the LGUs are the presence of Material Recovery Facilities (MRF), collection, and final disposal. A description of the SWM in the host LGUs is briefly described below.

1. Cagayan de Oro City - The 25-hectare City Sanitary Landfill opened in 2017 in Barangay Pagalungan about 12 kilometers from the city proper was the first in the city.

2. Tagoloan - The municipality temporarily established a Residual Containment Area (RCA) while in the process finalizing its sanitary landfill. The LGU has also an eco-SWM park in Barangay Santa Ana where municipal solid waste is sorted and processed.

3. Manolo Fortich - The municipal government is currently operating a five-hectare Controlled Dump Facility (CDF) at Barangay Alae. About 60 percent of the barangays have MRF. Major industries are required to manage their own waste because the conversion of municipal CDF to a Sanitary Landfill will only accommodate household waste.

4. Sumilao - Solid waste management in the urban barangays is handled by the Ecological Solid Waste Management Coordinator. Households and commercial establishments practice segregation of SW at source and hauled and temporarily disposed in a one-hectare dump site in Barangay San Vicente.

5. Impasug-ong – The municipality has a controlled dump site located in Barangay Capitan Bayong with an area of two hectares.

6. Malaybalay City - The City government uses a controlled disposal facility in Barangay Can-ayan for the final disposal of the collected waste. Biodegradables wastes is processed as organic fertilizer through Bioreactor and *vermi* composting. Non-biodegradable wastes are disposed in the City MRF for segregation and sorting with residual wastes are finally disposed in the final disposal area.

Solid wastes generation during construction and operation is expected. The initial estimate of municipal solid waste generation based on the maximum number of personnel during construction and the average generation rate of 0.4 kg/cap/day[5] is 19.2 MT/day. These non-hazardous wastes generally consist of paper, metals, glass, plastics, and food wastes.

Devaluation of land due to improper SW management however is unlikely because of the existing solid waste collection system of the host municipalities and the waste management plans that will be implemented during the construction and operation phases by the DPWH, construction contractor, and toll operator.

3.1.1.4 Mitigating measures

The recommended measures to minimize or address incompatibility with existing land uses, compatibility with classification as an Environmentally Critical Area (ECA), land tenure issues, devaluation of land value because of improper SWM and other related impacts are enumerated below. Impairment of visual aesthetics is not expected to have a significant impact.

Pre-construction

a) Reclassification of Project RROW to the appropriate land use category of the host LGU;
b) Conduct parcellary survey and proper compensation of affected property owners;
c) Consider the presence of ECAs in the detailed engineering design (DED); and
d) Formulate a Construction Waste Management Plan (CWMP) and Operation Waste Management Plan (CWMP).
e) Formulation of Buffer Zone Plan (BZP) during construction and operations.

Construction

a) Proper implementation of Construction Waste Management Plan (CWMP) and Operation Waste Management Plan (CWMP).
b) Construction activities that necessitate utilizing portion of the road/street should be undertaken upon permission by the LGU Traffic management team and outside of traffic rush hours. Construction activities should not be a hindrance to the operations in neighboring area.
c) Proper implementation of buffer zone area.
d) Maintain the construction site/ yards tidy and clean and rehabilitate after construction.
e) Temporary stockpiles of excavated materials from foundation works must be properly covered and regularly hauled to DENR approved disposal sites.
f) Litter and other types of domestic garbage from construction sites and camps must be properly kept in trash bins and regularly disposed through LGU garbage collectors.

Operation

a) Regular maintenance of highway to reduce visual impact due to expected wear and tear.
b) Implementation of best housekeeping practices.

[5] National Solid Waste Management Status Report (2008-2018), EMB-DENR

3.1.2 Geology/Geomorphology

3.1.2.1 Scope

This module described the existing geological conditions traversed by the alignment with focus on a) general geological and geomorphologic setting, b) regional seismicity, geology and structural setting, c) site geological setting, and d) possible geologic hazards that may affect the Project or may be induced by the development.

The key impacts assessed were changes in surface landform and sub-surface geology and inducement of geo-hazards, e.g., subsidence, liquefaction, landslides, mud or debris flow.

3.1.2.2 Methodology

The existing geological and geomorphological conditions traversed by the CMH alignment was described using primary (geological profiling and factual field geological mapping) and available secondary data, maps, and literature. The impact assessment was qualitative and guided by the MGB Memorandum Circular No. 2000-33 and DENR A.O. No. 2000-28. The existing conditions were integrated in the assessment of the key impacts previously mentioned. The geological conditions at the observation points, field logs summary of the road alignment, and road alignment profiles are attached in **Appendices 3** to **5**.

3.1.2.3 Assessment of key impacts

3.1.2.3.1 Change in surface landform and geomorphology

The composite topographic and slope maps showing the proposed alignment and existing Sayre Highway are shown in **Figure 3-13** and **Figure 3-14**, respectively. Photographs of the geological observation points are in **Appendix 3**. The general morphology and slopes along the CMH alignment from Cagayan de Oro to Malaybalay are defined by the following:

a) **Cagayan de Oro to Tagoloan** - Generally characterized by broadly undulating to flattish on top of rolling terrain with intermittent steep river valleys. Elevation varies from low (<20m) to ≤150m before the break-of-slope towards the south. Slope gradient varies from 10° to 30°.

b) **Manolo Fortich** - Elevation ranges from 320 to 650m. Slope gradient mostly from 10° to 30° with steep slopes of 50° to 70° across the existing river channels. Morphology is broadly undulating to flattish with ravines and steep riverbanks.

c) **Sumilao** - Elevation ranges from 550 to 850m. Slope gradient mostly from 10° to 30° with numerous creek channels having 30° slopes and steep slopes of 50° to 70° across the existing major river channels. Morphology is undulating to rolling with ravines and steep riverbanks.

d) **Impasug-ong** - Elevation ranges from 580 to 700m. Slope gradient mostly from 10° to 30° with numerous creek channels having 30° slopes. Terrain with steep slopes of 50° to 70° are found across the existing major river channels. Morphology is undulating to rolling with ravines and steep riverbanks.

e) **Malaybalay** - Elevation ranged from 750 to 950m. Slope gradient mostly from 10° to 30° with numerous creek channels having 30° slopes. Terrain with steep slopes of 50° to 70° are found across the existing major river channels. Morphology is broadly undulating to rolling with ravines and steep riverbanks.

The proposed CMH alignment will traverse areas underlain by the Cagayan Gravel in the northeast and the Bukidnon Formation consisting of moderate to thick beds of the tuffaceous sandstone/conglomerate/shale with localized andesitic volcaniclastics towards the south to Malaybalay.

The Project traversing Cagayan de Oro, Tagoloan, Manolo Fortich, Sumilao, Impasug-on and Malaybalay is expected to induce significant changes in the surface landform, topography, and slope. The road

development involves rock excavations that will expose poorly consolidated gravel/sandstone/shale at the northeastern section and the dominantly poorly indurated pebbly to conglomeratic tuffaceous sandstone of the Bukidnon formation towards the south. Voluminous materials during the construction will be disturbed and loose materials stockpiled.

Inclement weather conditions will induce downslope movement of rocks and regolith particularly on exposed and barren surfaces along the stretch of the proposed road alignment. Excavated areas with steep rock walls will be prone to mass-wasting processes such as rockfall, rockslide, erosion, slope failure and localized landslides. In addition, unconsolidated sediments will be prone to rill erosion by concentrated but intermittent flow of water usually during and immediately following moderate to heavy rains. Concomitant to this will be the sedimentation of the adjacent water channels that may induce flooding at the lower ground.

Figure 3-13. Composite topographic map showing proposed road alignment and existing highway with observation points

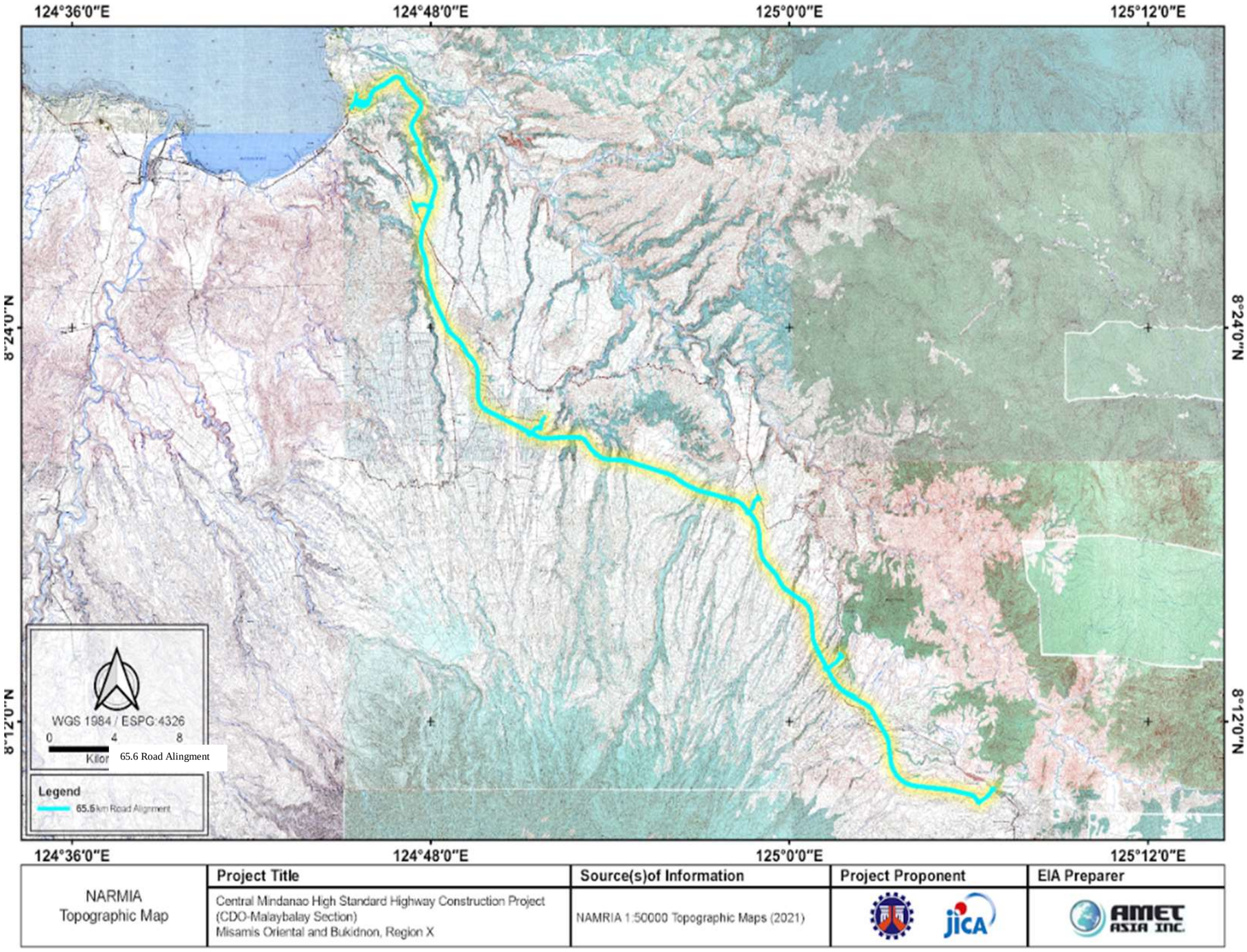
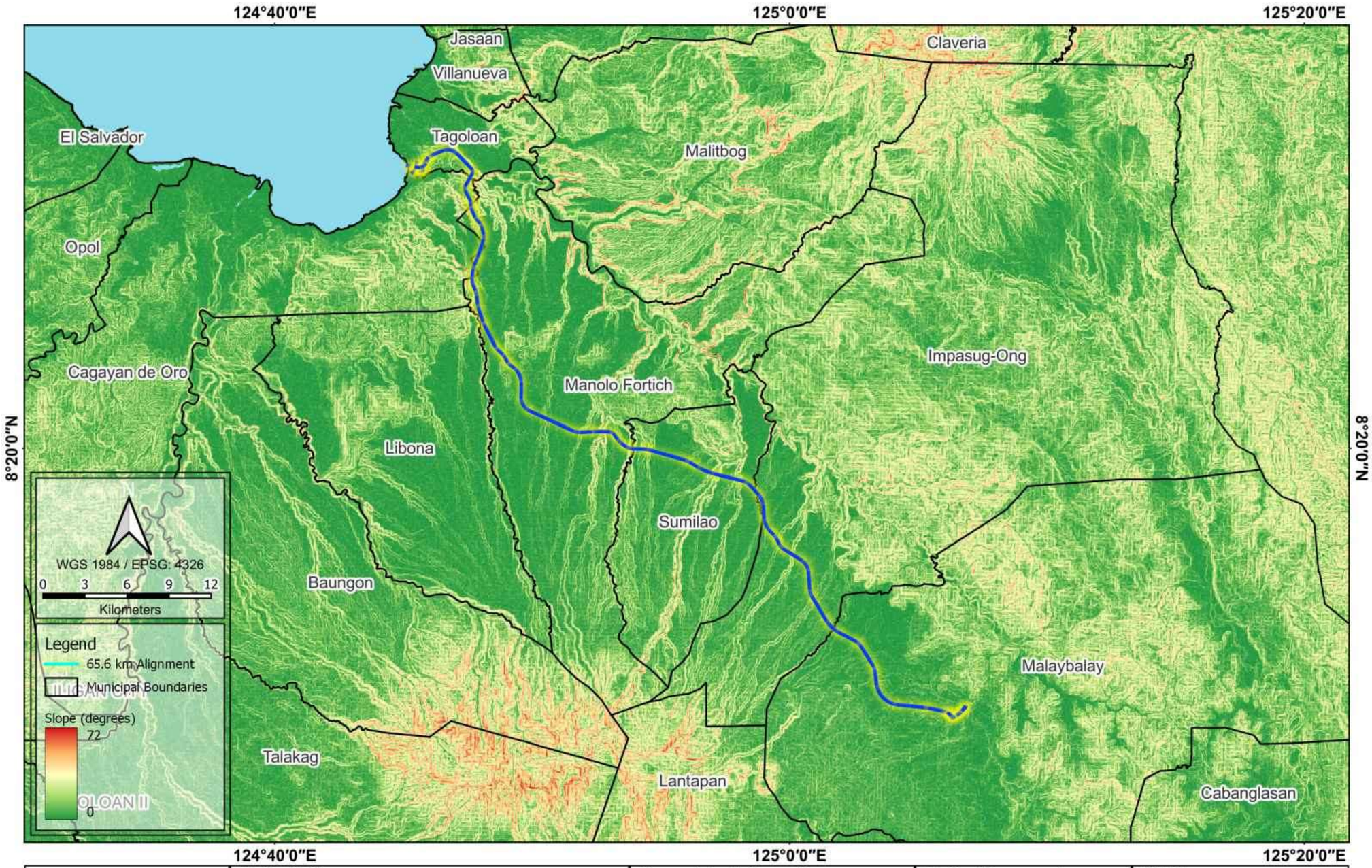


Figure 3-14. Slope map of the Project alignment



Slope Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	SRTM (Slope) PSA 2016 (Administrative Boundaries)		

3.1.2.3.2 Change in sub-surface geology and underground conditions

Regional geological setting

Tectonic setting - The Philippine Islands are within a complex and rapidly deforming area between the two opposing subduction zones: the Philippine Trench subduction zone on the east and the Manila Trench to the west (**Figure 3-15**)[6]. The 1,200-km-long Philippine fault zone (PFZ) is a major tectonic feature that transects the whole Philippine archipelago from northwestern Luzon to southeastern Mindanao[7]. It is divided into several segments and has been the source of large-magnitude earthquakes in recent years[8]. The Philippine Fault runs on a NW–SE direction offshore on the western half of Ragay Gulf.

In the southern Philippines, the Island of Mindanao is defined by the Philippine Trench to the east, the Cotabato Trench to the southwest, and the Sulu-Negros Trench-arc system to the northwest.

Stratigraphy - The general stratigraphy and regional geological map covering the proposed RROW from Cagayan De Oro to Malaybalay is shown in **Figure 3-16** and **Figure 3-17** respectively. Five (5) rock formations characterized the stretch of the proposed RROW: The Pleistocene Cagayan Terrace Gravel, Late Pliocene to Pleistocene Bukidnon Formation, Early Pliocene Indahag Formation, the Cretaceous Awang Ultramafic Complex, and the pre-Cretaceous Tago Schist, in the order of increasing age. The description of the rock formations is summarized in **Table 3-9**.

[6] Wong, et.al., Evaluating the Seismic Hazards in Metro Manila, 2006
[7] H. Tsutsumi, et.al, Timing of Surface-Rupturing Earthquakes on the Philippine Fault Zone in Central Luzon Island, Philippines
[8] PHIVOLCS, Large-scale digital mapping of the Philippine fault zone based on aerial photograph interpretation, July 2000

Figure 3-15. Regional tectonic setting in the southern portion of the Philippines

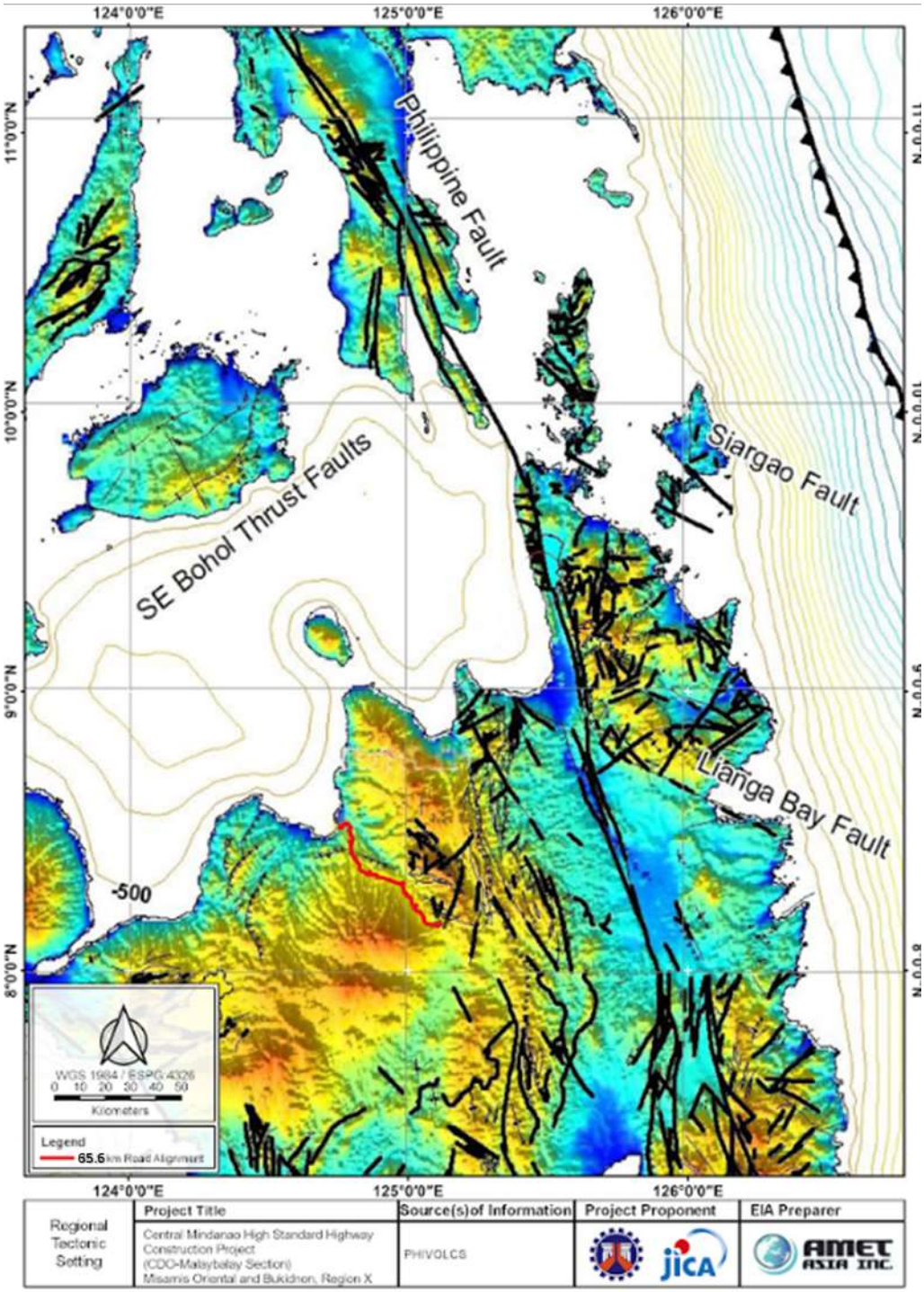
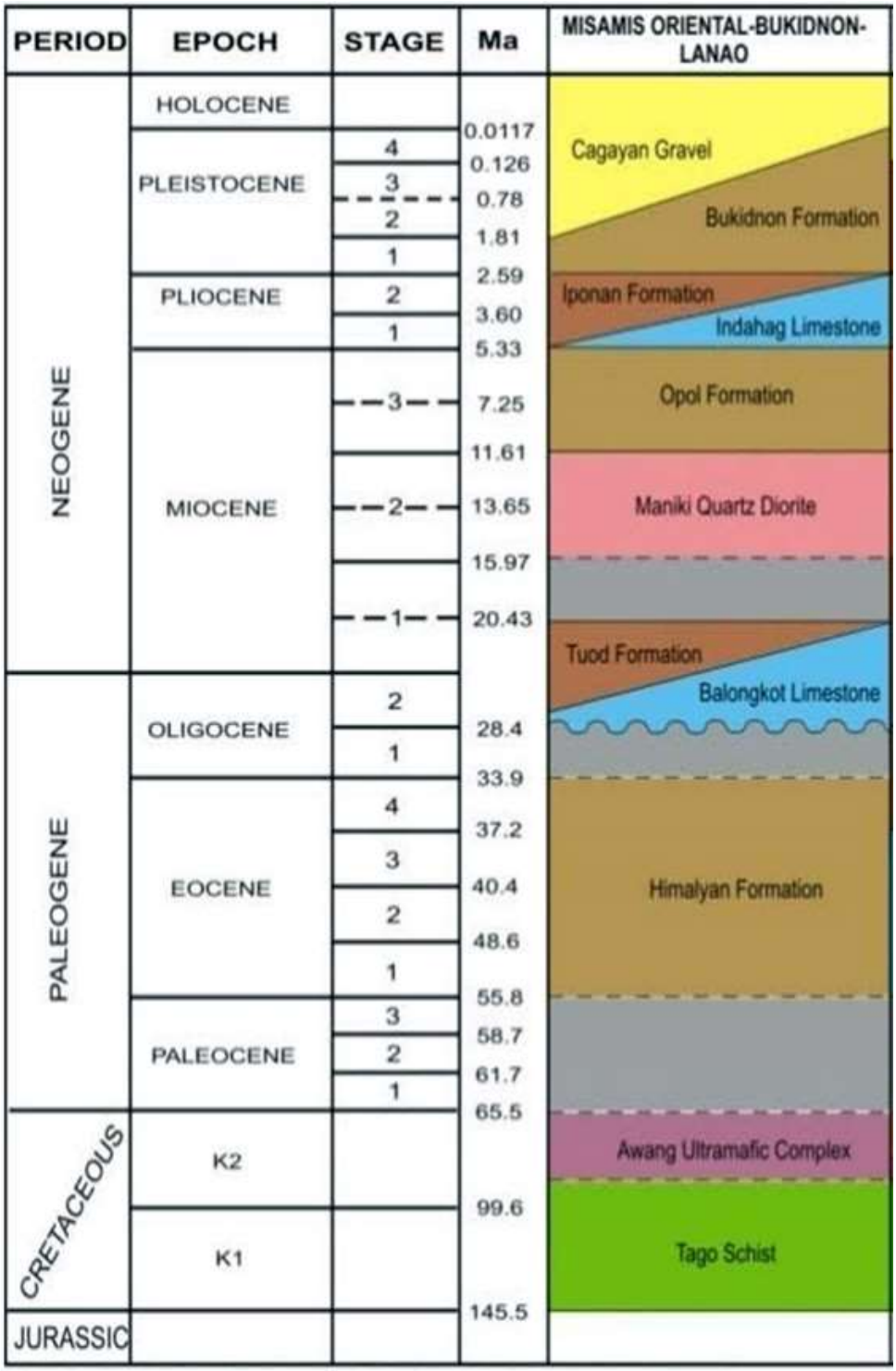


Figure 3-16. Generalized stratigraphy of Misamis Oriental-Bukidnon-Lanao



Geologic Time Scale adopted from International Commission on Stratigraphy (2009)
Source: Geology of the Philippines, 2nd Ed., 2010

Figure 3-17. Regional geologic map showing the proposed Project

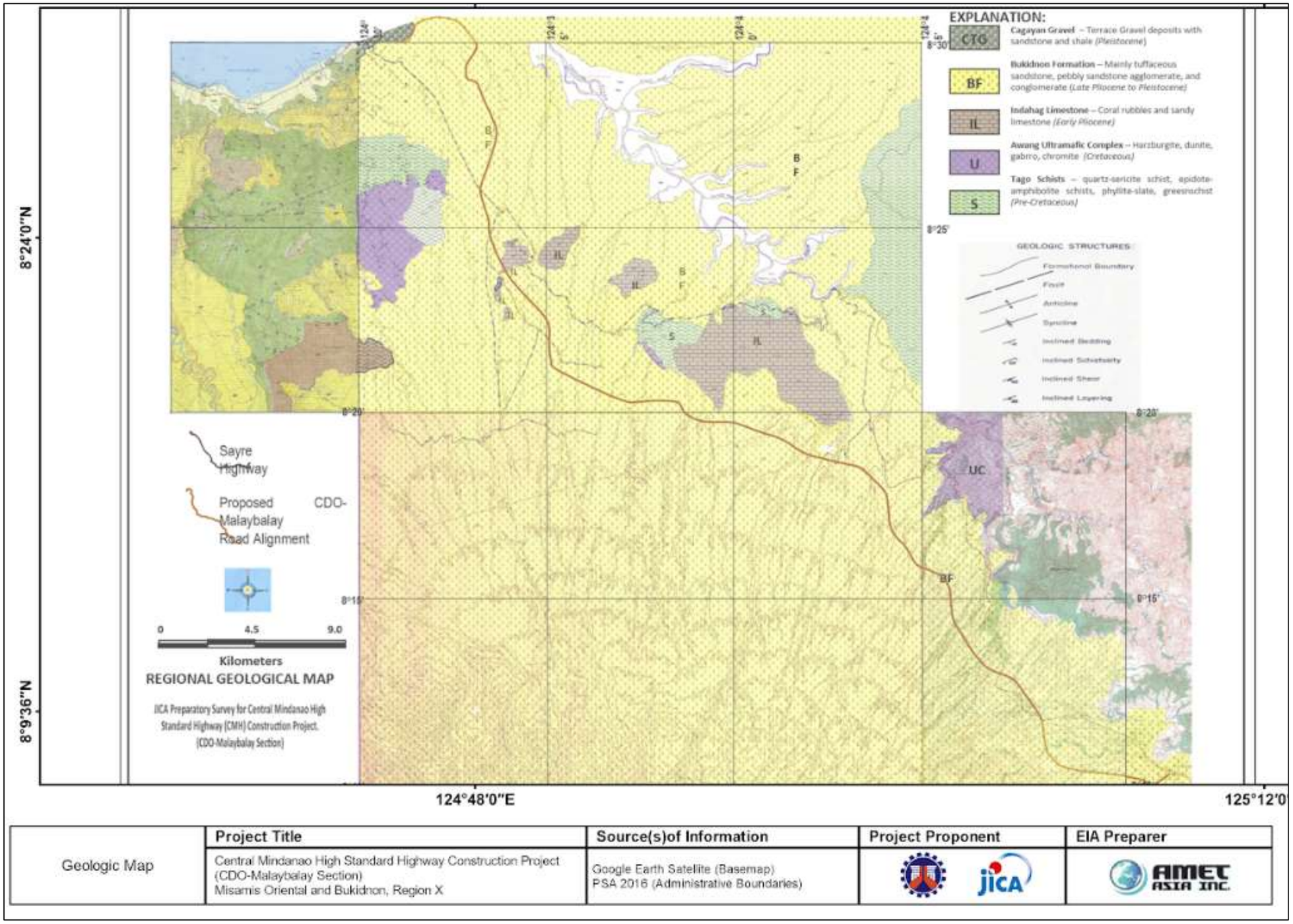


Table 3-9. Description of rock formations at the proposed alignment

Rock formation	Description
Tago Schist (Cretaceous)[9]	The oldest rock in the region which is composed of the garnetiferous quartz-sericite-epidote-amphibolite, greenschists, phyllite and slate. The rocks are distributed in Mt. Tago, Mangima Canyon, Sayre Highway between Manolo Fortich and Damay, Alae-Damilag area and vicinity of Mt Tagiptip in Bukidnon. Barangays Cugman, Balubal and Pigsag-an, Umalag Creek, Cagayan and Bobonawan Rivers in Misamis Oriental. The largest exposure in Bukidnon underlies the western slope of Mt. Tago, bounded by Amusig and Tagaloan Rivers on the northwest and southwest, respectively. In Misamis Oriental, the schist is extensively exposed along an east-west trending belt from Malasag in Brgy. Cugman to the upper reaches of Agusan River in Brgy. Balubal, Cagayan de Oro City. Other large exposures are to be found within the vicinity of Brgy. Pigsag-an, Cagayan de Oro City and the upper reaches of Cugman River. Smaller isolated bodies occur as erosional windows along Umalag Creek and Cagayan and Bobonawan rivers in Misamis Oriental and along Sayre Highway between Manolo Fortich and Damay, Mangima Canyon, and the western portion of Alae-Damilag area in the vicinity of Mt. Tagiptip in the province of Bukidnon. Most of the schists, which are intensely folded, are in fault contact with ultramafic rocks. The garnetiferous quartz-sericite schist is fine-to medium-grained and contains sericite, quartz, plagioclase and garnet. The epidote-amphibolite schist is closely associated with the garnetiferous quartz-sericite schist.
Awang Ultramafic Complex (Cretaceous)[10]	– consists of serpentinite, dunite, peridotite which is in fault contact with the Magina Schist and unconformably underlies the Himalyan Formation. This complex occurs as three (3) large bodies in the Caballero Range within the vicinity of Lourdes, southeast of Opol and between Bigaan and Agusan rivers. Serpentinites make up the largest portion of the Cretaceous ultramafic rocks. In the vicinity of Cagayan de Oro City, the rocks are lenticular bodies within a northeast trending fault zone. The serpentinite is usually highly sheared, locally schistose and contorted. It varies from dark to bluish green; when mylonitized, it is grayish, reddish or light greenish. It consists mainly of serpentine and chlorite with minor amounts of actinolite and talc. Along Iponan River, an elongated body of serpentinized peridotite is medium to coarse-grained, olive green to gray when fresh and reddish brown when weathered. It exhibits a shiny luster and has a soapy feel. Protoliths of the serpentinite are mainly harzburgite and dunite with minor pyroxenite. Fine- to medium-grained dunite usually occurs as small lenses interlayered in places with chromite. It is dense and dark when fresh and yellowish brown or dirty white when weathered.
Indahag Limestone (Pliocene)[11]	– consists of massive to well-bedded, dull white to brown and red, and coralline limestone with interbeds of conglomerate, tuffaceous sandstone and shale. The rocks are distributed in Indahag, Cagayan de Oro City; Lumbia; Opol; Lugait near Iligan City; Cagayan River, Brgy. Alae, Cagayan de Oro. Exposures can also be found along the seashore from Opol westward to Lugait near Iligan City; along Cagayan River and southeast of Barangay Alae, Cagayan de Oro City. Minor interbeds of clastic rocks include conglomerate, tuffaceous sandstone and shale. Three distinct horizons are recognizable along the banks of Cagayan River, where the outcrops are thickest. Pacis (1966) noted that the lowest horizon of the section along Cagayan River is largely coralline limestone with

[9] Geology of the Philippines, 2nd Ed. 2010, pp 398-399
[10] Geology of the Philippines, 2nd Ed. 2010, pp. 399-400
[11] Ibid, p. 403

Rock formation	Description
	calcisiltites, calcarenites and calcirudites. The middle section consists of limestone rubble and coral fingers. Intercalated layers of coralline limestone, calcarenite and limy tuff comprise the upper horizon. Projected thickness of the Indahag limestone ranges from 250 to 300m.
Bukidnon Formation (Pleistocene)	– consists of agglomerate, tuffaceous pebbly sandstone and conglomerate. Exposures are well observed in the area east of Cagayan River. The conglomerate is poorly sorted with pebble- to boulder-sized clasts of volcanic rocks, schists and serpentinite. The thickness of this formation is estimated at 800 m
Cagayan Gravel (Pleistocene – Holocene)	– consists of intercalated gravel deposits, with interbeds of tuffaceous sandstone and shale largely distributed in found along the National Road in Cagayan de Oro City to Indahag road; from Bugo to Alae; and on the west bank of Cagayan River just before the airport. The slightly consolidated and poorly sorted gravel is composed of rounded to sub-rounded pebble- to boulder-sized igneous and metamorphic rocks. The shales and tuffaceous sandstones are slightly compacted. Thickness is estimated at 100 m.

Structures - Two main fault systems (Philippine Fault and Mindanao Fault) and hundreds of fault splays and lineaments transect the region. The Diwata Range lies within the southern part of the Philippine between two major tectonic structures that influence the geologic evolution of the Philippine Archipelago: the NNW-SSE trending Philippine Fault Zone demarcating the western flank of the eastern Mindanao ridge and the Philippine trench located about 75 km east offshore of the Mindanao coastline (**Figure 3-18**).

Bukidnon is part of the seismically active region of Northern Mindanao (Region X) because of the presence of several active faults in the area which include the Central Mindanao Fault, Linugos River Fault, Cabanglasan Fault, Tagoloan River Fault, Lanao Fault System and segments of the Mindanao Fault.

Site geological setting

The geology of the individual host LGUs are presented in the succeeding paragraphs. The reader is referred to **Appendix 3** and **Appendix** 4 for the factual geological mapping and field logs of the sections traversed by the proposed Project.

Cagayan de Oro - The northeast area of the city traversed by the proposed Project was basically underlain by the Cagayan Gravel (CTG) consisting of gravel deposits with interbeds of tuffaceous sandstone and shale. Good exposures can be observed along the northern end of the Alae Bypass Road. Towards the south, the observable rock types consisted of agglomerate, tuffaceous pebbly sandstone and poorly sorted polymictic conglomerate of the Bukidnon Formation (BF). Exposures were well observed along the Alae Bypass Road and along the Sayre Highway.

Manolo Fortich - Most of the rocks observed along the Sayre Highway including the southern section of the Alae Bypass Road and the proposed alignment were the rocks of the BF consisting of moderately to thickly bedded pebbly to conglomeratic tuffaceous sandstone, conglomerate, and shale beds. Localized fragments of the Indahag Limestone (IL) were also noted along the Sayre Highway.

Sumilao – Three rock formations underlie the municipality: the Bukidnon Formation, Indahag Limestone, and the Tago Schist. The general area of Sumilao is underlain mostly by the pebbly to conglomeratic sandstone with shale interbeds, agglomerate, and volcaniclastics of the BF including the sections that could be traversed by the proposed alignment. Most of the rocks observed along the Sayre Highway belonged to the Tago Schist (TS) with intermittent occurrences of the tuffaceous sandstone/conglomerate and the Indahag Limestone.

Impasug-ong - The area that could be traversed by the proposed alignment was basically underlain by the rocks of the BF consisting variably of andesitic volcaniclastics, moderately to thickly bedded tuffaceous sandstone, conglomerate and shale. The Sayre Highway was generally underlain by the tectonized harzburgite with pyroxenite and dunite of the Ultramafic Complex (UC).

Malaybalay - The general area traversed by the Sayre Highway, the Diversion Road and the proposed alignment in Malaybalay was basically underlain by the BF consisting of bedded pebbly to conglomeratic sandstone/shale, poorly sorted conglomerate, and andesitic volcaniclastics. Most of the underlying rocks along the Diversion Road were moderately to heavily weathered leaving behind reddish brown to brown 2- to 3-meter-thick soil materials.

Geological structures

The beds of the sandstone and shale, for both the terrace gravel and the volcaniclastic rocks of the Bukidnon Formation area generally low dipping (5° to 15°) with variable strike directions to the NE for the gravel/sandstone/shale, and NW to NE for the tuffaceous sandstone/shale/conglomerate towards Malaybalay. Beds of the Indahag Limestone have moderate dips (20° to 45°) mostly towards the SE. The schistose rocks of the Tago Schist are moderately to highly jointed, mostly with crenulation folds, with variable orientations and having moderate to steep schistosity. The Ultramafic rocks along the Old Sayre Highway are generally tectonized/fragmented.

Road networks transecting the thick Bukidnon Formation, the Ultramafic Complex, and the Tago Schist are prone to creep, landslides and rockfall.

The nearest active fault relative to the northern section of the Project site is the segment of the Tagoloan River Fault which lies around 16km to the east. Other faults with their relative distances to the Project alignment are shown in **Figure 3-18** and **Figure 3-19.**

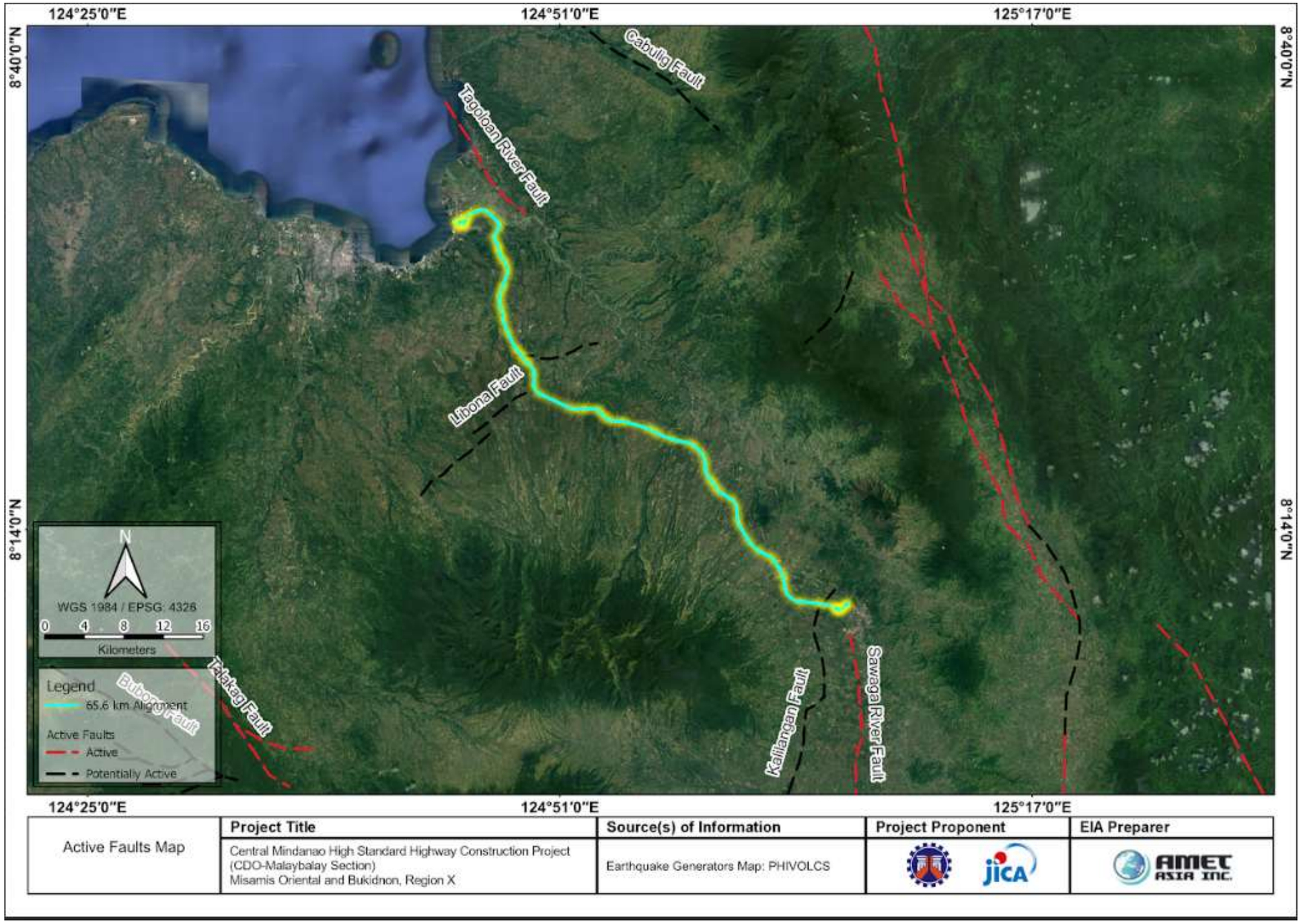
Table 3-10. Nearest active fault relative to the Project

Nearest Fault	Relative Distance to the Project
Cabangalasan Fault	37kms to the Northeast
Central Mindanao Fault	52kms to the East
Lianga Fault	80kms to the East-Northeast
Lanao Fault System	70kms to the West
Mindanao Fault Western Mindanao Extension	77kms to the West

The proposed alignment will traverse areas underlain by the Cagayan Gravel in the northeast and the Bukidnon Formation consisting of moderate to thick beds of the tuffaceous sandstone/conglomerate/ shale with localized andesitic volcaniclastics towards the south to Malaybalay.

Based on this, Project implementation will not induce significant change in the underlying rock types except during excavation where the sub-surface morphology will be locally altered. However, changes in the sub-surface morphology and the underlying soil types will be insignificant.

Figure 3-18. Distribution of active faults in Mindanao showing the Project



3.1.2.3.3 Inducement of subsidence, liquefaction, landslides, mud/debris flow

The project development, which will cover 65.6 linear-kilometers stretching from Cagayan de Oro to Tagoloan to Manolo Fortich to Sumilao to Impasug-on to Malaybalay, will definitely induce significant change in the surface landform / topography / terrain or slope. Road development will involve rock excavations that will expose poorly consolidated gravel/sandstone/shale at the northeastern section and the dominantly poorly indurated pebbly to conglomeratic tuffaceous sandstone of the Bukidnon formation towards the south. During construction, voluminous materials will be disturbed, and loose materials will be stockpiled.

Increment climatic conditions will induce downslope movement of rocks and regoliths particularly on exposed and barren surfaces along the stretch of the road alignment project. Excavated areas with steep rock walls will be prone to mass-wasting processes such as rockfall, rockslide, erosion, slope failure and localized landslides. In addition, unconsolidated sediments will be prone to rill erosion by concentrated but intermittent flow of water, usually during and immediately following moderate to heavy rains. Concomitant to this will be the sedimentation of the adjacent water channels that may induce flooding at the lower ground.

3.1.2.3.3.1 Ground acceleration

Ground acceleration is the actual trembling or jerking motion produced by an earthquake[12]. The degree of shaking is generally affected by the underlying materials; hence, shaking is more severe on areas underlain by unconsolidated sediments than site underlain by bedrocks.

The Deterministic Method developed by Fukushima and Tanaka (1990) represented by the equation below was used to assess the worst-case scenario of ground shaking.

$$\text{Log10 } A = 0.41M - \log10 (R + 0.32 \times 10 (0.41M)) - 0.0034R + 1.30$$

where A = mean peak acceleration (cm/sec2)
R = shortest distance between site and fault (km)
M = surface-wave magnitude

The method presumed that the highest magnitude earthquake (MCE) recorded along the segments of the active fault has the possibility to recur and that the epicenter will be at the nearest distance of the fault from the Project site. An MCE of Ms=7.5 was used for computing the worst peak ground acceleration (PGA). Amplification factors used for the different ground conditions were for medium soil is 1x, and for hard soil or bedrock is 0.6x. The attenuation relation used in the calculation has been applied to western Pacific Island settings[13]. The distance of the major seismogenic structure from the Project site was estimated using available maps from PHIVOLCS and Google Earth.

The result of the calculations for rock and soil conditions is shown in **Table 3-11**. The calculated deterministic PGA values for rock and soil conditions are high relative to the calculated values using the deterministic method[14].

Table 3-11. PGA and computed acceleration values for the Project Site

Earthquake Source			Computed PGA (g) acceleration				
mag	nearest fault	dist (km)	g	soft soil	rock	med soil	hard soil
7.5	Tagoloan River Fault	16	0.395114	0.549208	0.237068	0.343749	0.422772
7.5	Cabangalasan Fault	37	0.241394	0.335538	0.144837	0.210013	0.258292

[12] http://www.mona.uwi.edu/uds/GEOHAZARDS_2001/GEOHAZ2001-029.html
[13] Thenhaus et al., 1994
[14] Fukushima and Tanaka, 1990

Earthquake Source			Computed PGA (g) acceleration				
mag	nearest fault	dist (km)	g	soft soil	rock	med soil	hard soil
7.5	Central Mindanao Fault	52	0.178886	0.248652	0.107332	0.155631	0.191408
7.5	Lanao Fault	70	0.129486	0.179985	0.077691	0.112652	0.13855
7.5	Lianga Fault	80	0.109591	0.152331	0.065754	0.095344	0.117262
7.5	Mindanao Fault Western Mindanao Extension	97	0.083857	0.116561	0.050314	0.072955	0.089727

Note: In relation to potential earthquakes from various sources at various distances; mag – magnitude, dist – distance in km, g – acceleration

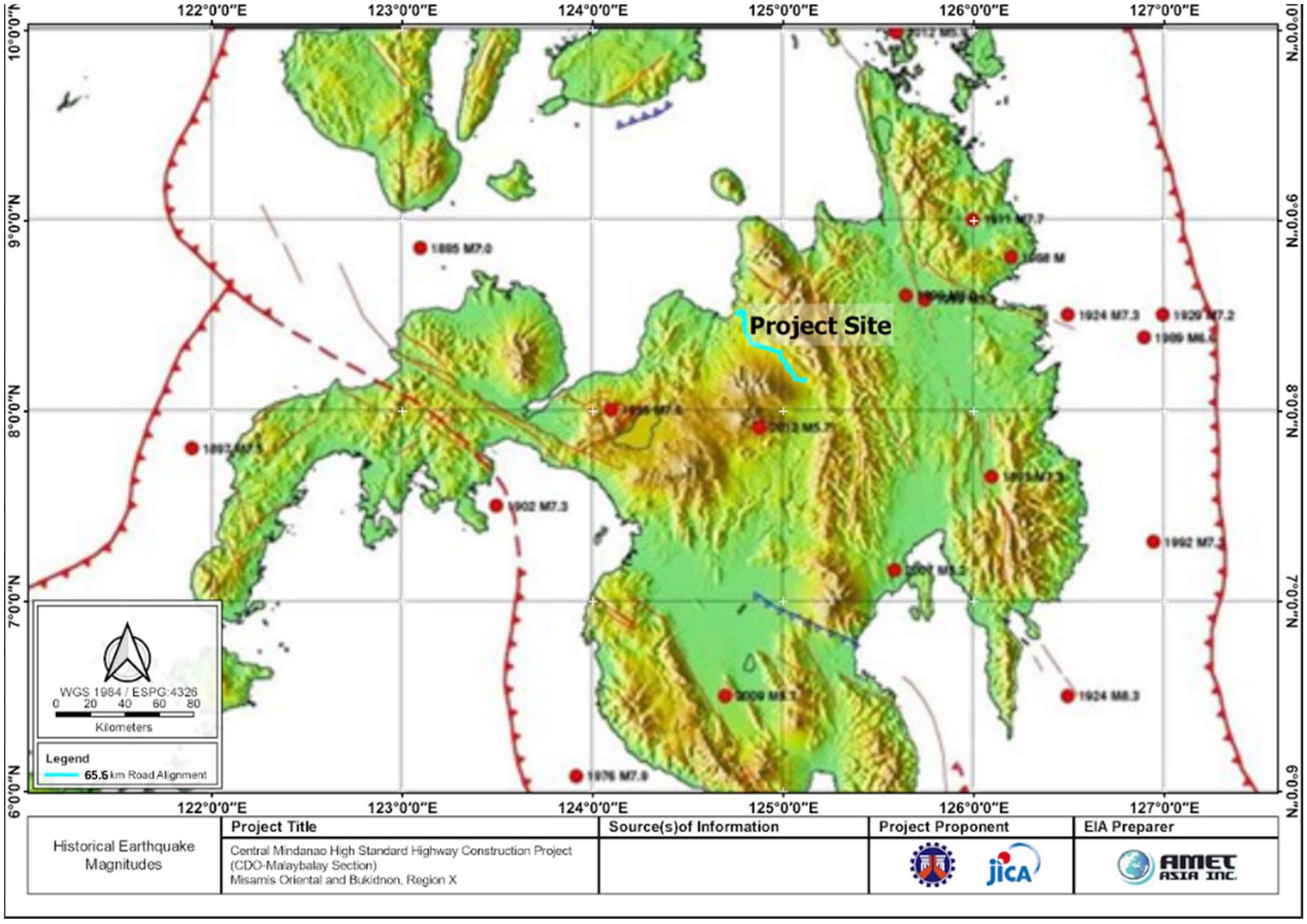
Using the Instrumentality Intensity Scale, the computed values originating from the Tagoloan River Fault (Intensity VIII) and Cabanglasan Fault (Intensity VII) with magnitude 7.5 earthquake will have very strong to severe perceive shaking with moderate to heavy potential damage at the site (**Table 3-12**).

Table 3-12. Instrumental Intensity Scale

Instrumental Intensity	Acceleration (g)	Velocity (cm/sec)	Perceived Shaking	Potential Damage
I	<0.0017	<0.1	Not Felt	None
II	0.0017-0.014	0.1-1.1	Weak	None
III	0.0017-0.014	0.1-1.1	Weak	None
IV	0.014-0.039	1.1-3.4	Light	None
V	0.039-0.092	3.4-8.1	Moderate	Very Light
VI	0.092-0.18	8.1-16	Strong	Light
VII	0.18-0.34	16-31	Very Strong	Moderate
VIII	0.34-0.65	31-60	Severe	Moderate to Heavy
IX	0.65-1.24	60-116	Violent	Heavy
X+	>1.24	116	Extreme	Very Heavy

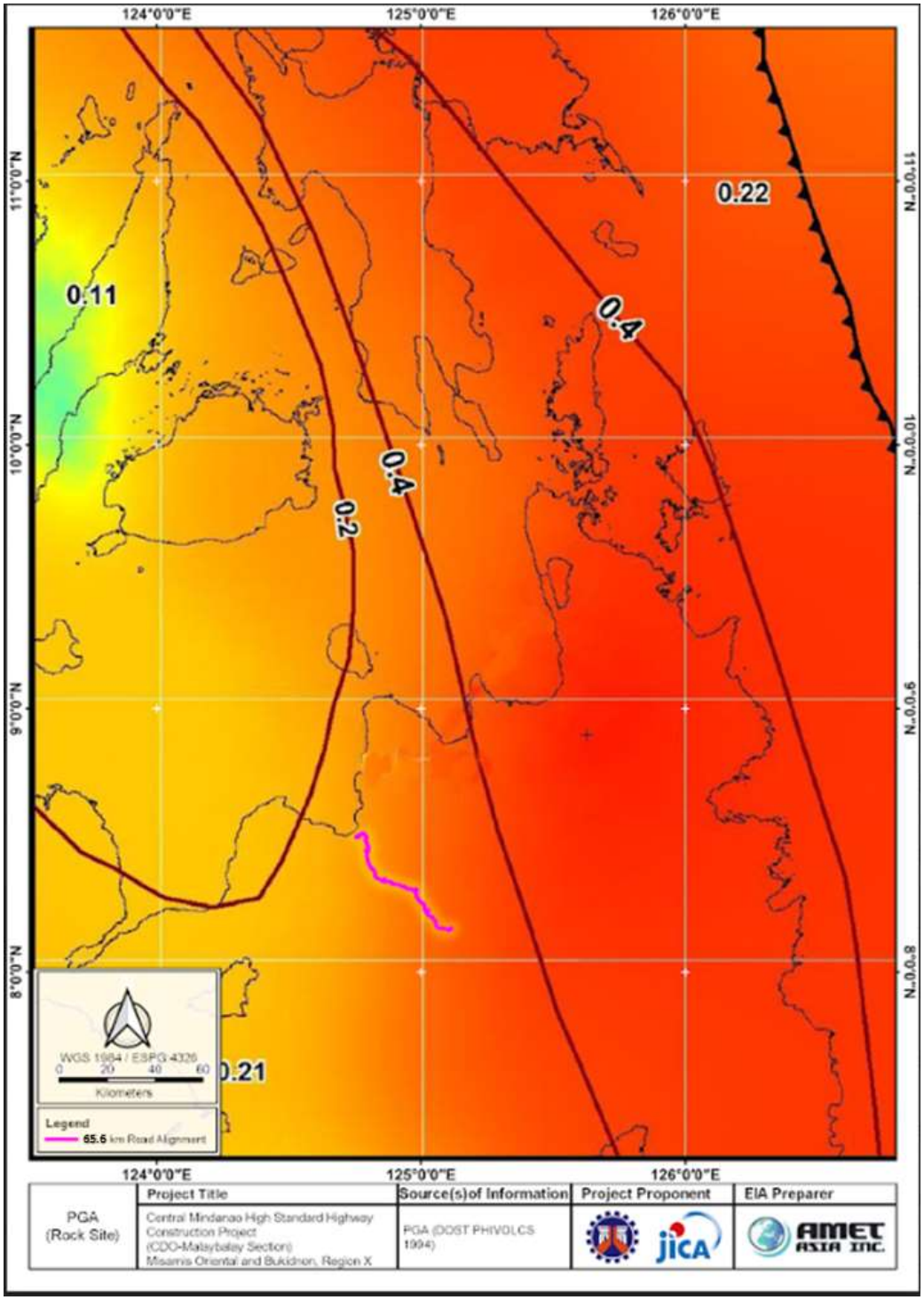
Source: USGS

Figure 3-19. Map indicating earthquakes intensities in Mindanao



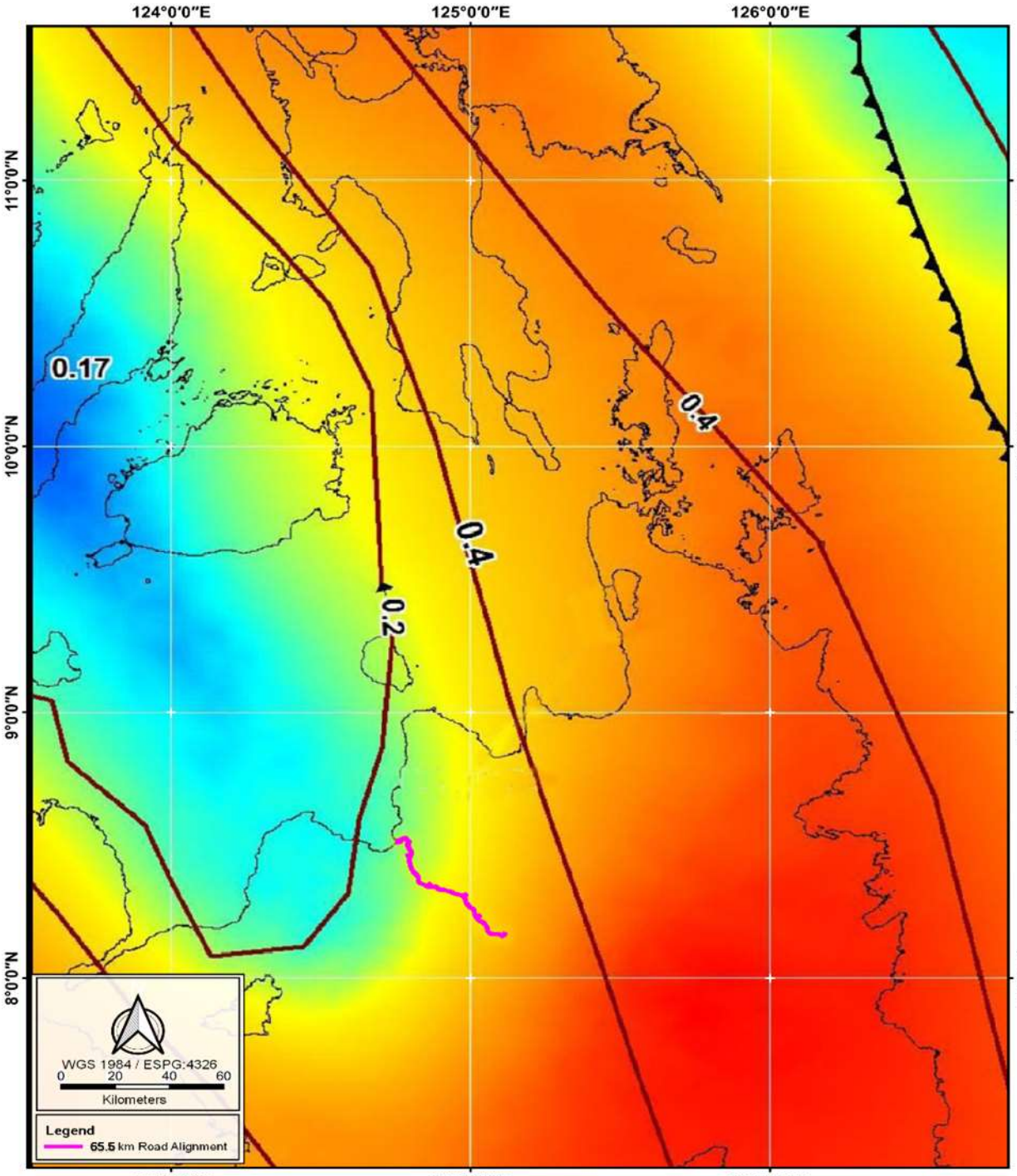
Probabilistic zonation maps shown in **Figure 3-20** to **Figure 3-22** provide a guide for estimating the peak ground acceleration (PGA) in the Philippines[15]. Using these maps, the estimated peak horizontal accelerations at the vicinity of the Project would be around 0.4g for the rock and medium soil component and 0.6 for the soft component. These estimated peak ground accelerations have a 10% chance of occurrence in 50 years. These standards will then apply to the 1 in 500-year probability.

Figure 3-20. PGA values for rock components in Northern Mindanao



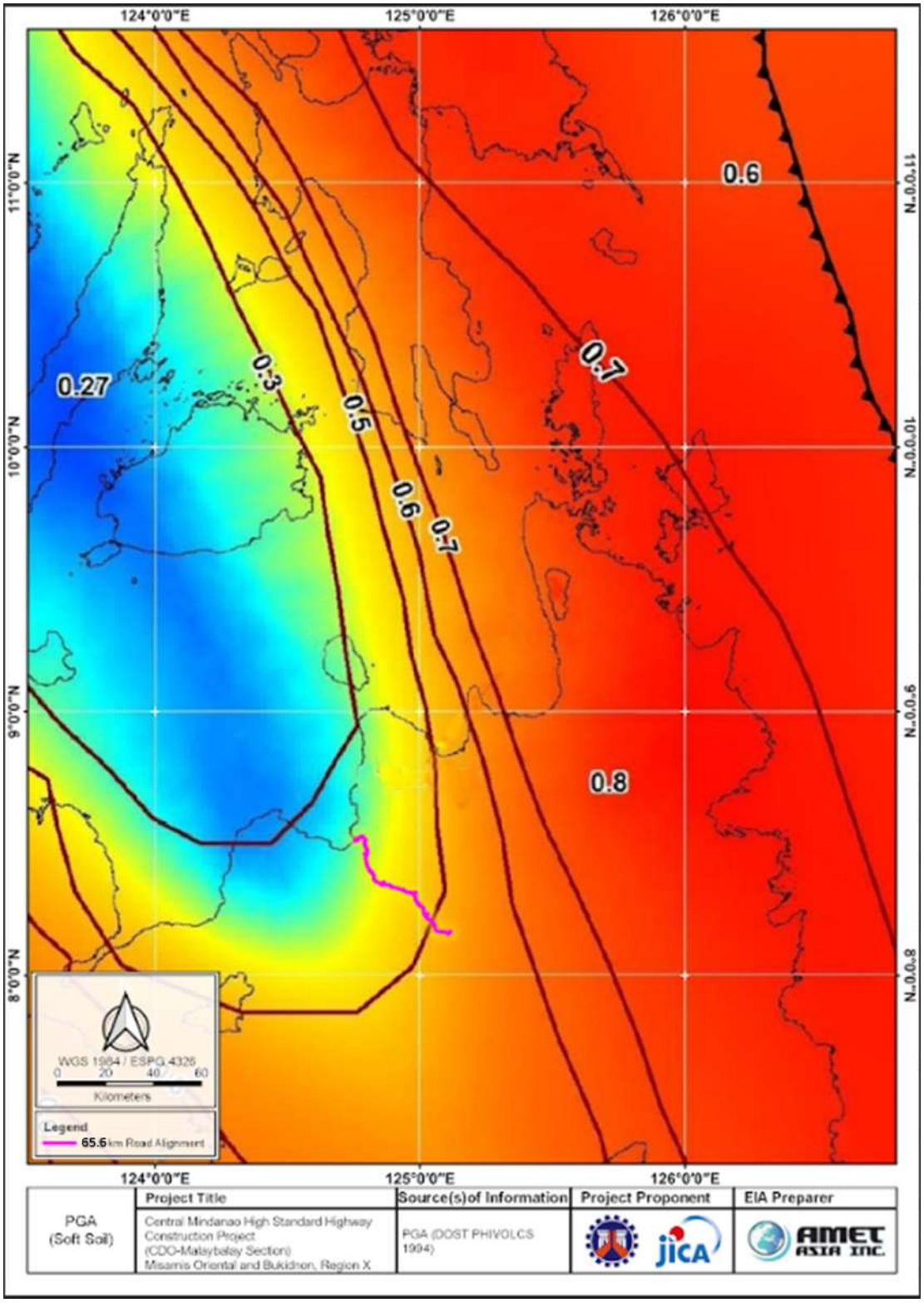
[15] Thenhaus, et. al, 1995

Figure 3-21. PGA values for medium soil components in Northern Mindanao



	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
PGA (Medium Soil)	Central Mindanao High Standard Highway Construction Project Municipality of Tagoloan and Cagayan de Oro City, Misamis Oriental, Region X	PGA (DOST PHIVOLCS 1994)	JICA	AMET ASIA INC.

Figure 3-22. PGA values for soft soil components in Northern Mindanao



3.1.2.3.3.2 Liquefaction

Liquefaction is a phenomenon where the strength and stiffness of soil is reduced by earthquake shaking or other rapid loading[16]. It occurs in saturated soils where the space between individual particles is completely filled with water. Earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other. When liquefaction occurs, the strength of the soil decreases and the ability of a soil deposit to support foundations for buildings and bridges is reduced. Liquefied soil also exerts higher pressure on retaining walls which can cause tilting or sliding. This movement can cause settlement of the retained soil and destruction of structures on the ground surface.

The CMH alignment is generally underlain by the bedrocks of the Cagayan Terrace Gravel and the tuffaceous sandstone/shale/conglomerate and andesitic volcaniclastics of the Bukidnon Formation which are not susceptible to liquefaction hazard (**Figure 3-23**).

3.1.2.3.3.3 Subsidence hazard

Localized outcrop of the Indahag Limestone was observed at the southern section of Barangay Alae, Manolo Fortich (**Figure 3-17**) which could be susceptible to subsidence hazard. The rest of the Road Alignment will traverse areas mostly underlain by conglomerate and sandstone of the Bukidnon Formation.

3.1.2.3.3.4 Landslide

The earthquake-triggered landslide susceptibility map showing the CMH alignment is shown in **Figure 3-28.** Based on this map, the northern section in Barangay Sugbongcogon, Tagoloan and the Alae Bypass Road has a high susceptibility to landslide and a localized portion with moderate susceptibility. Those areas with existing major deep river valleys from Cagayan de Oro southwards to Sumilao and the southern section of Impasug-ong have relatively high susceptibility to landslide with the smaller secondary river tributaries exhibiting moderate susceptibility. The major river channel approaching Malaybalay is susceptible to moderate landslide hazard.

Factual geological mapping identified several landslide zones on areas characterized by steeply sloping barren or less vegetated rock walls with exposed loosely consolidated gravel deposits (CG), the tuffaceous pebbly to conglomeratic sandstone and the heavily weathered andesitic volcaniclastics (BF), the schistose rocks (TS), and the limestone (IL).

Any road work involving deep excavations transecting the loosely consolidated gravel/sandstone/shale of the Cagayan Terrace Gravel, conglomerate/tuffaceous sandstone/shale of the Bukidnon Formation, the Tago Schist, and the Indahag Limestone will induce landslide, rock fall and associated mass-wasting hazard.

3.1.2.3.3.5 Creep

Soil creep is a slow and long-term process of mass wasting. The creep makes trees and shrubs curve to maintain their perpendicularity and can trigger landslides if they lose their root footing. In the course of time, the combination of small movements of soil or rock in different directions may contribute to mass downslope failure. Creep was observed in Barangay Puerto, CDO at 8°26’33” N/124°47’41” E where ‘terracettes’ or ‘soil ripples’ were observed along the slopes.

3.1.2.3.3.6 Flood hazard

Those areas transected by the proposed CMH alignment from the boundary of Impasug-ong to Malaybalay are susceptible to moderate to high flooding hazard while areas from the southern boundary of Impasug-ong to Malaybalay have high flood susceptibility (**Figure 3-24)**

[16] http://www.ahabreviewsandtips.com/2011/08/phivolcs-liquefaction-susceptibility.html

Any loose and unprotected stockpiled materials during the road development will be affected by rill and gully erosion that may cause siltation of the nearby streams. This will induce flooding not only at the Project segments but also areas at the lower ground.

3.1.2.3.3.7 Erosion/Slope failure

Several sections of the proposed road in **Figure 3-27** will traverse steep rivers banks that are highly prone to erosion or slope failure hazards.

3.1.2.3.3.8 Ground rupture

Ground rupture may arise during large earthquakes with the ground surface being displaced along the fault[17]. Any structure built across the fault is at risk of being torn apart as the two sides of the fault slip past each other.

In the event of strong earthquake along the Libona Fault, possible surface rupture may occur at the vicinity of 8°20’47”/124°51’22” and 8°21’12”/124°50’29.5”. Similar scenario may occur at the western segment of the Diclum Fault at 8°23’13”/124°49’14” (**Figure 3-29**).

[17] https://www.google.com/search?q=what+is+ground+or+surface+rupture

Figure 3-23. Liquefaction hazard map of Mindanao

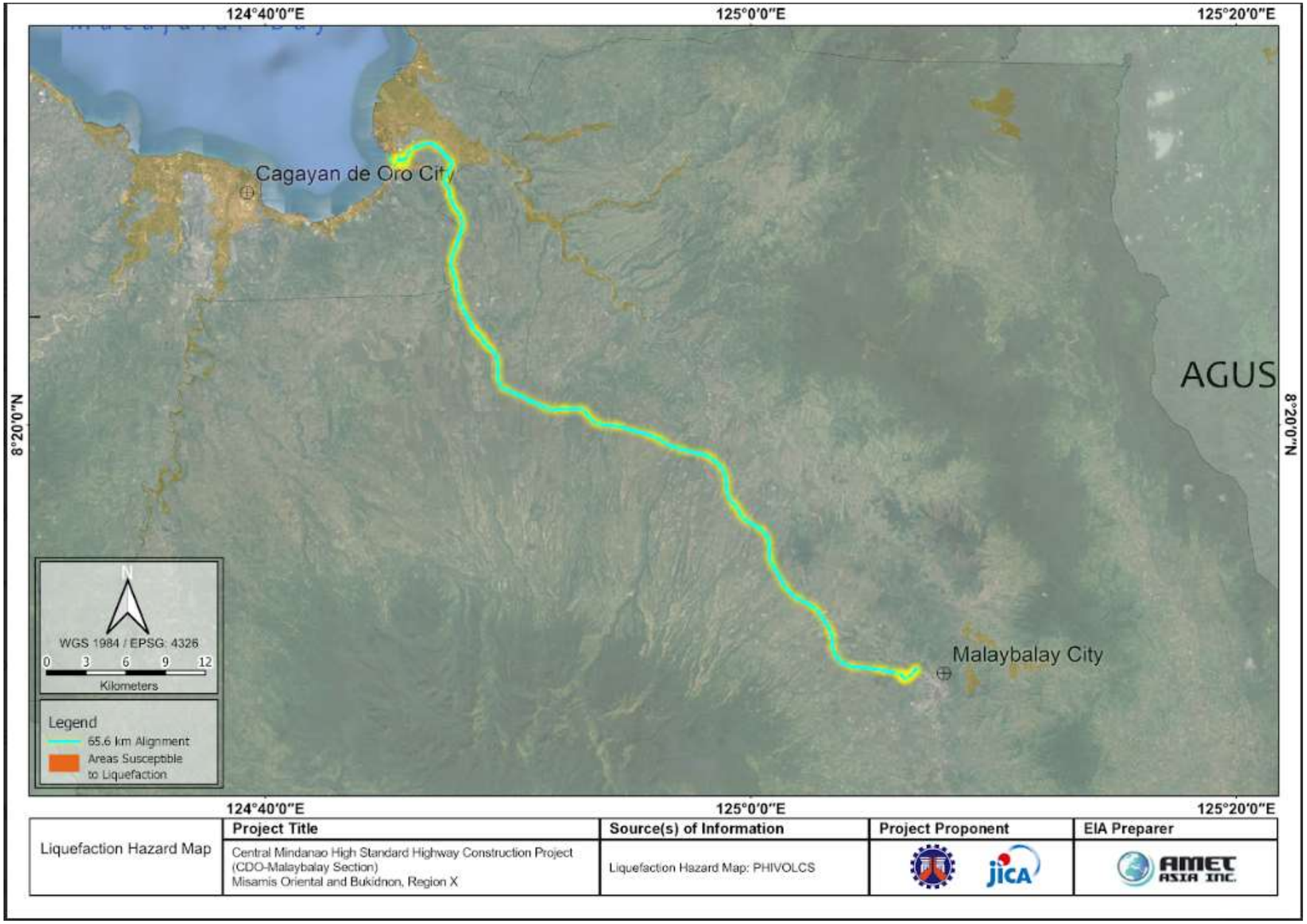


Figure 3-24. Flood hazard map of Project site

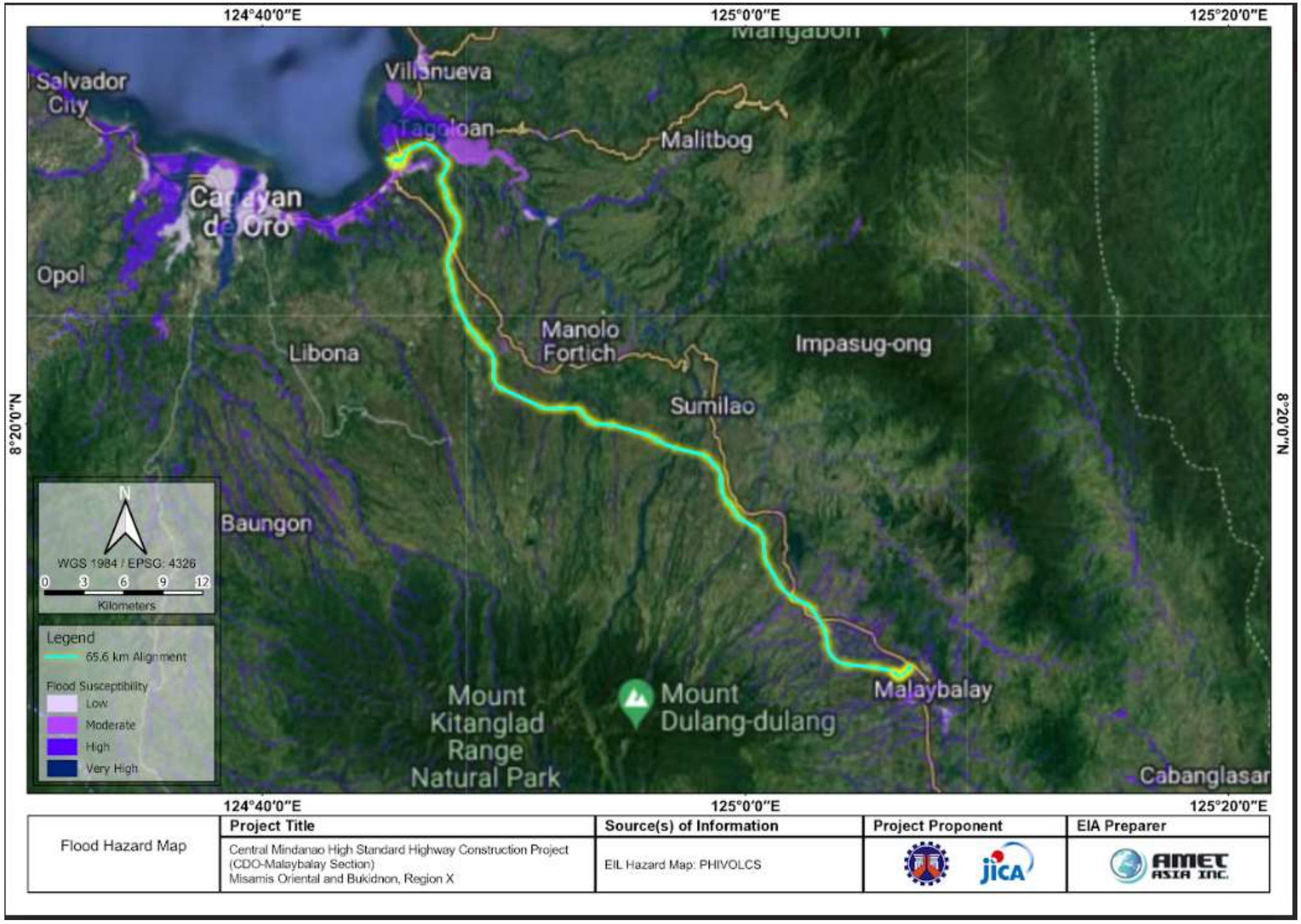


Figure 3-25. Eatthquake hazard map of Project site

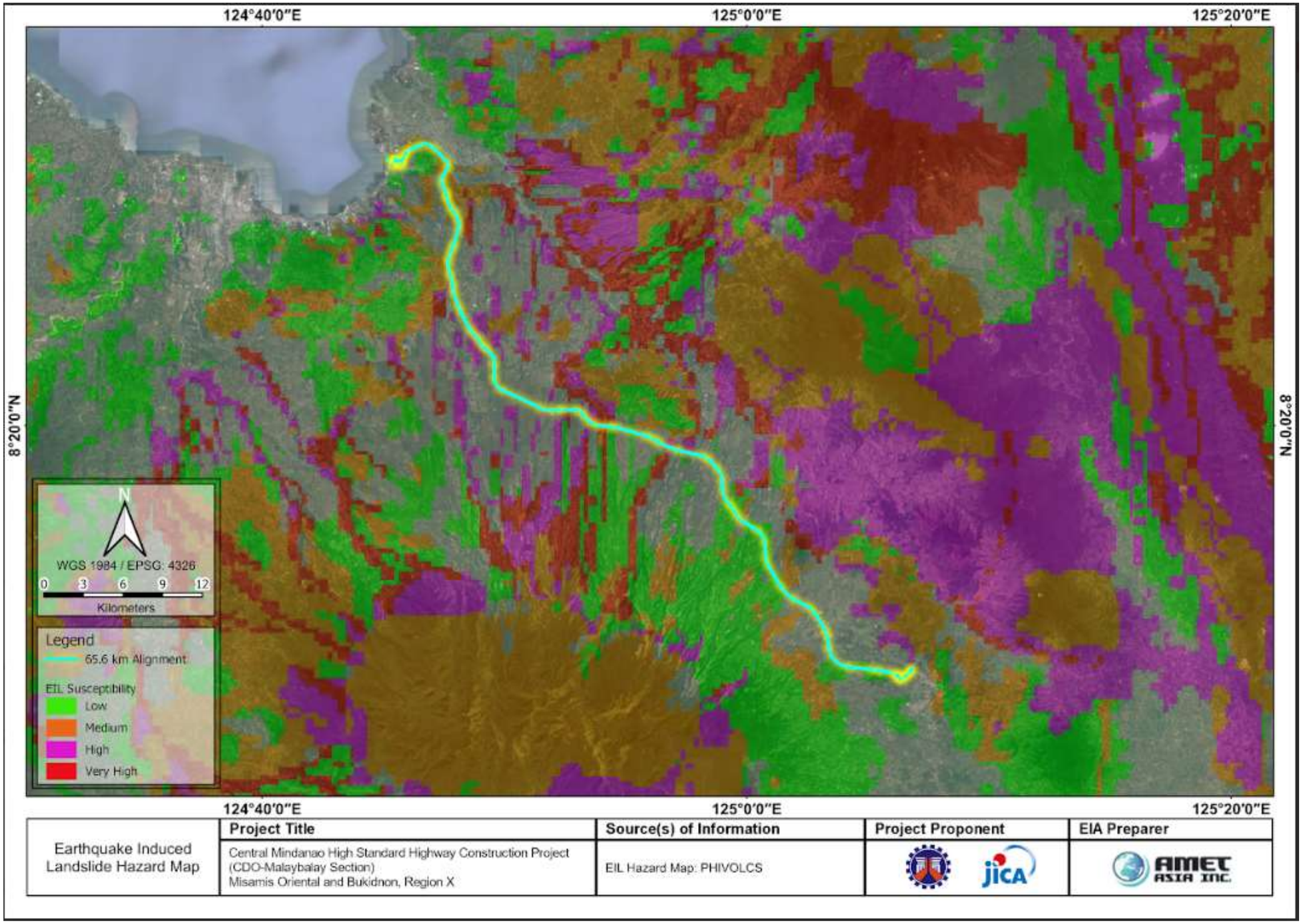


Figure 3-26. Volcanic Hazard Susceptability map of Project site

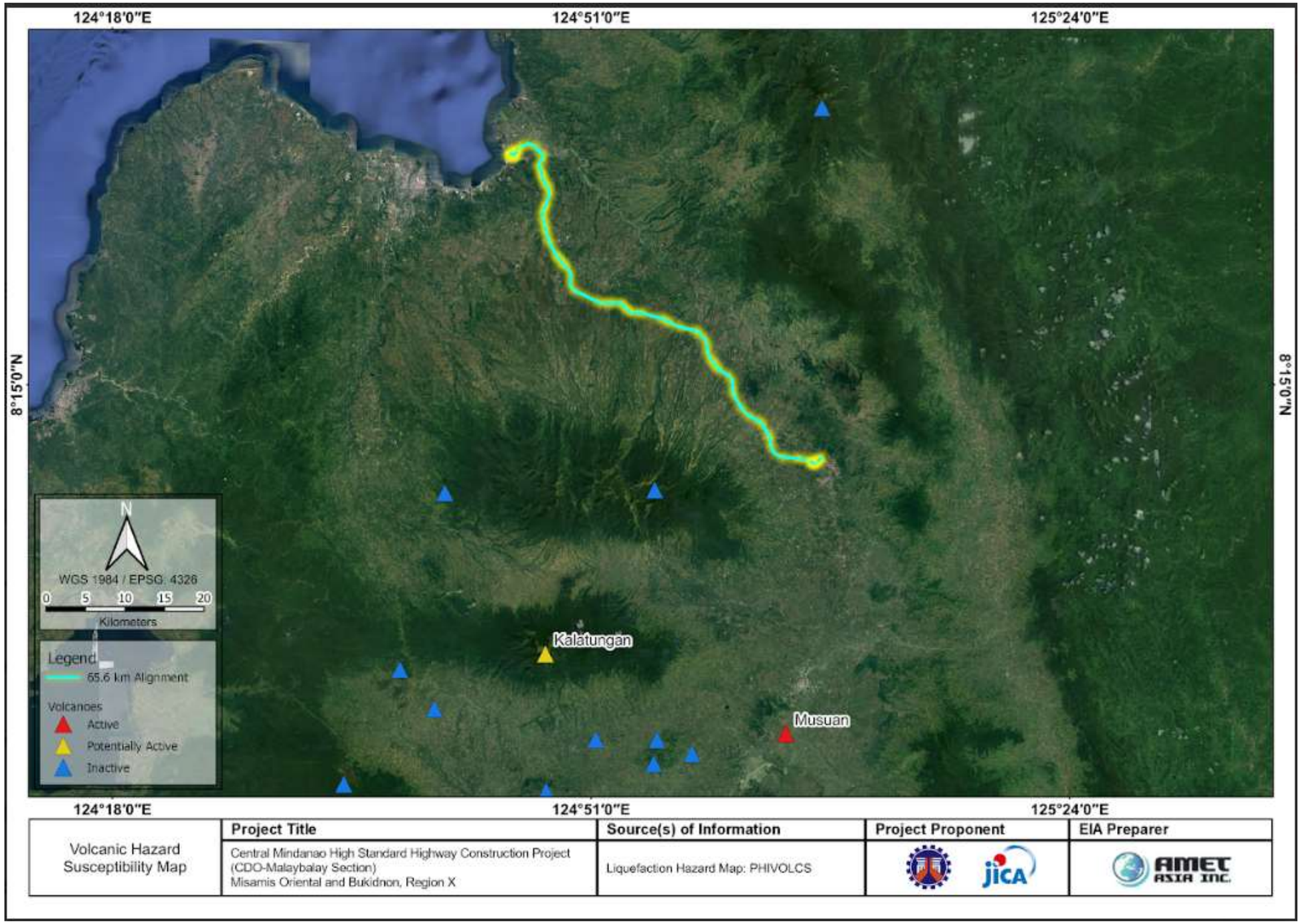


Figure 3-27. Rain Induced Landslide map of Project site

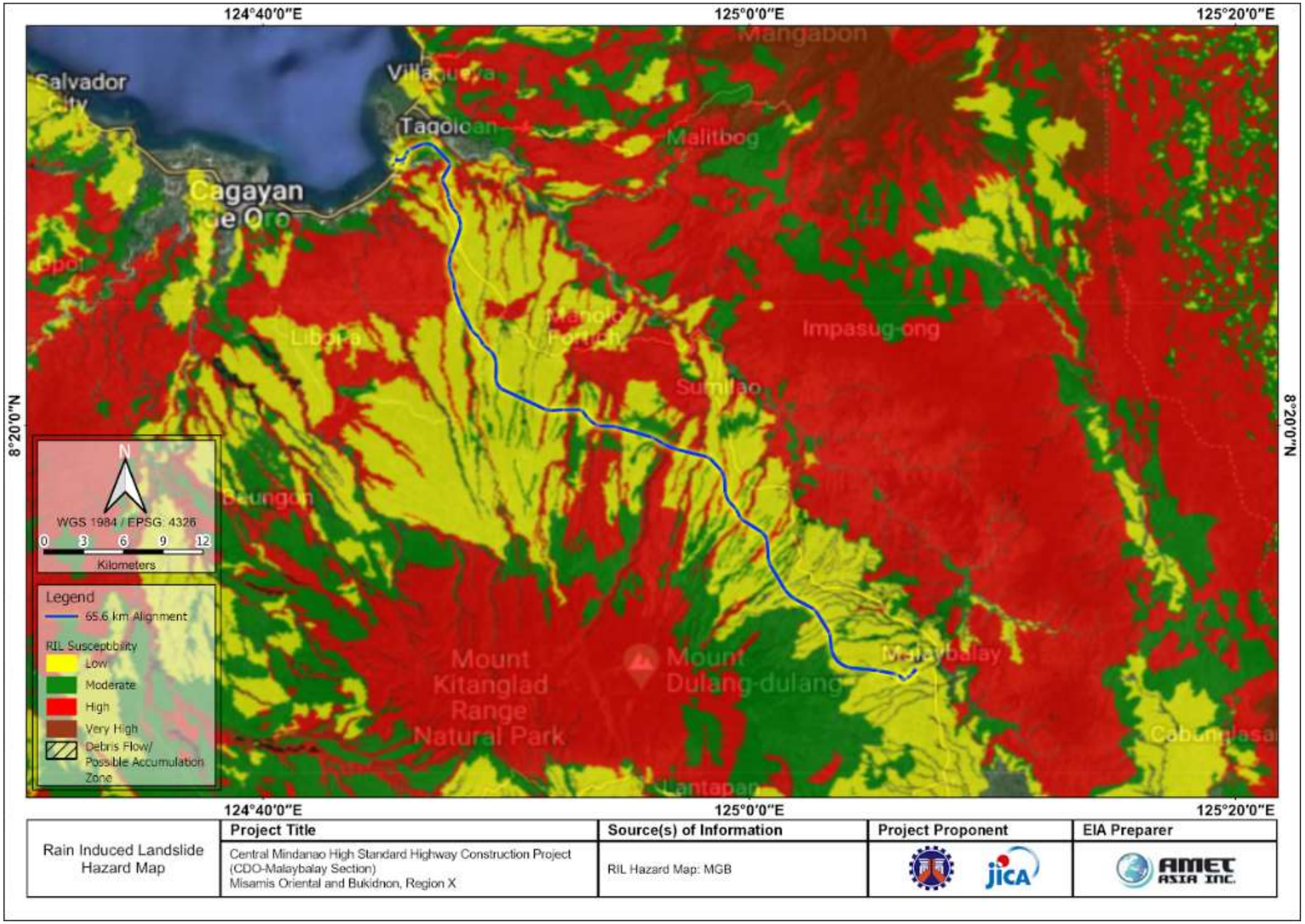


Figure 3-28. Landslide and flood hazard map of Project site

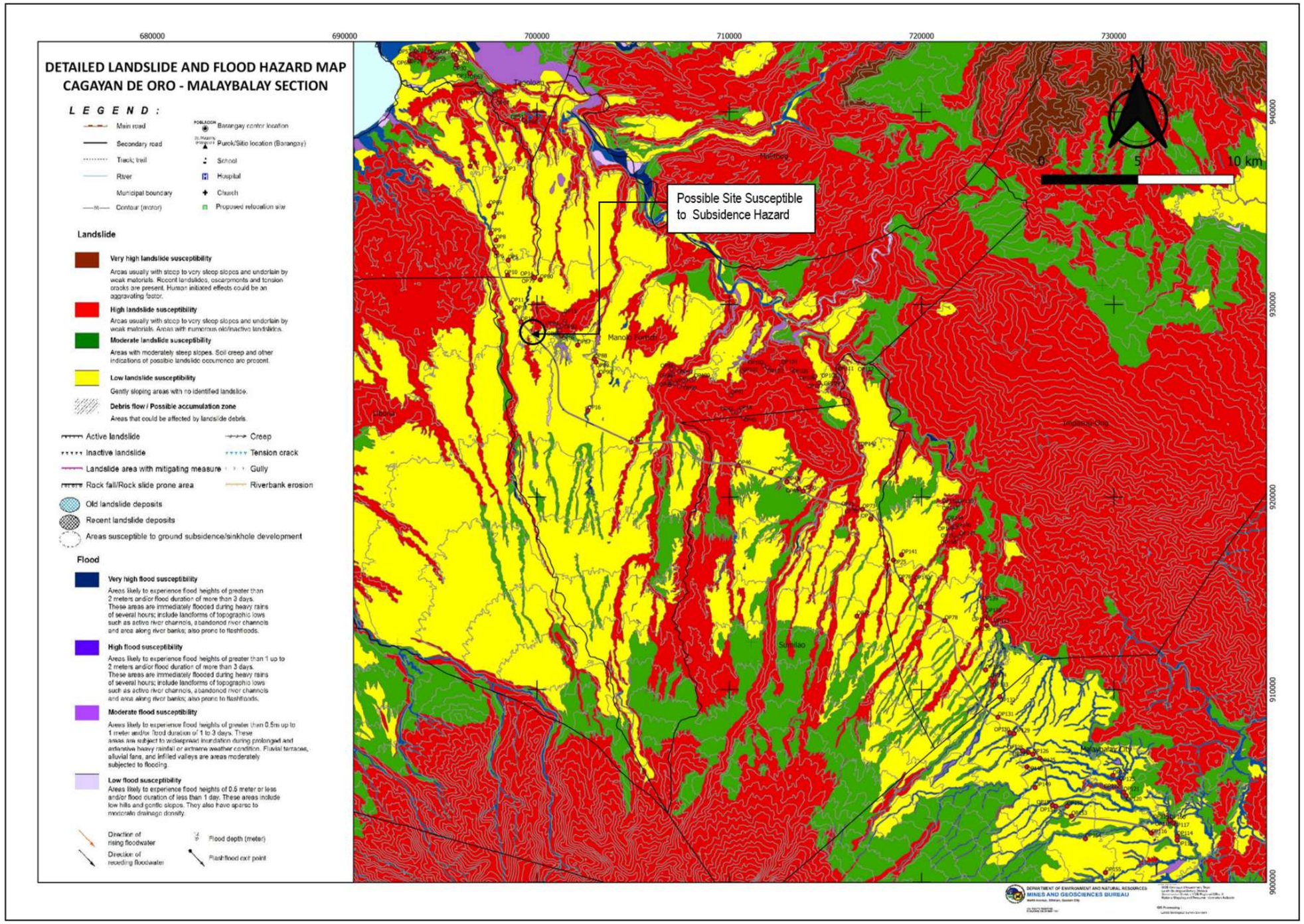
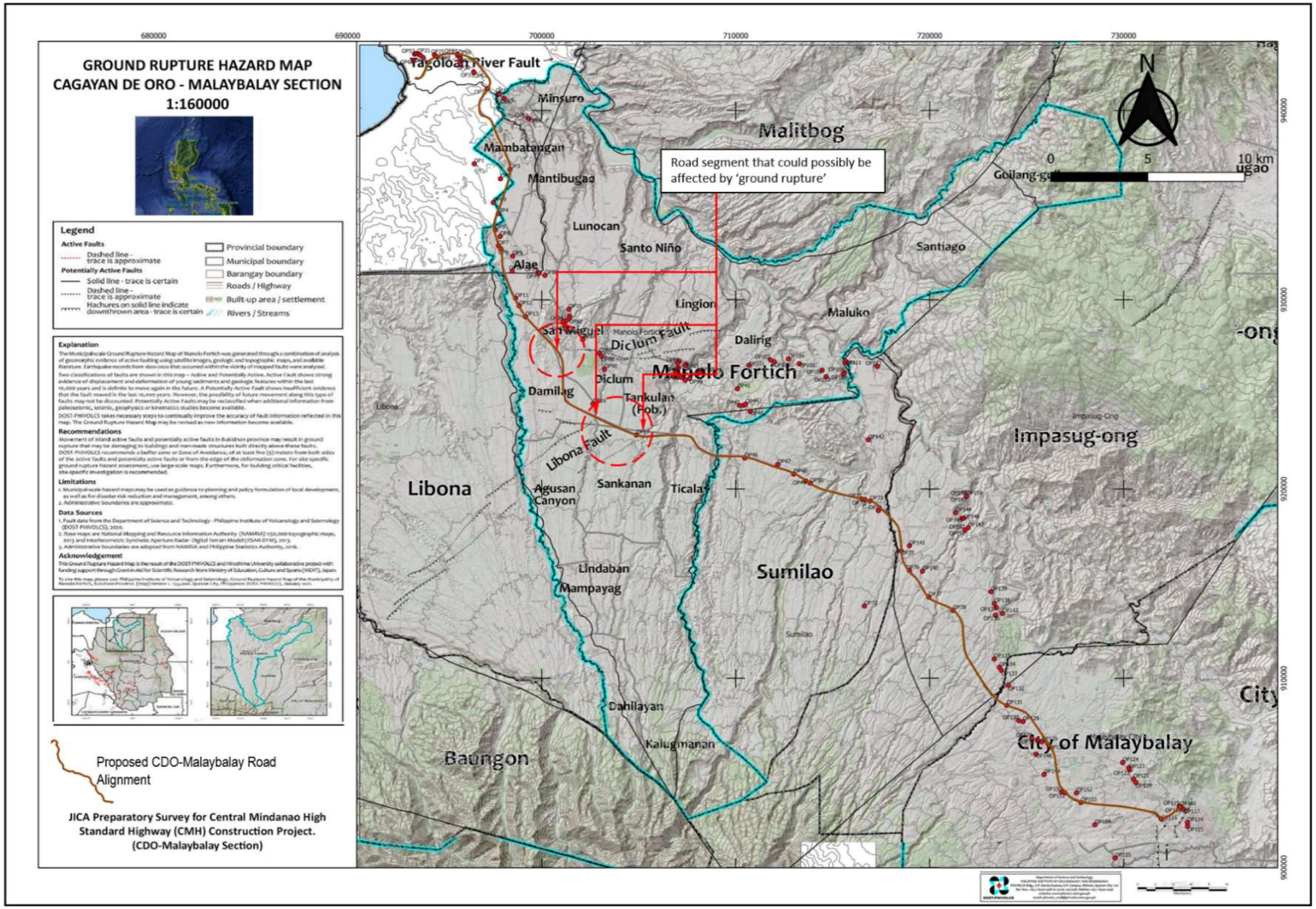


Figure 3-29. Ground rupture hazard map at the Project site



3.1.2.4 Proposed mitigating measures

3.1.2.4.1 Change in surface landform, geomorphology, topography, terrain, and slope

Pre-construction - Project development will induce significant change in the surface landform, topography, terrain or slope. Thus, it is necessary to conduct geological investigation, engineering geological and geohazard assessment and factual geological mapping that will focus on the geology, geomorphology, and geohazards at the CMH alignment in accordance with DAO 2000-28.

Construction – Road development will involve rock excavations that will expose poorly consolidated gravel/sandstone/shale at the northeastern section and the dominantly poorly indurated pebbly to conglomeratic tuffaceous sandstone of the Bukidnon formation towards the south. Construction activities will disturb voluminous materials and loose materials will be stockpiled. Inclement weather conditions will induce downslope movement of rocks and regolith particularly on exposed and barren surfaces along the stretch of the CMH alignment. Excavated areas with steep rock walls will be prone to mass-wasting processes such as rock fall, rockslide, erosion, slope failure and localized landslides. The following mitigation measures enumerated below will minimize these impacts.

a) Application of retaining walls, appropriate erosion control and slope protection measures and other engineered structures along steep walls;
b) Increase vegetation cover particularly at the vicinity of the break-of-slope;
c) Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes).
d) Recontouring of the slopes, benching or lowering the slope gradient;
e) Appropriate drainage system including under drain constructions and anchored structures.

Operation - Regular monitoring on the condition of the slopes and slopes stabilization measures particularly on landform changes. Recommend applicable solutions depending on the currently observed geological and geomorphological conditions.

3.1.2.4.2 Change in sub-surface geology/underground conditions

Construction -The construction of the proposed road will not induce any change in the underlying rock types. However, sub-surface morphology will be locally altered by any excavations. There must be a conduct of field assessment to include occurrences of any mass-wasting (landslide, rockfall, mudflow, creep, etc.) especially after heavy and prolonged rains and after earthquake occurrences.

Operation - Regular monitoring of areas identified as subsidence prone in the southern section of Brgy. Alae, Manolo Fortich where localized outcrop of the Indahag Limestone was identified. Follow the ecommendations of the geotechnical/civil engineer/geologist to address any identified adverse geological and geomorphological conditions.

3.1.2.4.3 Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc.

Pre-construction – The Project appeared to be susceptible to ground acceleration; landslide, rock fall, creep, settlement; road slip, and flooding. It is essential to conduct factual geological mapping focusing on the geology, geomorphology and geohazards and identification of sensitive areas that will be prone to any possible settlement or subsidence.

Construction phase - The following measures are recommended to minimize the occurrences and effect of the natural hazards previously presented.

a) Application of retaining walls and other engineered structures along steep walls;
b) Increase vegetation cover particularly at the vicinity of the break-of-slope;

c) Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes).
d) Contouring of the slopes re-contouring, benching or lowering the slope gradient;
e) Good drainage system including under drain constructions and anchored structures.
f) Implementation of the recommendations given by the geotechnical engineer and those stipulated in the geological/geohazard assessment report particularly on area identified to be prone to various geohazards.

Landslide:

- The northern section in Brgy. Sugbongcogon, Tagoloan, Alae Bypass Road.
- Those areas with existing major deep river valleys from Cagayan de Oro southwards to Sumilao and the southern section of Impasug-ong.
- The major river channel approaching Malaybalay
- Areas characterized by steeply sloping barren or less vegetated rock walls with exposed loosely consolidated gravel deposits (CG), the tuffaceous pebbly to conglomeratic sandstone and the heavily weathered andesitic volcaniclastics (BF), the schistose rocks (TS), and the limestone (IL).

Creep:

Brgy. Puerto, CDO at 8°26’33”N /124°47’41”E where ‘terracettes’ or ‘soil ripples’ were observed along the slopes.

Flood Hazard:

Areas transected by the proposed alignment from the boundary of Impasug-ong to Malaybalay, are susceptible to moderate to high flood hazard, while areas from the southern boundary of Impasug-ong to Malaybalay have high flood susceptibility.

Erosion / Slope Failure**:**

Sections of the proposed road will traverse steep rivers banks which are highly prone to erosion / slope failure hazard.

Ground Rupture:

Along the Libona Fault, possible surface rupture may occur at the vicinity of 8°20’47”/124°51’22” and 8°21’12”/124°50’29.5”.

Similar scenario may occur at the western segment of the Diclum Fault at 8°23’13”/124°49’14”

Operation – the following measures are recommended during the opening of the CMH road to traffic:

a) Regular monitoring of the slope conditions and slopes stabilization measures especially after prolonging heavy rains and earthquakes.
b) Regular monitoring of areas with identified geological hazards, their current condition, and the degree of the effects of hazards previously identified.

3.1.3 Pedology

3.1.3.1 Scope

This module described the existing soil types and quality traversed by the alignment. The key impacts assessed were soil erosion, loss of topsoil or overburden and change in soil quality or fertility that included sediment quality in streams affected by the Project.

3.1.3.2 Methodology

Soil quality and fertility -Soil samples were collected at three stations: at the start of the alignment in Cagayan de Oro City, middle segment in Sumilao, and at the end in Malaybalay City (**Table 3-13** and **Figure 3-30**). Composite soil samples were collected at the surface and at a depth of one meter. The parameters analyzed and their corresponding method are shown in **Table 3-14.**

Table 3-13. Location of the soil quality sampling points

Station	Latitude	Longitude	Location	Description
S1	8.509855	124.791145	Bugo, CDO	Located near an existing paved road
S2	8.313177	124.965641	Kisolon, Sumilao	Located near an existing road unpaved road and agricultural area
S3	8.165251	125.113072	Kalasungay, Malaybalay	Located near an existing road unpaved road and agricultural area

Table 3-14. Laboratory methods of analysis for soil quality

	Parameter	Analytic method
Primary Nutrients	Nitrogen	Kjeldahl
	Organic Matter	Walkley - Black
	pH	On-site instrument
	Phosphorus	Titrimetric
	Potassium	Direct Air-Acetylene Flame
Micronutrients	Molybdenum	Direct Nitrous Oxide-Acetylene Flame
	Zinc	Direct Air-Acetylene Flame
	Manganese	Direct Air-Acetylene Flame
	Iron	Direct Air-Acetylene Flame
	Nickel	Direct Air-Acetylene Flame
	Boron	Titrimetric
	Chlorine	Titrimetric

Stream sediment - Grab samples of sediment were collected at the same stations for surface water quality analyzed for five parameters following the laboratory analytic method in **Table 3-15.**

Table 3-15. Laboratory methods of analysis for riverbed sediment quality

Parameter	Analytic method
Arsenic	Manual Hydride Generation AAS
Cadmium, Chromium, Lead	Direct Air-Acetylene Flame
Mercury	Cold Vapor AAS

Table 3-16. Description of the stream sediment sampling stations

Stn.	Name of river	Coordinates		Barangay	Description
		Latitude	Longitude		
WQ1	Tagoloan River	8.52971N	124.788609E	Natumolan, Tagoloan	Major river with quarrying activities
WQ2	Dicklum River	8.35425N	124.84182E	Dicklum, Manolo Fortich	Located near agricultural area
WQ3	Kumaykay Stream	8.34422N	124.87815E	Ticala, Manolo Fortich	Located near agricultural area used for bathing
WQ4	Puntian River	8.29619N	124.91088E	Villa Vista/Puntian, Sumilao	Used for washing vehicles
WQ5	Tagalongon River	8.29878N	124.92311E	Culasi/Vista Villa, Sumilao	Used for bathing and washing
WQ6	Mapolo River	8.31123N	124.96838E	Poblacion/ Kisolon, Sumilao	Used for bathing and washing
WQ7	Ipoon River	8.21708N	125.02844E	Impalutao, Impasug-ong	Used for bathing and washing
WQ8	Komotal River	8.215275 N	125.030295E	Dalwangan, Malaybalay	Used for bathing and washing
WQ9	Sawaga River	8.17999 N	125.05012 E	Patpat, Malaybalay	Used for bathing
WQ10	Sawaga River	8.16246 N	125.11364 E	Sumpong, Malaybalay	Used for bathing

Figure 3-30. Map of the soil sampling stations

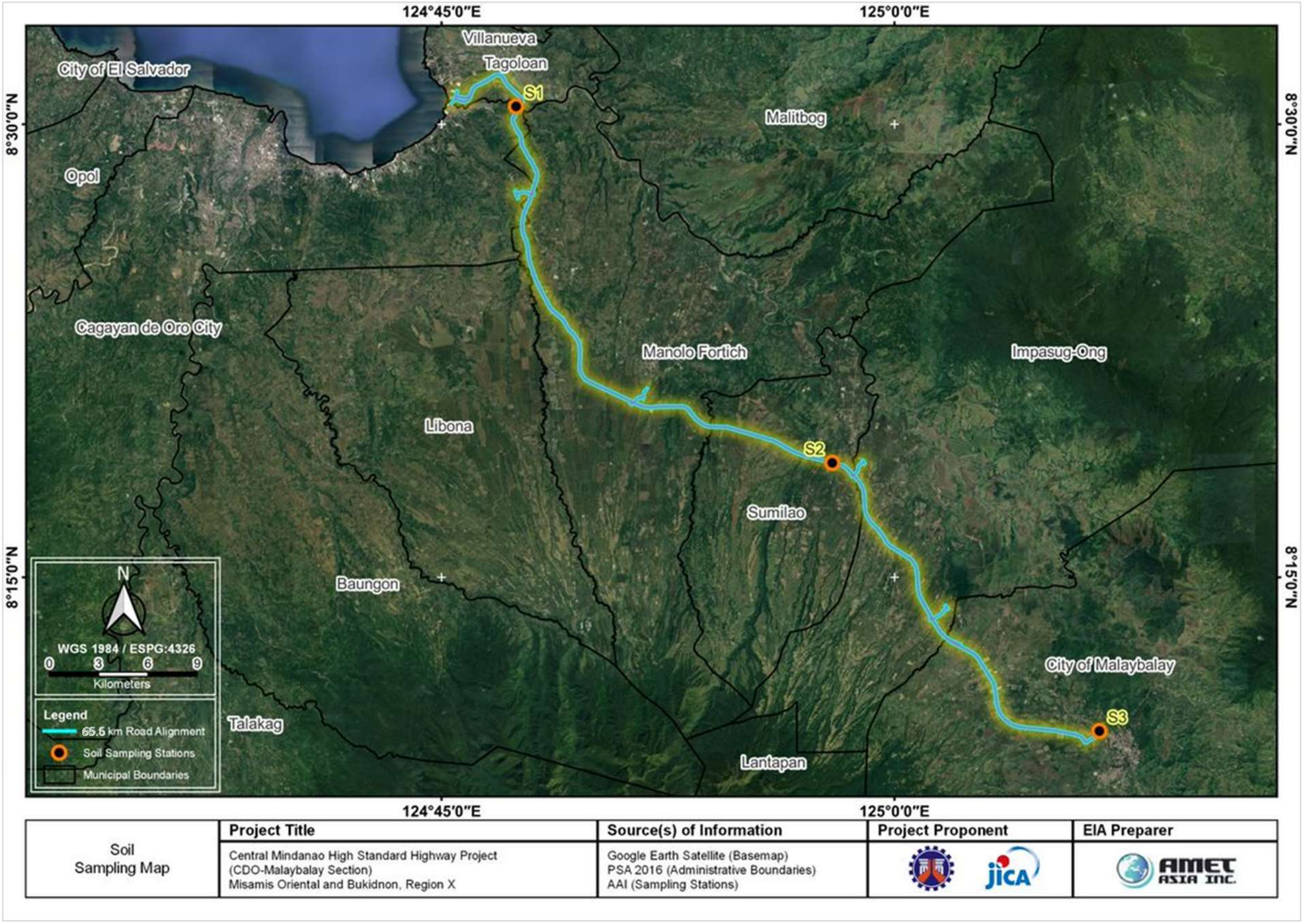
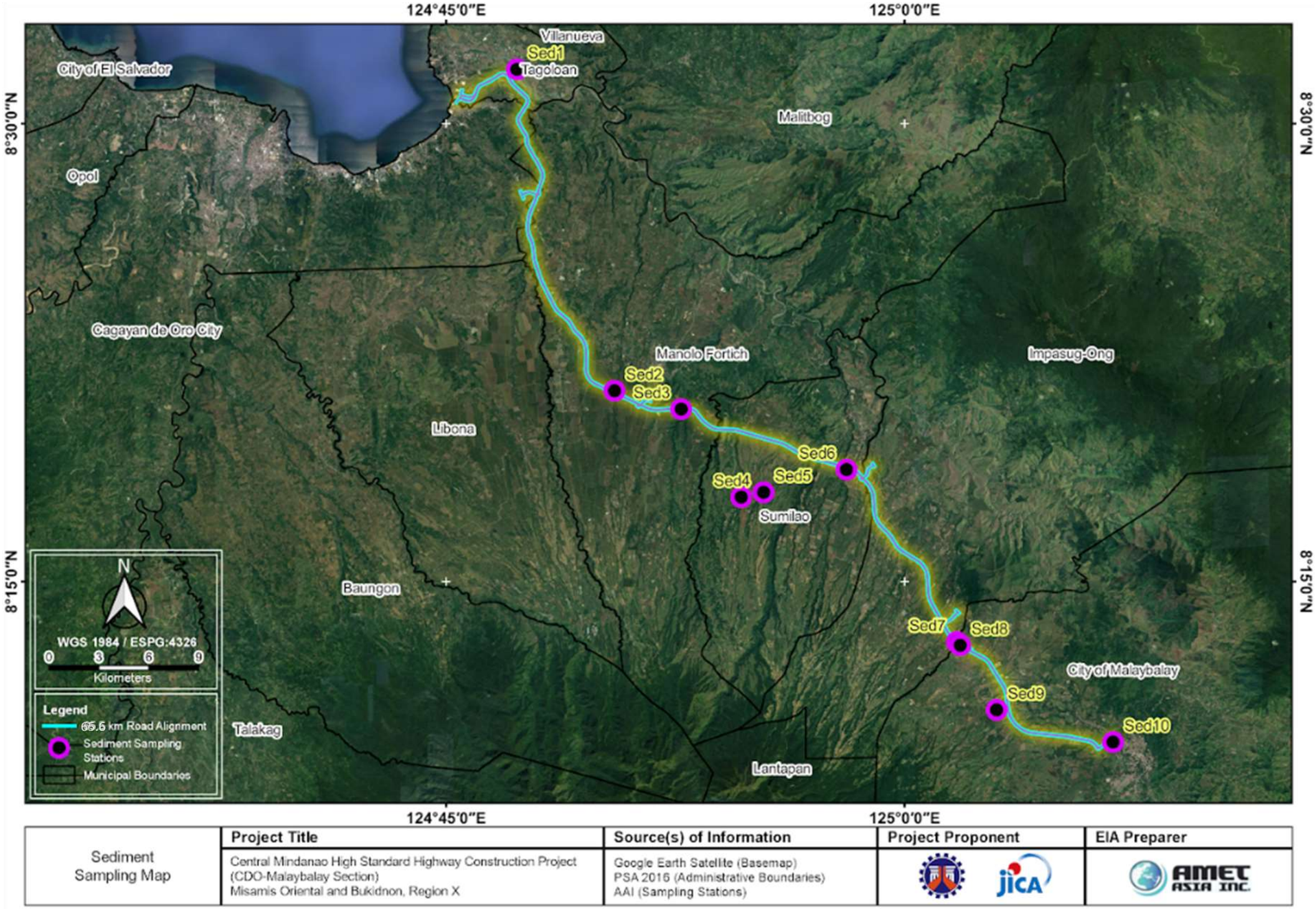


Figure 3-31. Map of the stream sediment sampling stations



	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
Sediment Sampling Map	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) AAI (Sampling Stations)	JICA	AMET ASIA INC.

3.1.3.3 Assessment of key impacts

3.1.3.3.1 Soil erosion, loss of topsoil or overburden

The proposed CMH alignment is will traverse lands with eight soil types (**Table 3-17**): San Manuel Loam, Umingan Clay Loam, Jasaan Clay Loam, Jasaan Silt Loam, Jasaan Clay, Adtuyan Clay, Calauag Clay, and Mountain Soil (undifferentiated). The brief description of these soil types is presented in **Table 3-17**.

Table 3-17. Soil types traversed by the CMH alignment

Soil type	Description
San Manuel Loam	The parent material of this soil type is recent alluvium deposit belonging to the soil order/great group of Inceptisol and Dystropepts. It is found in small areas along Pulangi River near Valencia and south-east of Dologon, Bukidnon. This soil type is characterized by fine loamy textured clay and sand soil with no particular mineral of any kind.
Umingan Clay Loam	This soil has a loamy texture with many gravels and pebbles skeletal occurring along the banks or rivers. It is subject to flooding fluventic receiving yearly depositions of alluvial soil materials from rivers. It is in the incipient development stage toward a mature soil Inceptisol but has not yet fully developed its diagnostic horizons.
Jasaan Clay Loam Jasaan Silt Loam Jasaan Clay	These soil type belong to the topographic group "Soils on a plateau" with volcanic materials as its parent material. It belongs to the soil order Ultisol/Hapludults and is found in Barangay Alae and its vicinity in the north central part adjoining Misamis Oriental.
Adtuyon Clay	This soil type covers almost the entire Bukidnon Plateau. Its parent material is volcanic lava or lahars composed of mixed boulders (basalt and andesite) and belongs to the soil order/soil great group Ultisol/Paleudults,Hapludults.
Calauag Clay	These soil type belong to the topographic group "Soils on a plateau" with metamorphic rocks (schist) as its parent material. It is found in the low grassy hills east of Malaybalay.
Mountain Soil (undifferentiated)	Mountain soils are found in Mt. Kitanglad and Mt. Kalatungan and the whole portion of the Pantadon Range and Mt. Malambo which borders Agusan and Davao Provinces.

Sources: Philippine Rice Research Institute, Dejarme-Calalang, Guadalupe M. and Colinet, Gilles (2014)

The proposed CMH alignment will transect areas mostly characterized by slopes of 0° to 10° (nearly level to gentle). Soil erosion in these areas is expected to be minimal and will only occur during the construction phase. At least five sections of the proposed road development, however, will transect existing natural drainages with steep slope channels varying from 30° to 70° (**Figure 3-14**). In general, the land can accommodate the proposed development with minimal loss of soil or overburden and soil erosion.

The general characteristic of the blanketing soil varies from clayey to sandy on the northern portion which becomes more lateritic with localized portion which are also clayey silt to sandy towards the elevated sections of Bukidnon. The dominant erosional processes along the proposed alignment will be sheet/rill and gully erosion where the finer soil and other unconsolidated materials are removed by concentrated but intermittent flow of water usually during and immediately following moderate rains.

3.1.3.3.2 Change in soil quality and fertility

Soil quality and fertility - The laboratory analysis showed high levels of soil fertility parameters in the soil samples (green cells in **Table 3-18**). For example, the organic matter content of the samples ranged from 11,890 to 94,480 mg/kg of soil while the NPK (Nitrogen, Phosphorus, Potassium) content ranged from 130 to 3000 mg/kg. This is indicative of suitability of the surrounding soils to agriculture and evidenced by the presence of large farmlands, orchards, and plantations along the alignment.

The results also showed adequate levels of Zinc, Manganese, and Iron across the stations (green cells in **Table 3-19**). The zinc content ranged from 76-112 mg/kg, manganese from 737 to 1,438 mg/kg, and iron from 44,900 to 72,500 mg/kg.

Table 3-18. Soil fertility at the sampling stations

	Lab results			Soil fertility guideline values*			Soil fertility evaluation		
Parameter	S1	S2	S3	High	Mod	Low	S1	S2	S3
pH	8.3	8.2	8.11	5.5 - 7.5	5.0 - 5.5	<5.0 & > 8.0	Low	Low	Low
Organic Matter, %	1.189	9.448	3.675	> 3	1 – 3	< 1	Mod	High	High
Nitrogen, %	0.05	0.3	0.3	> 0.25	0.15 - 0.25	< 0.15	Low	High	High
Phosphorus, ppm	310	130	520	> 35	26 – 35	< 25	High	High	High
Potassium, mg/kg	450	720	790	> 250	150 – 250	< 150	High	High	High

NOTES: S1, S2, S3 – soil sampling stations; *BSWM Soil fertility Rating Guideline Values; Mod - moderate

Table 3-19. Soil micronutrients at the sampling stations

		Lab results			Soil fertility guideline values			Soil fertility evaluation*		
Parameter	Unit	S1	S2	S3	Deficient	Marginal	Adequate	S1	S2	S3
Molybdenum	mg/kg	<0.20	<0.20	<0.20						
Zinc	mg/kg	78.34	112.4	76.22	<0.5	0.5-1.5	>1.5	Adequate	Adequate	Adequate
Manganese	mg/kg	833.07	737.67	1438.57	<1.0	none	>1.0	Adequate	Adequate	Adequate
Iron	mg/kg	44900	72500	45300	<1.5	2.5-4.5	>4.5	Adequate	Adequate	Adequate
Nickel	mg/kg	150.73	37.71	461.17						
Boron	%	0.41	0.41	0.3						
Chlorine	ppm	13.051	1.684	0.842						

NOTES: S1, S2, S3 – soil sampling stations; * values with < sign means analyte is below the method detection limit; If (-) adverse impact, (+) no impact. Value is the impact magnitude; NI - no impact; Source: General Guidelines for the Fertility of Soils, Bureau of Soils and Water Management

Stream sediment - Very low levels of sediment contaminants were detected across stations based on the Dutch soil intervention values indicating that the riverbed has not been contaminated (**Table 3-20** and **Table 3-21**). For example, Arsenic, Cadmium, Mercury, and Lead levels were undetected because these were below the Method Detection Limit of the laboratory analytic method.

Table 3-20. Heavy metal levels at the sediment sampling stations

	Lab results, mg/kg										
Parameter	Sed1	Sed2	Sed3	Sed4	Sed5	Sed6	Sed7	Sed8	Sed9	Sed10	DSIV**
Arsenic (As)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	55
Cadmium (Cd)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	12
Chromium (Cr)	64.48	59.10	19.97	22.04	8.57	<0.20	23.11	14.95	14.35	45.08	380
Mercury (Hg)	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	10
Lead (Pb)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	530

NOTES: S1, S2, S3 – soil sampling stations; * Dutch soil intervention value

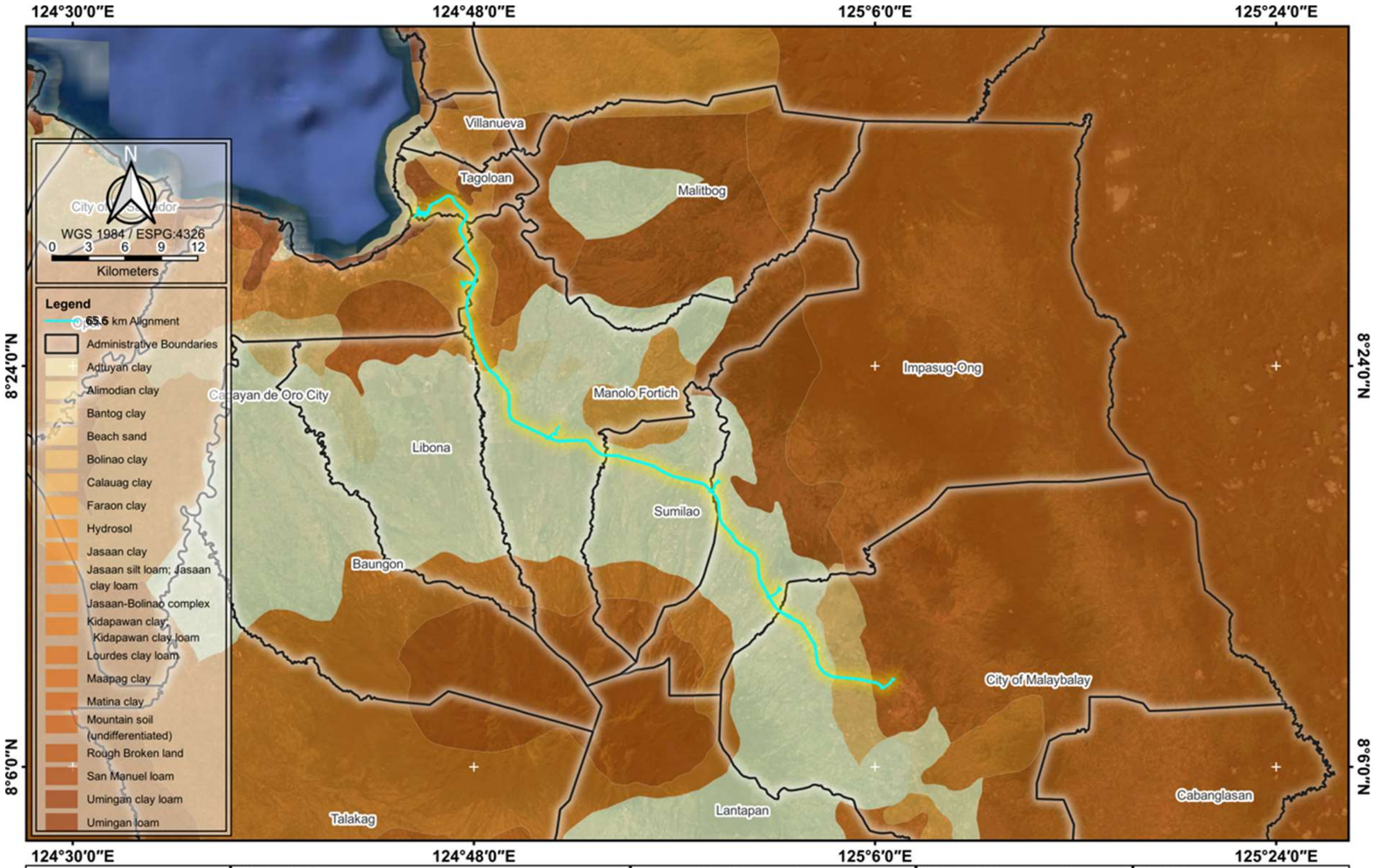
Table 3-21. Summary of heavy metal exceedances at the sediment sampling stations

	Lab results, mg/kg*										
Parameter	**Sed1**	**Sed2**	**Sed3**	**Sed4**	**Sed5**	**Sed6**	**Sed7**	**Sed8**	**Sed9**	**Sed10**	**DSIV****
Arsenic (As)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	55
Cadmium (Cd)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	12
Chromium (Cr)	315.52	320.9	360.03	357.96	371.43	NI	356.89	365.05	365.65	334.92	380
Mercury (Hg)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	10
Lead (Pb)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	530

NOTES: * values with < sign means analyte is below the method detection limit; **Dutch soil intervention value, mg/kg. Value is the impact magnitude: (a) difference between DSIV and lab result. If (-) adverse impact, (+) no impact, NI - no impact

The photo documentation of the soil and sediment sampling are shown in **Appendices 6 and 7** while the laboratory reports are shown in **Annexes 1 and 2**.

Figure 3-32. Soil types traversed by the proposed CMH alignment



	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
BSWM Soil Map	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) BSWM 2013 (Soil Map)		

3.1.3.4 Proposed mitigation measures

The measures to prevent soil erosion and contamination of the soil and sediment during Project implementation are enumerated below.

Pre-construction

a) Formulate a Soil Erosion Management Plan (SEMP) that includes among others minimized cut and fill operations during construction and operation.to minimize the modified area to prevent soil erosion of new surface soil due to cut and filling
b) Identify staging areas
c) Formulate Buffer Zone Plan during construction and operations

Construction

a) Implement the recommendations of the geotechnical engineer and the Engineering Geological and Geohazard Assessment (EGGA) Report particularly on areas with steep slopes and dissected or traversed by natural surface-water channels;
b) Surface drainage control works, e.g., construction of drainage canals at the break-of-slope (between the gentle to moderate slopes);
c) Ensure the slope protection after cut and filling as soon as possible
d) Immediate removal of excavated soil stockpiles;
e) Optimize re-use of spoils
f) Cover stockpiles with plastic sheeting;
g) Construct perimeter sediment barriers;
h) Divert upstream drainage away from the stockpiles; and
i) Install drainage canals and settling pond.

Operation - Regular monitoring of areas previously identified to be prone to soil erosion particularly sections with steep slopes, areas transected by river and creek channels, and identified exposed areas prone to soil erosion.

3.1.4 Terrestrial ecology

3.1.4.1 Scope

This section investigated the existing terrestrial flora and fauna at the proposed CMH alignment to determine species of interest under DAO 2007-01 and International Union for the Conservation of Nature (IUCN) Redlist during the low (April-May 2021) and high (July-August 2021) rainfall periods. The srvey season was decide based on the advises from the local ecological academic experts through Key Informant Interview on Biodiversity Experts (Annex 3).

The key impacts assessed were a) vegetation removal and loss of habitat, b) threat to existence of important local species, abundance, frequency and distribution of important species, and c) hindrance to wildlife access.

National legislation and regulations of known relevance to the proposed project were compiled as shown in **Table 3-22**. The listed legislation and regulations are focused on the conservation, management, and operations of the vegetation and wildlife that are present in the project area.

Table 3-22. National and Local Legislations on Terrestrial Ecology

National Legislations and Regulations	Description
Presidential Decree No. 1152 (1977)	The Environmental Code of the Philippines. Comprehensive environmental management was addressed, as were mitigating strategies, and the notion of environmental impact assessment was

National Legislations and Regulations	Description
	presented for the first time.
Presidential Decree No. 1586	Establishing an Environmental Impact Statement System which requires all governments and projects that are likely to have significant environmental impacts to undergo an environmental impact assessment (EIA) and secure an environmental compliance certificate (ECC) prior the implementation.
Revised Procedural Manual DAO No. 30 Series of 2003 (IRR of Presidential Decree No. 1586)	Provide procedural guidelines for the conduct of environmental impact assessments (EIAs) under the Philippine Environmental Impact Statement (EIS) System Law. The manual provides detailed procedures and requirements for various stages of the EIA process, including scoping, impact assessment, review and evaluation, public participation, and decision-making.
Republic Act 9147, otherwise known as the Wildlife Conservation and Protection Act of 2001	Provides for the regulation of wildlife trade and penalizes activities such as hunting, killing, trading, and collecting wildlife without proper permits or licenses. The law also establishes protected areas, wildlife sanctuaries, and critical habitats and mandates the creation of a national wildlife database and monitoring system.
DAO 2019-09 Updated National List of Threatened Fauna of the Philippines	Provides an up-to-date list of vulnerable fauna species in the country. The order revises the existing national list of threatened wildlife species and categorizes them based on their level of endangerment. The decree intends to give a more thorough and accurate assessment of the conservation status of wildlife in the Philippines.
DAO 2007-01 Establishing the National List of Threatened Philippine Plant and their Categories. DAO 2017-11 Updated National List of Threatened Philippine Plants and their Categories	Provides an updated list of threatened plant species in the country. The order classifies threatened plant species into different categories based on their level of endangerment, such as critically endangered, endangered, vulnerable, and other categories. The order aims to promote the conservation and sustainable use of Philippine plant species.
International Union for Conservation of Nature (IUCN) Red List of Threatened Species 2022	The Red List provides information on the conservation status of plant and animal species and categorizes them based on their level of endangerment. Thousands of species have been assessed in the 2022 update, including newly identified species and those that have been appraised based on new information.
Memorandum Circular No. 01, Series of 2014. Guidelines for the implementation of the DPWH-DENR-DSWD Partnership on the Tree Replacement Project	A joint memorandum circular issued by the DPWH, DENR, and (DSWD) in the Philippines. The circular provides guidelines for the implementation of the DPWH-DENR-DSWD Partnership on the Tree Replacement Project, which aims to address the negative impacts of road construction and development activities on trees and forests in the country.

3.1.4.2 Methodology

3.1.4.2.1 Survey locations

A total of 20 transects and 13 wildlife stations at the proposed CMH alignment were established for the terrestrial flora and fauna survey during low and high rainfall periods. The description of the survey stations and locations are shown in **Table 3-23**, **Figure 3-33**, and **Figure 3-34,** respectively.

Table 3-23. Description of survey transect locations and wildlife sampling stations

Transect	WS*	Coordinates		Location	Description	Elevation (Transect)	Elevation (WS)
		Latitude	Longitude				
T1		8.526824N	124.773805E	Brgy. Natumolan, Tagoloan, Misamis Oriental	- Near residential areas - Coconut and mango plantation areas, open grassland, and residual secondary forest patches at the ravine - Along a recently constructed bypass road	90 m	
T2		8.509145N	124.790908E	Brgy. Natumolan, Tagoloan, Misamis Oriental	- Residual secondary forest patches, with dragon fruit farms at the middle - Along a river designated as Station A2 in the Aquatic Ecology Report	79 m	
770	W1	8.471173N	124.801985E	Brgy. Puerto, Cagayan De Oro, Misamis Oriental	- Mix Agroforestry areas – mango orchards, tree plantation, and cornfields - Near residential areas	306 m	297m
T4	W2	8.440797N	124.794726E	Brgy. Alae, Manolo Fortich, Bukidnon	- Open grasslands, mango farms, and sugarcane plantations - Relatively dense vegetation - Near existing road	369 m	335 m
T5		8.390226N	124.818877E	Brgy. San Miguel, Manolo Fortich, Bukidnon	- Corn and pineapple plantations - Relatively dense vegetation of residual forest patches - Along existing farm road	488 m	
T6	W3	8.353218N	124.841403E	Brgy. Damilag, Manolo Fortich, Bukidnon	- Agroforest patches near the river - Surrounded by pineapple plantation - Along a river designated as	535 m	547 m

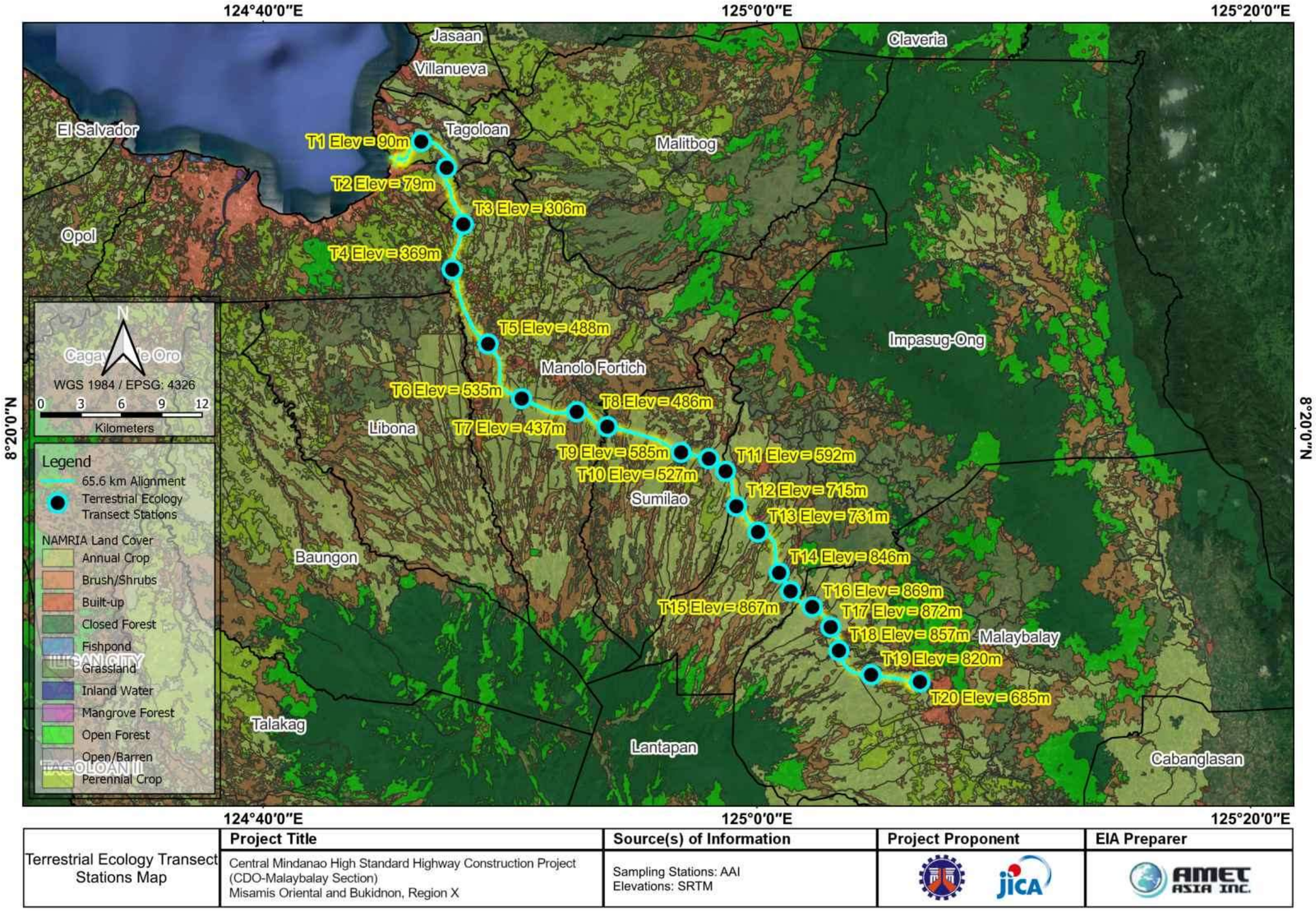
Transect	WS*	Coordinates		Location	Description	Elevation (Transect)	Elevation (WS)
		Latitude	Longitude				
					Station A4 in the Aquatic Ecology Report - Along a recently constructed bypass road		
T7	W4	8.344273N	124.878687E	Brgy. Ticala, Manolo Fortich, Bukidnon	- Along Mangima river designated as Station A5 in the Aquatic Ecology Report - Mix agroforest areas on both sides of the ravine - Cornfields near the river and pineapple plantation at the top of the plateau	437 m	448 m
T8	W5	8.334346N	124.899387E	Brgy, Ticala, Manolo Fortich, Bukidnon	- Pineapple plantations at the top of the plateau - Along Mangima river - Thick agroforest areas at the ravine	486 m	483 m
T9	W6	8.316875N	124.949273E	Brgy. Poblacion, Sumilao, Bukidnon	- Mix agroforest areas with pineapple plantations and cornfields - Open grasslands - Along Kulaman river designated as Station A8 in the Aquatic Ecology Report	585 m	615 m
T10	W7	8.312623N	124.968161E	Brgy. Kisolon, Sumilao, Bukidnon	- Cornfields and pineapple plantations with thick agroforest patches. - Along a river designated as Station A9 in the Aquatic Ecology Report - Along an existing road	527 m	527 m
T11	W8	8.304293N	124.979158E	Brgy. Kisolon, Sumilao, Bukidnon	- Cornfields and pineapple plantations at the top of the ravines with thick agroforest patches near the river - Along a river designated as Station A10 in the Aquatic Ecology Report	592 m	604 m

Transect	WS*	Coordinates		Location	Description	Elevation (Transect)	Elevation (WS)
		Latitude	Longitude				
T12		8.280694N	124.986617E	Brgy. Poblacion, Impasug-ong, Bukidnon	- Plantations of pineapple, sugarcane and corn - Near residential areas and existing road - Near poultry farms	715 m	
T13	W9	8.263415N	125.001206E	Brgy. La Fortuna, Impasug-ong, Bukidnon	- Sugarcane, corn and pineapple plantations - Thick agroforest areas on the ravines - Along a river designated as Station A11 in the Aquatic Ecology Report - Along existing road	731 m	757 m
T14		8.235670N	125.015447E	Brgy. Impalutao, Impasug-ong, Bukidnon	- Primarily grasslands - Plantations of pineapple, banana, corn and rice. - Generally minimal vegetation	846 m	
T15	W10	8.223170N	125.023118E	Brgy. Impalutao, Impasug-ong, Bukidnon	- Pineapple and cornfields with minimal vegetations - Open grasslands	867 m	
T16		8.212647N	125.037700E	Brgy. Dalwangan, Malaybalay, Bukidnon	- Open grasslands with minimal vegetations - Near poultry farms and community areas	869 m	
T17	W11	8.198904N	125.050225E	Brgy. Dalwangan, Malaybalay, Bukidnon	- Primarily pineapple plantations and plantation of lemons were noted. - Near large poultry farms and community areas - Along existing road	872 m	
T18	W12	8.183185N	125.055739E	Brgy. Patpat, Malaybalay, Bukidnon	- Plantation of corn, pineapple, sugarcane and rubber tree - Near Sawaga river designated as Station A15 in the Aquatic Ecology Report	867 m	
T19		8.166587N	125.077612E	Brgy. Kalasungay, Malaybalay, Bukidnon	- Plantation of pineapples, corn and sugarcane - Generally minimal vegetation	820 m	
T20	W13	8.162120N	125.110368E	Brgy.	- Plantation of corn,	685 m	

Transect	WS*	Coordinates		Location	Description	Elevation (Transect)	Elevation (WS)
		Latitude	Longitude				
				Kalasungay, Malabalay, Bukidnon	pineapples, sugarcane and some fruit bearing trees - Minimal vegetation - Near residences and large poultry farms - Along existing road - Near Sawaga river designated as Station A16 in the Aquatic Ecology Report		

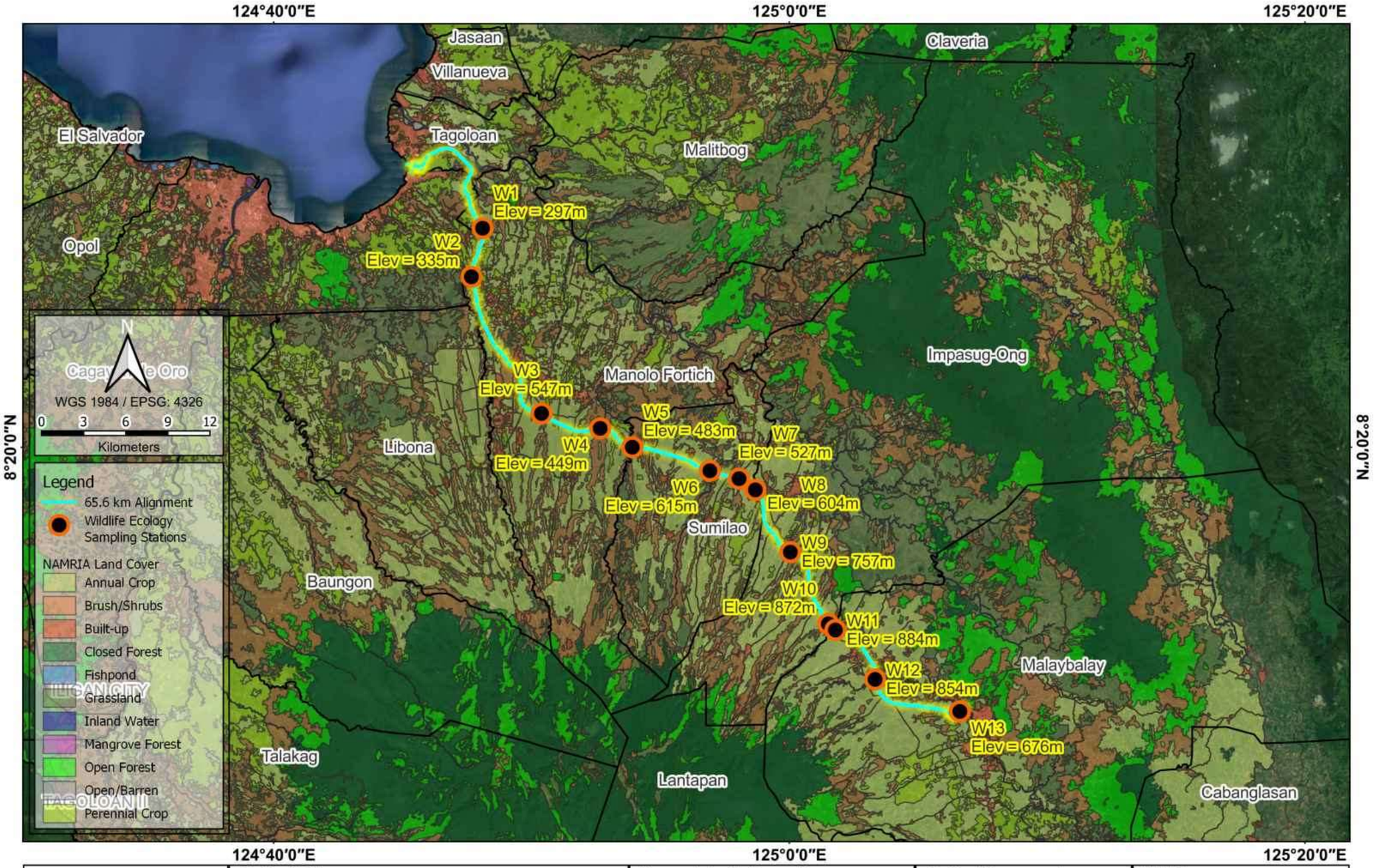
NOTE: WS* – wildlife station

Figure 3-33. Terrestrial flora and fauna survey stations map



	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
Terrestrial Ecology Transect Stations Map	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Sampling Stations: AAI Elevations: SRTM		

Figure 3-34. Wildlife survey stations map



Wildlife Ecology Sampling Stations Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Sampling Stations: AAI Elevations: SRTM		

3.1.4.2.2 Flora survey

Trees - Trees that fall within the survey stations including those within the riparian zones were counted beginning from the entry point of the proposed CMH alignment in Tagoloan, Misamis Oriental to its exit point in Malaybalay, Bukidnon. Trees were identified down to the species level as possible.

Grassland and understory vegetation - Grassland and understory vegetation along selected sections of the tree transects were assessed using 1.0 m^2 quadrats spaced 50m apart along the transect line for a total of 20 quadrats. All species documented within each 1.0 m^2 quadrat were identified and classified according to life form such as grass, shrub, tree seedling, fern, or vine, as applicable.

3.1.4.2.3 Wildlife Survey

Avifauna - Birds were surveyed by transect count, mist netting, and incidental surveys from Transect 1 to Transect 20 and by point surveys at the wildlife/riparian stations. Transect counts were done by walking a 2-km transect in each survey location for two hours. Two standard mist nets were installed in each of the 13 wildlife stations for a total of two net-nights/net-days per station.

Birds were identified using local names by acoustic calls and visual appearance with the aid of field guides (Kennedy et al., 2000; Fisher and Hicks, 2000; Strange, 2000). All birds captured using mist nets were subjected to standard biometric measurements such as total length (TL), tail-vent length (TV), weight (WT), wing cord (WC), bill or culmen (B), gape (G), and tarsus (T) and were released after documentation.

Bats - Bats were collected using mist-nets installed near fruiting *Ficus* trees and along probable flyways. Age and sex of bats were determined, alongside external measurements such as total length (TL), tail vent length (TV), ear length (EL), forearm length (FA), and hindfoot length (HF). Bats were identified using the Key to Philippine Bats (Ingle and Heaney, 1992). The bats were revitalized with sugar solution and released after documentation.

Herpetofauna - Herpetofauna were sampled using the cruising method (opportunistic sampling) or incidental surveys including nocturnal sampling for frogs. Streams, creeks, and microhabitats of each sampling station were thoroughly searched for the presence of frogs guided by frog vocalization. All captured individuals were subjected to morphometrics (snout-vent length, SVL). Identification of frogs is based on Alcala (1986), Alcala and Brown (1998), and Brown et al. (2000).

Non-volant mammals - Small mammals were sampled using cage traps or snap traps baited with roasted coconut meat and coated with peanut butter. Traps were positioned 5 to 10 m apart along possible runways, near burrow entrances, under root tangles, on top of fallen logs, and other probable faunal corridors.

All individuals captured were photographed and subjected to biometric measurements such as weight, sex, approximate age (adult, sub-adult or adult) and when applicable, reproductive condition, total length (TL), tail-vent length, (TV), ear length (E), and hindfoot length (HF). For large mammals such as macaques and wild pigs, survey techniques were carried out by detection of footprints and droppings.

Insects - Insects were collected via opportunistic sampling using a hand net. Specimens collected were placed in paper packets (paper wax/ glassine paper) or centrifuge tubes with a pre-filled 95% ethanol for preservation. After the collection period, rehydration and air drying will be done for butterflies and moths. Where possible, insects were identified down to the genus or species level.

3.1.4.3 Data analysis

The relative frequency, relative density, relative dominance and species importance value (SIV) were computed for all species as shown below:

$$\text{Relative Frequency} = \frac{\text{No. of plots containing a species}}{\text{Sum of frequencies of all species}} \times 100$$

$$\text{Relative Density} = \frac{\text{No. of individual species}}{\text{Total no. of individuals of all species}} \times 100$$

$$\text{Relative Dominance} = \frac{\text{Dominance of species}}{\text{Total dominance of species}} \times 100$$

$$\text{Abundance} = \frac{\text{Total Number of Individual species}}{\text{Total Number of Species Population}} \times 100$$

$$\text{Relative abundance} = \frac{\text{Abundance of one species}}{\text{Total Number of Species Population}} \times 100$$

SIV = relative frequency + relative density + relative dominance

3.1.4.4 Assessment of key impacts

The results of the surveys were integrated in the assessment of the key impacts previously presented. The reader is referred to the appendices enumerated below because only the salient findings of the survey were included in this section.

a) Appendices 11, 15, 19, 21, 23, 26 - Photo documentation of the terrestrial ecology survey
b) Appendix 8 - Tree inventory data
c) Appendix 9 - Importance values of trees recorded across the stations
d) Appendix 10 - Species and conservation status of trees documented across stations
e) Appendix 12 – List of Flora Species indicated in the IUCN Red List
f) Appendix 13 - Importance values of grassland and understory vegetation recorded across the stations
g) Appendix 14 - Abundance and distribution of birds across stations
h) Appendix 16 – List of Avifaunal Species indicated in the IUCN Red List
i) Appendix 17 - Total bat captures across stations in the Project Site
j) Appendix 18 - Individual morphometrics of bats captured per site
k) Appendix 20 - Abundance of murid species collected across the stations
l) Appendix 22 - Relative abundance of herpetofauna captured
m) Appendix 24 – List of Herpetofauna Species indicated in the IUCN Red List
n) Appendix 25 - Terrestrial insect distribution and abundance at the sampling sites

3.1.4.4.1 Vegetation removal and loss of habitat

Trees - The tree and bamboo survey recorded a total of 10,929 individuals and clumps with 98 species under 37 families. Trees further classified into a) forest-associated species, b) orchard, c) and plantation species were generally dominated by plantation species with a relative abundance of 84.14% (Figure **3-35).**

Across all sites, forest species were the most abundant with 72 species (73.46%) relative to orchard or plantation species both with 13 species (13.72%) (**Figure 3-36**). Diverse species of forest trees were generally observed in remnant forest patches along riparian zones. Transects with less tree diversity or abundance are generally associated with pineapple plantation or agricultural areas, starting from Transect 1 in Tagaloan, Misamis Oriental towards Transect 20 in Malaybalay, Bukidnon.

The most abundant species recorded was *Hevea brasiliensis* (Brazilian fire tree) with a total count of 4,903 individuals, followed by *Dendrocalamus asper* (Giant Bamboo) with 1,278 clumps, and *Falcataria moluccana* (falcata) with a total count of 1,131 individuals (**Table 3-25**). The rest of the top 10 most abundant trees were all tree plantation and orchard species, notably *Nephelium lappaceum* (rambutan), *Durio zibethinus* L. (durian), *Lansium domesticum* Correa (lanzones), *Gmelina arborea* Roxb. ex Sm. (gmelina), *Mangifera indica* L. (manga), *Swietenia macrophylla* King (mahogany), and *Spathodea campanulata* P.Beauv. (Tulip tree). *Spathodea campanulata* P.Beauv. (Tulip tree) was also the most frequently observed tree across the Project Site with a Relative Frequency of 90%, followed by *Gmelina arborea* (gmelina) and *Artocarpus odoratissimus* (marang) at 85 and 80% Relative Frequency, respectively (**Table 3-26**).

Table 3-24. Taxonomic Classification of the Flora Species Present in the Project Area

Family	Species	Common Name
Achariaceae	*Pangium edule*	Football Fruit
Actinidiaceae	*Saurauia sp.*	-
Adoxaceae	*Sambucus javanica*	Elderberry
Anacardiaceae	*Anacardium occidentale*	Cashew Nut
Anacardiaceae	*Mangifera indica*	Mango
Anacardiaceae	*Semecarpus sp.*	-
Anacardiaceae	*Rhus taitensis*	Sumac
Annonaceae	*Annona muricata*	Soursop
Annonaceae	*Annona squamosa*	Sugar apple
Annonaceae	*Polyalthia longifolia*	False Asoka
Araliaceae	*Osmoxylon sp.*	-
Araliaceae	*Polyscias nodosa*	Malapapaya
Apocynaceae	*Alstoniascholaris*	Blackboard Tree
Araucariaceae	*Araucaria heterophylla*	Norfolk Island Pine
Arecaceae	*Cocos nucifera*	Coconut Palm
Bignoniaceae	*Spathodeacampanulata*	African tuliptree
Bignoniaceae	*Tabebuia chrysotricha*	Golden Trumpet Tree
Bignoniaceae	*Hydroanthus chrysotrichus*	Yellow Trumpet Tree
Bombacacee	*Ceiba pentandra*	Kapok Tree
Brownlowiaceae	*Diplodiscuspaniculatus*	Balobo
Burseraceae	*Canarium ovatum*	Pilinut
Cannabaceae	*Trema orientalis*	Oriental Trema
Clusiaceae	*Garcinia mangostana*	Mangosteen
Combretaceae	*Terminalia catappa*	Tropical Almond Tree
Cunoniacee	*Spiraeopsissp*	-
Dipterocarpaceae	*Shorea contorta*	White Lauan
Elaeocarpaceae	*Elaeocarpus sp.*	-
Euphorbiaceae	*Macaranga bicolor*	Hamindang
Euphorbiaceae	*Macaranga hispida*	Nasturtium Tree
Euphorbiaceae	*Macaranga sp.*	-
Euphorbiaceae	*Macaranga tanarius*	Parasol Leaf Tree
Euphorbiaceae	*Mallotussp.*	-
Euphorbiaceae	*Melanolepismultiglandulosa*	Ayum-ayum
Euphorbiaceae	*Homalanthusmacradenius*	The bleeding Heart
Euphorbiaceae	*Hevea brasiliensis*	Brazilian Fire Tree
Fabaceae	*Acacia mangium*	Black Wattle
Fabaceae	*Casia fistula*	Golden Shower Tree
Fabaceae	*Erythrina variegata*	Variegated Coral Tree
Fabaceae	*Falcatariamoluccana*	Moluccan albizia
Fabaceae	*Leucaena leucocephala*	Ipil-ipil

Family	Species	Common Name
Fabaceae	*Pithecellobium dulce*	Manila Tamarind
Fabaceae	*Pterocarpus indicus*	Narra
Fabaceae	*Schizolobiumparahyba*	Brazilian Fern Tree
Fabaceae	*Caesalpinia pulcherrima*	Peacock Flower
Fabaceae	*Albizia saman*	Rain Tree
Fabaceae	*Albizia saponaria*	Soap Acacia
Hypericaceae	*Cratoxylumsumatranum*	Kansilay Tree
Lamiaceae	*Gmelina arborea*	Yemane
Lauraceae	*Litsea cordata*	Litsea
Lauraceae	*Litseaphilippinensis*	Bakan
Lauraceae	*Persea americana*	Avocado
Lauraceae	*Cinnamomum mercadoi*	Kalingag
Lecythidaceae	*Barringtonia reticulata*	Barringtonia
Lythraceae	*Duabanga sp.*	-
Malvaceae	*Duriozibethinus*	Durian
Melastomataceae	*Astroniasp.*	-
Meliaceae	*Lansiumdomesticum*	Lanzones
Meliaceae	*Sandoricumkoetjape*	Santol
Meliaceae	*Swietenia macrophylla*	Mahogany
Meliaceae	*Azadirachtaexcelsa*	Giant Neem Tree
Meliaceae	*Azadirachta indica*	Neem Tree
Moraceae	*Artocarpus blancoi*	Tipolo
Moraceae	*Artocarpus heterophyllus*	Jackfruit
Moraceae	*Artocarpus odoratissimus*	Marang
Moraceae	*Ficus ampelas*	Ampelas
Moraceae	*Ficus fiskei*	Sandpaper Leaf
Moraceae	*Ficus minahassae*	Cluster Fig Tree
Moraceae	*Ficus nota*	Tibig
Moraceae	*Ficus pseudopalma*	Philippine Fig
Moraceae	*Ficus septica*	Hauli Tree
Moraceae	*Ficus ruficaulis*	Ficus Tree
Moraceae	*Ficus sp. 1*	-
Moraceae	*Ficus sp. 2*	-
Moraceae	*Ficus sp. 3*	-
Moraceae	*Ficus balete*	Balete Tree
Moraceae	*Ficus magnoliifolia*	Common Fig
Moraceae	*Streblus asper*	Kalios Tree
Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum
Myrtaceae	*Eucalyptus deglupta*	Mindanao Gum
Myrtaceae	*Psidium guajava*	Guava
Myrtaceae	*Syzygiumaqueum*	Water Apple
Myrtaceae	*Syzygiumcumini*	Java Plum
Pinaceae	*Pinus kesiya*	Khasi Pine
Poaceae	*Dendrocalamus asper*	Rough Bamboo
Phyllanthaceae	*Antidesmaghaesembilla*	Black Currant Tree
Rhamnaceae	*Rhamnus philippinensis*	Buckthorn
Rhamnaceae	*Ziziphus jujuba*	Jujube
Rubiaceae	*Greeniopsissp.*	-
Rubiaceae	*Neonauclea sp.*	-
Rubiaceae	*Morindacitrifolia*	Indian Mulberry
Rutaceae	*Melicopetriphylla*	Three Leaf
Sapindaceae	*Pometia pinnata*	Lychee

Family	Species	Common Name
Sapindaceae	*Nephelium lappaceum*	Rambutan
Sapotaceae	*Chrysophyllumcainito*	Star Apple
Sterculiaceae	*Sterculia rubiginosa*	Rusty Sterculia
Sterculiaceae	*Kleinhoviahospita*	Guest Tree
Urticaceae	*Dendrocnide sp.*	-
Verbenaceae	*Vitex parviflora*	Molave

Table 3-25. Abundance estimates of top 10 tree species recorded across stations

Common Name	Scientific name	Species category	Number*
Rubber tree	*Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.*	Plantation	4,903
Giant Bamboo	*Dendrocalamus asper (Schult.f.) Backer ex Heyne*	Plantation	1,278
Peacocks plume	*Falcataria moluccana (Miq.) Barneby & J.W.Grimes*	Plantation	1,131
Rambutan	*Nephelium lappaceum L.*	Orchard	493
Durian	*Durio zibethinus L.*	Orchard	455
Lanzones	*Lansium domesticum Correa*	Orchard	327
Gmelina	*Gmelina arborea Roxb. ex Sm.*	Plantation	292
Mango	*Mangifera indica L.*	Orchard	272
Mahogany	*Swietenia macrophylla King*	Plantation	232
Tulip tree	*Spathodea campanulata P.Beauv.*	Plantation	216

*Number of individuals or clumps

Table 3-26. Top 10 species of trees frequently recorded across survey sites

Common Name	Scientific name	Species Category	Frequency (%)
Tulip tree	*Spathodea campanulata* P. Beauv.	Tree Plantation	90
Gmelina	*Gmelina arborea Roxb.* ex Sm.	Tree Plantation	85
Marang	*Artocarpus odoratissimus* Merr.	Orchard	80
Mahogny	*Swietenia macrophylla* King	Tree Plantation	70
Bakan	*Litsea philippinensis* Merr.	Forest	70
Antipolo	*Artocarpus blancoi* (Elmer) Merr.	Forest	65
Jackfruit	*Artocarpus heterophyllus* Lam.	Orchard	65
Malapapaya	*Polyscias nodosa* (Blume) Seem	Forest	60
Ipil-ipil	*Leucaena leucocephala* (Lam.) de Wit	Exotic Reforestation	55
Alim	*Melanolepis multiglandulosa* (Reinw. ex Blume) Rchb. & Zoll.	Forest	55

Figure 3-35. Abundance of trees at the survey stations

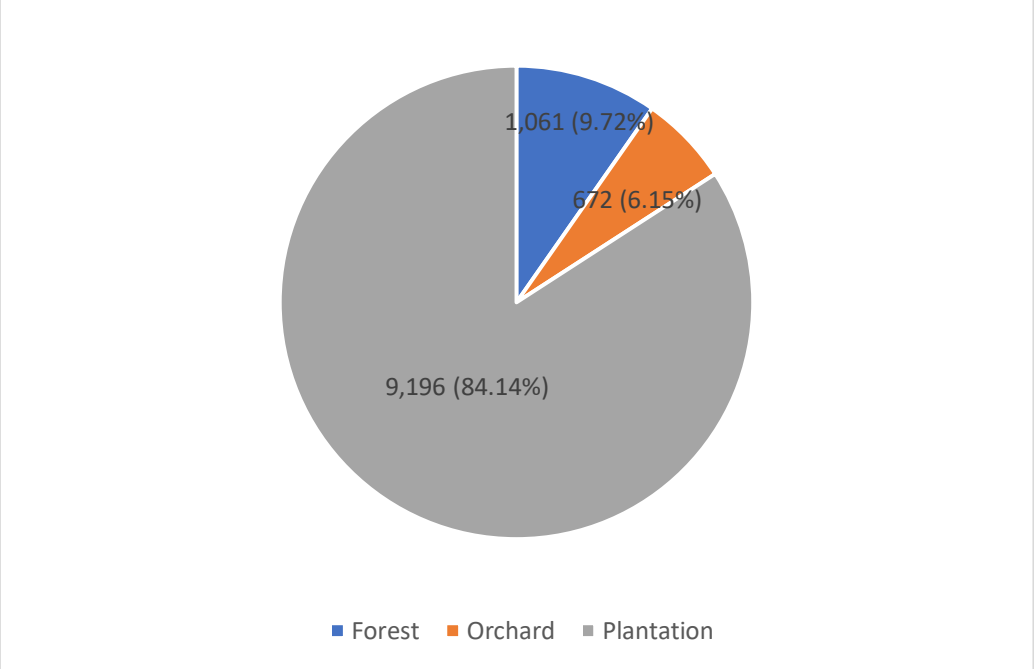
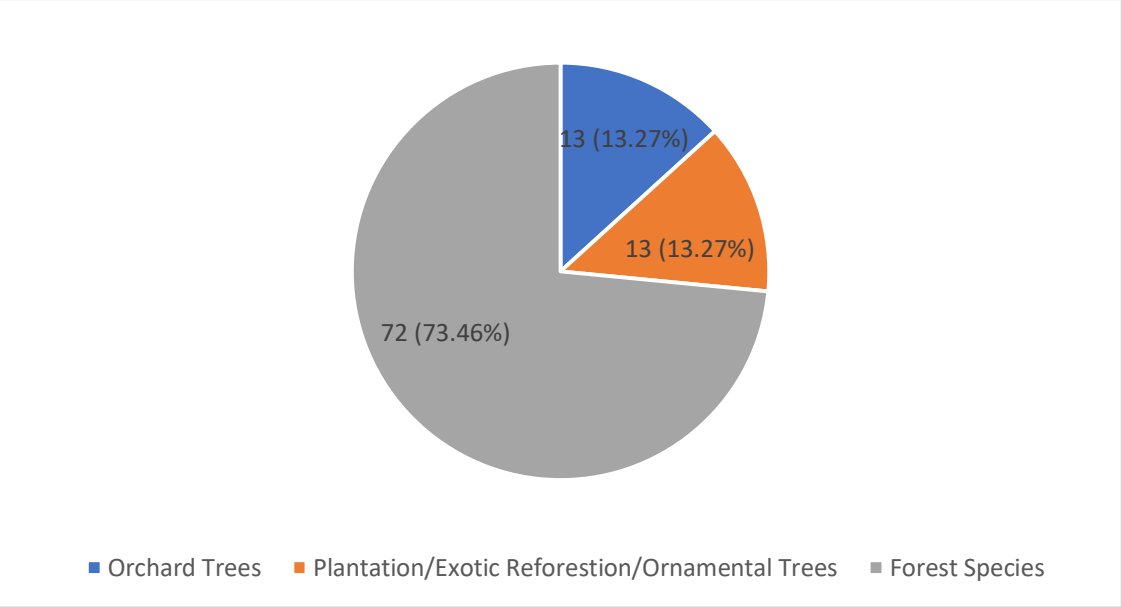


Figure 3-36. Species richness per tree category recorded at the survey stations



The proposed CMH alignment will cut across vast agricultural areas that will affect existing orchards and tree and pineapple plantations. As such, majority of trees that will be removed during road construction are orchard/plantation species (Relative Abundance=90.3%) such as coconuts, mango trees, Brazilian rubber tree, Brazilian fire tree, gmelina, mahogany, and cash crops like corn and vegetables. Only sections around Barangay Natumolan in Tagoloan, Barangay Alae in Manolo Fortich and riparian zones have significant stands of forest trees (Relative Abundance=9.7%), usually interspersed with or surrounded by small farms.

3.1.4.4.2 Threat to existence, abundance, frequency, and distribution of important species

The IBAT Proximity Report identified 523 species in the IUCN Red List that are potentially found within 50 km of the area of interest. IBAT Proximity Report using buffer of 50 km indicates that there are 40 species listed as endangered (EN) and 11 species listed as critically endangered (CR), 246 are Vulnerable (VU), 226 are Near Threatened (NT). IBAT results also show that there are two Key Biodiversity Areas near the Project (i.e., Mt. Tago Range and Mt. Kaluayan - Mt. Kinabalian Complex) and three Protected Areas (i.e., Mahoganao, Mt Kitanglad Range and Manupali)

As for habitats of birds and/or others in the area, it may be changed due to cutting trees though its impact is considered as small degree. However, road projects may enhance access to the biodiversity-rich areas and protected areas that might lead to habitat destruction and the catalyst for the spread of major threats. Since the project is located outside the nearest Protected Area (Mt. Kitanglad at 7.07 km) and KBA (Mt. Tago Range at 950m), minimal impacts were expected.

3.1.4.4.2.1 Flora

Trees - Calculations of Species Importance Values (SIVs) showed *Hevea brasiliensis* (Brazilian fire tree) as the 'most important species' vis-à-vis most planted commercial species with an SIV of 91.95, followed by *Dendrocalamus* asper and *Falcataria moluccana* (falcata) at SIVs of 25.85 and 19.67, respectively. The rest of the top 10 species with highest SIVs are all tree plantation or orchard species. *Hevea brasiliensis* (Para rubber tree) is a widespread species native to the Amazon region of South America. This species has been introduced to several tropical countries outside its natural range where plantations to produce natural rubber have been established[18].

Species Diversity
Table 3-27 displays data collected from transects regarding species diversity. There are 20 transects listed, and for each transect, the number of species, individuals, dominance, evenness, H-diversity, and criterion are recorded. The number of species identified in each transect ranges from 3 to 50, and the number of individuals ranges from 4 to 1427. Dominance is a measure of the most common species, and it ranges from 6.93% to 77.57%. Evenness is a measure of how equally distributed the species are, and it ranges from 9.31% to 75.37%.

H-diversity is a measure of the diversity of the area, and it ranges from 0.76 to 3.06. A higher H-diversity indicates a more diverse area. The criterion ranges from very low to high and is based on the H-diversity score. Overall, the data suggests that most of the transects have very low to low diversity, with only a few having moderate or high diversity. The evenness of the diversity index varies widely, indicating that some areas have a more evenly distributed variety of species than others. The dominance measure also varies widely, with some areas having a few dominant species and others having more evenly distributed dominance.

Table 3-27. Species Diversity Indices of the Transects Established for Flora

Transects	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
1	50	498	6.93%	42.64%	3.06	High
2	15	89	18.80%	50.09%	2.02	Low
3	28	1016	48.64%	14.44%	1.4	Very Low
4	20	312	24.55%	32.28%	1.87	Very Low
5	24	252	12.64%	45.12%	2.38	Low
6	20	120	61.67%	15.62%	1.14	Very Low
7	24	55	7.44%	75.37%	2.9	Moderate
8	21	536	75.38%	10.22%	0.76	Very Low

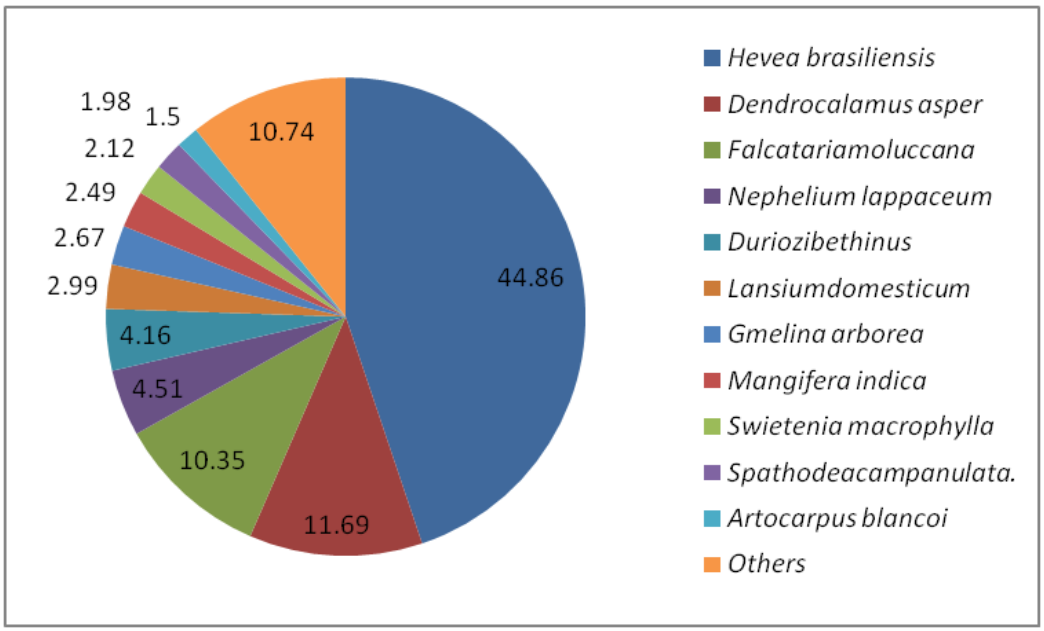
[18] Fabriani, F. & Hills, R. 2020. *Hevea brasiliensis.* The IUCN Red List of Threatened Species 2020

Transects	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
9	28	78	8.88%	61.70%	2.85	Moderate
10	23	147	29.63%	31.34%	1.98	Very Low
11	15	137	64.87%	17.73%	0.98	Very Low
12	8	37	29.47%	56.80%	1.51	Very Low
13	24	182	55.49%	15.56%	1.32	Very Low
14	3	4	37.50%	94.28%	1.04	Very Low
15	16	277	42.16%	27.27%	1.47	Very Low
16	26	1215	30.41%	17.15%	1.5	Very Low
17	16	42	11.90%	72.42%	2.45	Low
18	21	1101	76.56%	9.31%	0.67	Very Low
19	18	456	77.57%	9.73%	0.56	Very Low
20	24	1427	37.54%	17.83%	1.45	Very Low

Relative Abundance

Figure 3-37 shows the most abundant species recorded was *Hevea brasiliensis* (Brazilian fire tree) with a total count of 4,903 individuals, followed by *Dendrocalamus asper* (Giant Bamboo) with 1,278 clumps, and Falcataria moluccana (falcata) with a total count of 1,131 individuals. However, the species "Others" were the summation of trees which has less than 1% relative abundance that overall comprises as 10.74%. Across all sites, forest species were the most abundant with 72 species (73.46%) relative to orchard or plantation species both with 13 species (13.72%). Diverse species of forest trees were generally observed in remnant forest patches along riparian zones. Transects with less tree diversity or abundance are generally associated with pineapple plantation or agricultural areas, starting from Transect 1 in Tagaloan, Misamis Oriental towards Transect 20 in Malaybalay, Bukidnon.

Figure 3-37. Overall Relative Abundance of Terrestrial Flora



Species Presence

Table 3-28 lists below shows tree species observed with their presence or absence in 20 transects. Some species are present in almost all transects, such as *Albizia saman*, while others are only present in a few transects, such as *Astronia* sp. One interesting thing to note is the presence of certain species in specific transects. For example, *Artocarpus blancoi* is present in all transects except for transect 1 and 13. In

addition,there are clustering of certain species in the transects. For instance, transects 1, 6, and 9 have a high number of *Artocarpus heterophyllus*, while transects 4, 5, and 7 have a high number of *Ceiba pentandra*. This could be because these species are adapted to specific environmental conditions that are present in these transects.

Table 3-28. Presence of Floral Species per Station and their Location

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Acacia mangium					+												+	+		+
Albizia saman	+	+																		
Albizia saponaria									+											
Alstoniascholaris				+																
Anacardium occidentale	+						+													
Annona muricata	+		+	+					+											
Annona squamosa	+																			
Antidesmaghaesembilla	+		+																	
Araucaria heterophylla																+				
Artocarpus blancoi	+	+	+	+	+	+	+	+	+	+			+					+		+
Artocarpus heterophyllus	+	+	+	+	+		+	+			+		+			+	+	+		+
Artocarpus odoratissimus	+			+	+	+	+		+	+	+	+	+		+	+	+	+	+	+
Astronia sp.																			+	

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Azadirachtaexcelsa	+												+							
Azadirachta indica	+																			
Barringtonia reticulata.	+																			
Caesalpinia pulcherrima																				+
Canarium ovatum	+																			
Casia fistula			+		+	+														
Ceiba pentandra	+	+	+	+					+	+			+							+
Chrysophyllumcaimito	+		+										+							+
Cinnamomum mercadoi							+													
Cocos nucifera	+						+													
Cratoxylumsumatranum								+	+	+							+			
Dendrocalamus asper			+			+		+		+	+		+		+			+	+	+
Dendrocnide sp.						+														
Diplodiscuspaniculatus													+							

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Duabanga sp.	+																			
Duriozibethinus															+	+		+		+
Elaeocarpus sp.								+	+											
Erythrina variegata					+								+							
Eucalyptus camaldulensis															+					
Eucalyptus deglupta			+														+			
Falcatariamoluccana			+	+	+					+		+		+		+	+		+	
Ficus ampelas													+							
Ficus balete	+			+																
Ficus fiskei										+										
Ficus magnoliifolia	+		+																	
Ficus minahassae					+	+	+		+	+	+		+			+	+			+
Ficus nota					+	+	+			+	+		+			+			+	
Ficus pseudopalma	+									+	+									

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Ficus ruficaulis	+	+	+			+														
Ficus septica	+					+			+											
Ficus sp.					+		+	+	+		+								+	+
Ficus sp. 2																+			+	
Ficus sp. 3	+															+		+		
Ficus sp. 4																		+		
Garcinia mangostana																+				+
Gmelina arborea	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+	+		+
Greeniopsis sp.										+	+								+	
Hevea brasiliensis												+			+			+	+	+
Hydroanthuschrysotrichus			+							+										4
Kleinhoviahospita	+																			
Lansiumdomesticum				+	+			+	+							+		+		+
Leucaena leucocephala	+			+	+	+			+	+	+			+	+		+	+	+	

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Litsea cordata																			+	
Litseaphilippinensis			+		+	+	+	+	+		+		+		+		+	+	+	+
Macaranga bicolo	+							+		+			+			+	+		+	
Macaranga hispida	+	+	+	+		+							+						+	
Macaranga sp.									+				+							
Macaranga tanarius	+	+	+		+	+	+	+	+		+		+							
Mallotus sp.	+																		+	
Mangifera indica	+	+	+	+											+	+	+	+		+
Melanolepismultiglandulosa	+	+	+	+	+	+	+	+	+	+										+
Melicopetriphylla								+											+	
Morindacitrifolia							+													
Neonauclea sp.	+									+										
Nephelium lappaceum			+	+												+				
Omalanthuspopulneus								+	+								+			

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Osmoxylon sp.					+	+	+			+	+		+							
Palaquium sp.	+																			
Pangiumedule							+													
Persea americana	+			+			+								+	+				
Pinus kesiya					+							+			+	+		+		
Pithecellobium dulce	+						+		+	+	+									
Polyalthia longifolia			+																	
Polyscias nodosa	+	+	+		+	+	+	+	+		+				+	+		+		
Pometia pinnata	+						+			+			+							
Psidium guajava	+		+						+							+				
Pterocarpus indicus	+			+			+			+		+			+	+	+	+		+
Rhamnus philippinensis																			+	
Rhus taitensis								+	+											
Sandoricumkoetjape	+		+	+	+				+				+			+		+		+

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Saurauia sp.								+									+			
Schizolobiumparahyba	+		+					+	+	+								+		+
Semecarpus sp.	+					+		+												
Shorea contorta															+					
Spathodeacampanulata.	+		+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
Spiraeopsis sp.						+														
Sterculia rubiginosa	+						+		+											
Streblus asper	+																			
Swietenia macrophylla	+	+	+	+	+	+	+	+	+			+	+		+	+				+
Syzygiumaqueum																+				
Syzygiumcumini	+																			
Terminalia catappa	+				+											+				
Trema orientalis	+	+	+		+				+				+			+		+		
Vitex parviflora	+	+																		

Species	Transects																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In between forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Ziziphus jujuba		+																		

From the 98 species recorded, *Pterocarpus indicus Willd.* is classified as Endangered according to IUCN and Vulnerable as per DAO 2017-11, while the others were classified as follows based on DAO 2017-11: *Vitex parviflora and Shorea contorta* – Endangered; *Azadirachta excelsa* – Vulnerable; *Canarium ovatum* and *Cinnamommum mercadoi* - Other Threatened Species (**Table 3-29**).

Pterocarpus indicus is a large tree species native to much of China, India and Southeast Asia. The species has a very wide native range but is experiencing severe population decline in all parts of the distribution and in each country within the range. Vitex parviflora is known from 13 localities in the Philippines and Indonesia (Moluccas and Lesser Sunda Islands) and East Timor. Reported to be one of the dominant trees in the Philippine monsoon forest. There is a decline in area of occupancy and extent of occurrence as well as loss of quality of habitat[19]. While *Shorea contorta* is a large tree endemic to the Philippines. It has been a commercially important source of timber. *Shorea contorta* has experienced decline due to illegal logging and timber extraction as it is one of the premium hardwoods in the country[20].

The three species "Introduced" were *Anacardium occidentale L., Casia fistula L.*, and *Falcataria moluccana (Miq.) Barneby & J.W. Grimes*. Invasive tree species recorded were the *Gmelina arborea Roxb. ex Sm.*, *Eucalyptus camaldulensis Dehnh.*, and *Psidium guajava L.*

Table 3-29. Conservation status of recorded tree and plant species

Common Name	Scientific name	IUCN	DAO 2017-11
Narra	*Pterocarpus indicus* Willd.	En	Vu
Molave	*Vitex parviflora*	LC	En
White lauan	*Shorea contorta*	LC	En
Philippine Neem Tree	*Azadirachta excelsa*	LC	Vu
Pili	*Canarium ovatum*	LC	OTS
Kalingag	*Cinnamommum mercadoi*	LC	OTS

NOTES: Conservation status: En=Endangered, Vu = vulnerable, and OTS = Other Threatened Species

Grassland and Understory Vegetation - A total of 38,654 individuals of grassland and understory vegetation representing 62 species in 24 families across habitat gradients were sampled from Transect 1 to Transect 20. *Astraceae* was the dominant family across all transects with 10 species followed by *Fabaceae* with 8 species. On a per Family basis, *Poaceae* was the dominant family with 12,476 individual counts followed by *Acanthaceae* with 11,972 individuals.

Across all species, *Asytasia gangetica* subsp. Micrantha (Chinese violet) had the highest Species Importance Value (SIV) with 74.06 followed by *Axonopus compressus* (carabao grass), *Rottboella cochinchinensis*, *Sphagneticola trilobata*, and *Oplimenus hirtellu,* with Species Importance Values of 54.18, 18.37, 13.32, 12.48, respectively. Except for saplings of *Coffea arabica*, *Swietenia macrophylla*, *Colocasia esculenta* (taro), and *Manihot esculenta* (cassava), most understory plants across the Project Site were generally weed vegetation.

Based on **Table 3-30,** there are a total of 64 species belonging to 28 families of which family Poaceae has the highest number of species observed, which is 7 species. This is followed by the Asteraceae family with 6 species listed and Fabaceae family with 5 species listed.

Moreover, the Poaceae family, also known as the grass family, is represented by several species including *Axonopus compressus*, commonly called Carpet Grass, *Eleusine indica*, known as Goosegrass, and Eragotis amabilis, or Lovegrass. These grasses are commonly found in lawns and pastures due to their tolerance for heavy foot traffic and grazing.

[19] de Kok, R. 2020. *Vitex parviflora*. The IUCN Red List of Threatened Species 2020
[20] Energy Development Corporation (EDC). 2020. *Shorea contorta*. The IUCN Red List ofThreatened Species 2020

Table 3-30. Taxonomic Classification of the Grass and Shrubs Present in the Project Area

Family	Species	Common Name
Acanthaceae	*Asytasia gangetica subsp. Micrantha*	Chinese violet
Acanthaceae	*Ruella tuberosa*	Minnieroot
Acanthaceae	*Odontonema cuspidatum*	Firespike
Acanthaceae	*Phaulopsis imbritica*	Purple phaulopsis
Amaranthaceae	*Amaranthus spinosus*	Spiny amarath
Amaranthaceae	*Amaranthus viridis*	Slender amaranth
Araceae	*Colocasia esculenta*	Taro
Araceae	*Alocasia cucullate*	Chinese Taro
Aspleniaceae	*Cyathillium cinereum*	Soft tree fern
Asteraceae	*Sphagneticola trilobata*	Creeping oxeye
Asteraceae	*Ageratum conyzoides*	Billygoat Weed
Asteraceae	*Chromolaena odorata*	Siam Weed
Asteraceae	*Synedrella nodiflora*	None
Asteraceae	*Crassocephalum crepidiodes*	Unknown
Asteraceae	*Spilanthes paniculata*	Toothache plant
Asteraceae	*Acmella paniculata*	Toothache plant
Asteraceae	*Erigeron canadensis*	Canadian fleabane
Asteraceae	*Eclipta prostata*	False daisy
Asteraceae	*Tridax procumbens*	Coatbuttons
Bromeliaceae	*Ananas comosus*	Pineapple
Commelinaceae	*Commelina diffusa*	None
Commelinaceae	*Tradescantia fluminensis*	Inch plant
Convolvulaceae	*Ipomea batatas*	Sweet potato
Cornaceae	*Cornus sericea*	Red osier dogwood
Cucurbitaceae	*Melothria pendula*	Creeping cucumber
Cucurbitaceae	*Melonchia corchorifolia*	Heartleaf melon
Cyperaceae	*Kylinga nemoralis*	None
Euphorbiaceae	*Euphorbia hirta*	Asthma plant
Euphorbiaceae	*Euphorbia heterophylla*	Wild poinsettia

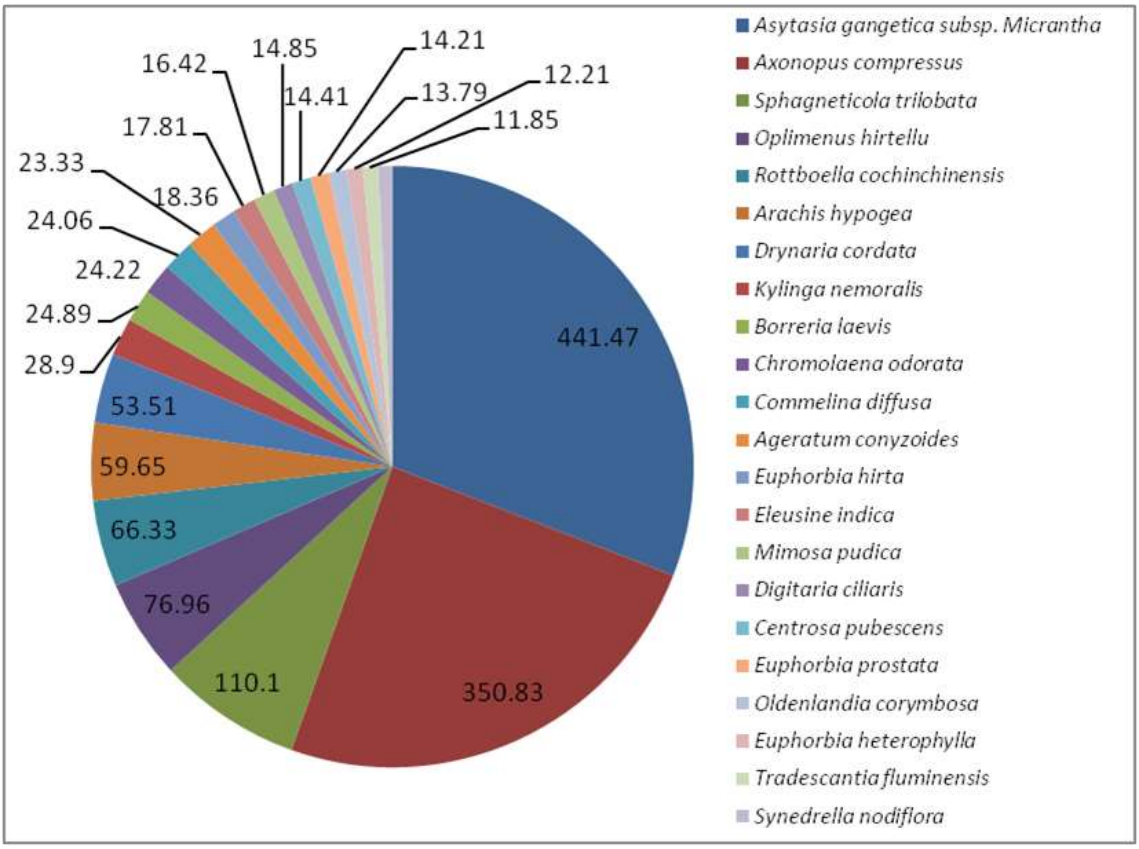
Family	Species	Common Name
Euphorbiaceae	*Euphorbia prostata*	None
Euphorbiaceae	*Manihot esculenta*	Cassava
Fabaceae	*Mimosa pudica*	Sensitive Plant
Fabaceae	*Arachis hypogea*	Peanut
Fabaceae	*Calopogonium mucunoides*	None
Fabaceae	*Crotalaria pallida*	None
Fabaceae	*Mimosa diploticha*	Giant Sensitive Plant
Fabaceae	*Chamaecrista nictitans*	Sensitive Partridge Pea
Malvaceae	*Sida rhombifolia*	Arrowleaf sida
Malvaceae	*Corchorus olitorus*	Jew's mallow
Meliaceae	*Swietenia sapling*	Mahogany
Nephrolepidaceae	*Nephrolepis bisserata*	Sword fern
Piperaceae	*Peperomia pellucida*	Shiny bush
Piperaceae	*Piper sarmentosum*	Wild betel
Poaceae	*Axonopus compressus*	Carpet Grass
Poaceae	*Rottboella cochinchinensis*	None
Poaceae	*Oplimenus hirtellu*	Basket grass
Poaceae	*Eleusine indica*	Goosegrass
Poaceae	*Digitaria ciliaris*	Southern crabgrass
Poaceae	*Cloeme rutidosperma*	Sweetgrass
Poaceae	*Echinocloa colona*	Jungle Rice
Poaceae	*Grona trifloral*	Clustered bluegrass
Poaceae	*Eragotis amabilis*	Lovegrass
Polygonaceae	*Polygonum tomentosum*	Woolly jointweed
Polypodiaceae	*Drynaria cordata*	Heartleaf fern
Rubiaceae	*Centrosa pubescens*	Buttonweed
Rubiaceae	*Borreria laevis*	Smooth Borreria
Rubiaceae	*Richardia grandiflora*	largeflower pusley
Rubiaceae	*Oldenlandia corymbosa*	
Rubiaceae	*Borreria ocymoides*	Smooth buttonweed

Family	Species	Common Name
Rubiaceae	*Coffea arabica* seedlings*	Arabica coffee
Solanaceae	*Solanum torvum*	Turkey berry
Thelypteridaceae	*Christella normalis*	None
Verbenaceae	*Stachytarpheta jamaicensis*	Blue porterweed
Verbenaceae	*Lantana camara*	Lantana

Species Density

Figure 3-38 displays the density of species in both grassland and understory vegetation, with a threshold of 10 individuals/m^2. According to the data presented, the plant species with the highest density is *Asytasia gangetica* subsp. Micrantha, with 441.47 individuals/m^2. On the other hand, the species with the lowest density is *Melonchia corchorifolia*, with only 0.33 individuals/m^2.

Figure 3-38. Overall Relative Abundance of Grass and Shrubs Present in the Project Area

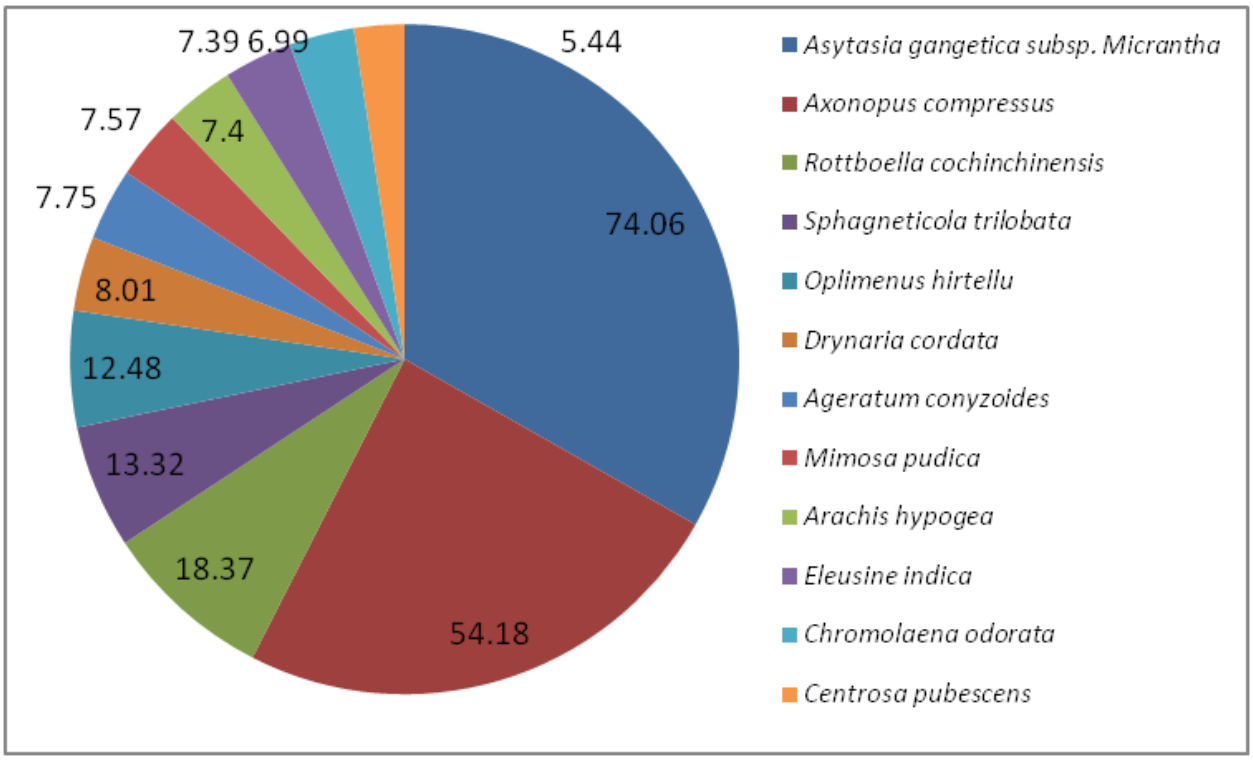


Species Importance Values

Across all species, Asytasia gangetica subsp. Micrantha (Chinese violet) had the highest species importance value (SIV) with 74.06, followed by *Axonopus compressus* (carabao grass), *Rottboella cochinchinensis*, *Sphagneticola trilobata*, *and Oplimenus hirtellu*, with species importance values of 54.18, 18.37, 13.32, and 12.48, respectively. Except for saplings of *Coffea arabica*, *Swietenia macrophylla*, *Colocasia esculenta* (taro),

and *Manihot esculenta* (cassava), most understory plants across the project site were generally weed vegetation.

Figure 3-39. Importance Value of Grass and Shrubs Present in the Project Area



List of Important Flora Species

Appendix 12 Flora species were recorded as vulnerable, endangered and near threatened species, according to IUCN and DAO 2017-11, which was observed in the survey. These species were considered as important flora species.

3.1.4.4.2.2 Fauna

Avifauna - Columbidae was the most species-rich family throughout the sampling season with a total of four species during the low rainfall period and six species during the high-rainfall period.

Table 3-31. Taxonomic Classification of the Avifauna Species

Family	Common Name	Scientific Name
Accipitridae	*Brahminy kite*	*Haliastur indus****
Accipitridae	*Philippine serpent-eagle*	*Spilornis cheela**
Accipitridae	*Black-shouldered kite*	*Elanus axillaris***
Alcedinidae	*Collared Kingfisher*	*Todiramphus chloris****
Alcedinidae	*Southernsilvery kingfisher*	*Ceyx argentatus**
Alcedinidae	*White-throated kingfisher*	*Halcyon gularis***

Family	Common Name	Scientific Name
Anatidae	*Philippine Duck*	*Anas luzonica**
Apodidae	*Fork-tailed swift*	*Apus pacificus***
Apodidae	*House swift*	*Apus nipalensis***
Apodidae	*Glossy swiftlet*	*Collocalia esculenta****
Ardeidae	*Cattle egret*	*Bubulcus ibis****
Artamidae	*White breasted wood swallow*	*Artamus leucoryn****
Bucerotidae	*Mindanao hornbill*	*Penelopides affinis***
Campephagidae	*Pied triller*	*Lalage nigra**
Columbidae	*Grey-capped emerald dove*	*Chalcophaps indica****
Columbidae	*Pied Imperial Pigeon*	*Ducula bicolor***
Columbidae	*Philippine Cuckoo Dove*	*Macropygia tenuirostris****
Columbidae	*Red Collared Dove*	*Streptopelia tranquebarica***
Columbidae	White-eared brown dove	*Phapitreron leucotis****
Columbidae	Zebra dove	*Geopelia striata****
Corvidae	Large-billed crow	*Corvus macrorhynchos****
Cuculidae	Black-faced coucal	*Centropus melanops****
Cuculidae	Philippine coucal	*Centropus viridis****
Dicaeidae	Fire-breasted flowerpecker	*Dicaeum ignipectus****
Dicaeidae	Red keeled flowerpecker	*Dicaeum austral****
Estrildidae	White-bellied Munia	*Lonchura leucogastra***
Estrildidae	Chestnut munia	*Lonchura atricapilla****
Falconidae	Philippine falconet	*Microhierax erythrogenys**
Hirundinidae	Barn Swallow	*Hirundo rustica***
Laniidae	Long-tailed shrike	*Lanius schach****
Locustellidae	Striated grassbird	*Megalurus palustris****
Locustellidae	Tawny grassbird	*Megalurus timoriensis****
Megalaimidae	Coppersmith barbet	*Psilopogon haemacephalus****
Meropidae	Blue-throated bee-eater	*Merops viridis****
Monarchidae	Black-naped Monarch	*Hypothymis azurea***
Motacillidae	Eastern Yellow Wagtail	*Motacilla flava**

Family	Common Name	Scientific Name
Muscicapidae	Blue-and-white flycatcher	*Cyanoptila cyanomelana**
Muscicapidae	Oriental magpie-robin	*Copsychus saularis****
Muscicapidae	Pied Buschat	*Saxicola caprata****
Nectariniidae	Brown-throated sunbird	*Anthreptes malacensis**
Nectariniidae	Lina's sunbird	*Aethopyga linaraborae****
Nectariniidae	Olive-backed sunbird	*Cinnyris jugularis****
Oriolidae	Black-naped Oriole	*Oriolus chinensis***
Pachycephalidae	White-vented whistler	*Pachycephala homeyeri**
Passeridae	Eurasian tree sparrow	*Passer montanus****
Psittacidae	Philippine hanging parrot	*Loriculus philippensis****
Psittaculidae	Guaiabero	*Bolbopsittacus lunulatus***
Pycnonotidae	Philippine bulbul	*Hypsipetes philippinus****
Pycnonotidae	Yellow-vented bulbul	*Pycnonotus goiavier****
Rallidae	Barred rail	*Hypotaenidia torquata****
Rhipiduridae	Black-and-cinnamon fantail	*Rhipidura nigrocinnamomea**
Rhipiduridae	Philippine pied fantail	*Rhipidura nigritorquis****
Sturnidae	Asian glossy starling	*Aplonis panayensis****
Sturnidae	Coleto	*Sarcops calvus**
Timaliidae	Brown tit-babbler	*Macronus striaticeps**
Turdidae	Island thrush	*Turdus poliocephalus**
Turnicidae	Barred Button quail	*Turnix suscitator****
Tytonidae	Eastern Grass-owl	*Tyto longimembris****
Zosteropidae	Mountain white-eye	*Zosterops japonicus****
Note: (*) means present during Low Rainfall Period; (**) means present during High Rainfall Period; (***) means present in both Period		

Species Diversity

Table 3-32 shows the diversity of species across different locations and times. The data accumulated during the two sampling periods has a criterion ranging from very low to moderate diversity. The number of species identified greatly influences the diversity of the area. Species count or number is directly proportional to the value of H-diversity, the greater number of species the higher H-diversity. Moreover, the table below shows that Transect 9 under low rainfall period has the highest H-diversity with 2.55 which categorized to moderate diversity on Shannon-Weiner index with a total of 17 species, dominance of 9.80% and evenness 75.05%. With the result, it shows that the species are highly distributed and poorly dominated in the area. Dominance

considers both the richness and evenness of the species. Moreover, the evenness in the diversity index presents the degree of evenness on the area composition and richness. It is a measure of biodiversity which quantifies how equal the community is.

Table 3-32. Species Diversity Indices of Avifauna

Transect	Period	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
1	Low-Rainfall Period	15	60	16.83%	59.07%	2.18	Low
	High-Rainfall Period	19	408	29.85%	29.23%	1.71	Very Low
2	Low-Rainfall Period	8	17	16.26%	86.65%	1.94	Very Low
	High-Rainfall Period	13	50	29.04%	44.95%	1.77	Very Low
3	Low-Rainfall Period	3	13	62.13%	66.26%	0.69	Very Low
	High-Rainfall Period	18	124	28.43%	35.89%	1.87	Very Low
4	Low-Rainfall Period	6	6	16.67%	100%	1.79	Very Low
	High-Rainfall Period	14	170	32.29%	33.77%	1.55	Very Low
5	Low-Rainfall Period	2	2	50%	100%	0.69	Very Low
	High-Rainfall Period	17	58	27.23%	43.03%	1.99	Very Low
6	Low-Rainfall Period	10	18	11.73%	91.72%	2.22	Low
	High-Rainfall Period	9	20	29.00%	59.60%	1.68	Very Low
7	Low-Rainfall Period	23	63	9.15%	70.60%	2.79	Moderate
	High-Rainfall Period	13	40	28.63%	46.78%	1.81	Very Low
8	Low-Rainfall Period	11	14	11.22%	91.09%	2.31	Low
	High-Rainfall Period	12	22	27.27%	55.28%	1.89	Very Low
9	Low-Rainfall Period	17	39	9.80%	75.05%	2.55	Moderate
	High-Rainfall Period	9	21	26.98%	62.37%	1.73	Very Low
10	Low-Rainfall Period	21	80	13.28%	54.96%	2.45	Low
	High-Rainfall Period	8	13	25.44%	71.07%	1.74	Very Low
11	Low-Rainfall Period	9	11	12.40%	94.66%	2.15	Low
	High-Rainfall Period	9	47	37.35%	40.40%	1.29	Very Low
12	Low-Rainfall Period	3	3	33.33%	100%	1.1	Very Low
	High-Rainfall Period	4	6	33.33%	86.60%	1.24	Very Low
13	Low-Rainfall Period	11	17	14.88%	79.30%	2.17	Low
	High-Rainfall Period	13	60	32.83%	36.68%	1.56	Very Low
14	Low-Rainfall Period	2	15	68%	82.47%	0.5	Very Low

Transect	Period	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
	High-Rainfall Period	4	6	33.33%	86.60%	1.24	Very Low
15	Low-Rainfall Period	22	110	14.94%	48.25%	2.36	Low
	High-Rainfall Period	19	42	24.38%	46.52%	2.18	Low
16	Low-Rainfall Period	3	7	34.69%	98.06%	1.08	Very Low
	High-Rainfall Period	19	54	26.95%	41.24%	2.06	Low
17	Low-Rainfall Period	3	14	38.78%	90.99%	1	Very Low
	High-Rainfall Period	13	24	27.08%	53.29%	1.94	Very Low
18	Low-Rainfall Period	16	124	20.72%	48.31%	2.05	Low
	High-Rainfall Period	18	80	27.97%	37.54%	1.91	Very Low
19	Low-Rainfall Period	3	38	42.38%	85.56%	0.94	Very Low
	High-Rainfall Period	13	28	27.56%	51.17%	1.9	Very Low
20	Low-Rainfall Period	13	157	24.44%	46.95%	1.81	Very Low
	High-Rainfall Period	28	232	28.50%	25.16%	1.95	Very Low

Relative Abundance

The five most commonly encountered bird species across transects during the low-rainfall period were the Eurasian tree sparrow (*Passer montanus*) with a mean relative abundance of 29.58%, Yellow-vented bulbul (*Pycnonotus goiavier*) at 12.62%, Glossy swiftlet (*Collocalia esculenta*) at 11.01%, Zebra dove (*Geopelia striata*) at 7.05%, and Olive-backed sunbird (*Cinnyris jugularis)* at 4.70% (orange cells **Table 3-33**).

During high rainfall period, the Glossy swiftlet (*Collocalia esculenta*) with a mean relative abundance of 21.46%, Eurasian tree sparrow (*Passer montanus*) at 19.82%, Yellow-vented bulbul (*Pycnonotus goiavier*) at 9.91%, White breasted wood swallow (*Artamus leucoryn*) at 6.56%, and Zebra dove (*Geopelia striata*) at 5.47% were the dominant species (orange cells in **Table 3-33**). The dominance of these birds was greatly influenced by the availability of food items such as in the case of granivores like *Passer montanus* which were common and abundant near rice fields, and *Pycnonotus goiavier* which feeds on nearby fruiting trees[21] [22]

Passer montanus species has an extremely large range from Asia and Europe. The population was suspected to be stable overall in the absence of evidence for any declines or substantial threats. It is found increasingly not only in built-up areas, but also in open arid countries. Their breeding season begins in April or May and goes on to January. Declines in this species in Europe may be a result of changes in agricultural practices such as the increased use of pesticides and herbicides[23]. *Pycnonotus goiavier* is described as common throughout its range and abundant in lowland and mid-altitude areas of Borneo. The population is suspected to be increasing rapidly as this species benefits from deforestation and the creation of artificial habitats[24]. *Collocalia esculenta* global population size has not been quantified, but the species is reported to be

[21] Tanalgo, K. C., Pineda, J. A., Agravante, M. E., & Amerol, Z. M. (2015). Bird Diversity and Structure in Different Land-use Types in Lowland South-Central Mindanao, Philippines. Tropical life sciences research, 26(2), 85–103.
[22] Sekercioglu, C. H. (2012). Bird functional diversity and ecosystem services in tropical forests, agroforests and agricultural areas. Journal of Ornithology, 153(1), 153-161.
[23] BirdLife International. 2017. *Passer montanus*. The IUCN Red List of Threatened Species.2017
[24] BirdLife International. 2016. *Pycnonotus goiavier*. The IUCN Red List of Threatened Species 2016

abundant. The population is suspected to be stable in the absence of evidence for any declines or substantial threats[25]

Table 3-33. Composition and abundance of bird species during the low-rainfall period

Family	Common Name	Scientific Name	Total	RA (%)
Accipitridae	Brahminy kite	*Haliastur indus*	4	0.5
	Philippine serpent-eagle	*Spilornis cheela*	1	0.12
Alcedinidae	Collared Kingfisher	*Todiramphus chloris*	33	4.08
	Southern silvery kingfisher	*Ceyx argentatus*	1	0.12
	White-throated kingfisher	*Halcyon gularis*	9	1.11
Anatidae	Philippine Duck	*Anas luzonica*	1	0.12
Apodidae	Glossy swiftlet	*Collocalia esculenta*	89	11.01
Ardeidae	Cattle egret	*Bubulcus ibis*	14	1.73
Artamidae	White breasted wood swallow	*Artamus leucoryn*	17	2.1
Campephagidae	Pied triller	*Lalage nigra*	2	0.25
Columbidae	Grey-capped emerald dove	*Chalcophaps indica*	3	0.37
	Philippine Cuckoo Dove	*Macropygia tenuirostris*	1	0.12
	White-eared brown dove	*Phapitreron leucotis*	31	3.84
	Zebra dove	*Geopelia striata*	57	7.05
Corvidae	Large-billed crow	*Corvus macrorhynchos*	5	0.62
Cuculidae	Black-faced coucal	*Centropus melanops*	3	0.37
	Philippine coucal	*Centropus viridis*	2	0.25
Dicaeidae	Fire-breasted flowerpecker	*Dicaeum ignipectus*	2	0.25
	Red keeled flowerpecker	*Dicaeum austral*	11	1.36
Estrildidae	Chestnut munia	*Lonchura atricapilla*	5	0.62
Falconidae	Philippine falconet	*Microhierax erythrogenys*	2	0.25
Laniidae	Long-tailed shrike	*Lanius schach*	4	0.5
Locustellidae	Striated grassbird	*Megalurus palustris*	8	0.99
	Tawny grassbird	*Megalurus timoriensis*	1	0.12
Megalaimidae	Coppersmith barbet	*Psilopogon haemacephalus*	6	0.74
Meropidae	Blue-throated bee-eater	*Merops viridis*	10	1.24
Motacillidae	Eastern Yellow Wagtail	*Motacilla flava*	1	0.12
Muscicapidae	Blue-and-white flycatcher	*Cyanoptila cyanomelana*	4	0.5
	Oriental magpie-robin	*Copsychus saularis*	5	0.62
	Pied Buschat	*Saxicola caprata*	1	0.12
Nectariniidae	Brown-throated sunbird	*Anthreptes malacensis*	11	1.36
	Lina's sunbird	*Aethopyga linaraborae*	4	0.5
	Olive-backed sunbird	*Cinnyris jugularis*	38	4.7
Pachycephalidae	White-vented whistler	*Pachycephala homeyeri*	3	0.37
Passeridae	Eurasian tree sparrow	*Passer montanus*	239	29.58
Psittacidae	Philippine hanging parrot	*Loriculus philippensis*	2	0.25
Pycnonotidae	Philippine bulbul	*Hypsipetes philippinus*	11	1.36
	Yellow-vented bulbul	*Pycnonotus goiavier*	102	12.62
Rallidae	Barred rail	*Hypotaenidia torquata*	5	0.62
Rhipiduridae	Black-and-cinnamon fantail	*Rhipidura nigrocinnamomea*	2	0.25
	Philippine pied fantail	*Rhipidura nigritorquis*	11	1.36
Sturnidae	Asian glossy starling	*Aplonis panayensis*	35	4.33
	Coleto	*Sarcops calvus*	2	0.25
Timaliidae	Brown tit-babbler	*Macronus striaticeps*	3	0.37
Turdidae	Island thrush	*Turdus poliocephalus*	1	0.12
Turnicidae	Barred Button quail	*Turnix suscitator*	1	0.12
Tytonidae	Eastern Grass-owl	*Tyto longimembris*	2	0.25
Zosteropidae	Mountain white-eye	*Zosterops japonicus*	3	0.37
Total			**808**	**100.00**

NOTE: RA – relative abundance

[25] BirdLife International. 2020. *Collocalia esculenta*. The IUCN Red List of Threatened Species 2020

Figure 3-40. Relative abundance of Avifaunal species in Low Rainfall Period.

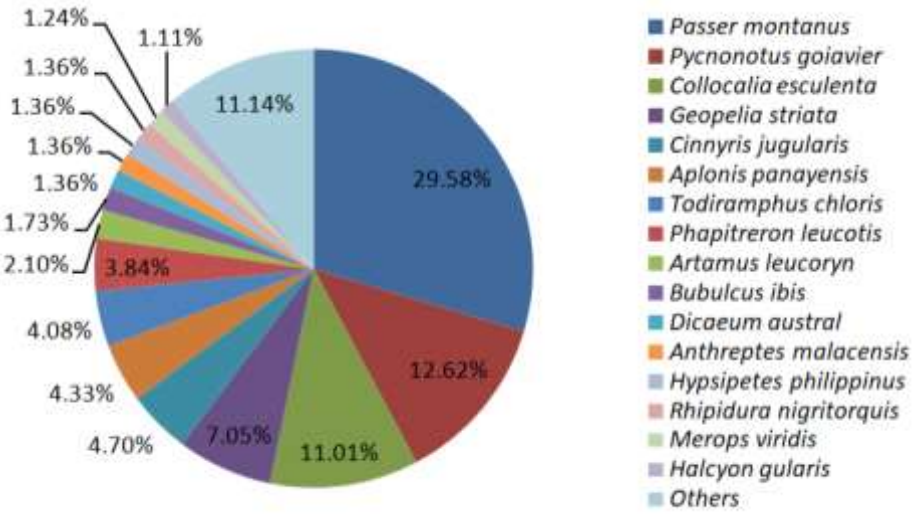


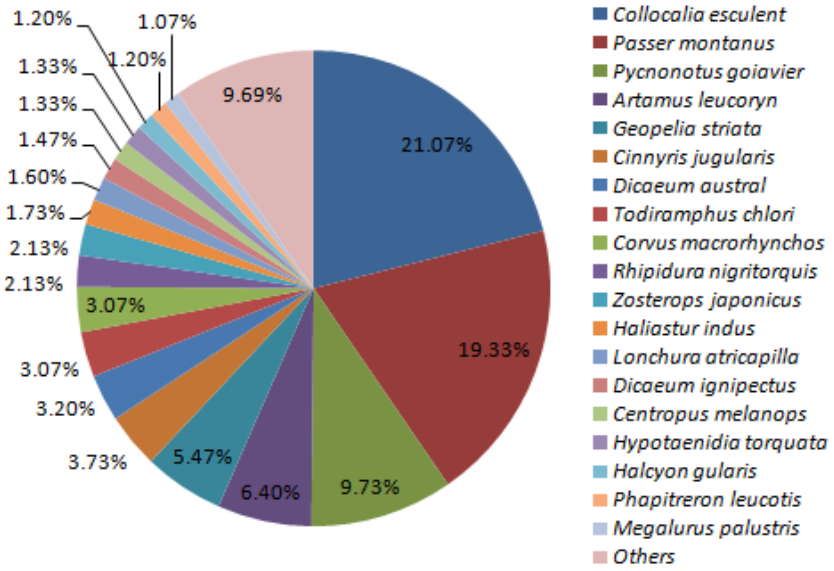
Table 3-34. Composition and abundance of bird species during the high-rainfall period

Family	Common Name	Scientific Name	Total	RA (%)
Accipitridae	Brahminy kite	*Haliastur indus*	13	1.72
	Black-shouldered kite	*Elanus axillaris*	2	0.27
Alcedinidae	Collared Kingfisher	*Todiramphus chloris*	22	2.95
	White-throated kingfisher	*Halcyon gularis*	9	1.24
Apodidae	Fork-tailed swift	*Apus pacificus*	2	0.27
	Glossy swiftlet	*Collocalia esculenta*	157	21.55
	House swift	*Apus nipalensis*	3	0.41
Ardeidae	Cattle egret	*Bubulcus ibis*	2	0.21
Artamidae	White breasted wood swallow	*Artamus leucoryn*	48	6.59
Bucerotidae	Mindanao hornbill	*Penelopides affinis*	1	0.14
Columbidae	Grey-capped emerald dove	*Chalcophaps indica*	2	0.21
	Pied imperial pigeon	*Ducula bicolor*	1	0.07
	Philippine Cuckoo Dove	*Macropygia tenuirostris*	1	0.14
	Red collared dove	*Streptopelia tranquebarica*	2	0.27
	Zebra dove	*Geopelia striata*	40	5.49
	White-eared brown dove	*Phapitreron leucotis*	9	1.17
Corvidae	Large-billed crow	*Corvus macrorhynchos*	22	3.02
Cuculidae	Black-faced coucal	*Centropus melanops*	10	1.37
	Philippine coucal	*Centropus viridis*	1	0.07
Dicaeidae	Fire-breasted flowerpecker	*Dicaeum ignipectus*	11	1.44
	Red keeled flowerpecker	*Dicaeum austral*	23	3.16
Estrildidae	Chestnut munia	*Lonchura atricapilla*	11	1.51
	White-bellied Munia	*White-bellied munia*	2	0.21
Hirundinidae	Barn swallow	*Hirundo rustica*	7	0.89
Laniidae	Long-tailed shrike	*Lanius schach*	4	0.48
Locustellidae	Tawny grassbird	*Megalurus timoriensis*	5	0.69
	Striated grassbird	*Megalurus palustris*	7	0.96
Megalaimidae	Coppersmith barbet	*Psilopogon haemacephalus*	7	0.96
Meropidae	Blue-throated bee-eater	*Merops viridis*	1	0.14
Monarchidae	Black-naped monarch	*Hypothymis azurea*	1	0.14
Muscicapidae	Oriental magpie-robin	*Copsychus saularis*	7	0.96
	Pied Buschat	*Saxicola caprata*	1	0.14
Nectariniidae	Lina's sunbird	*Aethopyga linaraborae*	1	0.14
Nectariniidae	Olive-backed sunbird	*Cinnyris jugularis*	27	3.71

Family	Common Name	Scientific Name	Total	RA (%)
Oriolidae	Black-naped oriole	*Oriolus chinensis*	1	0.14
Passeridae	Eurasian tree sparrow	*Passer montanus*	145	19.9
Psittacidae	Philippine hanging parrot	*Loriculus philippensis*	1	0.14
Psittaculidae	Guaiabero	*Bolbopsittacus lunulatus*	1	0.14
Pycnonotidae	Philippine bulbul	*Hypsipetes philippinus*	7	0.89
	Yellow-vented bulbul	*Pycnonotus goiavier*	73	9.95
Rallidae	Barred rail	*Hypotaenidia torquata*	9	1.24
Rhipiduridae	Philippine pied fantail	*Rhipidura nigritorquis*	15	1.99
Sturnidae	Asian glossy starling	*Aplonis panayensis*	2	0.27
Turnicidae	Barred Button quail	*Turnix suscitator*	3	0.34
Tytonidae	Eastern Grass-owl	*Tyto longimembris*	1	0.14
Zosteropidae	Mountain white-eye	*Zosterops japonicus*	16	2.2
Total			**729**	**100.00**

NOTE: RA – relative abundance

Figure 3-41. Relative abundance of Avifaunal species in High Rainfall Period.



The 808 birds recorded during low-rainfall period sampling (April-May 2021) resolved into 48 species and 32 families comprised of 15 Philippine endemics with three (3) island endemics, 32 resident species, one (1) migratory species, and one (1) introduced. The high-rainfall period sampling (July-August 2021) recorded 732 individuals classified into 47 species and 30 families, with only nine (9) Philippine endemics, one (1) island endemic, eighteen (18) resident species, one (1) migratory, and one (1) introduced.

Philippine endemic species were the Philippine serpent-eagle (*Spilornis cheela*) under family Accipitridae, Philippine Duck (*Anas luzonica*) under Anatidae, White-eared brown dove (*Phapitreron leucotis*) and Philippine Cuckoo Dove (*Macropygia tenuirostris*) under family Columbidae, Black-faced coucal (*Centropus melanops*) and Philippine coucal (*Centropus viridis*) under Cuculidae, Red keeled flowerpecker (*Dicaeum austral*) under Dicaeidae, Philippine falconet (*Microhierax erythrogenys*) under family Falconidae, Yellow-vented bulbul (*Pycnonotus goiavier*), Philippine pied fantail *(Rhipidura nigritorquis*) under Rhipiduridae, Coleto (*Sarcops calvus*) under Sturnidae, and Brown tit-babbler (*Macronus striaticeps*) under family Timaliidae (green cells in **Table 3-35**).

The survey also documented three Mindanao endemics, namely, Southern silvery kingfisher (*Ceyx argentatus*) under family Alcedinidae, Lina's sunbird (*Aethopyga linaraborae*) under Nectariniidae, and Black-and-

cinnamon fantail (*Rhipidura nigrocinnamomea*) under the family Rhipiduridae. New endemic species recorded during the high-rainfall period sampling were the Mindanao tarictic hornbill (*Penelopides affinis*) under the family Bucerotidae, and Guaiabero (*Bolbopsittacus lunulatus*) under family Psittaculidae (yellow cells in **Table 3-35**).

The Mindanao endemic Southern Silvery Kingfisher (*Ceyx argentatus*) is classified as Near Threatened by IUCN and Vulnerable according to DAO 2019-09 (reds cell in **Table 3-35**), while Philippine endemic Philippine Duck (*Anas luzonica*) is classified as Vulnerable both in IUCN and DAO 2019-09 (red cells in **Table 3-35**) and Lina's sunbird (*Aethopyga linaraborae*) as Near Threatened as per IUCN and Vulnerable by DAO 2019-09 (**Table 3-35**). Eurasian tree sparrow *(Passer montanus*) is an introduced species with a conservation status of Least Concern (blue cell in **Table 3-35**).

Table 3-35. Species, endemicity and conservation status of bird species along the CMH alignment[26]

Family	Species	Residency	IUCN Status	DAO 2019-09
Accipitridae	Black-shouldered kite (*Elanus axillaris*)	Mig	LC	NI
	Brahminy kite (*Haliastur indus)*	N	LC	NI
	Philippine serpent-eagle (*Spilornis cheela*)	PE	LC	NI
Alcedinidae	Collared Kingfisher (*Todiramphus chloris*)	N	LC	NI
	Southern silvery kingfisher (*Ceyx argentatus*)	ME	NT	VU
	White-throated kingfisher (*Halcyon gularis*)	PE	LC	NI
Anatidae	Philippine Duck (*Anas luzonica*)	PE	VU	VU
Apodidae	Fork-tailed swift (*Apus pacificus*)	N	LC	NI
	Glossy swiftlet (*Collocalia esculenta*)	N	LC	NI
	House swift (*Apus nipalensis*)	N	LC	NI
Ardeidae	Cattle egret (*Bubulcus ibis*)	N	LC	NI
Artamidae	White breasted wood swallow (*Artamus leucorynchus*)	N	LC	NI
Bucerotidae	Mindanao tarictic hornbill (*Penelopides affinis*)	ME	LC	EN
Campephagidae	Pied triller (*Lalage nigra*)	N	LC	NI
Columbidae	Zebra dove (*Geopelia striata*)	N	LC	NI
	Philippine Cuckoo Dove (*Macropygia tenuirostris)*	PE	LC	NI
	Pied imperial pigeon (*Ducula bicolor*)	N	LC	NI
	Red collared dove (*Streptopelia tranquebarica*)	N	LC	NI
	White-eared brown dove (*Phapitreron leucotis*)	PE	LC	NI
	Grey-capped emerald dove (*Chalcophaps indica*)	N	LC	NI
Corvidae	Large-billed crow (*Corvus macrorhynchos*)	N	LC	NI
Cuculidae	Black-faced coucal (*Centropus melanops*)	PE	LC	NI
	Philippine coucal (*Centropus viridis*)	PE	LC	NI
Dicaeidae	Red keeled flowerpecker (*Dicaeum australe*)	PE	LC	NI
	Fire-breasted flowerpecker (*Dicaeum ignipectus*)	N	LC	NI
Estrildidae	White-bellied Munia (*White-bellied Munia*)	N	LC	NI
	Chestnut munia (*Lonchura atricapilla*)	N	LC	NI
Falconidae	Philippine falconet (*Microhierax erythrogenys*)	PE	LC	NI
Hirundinidae	Barn swallow (*Hirundo rustica*)	N	LC	NI
Laniidae	Long-tailed shrike (*Lanius schach*)	N	LC	NI
Locustellidae	Striated grassbird (*Megalurus palustris*)	N	LC	NI
	Tawny grassbird (*Megalurus timoriensis*)	N	LC	NI
Megalaimidae	Coppersmith barbet (*Psilopogon haemacephalus*)	N	LC	NI
Monarchidae	Black-naped monarch (*Hypothymis azurea*)	N	LC	NI
Meropidae	Blue-throated bee-eater (*Merops viridis*)	N	LC	NI
Monarchidae	Black-naped monarch (*Hypothymis azurea*)	N	LC	NI
Motacillidae	Eastern Yellow Wagtail (*Motacilla flava*)	N	LC	NI
Muscicapidae	Oriental magpie-robin (*Copsychus saularis*)	N	LC	NI

[26] low and high-rainfall periods

Family	Species	Residency	IUCN Status	DAO 2019-09
	Pied Buschat (*Saxicola caprata*)	N	LC	NI
	Blue-and-white flycatcher (*Cyanoptila cyanomelana*)	N	LC	NI
Nectariniidae	Brown-throated sunbird (*Anthreptes malacensis*)	N	LC	NI
	Lina's sunbird (*Aethopyga linaraborae*)	ME	NT	VU
	Olive-backed sunbird (*Cinnyris jugularis*)	N	LC	NI
Oriolidae	Black-naped oriole (*Oriolus chinensis*)	N	LC	NI
Pachycephalidae	White-vented whistler (*Pachycephala homeyeri*)	N	LC	NI
Passeridae	Eurasian tree sparrow (*Passer montanus*)	I	LC	NI
Psittacidae	Philippine hanging parrot (*Loriculus philippensis*)	N	LC	NI
	Guaiabero (*Bolbopsittacus lunulatus*)	ME	LC	NI
Pycnonotidae	Yellow-vented bulbul (*Pycnonotus goiavier*)	N	LC	NI
	Philippine bulbul (*Hypsipetes philippinus*)	E	LC	NI
Rallidae	Barred rail (*Hypotaenidia torquata*)	N	LC	NI
Rhipiduridae	Philippine pied fantail (*Rhipidura nigritorquis*)	PE	LC	NI
	Yellow-vented bulbul (*Pycnonotus goiavier*)	PE	LC	NI
	Black-and-cinnamon fantail (*Rhipidura nigrocinnamomea*)	ME	LC	NI
Sturnidae	Asian glossy starling (*Aplonis panayensis*)	N	LC	NI
	Coleto (*Sarcops calvus*)	PE	LC	NI
Timaliidae	Brown tit-babbler (*Macronus striaticeps*)	PE	LC	NI
Turdidae	Island thrush (*Turdus poliocephalus*)	N	LC	NI
Turnicidae	Barred Button quail (Tur*nix suscitator*)	N	LC	NI
Tytonidae	Eastern Grass-owl (*Tyto longimembris*)	N	LC	NI
Zosteropidae	Mountain white-eye (*Zosterops japonicus*)	N	LC	NI

NOTES: Residency status: I = introduced, N = Native, PE=Philippine endemic, ME=Mindanao endemic, M = migratory. Conservation status: CR = Critically Endangered, EN=Endangered, VU = vulnerable, NT = Near Threatened, and LC = Least concern

Species Presence

Table 3-36 shows the species presence in each transect between two different sampling periods. However, there are only 13 species that were only observed during low rainfall periods. Meanwhile, there are 11 species that were recorded during the high rainfall sampling period.

Table 3-36. Presence of the Identified Avifauna per Station and their Location

Species	Transect																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In etween forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Aethopyga linaraborae	a					b	a													
Anas luzonica															a					
Anthreptes malacensis																				a
Aplonis panayensis	a		b				a		a	a					a	b		a		b
Apus nipalensis				b																b
Apus pacificus	b																			b
Artamus leucoryn	a	ab	b		a		ab			a			a	b	ab		b	a		ab
Bolbopsittacus lunulatus						b														
Bubulcus ibis															a	b				b
Centropus melanops	b	b		b					a						b			a		ab
Centropus viridis	a												a			b				
Ceyx argentatus								a												
Chalcophaps indica	b		b		b			a	a				a							

Species	Transect																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In etween forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Cinnyris jugularis	b	ab	b	ab	b	a	ab	a	a	ab	ab	a	ab		a	b		ab	b	ab
Collocalia esculenta	ab	ab	ab	b	b	b	a	ab	a	ab	b				ab	ab	a	ab	b	ab
Copsychus saularis	b			b		a	b	ab	a	a			b					a		b
Corvus macrorhynchos	b		b						b		b	b	ab		ab	b		b		ab
Cyanoptila cyanomelana						a	a			a			a							
Dicaeum austral	b	b	b	b			a			ab			ab		ab	b		ab	b	b
Dicaeum ignipectus	b				b	b	b	a	b	ab			b		b			b		b
Ducula bicolor																b				
Elanus axillaris																				b
Geopelia striata	ab	b	b	ab	b	a	ab	ab	b	a			b		b	b	ab	a	ab	ab
Halcyon gularis	ab	b		b	b	a	a	b					a					a		
Haliastur indus			b		b		ab	b	a	a		b			b	b	b		b	b
Hirundo rustica		b	b																	b
Hypotaenidia torquata	b	ab			b		a	b	a		b				ab		b	b	b	

Species	Transect																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In etween forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Hypothymis azurea																			b	
Hypsipetes philippinus	b				b	b	a		a	a	a				a	b		b		
Lalage nigra	a										a									
Lanius schach								b		a					b		b	a		ab
Lonchura atricapilla				b			ab	b							b	b	b	b		ab
Loriculus philippensis							a		b											
Macronus striaticeps							a								a					
Macropygia tenuirostris		a																b		
Megalurus palustris	ab	b			b		a	a		a	a				ab	b		b		
Megalurus timoriensis			b								ab				b	b		b		b
Merops viridis	a					a	a		b						a					
Microhierax erythrogenys								a		a										
Motacilla flava											a									

Species	Transect																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In etween forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
Oriolus chinensis																				b
Pachycephala homeyeri																		a		
Passer montanus	ab	ab	ab	b	b	ab	ab	ab	a	a	ab	ab	ab	ab	a	ab	ab	ab	ab	ab
Penelopides affinis							b													
Phapitreron leucotis	a		b		ab	a	a	a	ab	a	a		ab		ab			ab		b
Psilopogon haemacephalus				a	b		ab		b	a					a			b		
Pycnonotus goiavier	ab	ab	b	ab	b	ab	ab	b	a	ab	b		ab	ab	a	ab	b	ab	ab	ab
Rhipidura nigritorquis	ab		b	ab	b		a		a	b					ab	b	b	ab	b	b
Rhipidura nigrocinnamomea																				a
Sarcops calvus		a								a										
Saxicola caprata									a											b
Spilornis cheela									a											
Streptopelia								b									b			

Species	Transect																			
	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20
	Forest Patch	Riparian Forest	Plantation	Plantation	Forest Patch/Plantation	Plantation	Riparian Flora	Riparian Forest	Riparian Forest	Riparian Forest	In etween forest and plantation	Plantation	Riparian Forest	Plantation	Plantation	Farm Field	Plantation/ Farm Field	Riparian Forest	Plantation	Riparian Forest
tranquebarica																				
Todiramphus chloris	ab		ab	ab	b	ab	ab		a	a		a	b		ab	b		ab	b	ab
Turdus poliocephalus															a					
Turnix suscitator													b		ab		b			
Tyto longimembris															a					b
White-bellied Munia			b														b			
Zosterops japonicus									a	a	a		b							
Note: (a) means present in Low Rainfall Period; (b) means present in High Rainfall Period; (ab) means present in both Periods																				

List of Important Species

Appendix 16 shows the list of avifaunal species found across the stations as listed in the IUCN Red List. Avifaunal species were recorded as vulnerable, endangered and near threatened species, according to IUCN and DAO 2019-09, which was observed in the survey. These species were considered as important avifaunal species.

Bats

A total of 71 bats were collected during low rainfall period across 11 stations resolved into five (5) species of fruit bats (*Pteropodidae*) and one (1) species of insect bat (*Hipposideridae*). *Ptenochirus jagori* was the most abundant with a relative abundance of 70.42% followed by *Cynopterus brachyotis* and *Rousettus amplexicaudatus* with relative abundances of 19.72 and 4.23%, respectively. A lone insect bat, *Hipposideros diadema* was also collected. Majority of bats collected had almost 1:1 age and sex ratio.

Table 3-37. Taxonomic Classification of Volant Mammals

Family	Common Name	Scientific Name
Pteropodidae	Greater Musky Fruit Bat	*Ptenochirus jagori****
	Lesser Short-Nosed Fruit Bat	*Cynopterus brachyotis****
	Long-tongued Nectar Bat	*Macroglossus minimus****
	Geoffroy's Rousette	*Rousettus amplexicaudatus****
	Fischer's pygmy Fruit Bat	*Haplonycteris fischeri**
	Lesser Musky Fruit Bat	*Ptenochirus minor***
Hipposideridae	Diadem Leaf-Nosed Bat	*Hipposideros diadema**
Note: (*) means present during Low Rainfall Period; (**) means present during High Rainfall Period; (***) means present in both Period		

Species Diversity

Table 3-38 shows the species diversity between stations in different sampling periods. The data accumulated during the two sampling periods has a criterion ranging from none to very low diversity. The number of species identified greatly influences the diversity of the area. The result shows that the species are highly distributed and averagely to highly dominated the area. Dominance considers both the richness and evenness of the species. Moreover, the evenness in the diversity index presents the degree of evenness on the area composition and richness. It is a measure of biodiversity which quantifies how equal the community is. However, it can be inferred in the table that during high rainfall period it has a higher H-diversity than the low rainfall period.

Table 3-38. Species Diversity Indices of the Stations Established for Volant Mammals

Station	Period	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
1	Low-Rainfall Period	2	6	72.22%	78.46%	0.45	Very Low
	High-Rainfall Period	4	7	30.61%	89.65%	1.27	Very Low
2	Low-Rainfall Period	2	2	50%	100%	0.69	Very Low
	High-Rainfall Period	-	-	-	-	-	-
3	Low-Rainfall Period	2	4	62.5%	87.74%	0.56	Very Low

Station	Period	Species	Individuals	Dominance	Evenness	H-diversity	Criterion
	High-Rainfall Period	4	23	38.37%	75.37%	1.10	Very Low
4	Low-Rainfall Period	0	0	-	-	-	-
	High-Rainfall Period	4	18	30.25%	89.58%	1.28	Very Low
5	Low-Rainfall Period	3	6	50%	79.37%	0.86	Very Low
	High-Rainfall Period	2	8	62.5%	87.74%	0.56	Very Low
6	Low-Rainfall Period	3	12	43.06%	83.51%	0.92	Very Low
	High-Rainfall Period	4	19	45.15%	69.89%	1.03	Very Low
7	Low-Rainfall Period	3	12	43.06%	83.51%	0.92	Very Low
	High-Rainfall Period	3	15	39.56%	91.48%	1.01	Very Low
8	Low-Rainfall Period	1	8	100%	100%	0	None
	High-Rainfall Period	2	5	52%	98.01%	0.67	Very Low
9	Low-Rainfall Period	1	3	100%	100%	0	None
	High-Rainfall Period	3	8	46.88%	82.01%	0.90	Very Low
10	Low-Rainfall Period	1	3	100%	100%	0	None
	High-Rainfall Period	2	3	55.56%	94.46%	0.64	Very Low
11	Low-Rainfall Period	3	15	66.22%	62.44%	0.63	Very Low
	High-Rainfall Period	3	5	36%	95.72%	1.06	Very Low
12	Low-Rainfall Period	-	-	-	-	-	-
	High-Rainfall Period	4	21	50.57%	61.61%	0.90	Very Low
13	Low-Rainfall Period	-	-	-	-	-	-
	High-Rainfall Period	2	11	70.25%	80.33%	0.47	Very Low

Relative Abundance

In the low-rainfall period, *Ptenochirus jagori* was the most abundant with a relative abundance of 70.42% followed by *Cynopterus brachyotis* and *Rousettus amplexicaudatus* with relative abundances of 19.72 and 4.23%, respectively. A lone insect bat, *Hipposideros diadema* was also collected. Majority of bats collected had almost a 1:1 age and sex ratio.

During the high-rainfall period, a total of 144 bats were collected representing 5 under Pteropodidae. Across all sites, *Ptenochirus jagori* was the most abundant bat species with a relative abundance of 55.56% (blue cell in **Table 3-39** followed by *Cynopterus brachyotis* and *Ptenochirus minor* with relative abundances of 20.83 and 12.50% respectively. Majority of bats captured were adults (79.8%) and female (64.9%), suggesting relatively high reproductive capacity. Although this is a widespread and abundant species with large populations, *Ptenochirus jagori* has likely experienced low-level population declines due to forest loss. The species is most common in lowland forest and is also common in secondary forest, often present in cropland and urban parks and residential areas and relatively common in Ultramafic Forest and mangrove forest. This frugivorous tree and cave roosting species which occurs from sea level to at least 1,950 m is abundant in primary forest and

common in secondary forest. *Ptenochirus jagori* is occasionally present in agricultural areas near forest and has been found in degraded habitats[27]

In terms of species endemicity and conservation status, *Ptenochirus jagori, P. minor* and *Haplonycteris fischeri* are Philippine endemics while the rest are native species. All of the bat species were under the least concern category of IUCN and not included in DAO 2019-09.

Figure 3-42. Overall relative abundance of bat species surveyed during the low and high rainfall periods

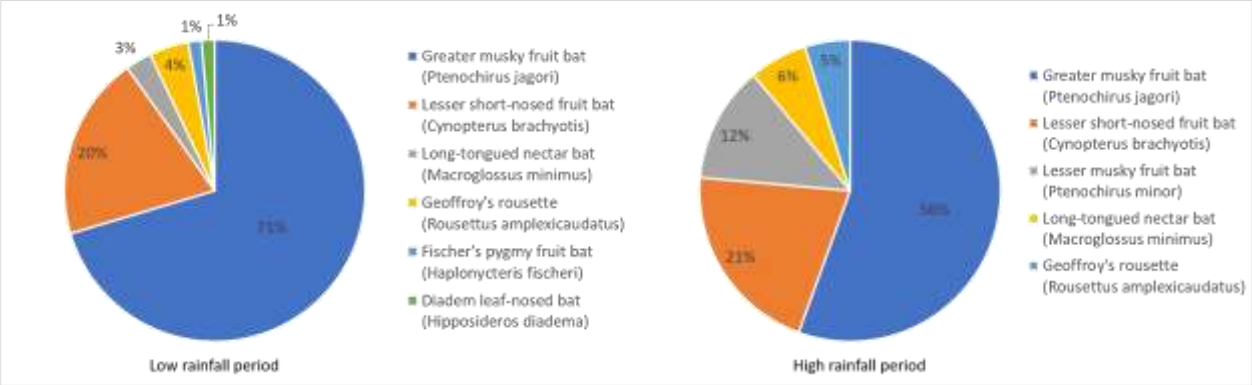


Table 3-39. Composition and abundance of bats species captured across survey sites

Low rainfall period			High rainfall period		
Species name	**Abundance**	**RA (%)**	**Species name**	**Abundance**	**RA (%)**
Ptenochirus jagori	50	70.42	*Ptenochirus jagori*	80	55.56
Cynopterus brachyotis	14	19.72	*Cynopterus brachyotis*	30	20.83
Macroglossus minimus	2	2.82	*Ptenochirus minor*	18	12.50
Rousettus amplexicaudatus	3	4.23	*Macroglossus minimus*	9	6.25
Haplonycteris fischeri	1	1.41	*Rousettus amplexicaudatus*	7	4.86
Hipposideros diadema	1	1.41	**Total**	**144**	**100.00**
Total	**71**	**100.00**			

NOTE: RA – relative abundance

Species Presence

The table below shows the presence of volant species in different stations. The table shows that species *Ptenochirus minor* was only observed in high rainfall sampling period, while *Hipposideros diadema* and *Haploncyteris fischeri* were present in the low rainfall sampling period.

Table 3-40. Species Presence Per Station for Volant Mammals

Common Name	Species Name	Stations												
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13
Greater Musky Fruit Bat	*Ptenochirus jagori*	ab		ab	b	ab	ab	ab	ab	ab	ab	ab	b	b
Lesser Short-Nosed Fruit Bat	*Cynopterus brachyotis*	ab		ab	b		ab	ab	b	b	b	ab	b	b
Long-tongued Nectar Bat	*Macroglossus minimus*			b		a	b					a	b	
Geoffroy's	*Rousettus*	b		b	b	a	ab	a				b	b	

[27] Alviola, P.A. et al. 2021. Ptenochirus jagori. The IUCN Red List of Threatened Species 2021

Common Name	Species Name	Stations												
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13
Rousette	*amplexicaudatus*													
Fischer's pygmy Fruit Bat	*Haplonycteris fischeri*		a											
Lesser Musky Fruit Bat	*Ptenochirus minor*	b			b	b	b	b		b				
Diadem Leaf-Nosed Bat	*Hipposideros diadema*		a											
Note: (a) means present in Low Rainfall Period; (b) means present in High Rainfall Period; (ab) means present in both Periods														

Conservation Status and Endemicity

In terms of species endemicity and conservation status, *Ptenochirus jagori, P. minor* and *Haplonycteris fischeri* are Philippine endemics while the rest are native species. All the bat species were under the least concern category of IUCN and not included in DAO 2019-09.

Table 3-41. Species, endemicity and conservation status of bat species across survey sites

Family	Common Name	Scientific name	Residency	IUCN Status	DAO 2019-09
Pteropodidae	Greater musky fruit bat	*Ptenochirus jagori*	PE	LC	NI
	Lesser short-nosed fruit bat	*Cynopterus brachyotis*	N	LC	NI
	Long-tongued nectar bat	*Macroglossus minimus*	N	LC	NI
	Geoffroy's rousette	*Rousettus amplexicaudatus*	N	LC	NI
	Fischer's pygmy fruit bat	*Haplonycteris fischeri*	PE	LC	NI
	Lesser musky fruit bat	*Ptenochirus minor*	PE	LC	NI
Hipposideridae	Diadem leaf-nosed bat	*Hipposideros diadema*	N	LC	NI

NOTES: Residency status: N - native, PE - Philippine endemic, Conservation status: LC - Least concern, NI- not included

Herpetofauna – A total of eight (8) species were recorded belonging to seven (7) families of which three (3) species were observed in two rainfall periods. These are frogs or toads such as *Rhinela marina, Limnonectes mangnus* and *Kaloula pulchra.* However, 4 species were only observed during the high rainfall period, which comprises snakes and toads. The table below shows the species composition present in different rainfall periods.

Table 3-42. Taxonomic Classification of the Herpetofauna Present in the Project Area

Family	Common Name	Scientific Name
Bufonidae	Cane Toad	*Rhinela marina****
Ceratobatrachidae	Platymantis	*Platymantis* sp**
Dicroglossidae	Giant Philippine Frog	*Limnonectes mangnus****
Megaphrydae	Mindanao Horned Frog	*Megophrys stejnegeri***
Microhyalidae	Painted Narrowmouth Toad	*Kaloula picta***

Family	Common Name	Scientific Name
	Banded Bullfrog	*Kaloula pulchra****
Colubridae	Rat Snake	*Coelagnathus* sp.**
Varanidae	Yellow Headed Water Monitor	*Varanus cumingi***
Note: (*) means present during Low Rainfall Period; (**) means present during High Rainfall Period; (***) means present in both Period		

Relative Abundance
The 34 frogs collected during the low rainfall period and resolved into 3 families and 3 species was dominated by *Limnonectes magnus* with a relative abundance of 70.59% (**Table 3-44**).

During high rainfall season, total frog captures were also dominated by *Limnonectes magnus* with a relative abundance of 53.33% (blue cell in **Table 3-44**) followed by *Rhinela marina* at 33.33%. Other herpetofauna captured were three (3) individuals of *Coelognathus* sp. and one (1) individual of *Varanus cumingi* both captured during high-rainfall period. Frog abundance and diversity across all sites were very low and high poaching pressure for the edible *Limnonectes magnus.*

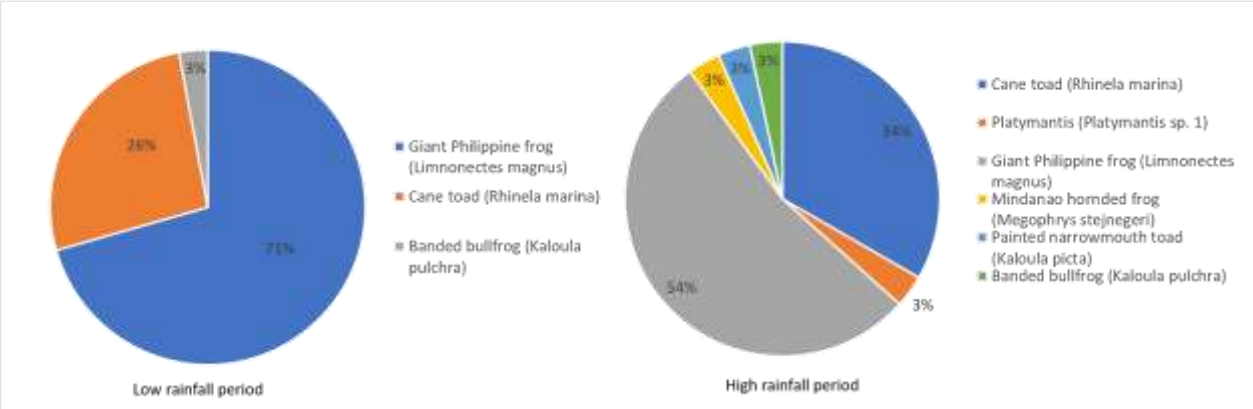
Limnonectes magnus species complex is found on Mindanao, Basilan, Bohol, Camiguin, Samar and Leyte Islands in the Philippines. It is common to very common where its habitat remains intact, although some subpopulations are in decline because of over-exploitation. It inhabits undisturbed and disturbed streams and rivers in lower montane and lowland forests. It breeds and deposits egg clutches in quiet side pools of forested riverine habitats. Due to its large size, the species is collected in large numbers for human consumption, which may pose a threat to the overall population. On Mindanao, the major threat is the destruction and conversion of both lowland and montane rainforest habitat due to small-scale agricultural activities, large-scale oil palm plantations, wood collection for charcoal production, and expanding human settlements[28]

With regards to frog species endemicity, the *Megophrys stejnegeri* and *Kaloula picta* are Philippine endemics while *Limnonectes magnus* and *Varanus cumingi* is a Mindanao endemic. However, *Kaloula pulchra* and *Rhinela marina* are considered as introduced and invasive species. In terms of conservation status, *Limnonectes magnus* is under Near Threatened category under IUCN and Other Threatened Species (red cells in **Table 3-46**) as per DAO 2019-09 with the rest under Least Concern and not included in DAO 2019-09.

Conservation Status and Endemicity
With regards to frog species endemicity, the *Megophrys stejnegeri* and *Kaloula picta* are Philippine endemics while *Limnonectes magnus* and *Varanus cumingi* are Mindanao endemic. However, *Kaloula pulchra* and *Rhinela marina* are considered as introduced and invasive species. In terms of conservation status, *Limnonectes magnus* is under Near Threatened category under IUCN and Other Threatened Species as per DAO 2019-09 with the rest under Least Concern and not included in DAO 2019-09.

[28] IUCN SSC Amphibian Specialist Group. 2020. Limnonectes magnus (amended version of 2019 assessment). The IUCN Red List of Threatened Species 2020

Figure 3-43. Overall relative abundance of frog species during low and high rainfall periods



Species Presence

Table 3-43 shows the occurrences or presence of herpetofauna observed in different stations between the two rainfall periods. The table shows that the species *Platymantis* sp was only observed in Station 7. As well as the species *Megophrys stejnegeri, Kaloula picta. Kaloula pulchra* and *Varanus cumingi* were observed at stations 6, 7, 8 and 4 alone, respectively. However, it can also be observed that there are no species that were present in the same station for two rainfall periods. Consequently, there are certain stations in which this species favors the vegetation and food availability during such rainfall period.

Table 3-43. Species Presence of Herpetofauna

Species Name	Stations												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Rhinela marina	b	a	b		a				a	a	a	a	
Platymantis sp.							b						
Limnonectes mangnus	b	a	a	b				a	b	b	b	b	
Megophrys stejnegeri						b							
Kaloula picta							b						
Kaloula pulchra								b					
Coelagnathus sp.								b			b		b
Varanus cumingi				b									
Note: (a) means present in Low Rainfall Period; (b) means present in High Rainfall Period; (ab) means present in both Periods													

Table 3-44. Composition and abundance of frog species captured

Low rainfall period			High rainfall period		
Species name	**Abundance**	**RA (%)**	**Species name**	**Abundance**	**RA (%)**
Kaloula pulchra	1	2.94	*Rhinela marina*	10	33.33
Limnonectes magnus	24	70.59	*Platymantis* sp. 1	1	3.33
Rhinela marina	9	26.47	*Limnonectes magnus*	16	53.33
Total	**34**	**100.00**	*Megophrys stejnegeri*	1	3.33
NOTE: RA – relative abundance			*Kaloula picta*	1	3.33
			Kaloula pulchra	1	3.33
			Total	**30**	**100.00**

Table 3-45. Composition and abundance of other herpetofauna captured (high rainfall)

Family	Common Name	Scientific Name	Abundance	RA (%)
Colubridae	Rat snake	*Coelognathus sp.*	3	75.00
Varanidae	Yellow headed water monitor	*Varanus cumingi*	1	25.00
Total			**4**	**100.00**

Conservation Status and Endemicity

With regards to frog species endemicity, the Megophrys stejnegeri and Kaloula picta are Philippine endemics while Limnonectes magnus and Varanus cumingi are Mindanao endemic. However, Kaloula pulchra and Rhinela marina are considered as introduced and invasive species. In terms of conservation status, Limnonectes magnus is under Near Threatened category under IUCN and Other Threatened Species as per DAO 2019-09 with the rest under Least Concern and not included in DAO 2019-09.

Table 3-46. Species, endemicity and conservation status of herpetofauna across survey sites

Family	Common Name	Scientific name	Residency	IUCN	DAO 2019-09
Bufonidae	Cane toad	*Rhinela marina*	I	LC	NI
Ceratobatrachidae	Platymantis	*Platymantis* sp. 1	-	-	-
Dicroglossidae	Giant Philippine frog	*Limnonectes magnus*	ME	NT	OTS
Megophrydae	Mindanao horned frog	*Megophrys stejnegeri*	PE	LC	NI
Microhyalidae	Painted Narrowmouth Toad	*Kaloula picta*	PE	LC	NI
	Banded Bullfrog	*Kaloula pulchra*	I	LC	NI
Colubridae	Rat snake	*Coelognathus sp.*	-	-	-
Varanidae	Yellow headed water monitor	*Varanus cumingi*	ME	LC	NI

NOTES: Residency status: I = introduced, PE=Philippine endemic, ME=Mindanao endemic; Conservation status: LC = Least concern, NT=Near Threatened, NI= not included, OTS=Other Threatened Species

List of Important Species

In this report, only species *Limnonectes magnus* was recorded as Near threatened by IUCN and Other Threatened species in DAO 2019-09**. Appendix 24** shows the details of the important species.

Small Mammals **–** There are 3 species of non-volant mammals recorded in the report that belonged to only one family- Muridae. Furthermore, only *Rattus tanezumi* was observed in two rainfall sampling period, while *Rattus norvegicus* and *Rattus rattus* was only observed during high rainfall period.

Table 3-47. Taxonomic Classification of Small Mammals

Family	Common Name	Scientific Name
Muridae	Brown Rat	*Rattus norvegicus***
	Asian House Rat	*Rattus tanezumi****
	Black Rat	*Rattus rattus***
Note: (*) means present during Low Rainfall Period; (**) means present during High Rainfall Period; (***) means present in both Period		

Relative Abundance

Only one rodent (*Rattus tanezumi*) was captured during low-rainfall survey (orange cell in **Table 3-48**) while three species were recorded during high-rainfall period where the *Rattus norvegicus ad* a relative abundance of 50% and *Rattus tanezumi* and *Rattus rattus* both with 25% each. All murid species collected were introduced species and considered as pests in households and agricultural areas.

Figure 3-44. Relative Abundance of Non-volant Mammals in Low-rainfall and High-rainfall Period

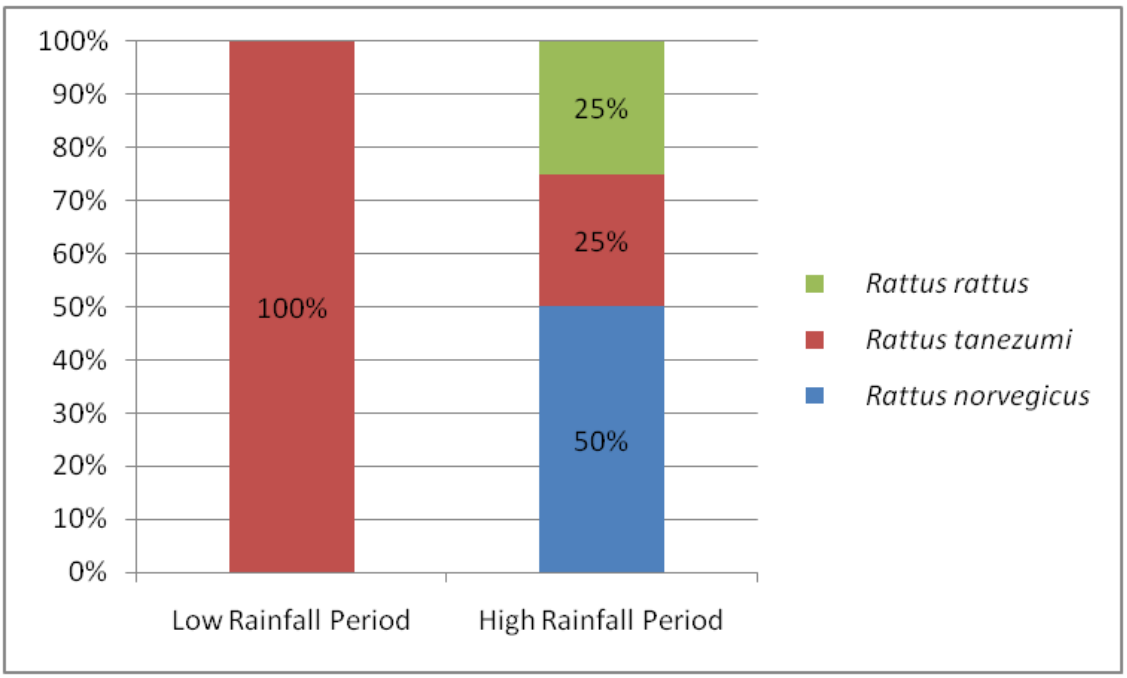
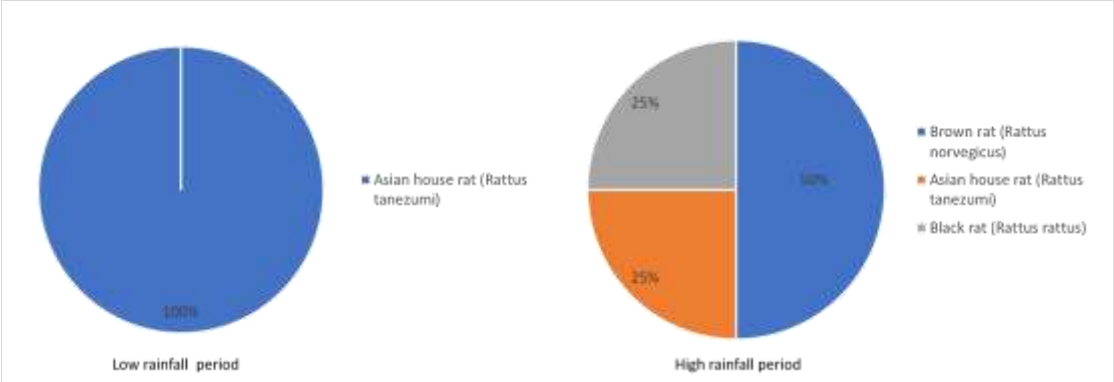


Table 3-48. Composition and abundance of murid species captured (high rainfall)

Low rainfall period			High rainfall period		
Species name	**Abundance**	**RA (%)**	**Species name**	**Abundance**	**RA (%)**
Rattus tanezumi	1	100.00	*Rattus norvegicus*	2	50
Total	*1*	**100.00**	*Rattus tanezumi*	1	25
			Rattus rattus	1	25
			Total	**4**	**100.00**

NOTE: RA – relative abundance

Figure 3-45. Overall relative abundance of non-volant mammals during low and high rainfall periods



Conservation Status and Endemicity
All murid species collected were introduced species and considered as pests in households and agricultural areas.

Table 3-49. Species, endemicity and conservation status of murid species across survey sites

Common Name	Scientific name	Residency	IUCN	DAO 2019-09
Brown rat	*Rattus norvegicus*	I	LC	NI
Asian house rat	*Rattus tanezumi*	I	LC	NI
Black rat	*Rattus rattus*	I	LC	NI

Insects - A total of 109 individuals under 26 genera belonging to seven Orders of insects were recorded during low rainfall period sampling and 100 individuals in 24 genera representing 8 orders were recorded during the high rainfall period (**Table 3-50**). All the insects identified and recorded in the project area were not classified as threatened species according to DAO 2019-09, which presents the 'Updated National List of Threatened Philippine Fauna and Other Categories'.

Table 3-50. Taxonomic Classification of the Insect Identified within the Project Area

Order	Common Name	Family/ Scientific Name
Blattodea	Roach	*Blattodea***
Coleoptera	Metallic flea beetle	*Alticini sp.****
Coleoptera	Jewel beetle	*Buprestidae**
Coleoptera	Tortoise beetle	*Cassidinae**
Coleoptera	Leaf beetle	*Chrysomelidae****
Coleoptera	Long nose weevil	*Rhinotia sp.**
Coleoptera	Asian lady beetle	*Harmonia sp.****
Coleoptera	Firefly	*Lampyridae****
Coleoptera	Broad nose weevil	*Curculionidae****
Coleoptera	Long horn beetle	*Oberea nigriventis****

Order	Common Name	Family/ Scientific Name
Coleoptera	Tiger beetle	*Neocollyris sp.***
Coleoptera	Tiger Beetles	*Cicindelinae***
Coleoptera	Weevil	*Pseudapocyrtus sp.****
Diptera	Mosquito hawk	*Tipulidae**
Hemiptera	Red cotton stainer	*Dysdercus cingulatus****
Hemiptera	Assasin bug	*Rhynocoris iracundus***
Hemiptera	Kissing bug	*Triatominae***
Hymenoptera	Carpenter ant	*Camponotus**
Hymenoptera	Yellow spotted mason wasp	*Odynerus bicinctus**
Hymenoptera	Velvet ant	*Mutillidae***
Lepidoptera	Common grass yellow	*Eurema hecabe**
Lepidoptera	Blue moon butterfly	*Hypolimas bolina philippinensis**
Lepidoptera	Metalmark moths	*Choreutidae***
Lepidoptera	Scarlet Mormon	*Papilio rumanzovia***
Lepidoptera	Common Mormon	*Papilio polytes alphenor***
Odonata	Dancer Damselfly	*Argia sp.**
Odonata	Ebony jewel wing	*Calopteryx maculata**
Odonata	Blue ground Skimmer	*Diplacodes trivialis****
Odonata	Crimson marsh glider	*Trithemis aurora***
Odonata	Green skimmer	*Orthetrum serapia***
Odonata	Red parasol dragonfly	*Neurothermis terminata**
Odonata	Slender skimmer	*Orthetrum sabina sabina****
Odonata	Black bambootail damselfly	*Prodasineura verticalis**
Odonata	Jewel damselfly	*Rhinocypha colorata****
Odonata	Red-veinted darter dragonfly	*Sympetrum fonscolombii**
Odonata	Pigmy skimmer dragonfly	*Tetrathemis platyptera**
Orthoptera	Grasshopper	*Caelifera****
Phasmatodea	Stick insect	*Phasmatodea***
Note: (*) means present during Low Rainfall Period; (**) means present during High Rainfall Period; (***) means present in both Period		

Species Diversity

Table 3-51 displays the variation in species diversity across stations during different sampling periods. The data collected during these periods indicates a range of diversity from none to very low. Based on the results, it is evident that the species are widely distributed due to its high evenness and less likely to dominate the area. However, the data shows no relationship with H-diversity between two sampling periods.

Table 3-51. Species Diversity Indices Per Station Established for Insects

Station	Period	Family/Species	Individuals	Dominance	Evenness	H-diversity	Criterion
1	Low-Rainfall Period	6	7	18.37%	95.71%	1.74	Very Low
	High-Rainfall Period	-	-	-	-	-	-
2	Low-Rainfall Period	-	-	-	-	-	-
	High-Rainfall Period	7	11	15.7%	94.92%	1.89	Very Low
3	Low-Rainfall Period	6	19	39.06%	59.01%	1.26	Very Low
	High-Rainfall Period	1	7	100%	100%	0	None
4	Low-Rainfall Period	5	10	26%	82.85%	1.60	Very Low
	High-Rainfall Period	4	13	32.54%	85.61%	1.23	Very Low
5	Low-Rainfall Period	3	4	37.5%	94.28%	1.04	Very Low
	High-Rainfall Period	2	5	68%	82.47%	0.50	Very Low
6	Low-Rainfall Period	7	10	22%	82.05%	1.75	Very Low
	High-Rainfall Period	5	7	26.53%	87.43%	1.47	Very Low
7	Low-Rainfall Period	7	11	17.36%	90.51%	1.85	Very Low
	High-Rainfall Period	5	14	38.78%	67.43%	1.22	Very Low
8	Low-Rainfall Period	7	14	20.41%	83.63%	1.77	Very Low
	High-Rainfall Period	7	11	19.01%	86.31%	1.80	Very Low
9	Low-Rainfall Period	6	10	20%	90.84%	1.70	Very Low
	High-Rainfall Period	5	8	25%	89.11%	1.49	Very Low
10	Low-Rainfall Period	3	7	38.78%	90.99%	1.00	Very Low
	High-Rainfall Period	7	10	18%	89.45%	1.83	Very Low
11	Low-Rainfall Period	9	16	28.13%	62.85%	1.73	Very Low
	High-Rainfall Period	6	14	25.51%	80.44%	1.57	Very Low

Relative Abundance

Terrestrial insects under Order *Coleoptera* were the most dominant taxa in both low and high rainfall sampling with a mean relative abundance of 66.67% and 79% of the total population, respectively (orange and blue cells in **Table 3-52** followed by order *Odonata* with a mean relative abundance of 19.44 and nine

percent during the low- and high rainfall periods. Other major groups of terrestrial insects were poorly represented in both low and high rainfall period with a mean relative abundance of below 5 percent each.

Broad-nose weevils (*Curculionidae*) of order *Coleoptera* were the most dominant species (30 individuals) representing 28 percent mean relative abundance (orange cell in **Table 3-53**) of the total population during the low rainfall period and a mean relative abundance of 34% in high rainfall period (blue cell in **Table 3-54**). This species was the most common across survey sites and occurs conspicuously in groups. Moreover, the top five most abundant species in the low and high rain periods were all from Order *Coleoptera*. Data further suggested a low diverse terrestrial insect community throughout the sampling periods essentially dominated by broad-nose weevils (*Curculionidae*). As the largest group in the *Coleoptera*, *Curculionidae* are common in the Philippines (Bacras et al., 2021).

Table 3-52. Composition and abundance of insect Orders captured

Low rainfall			High rainfall		
Order	**Abundance**	**RA (%)**	**Order**	**Abundance**	**RA (%)**
Coleoptera	73	66.67	Coleoptera	79	79.00
Odonata	21	19.44	Odonata	9	9.00
Lepidoptera	4	3.7	Lepidoptera	4	4.00
Orthoptera	4	3.7	Orthoptera	1	1.00
Hemiptera	3	2.78	Hemiptera	4	4.00
Hymenoptera	3	2.78	Hymenoptera	1	1.00
Diptera	1	0.93	Phasmatodea	1	1.00
Total	**109**	**100.00**	Blattodea	1	1.00
			Total	**100**	**100.00**

NOTE: RA – relative abundance

Table 3-53. Composition and abundance of terrestrial insects captured (low rainfall)

Order	Common Name	Scientific name	Abundance	RA (%)
Coleoptera	Metallic flea beetle	*Alticini sp.*	7	6.42
	Jewel beetle	Buprestidae	1	0.92
	Tortoise beetle	Cassidinae	2	1.83
	Leaf beetle	Chrysomelidae	6	5.50
	Long nose weevil	*Rhinotia sp.*	12	11.01
	Asian lady beetle	*Harmonia sp.*	4	3.67
	Firefly	Lampyridae	4	3.67
	Broad nose weevil	Curculionidae	30	27.52
	Long horn beetle	*Oberea nigriventis*	2	1.83
	Weevil	*Pseudapocyrtus sp.*	4	3.67
Diptera	Mosquito hawk	Tipulidae	1	0.92
Hemiptera	Red cotton stainer	*Dysdercus cingulatus*	3	2.75
Hymenoptera	Carpenter ant	Camponotus	1	0.92
	Yellow spotted mason wasp	*Odynerus bicinctus*	2	1.83
Lepidoptera	Common grass yellow	*Eurema hecabe*	1	0.92
	Blue moon butterfly	*Hypolimas bolina philippinensis*	3	2.75
Odonata	Dancer Damselfly	*Argia sp.*	1	0.92
	Ebony jewel wing	*Calopteryx maculata*	4	3.67
	Blue ground Skimmer	*Diplacodes trivialis*	1	0.92
	Red parasol dragonfly	*Neurothermis terminata*	2	1.83
	Slender skimmer	*Orthetrum sabina sabina*	1	0.92
	Black bambootail	*Prodasineura verticalis*	2	1.83

Order	Common Name	Scientific name	Abundance	RA (%)
	damselfly			
	Jewel damselfly	*Rhinocypha colorata*	6	5.50
	Red-veinted darter dragonfly	*Sympetrum fonscolombii*	3	2.75
	Pigmy skimmer dragonfly	*Tetrathemis platyptera*	1	0.92
	Grasshopper	Caelifera	4	3.67
	Total		**109**	**100.00**

NOTE: RA – relative abundance

Table 3-54. Composition and abundance of terrestrial insects captured (high-rainfall)

Order	Common Name	Scientific Name	Abundance	RA (%)
Blattodea	Roach	Blattodea	1	1
Coleoptera	Asian lady beetle	*Harmonia sp.*	8	8
	Broad nose weevil	Curculionidae	34	34
	Firefly	Lampyridae	3	3
	Leaf beetle	Chrysomelidae	6	6
	Long horn beetle	Cerambycidae	2	2
	Metallic flea beetle	*Alticini sp.*	8	8
	Tiger beetle	*Neocollyris sp.*	1	1
	Tiger beetle	Cicindelinae	3	3
	Weevil	*Pseudapocyrtus sp.*	14	14
Hemiptera	Assasin bug	*Rhynocoris iracundus*	1	1
	Kissing bug	Triatominae	1	1
	Red cotton stainer	*Dysdercus cingulatus*	2	2
Hymenoptera	Velvet ant	Mutillidae	1	1
Lepidoptera	Common Mormon	*Papilio polytes alphenor*	2	2
	Metalmark moths	Choreutidae	1	1
	Scarlet Mormon	*Papilio rumanzovia*	1	1
Odonata	Blue ground Skimmer	*Diplacodes trivialis*	2	2
	Crimson marsh glider	*Trithemis aurora*	3	3
	Green skimmer	*Orthetrum serapia*	2	2
	Jewel damselfly	*Rhinocypha colorata*	1	1
	Slender skimmer	*Orthetrum sabina sabina*	1	1
Orthoptera	Grasshopper	Caelifera	1	1
Phasmatodea	Stick insect		1	1
Total			**100**	**100**

NOTE: RA – relative abundance

Figure 3-46. Overall relative abundance of terrestrial insect order

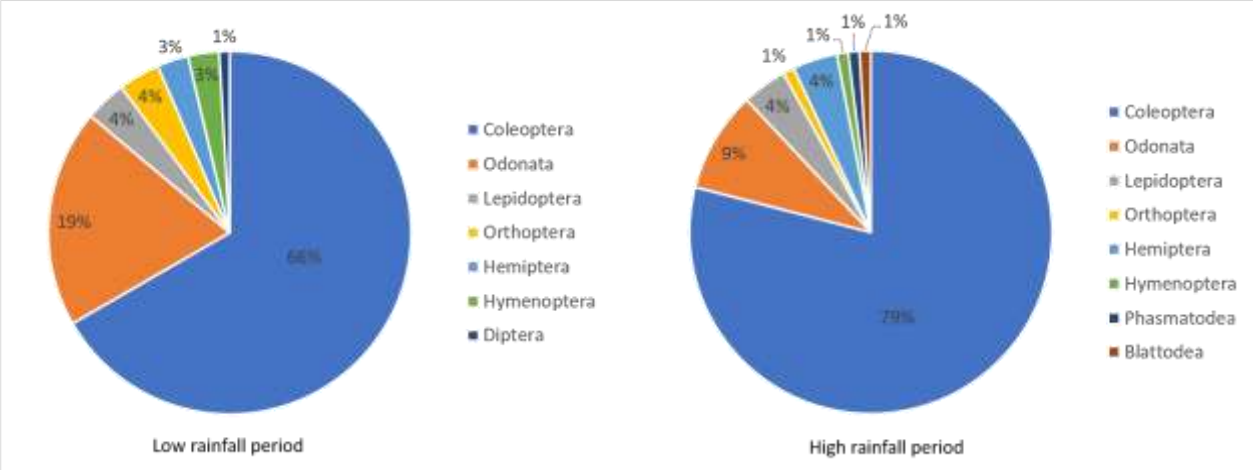
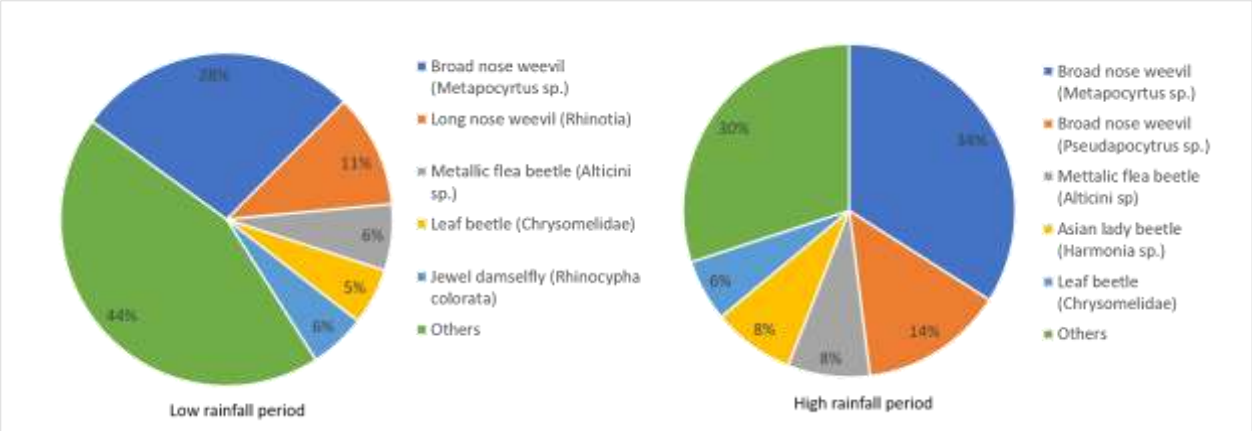


Figure 3-47. Overall relative abundance of dominant terrestrial insect species



3.1.4.4.3 Hindrance to wildlife access

Ecologically significant areas are the limited remnant forest patches in riparian zones surrounded or interspersed with small farms. The entire stretch of the proposed CMH alignment is highly disturbed following massive conversion to agricultural areas, thus there will be no hindrance to wildlife access that will be affected by the Project.

Murid species recorded were considered as pests. No large mammals were documented, e.g., highly mobile species, Philippine macaques, wild pigs, and deers, whose mobility or habitat access might be limited by the Project. According to the interview with Philippine Haribon Foundation, the known nesting habitats of the Philippine Eagle were mostly in Mt. Tago and Mt. Kitanglad and were also remotely located to be affected by the Project. However, the Project cuts across a portion of the Kulaman River in Poblacion Sumilao, a known staging area of Philippine eagle juveniles in search of territories.

3.1.4.5 Proposed mitigation measures

3.1.4.5.1 Vegetation removal and loss of habitat

Direct impacts of road construction refer to the physical changes and disturbances that occur in the natural environment because of the construction activities. This includes habitat loss or fragmentation, soil erosion and vegetation removal. Indirect impacts may not become evident until some time after construction has

been completed. However, mitigating measures for both direct and indirect impacts are provided in the discussion below.

The proposed CMH alignment will cut across vast agricultural areas affecting existing orchards and plantations (tree and pineapple). As such, the majority of trees that will be removed during road construction are orchard/plantation species and cash crops like corn and vegetables. Vegetation clearing will be involved prior to the road construction which can result in loss of habitat and decrease in biodiversity.

Pre-construction – It is necessary to consider the locations of significant vegetation types and populations during Project design. A complete census of flora in the planned development areas must be conducted to determine the number and species of vegetation that will be affected followed by securing a Tree Cutting/Earth-balling Permit from the DENR. Establishment of buffer zone with widths around ecologically sensitive areas, especially the area near the foot of Mount Tago, which is approximately 950 meters from the proposed alignment will be part of the mitigating measures. Buffer zones are determined based on the sensitivity of vegetation areas, wildlife habitats, and riparian zones, with an approximate buffer zone width of 100 meters. Non-sensitive areas, on the other hand, can accommodate buffer zone widths of approximately 10 to 20 meters.

Construction – Roads can act as barriers that fragment habitats, making it difficult for plants to disperse and colonize new areas which may eventually make the plant populations more vulnerable to disease, pests and other threats. Earthworks and rock excavations during construction can lead to increased soil erosion. Soil erosion can result in the loss of valuable topsoil which is important for plant growth. Emissions from vehicles and heavy machines during construction of road infrastructure.

Generation of dust may occur during construction activities due to the removal of vegetation and disturbance to the topsoil, vehicle movements on unsealed roads and wind dispersion of stockpile materials. This may affect the transpiration and photosynthesis which can cause smothering of vegetation. Key important species for both flora and fauna might be affected. The following measures are recommended to minimize the impacts of vegetation removal.

Avoidance of unnecessary tree cutting. If tree cutting is required, secure a tree cutting permit from DENR and DPWH. Replacement of cut trees will be in accordance with DENR Memorandum Order (DMO) 2012-02. Create and provide an infrastructure plan with tree charting indicating the geotagged location of individual trees affected by the project. Regular inspections will be carried out to ensure that vegetation is cleared and stockpiled in the appropriate locations, that no necessary flora is impacted, and that the relevant databases are kept up to date. Stockpiles should be appropriately shaped and compacted to avoid erosion and sedimentation of nearby open water courses or drains. Incorporating green infrastructure into road and highway design can help to mitigate the impacts of roads on terrestrial flora. For example, roadside vegetation can act as wildlife corridors, and permeable surfaces can help to reduce runoff and soil erosion. Reroute the alignment of highways to avoid hitting the Key Biodiversity Area and disturbing key important species.

3.1.4.5.2 Threat to existence, abundance, frequency and distribution of important species

Construction – Sapling collection of endangered, vulnerable and other threatened species such as *Vitex parviflora* (Endangered), *Pterocarpus indicus* (Vulnerable), *Shorea contorta* (Vulnerable), *Azadirachta excelsa* (Vulnerable), *Canarium ovatum* (Other Threatened Species), and *Cinnamommum mercadoi* (Other Threatened Species), hardening in established nurseries, and transpplanting the hardened saplings in target reforestation areas. It is also necessary to implement a *"no hunting, no collection"* policy on wildlife during the construction.

It is imperative to institutionalize the practice of reforesting road buffer zones with native trees and integrate substantial reforestation funding in the overall road construction budget. Reforestation of the buffer lanes on

both sides of the road with native species should be a default mitigation plan for road projects to protect local indigenous species of trees and enhance vegetation cover.

3.1.4.5.3 Hindrance to wildlife access

Despite the fact that the stretch of the Project alignment is highly disturbed following massive conversion to agricultural areas, reforestation of riparian zones with native species will improve riparian ecology and enhance habitat access and utilization and minimize hindrance of wildlife access. Even though there is a little possibility of the occurrence of road killings of wildlife, walls should be installed on both sides of the project alignment. Speed limits during the construction phase should be implemented.

Unnatural lighting effects that may impact upon flora and fauna or deplete the sense of naturalness of the area. This can negatively impact insects and animals through attraction and disorientation or by disrupting their natural habitats. Artificial nighttime lighting is thought to reduce occupancy of habitat areas adjacent to roadways for some species and may decrease use of wildlife crossing structures. Additionally, nighttime lighting attracts insects and may indirectly lead to increased road mortality for bats and other insectivorous animals. Among the possible management options to reduce the effect of light pollution at night is the reduction of light intrusion by modifying the height of streetlamps, lighting intensity, spectral composition.

In addition, the establishment of underpasses or box culverts may be considered a critical mitigating measure to protect wildlife and promote ecological connectivity. Road alignment can act as a physical barrier, hindering the movement of wildlife and disrupting their natural migration patterns. Also, by providing underpasses or box culverts, the chances of wildlife-vehicle collisions will be greatly reduced, ensuring safer roads.

3.1.4.5.4 Invasion of weed species and loss of important local species

Roads can act as corridors for invasive plant species, which can quickly spread into new areas and outcompete native plant species. This can lead to the displacement of native flora and a reduction in biodiversity. One of the most effective ways to mitigate the impacts of roads on terrestrial flora is to restore habitats that have been disturbed or destroyed during construction. This can involve replanting native species, removing invasive species, and restoring natural water flows. Site nurseries in partnership with the Barangay LGU are recommended to establish in accessible locations to serve as repositories of recovered saplings of forest trees when vegetation removal becomes inevitable. After saplings are hardened in nurseries, saplings will be transferred to highly impacted areas, especially riparian zones. The development activities must also be limited within the planned structure or component footprint.

3.2 THE WATER

3.2.1 Hydrology/Hydrogeology

3.2.1.1 Scope

This module described the existing hydrology and hydrogeology at the proposed CMH alignment and its vicinities relevant to assessing the following key impacts: a) change in drainage morphology, b) inducement of flooding, c) reduction in stream volumetric flow, d) change in stream depth, and e) water source use and competition.

3.2.1.2 Methodology

Primary data was obtained by doing streamflow measurements of streams traversed by the alignment **(Table 3-55**). The stream width, depth, and velocity were measured to estimate its discharge rate. The activity was conducted on April 25 to 30 and July 27 to 31, 2021 covering the low and high rainfall periods. The photo-documentation of the field work is shown in **Appendix 27**.

Table 3-55. Location and observations of streamflow measurement points

Station	Coordinates		Name of river	Location	Description
	Latitude	Longitude			
H1	8.5292191 N	124.7891425 E	Tagoloan River	Natumolan, Tagoloan	Sand and gravel mining activities; near the bay
H2	8.3535948 N	124.8405358 E	Dicklum River	Dicklum, Manolo Fortich	Small tributary stream surround by bamboo
H3	8.3447317 N	124.8745521 E	Kumaykay River	Ticala, Manolo Fortich	Located in deep ravines, used for swimming and animal bathing.
H4	8.3357613 N	124.9051012 E	Puntian River Tributary	Vista-Villa-Puntian Boundary, Sumilao	Used for swimming and washing
H5	8.3170328 N	124.9496271 E	Tagolongon River Tributary	Culasi-Vista Villa Boundary, Sumilao	Used for washing
H6	8.3161957 N	125.0009035 E	Kulaman River Tributary	Poblacion Boundary, Sumilao, Bukidnon	Used for swimming and washing.
H7	8.2167793 N	125.0289096 E	Ipoon River	Impalutao, Impasug-ong	Clear cold water with reddish sediments
H8	8.2167793 N	125.0289096 E	Komotal River	Dalwangan, Malaybalay	Has a small dam for irrigation water supply. Used for swimming and washing.
H9	8.1839268 N	125.0575419 E	Sawaga River	Patpat, Malaybalay	Used for swimming and washing.
H10	8.1640427 N	125.1130562 E	Sawaga River	Sumpong, Malaybalay	Used for swimming and washing.

Secondary data consisted of literature from recent surveys and key informant interviews with focus on the portion of the Tagoloan River watershed traversed by the proposed CMH road. The assessment and the corresponding methodology for floodplain inundation are made with respect to Tagoloan River.

3.2.1.2.1 Flood analysis

The flood hazard analysis was conducted for the 100-year return period using the 2-D option of HEC-RAS defined by underlying topography and 2D shallow water and momentum equations. The model simulates flood properties such as flood extent, flood depths and velocities. It consisted of a short-term storm event

simulation module for flooding by river overflow and flash flood events with a time scale within a couple of hours to a few days. The physical characteristics of the Project area and a digital elevation model were combined with the result of flood simulations to generate the flood hazard map.

The areal extent of 2D model showing in **Figure 3-50** is the watershed of Tagoloan River taking into account the location of the proposed CMH alignment. The simulation results can be used as a basis in the detailed design of flood control facilities or as part of engineering measures for the proposed CMH Project.

3.2.1.2.2 Tagoloan river basin spatial analysis

The Tagoloan River Basin crosses Malaybalay City, municipalities of Sumilao, Baungon, Impasug-ong, Manolo Fortich, and Malitbog in the province of Bukidnon; and municipalities of Tagoloan, Villanueva, and Claveria in the Province of Misamis Oriental, and drains to Macajalar Bay through the municipality of Tagoloan.

The basin has an area of 177,300.16 hectares based on spatial analysis. The extent of this area was used to estimate the river basin discharge. A digital terrain model (DTM) was generated using a digital elevation model (DEM) of a portion of Northern Mindanao processed by an open-source GIS platform. The Tagoloan River Basin and its tributary channels were delineated using the generated DEM and DTM.

3.2.1.2.3 Water balance analysis

Water balance in hydrology is a study where portions of the precipitation in the form of rain go in each of the stages in the hydrologic cycle. It is used to describe and quantify the flow of water in and out of a system.

A monthly water balance estimate for the Tagoloan River Basin was simulated using a site-specific water balance model developed by the US Geological Survey (USGS, 2007). The model, referred to as the Thornthwaite Monthly Water Balance Program, computes the components of the hydrologic cycle such as precipitation, evapotranspiration, and runoff, among others.

Inputs to the model are data on mean monthly temperature, *(T)* in degrees Celsius (°C); monthly total precipitation, *(P)* in millimeters; and the latitude (in decimal degrees) of the location of interest. Temperature and rainfall records (1985 - 2020) from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) station in Lumbia, Cagayan de Oro City was used because it is closest to the river basin. The latitude of the location of interest (in this case, 8°) was used for computing the day length needed for the calculating potential evapotranspiration *(PET)*. The PET represents the climatic demand for water, relative to the available energy.

According to the Thornthwaite Program, when *P* for a month is less than PET, then the *AET* is equal to *P* plus the amount of soil moisture that can be withdrawn from storage in the soil. Soil-moisture storage withdrawal (STW) linearly decreases with decreasing S such that as the soil becomes drier, water becomes more difficult to remove from the soil and less is available for AET. The water balance diagram is shown in **Figure 3-48**.

Figure 3-48. Diagram of a water balance model

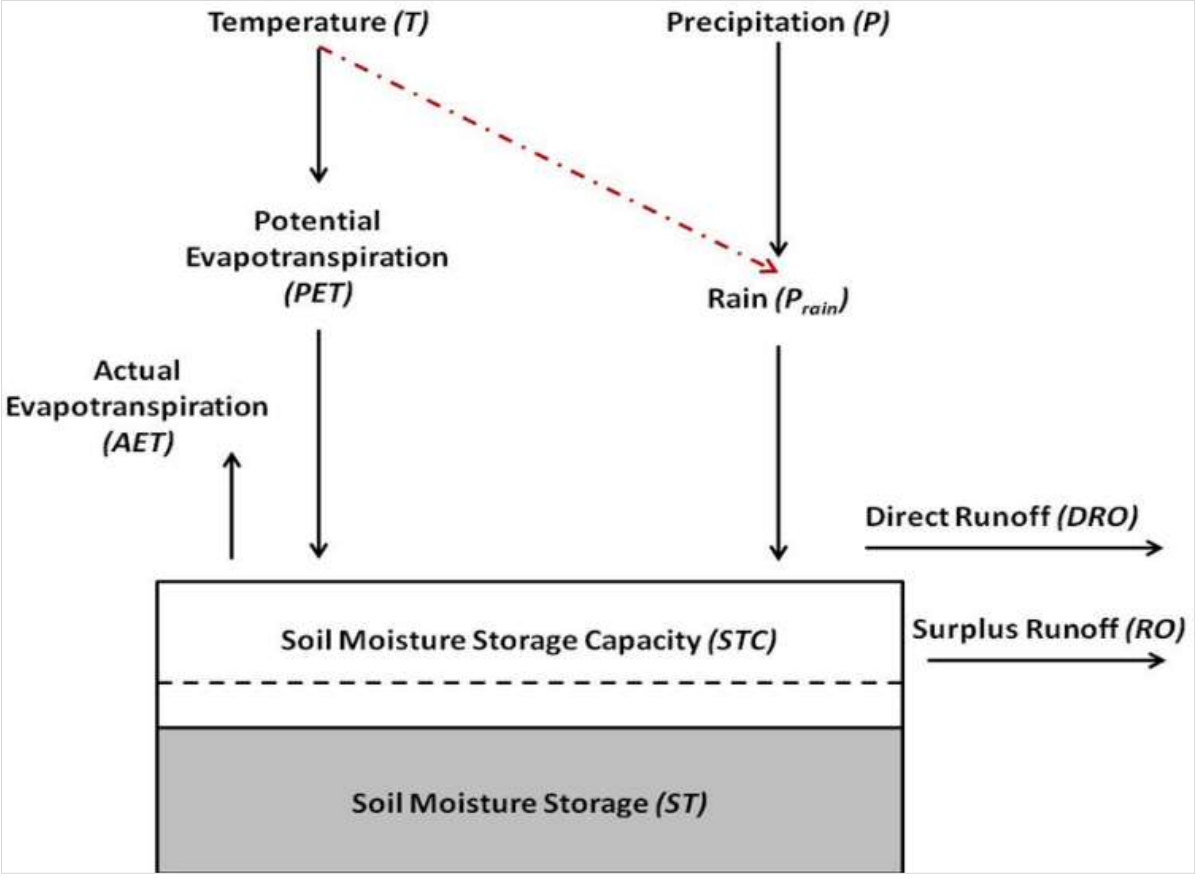


Figure 3-49. Location map of streamflow measurements

	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
Hydrology Sampling Map	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) AAI (Sampling Stations)	JICA	AMET ASIA INC.

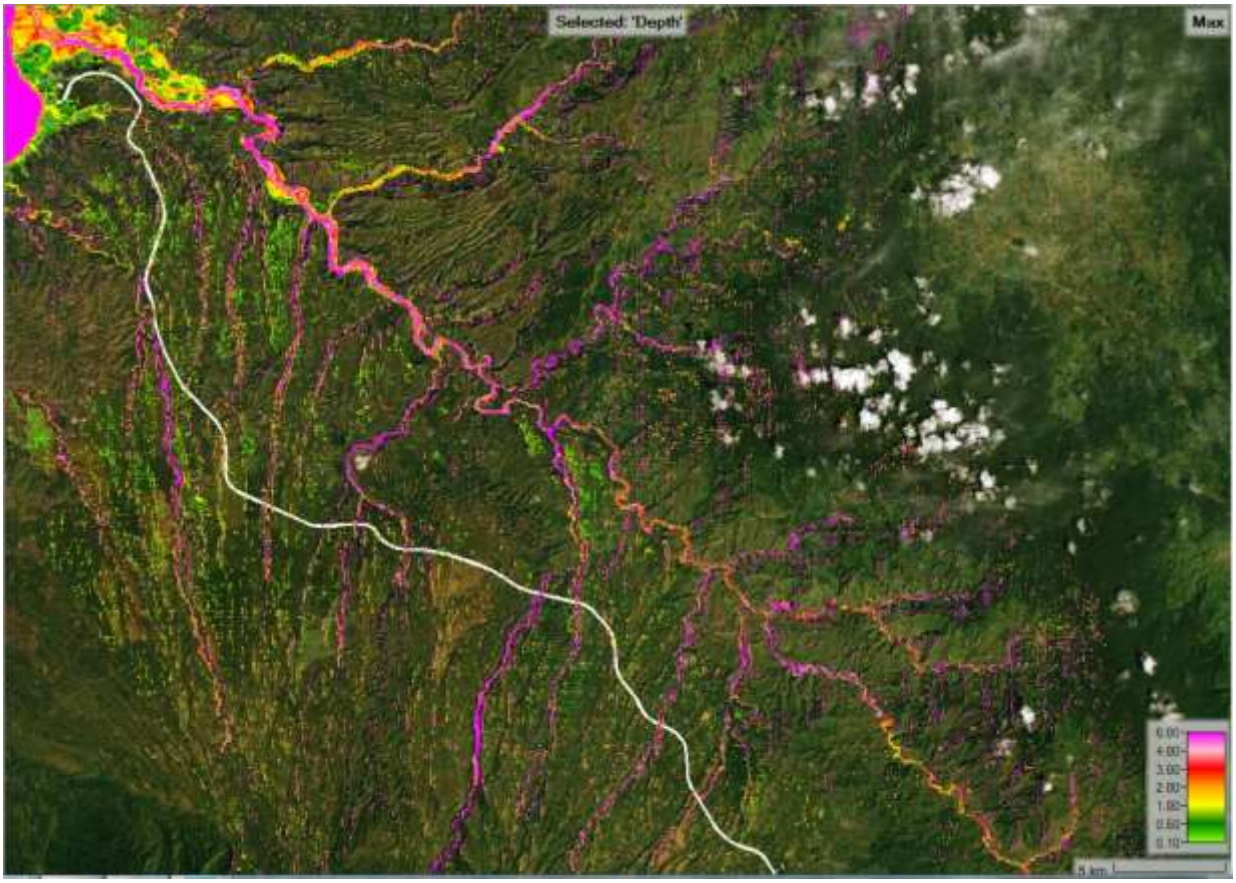
Figure 3-50. Extent of the 2D flood model (cyan-colored polygon) and river networks surrounding the proposed Project

3.2.1.3 Assessment of key impacts

3.2.1.3.1 Change in drainage morphology/inducement of flooding/reduction in stream volumetric flow

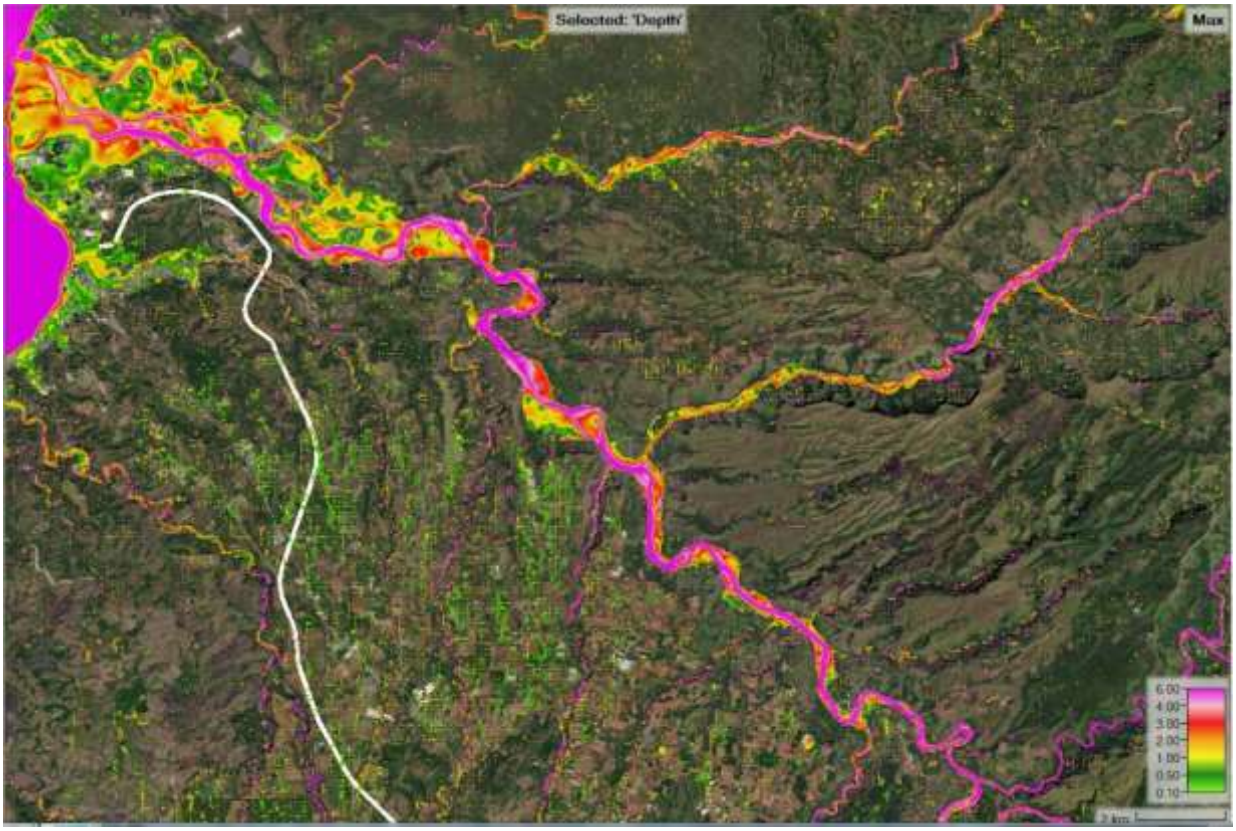
Flood analysis - **Figure 3-51** and **Figure 3-52** show the simulated maximum flood depth (meters) including portions of the floodplain for the 100-year return period indicating the general trends of floodplain inundation. Most of the floodwaters were confined in the main rivers and tributaries, with large swatches of inundation visible near the riverbanks indicating overflows and those isolated areas representative of depression storages in the catchment.

Figure 3-51. Predicted 100-year flood inundation map of the Project site at baseline conditions



NOTES: in meters

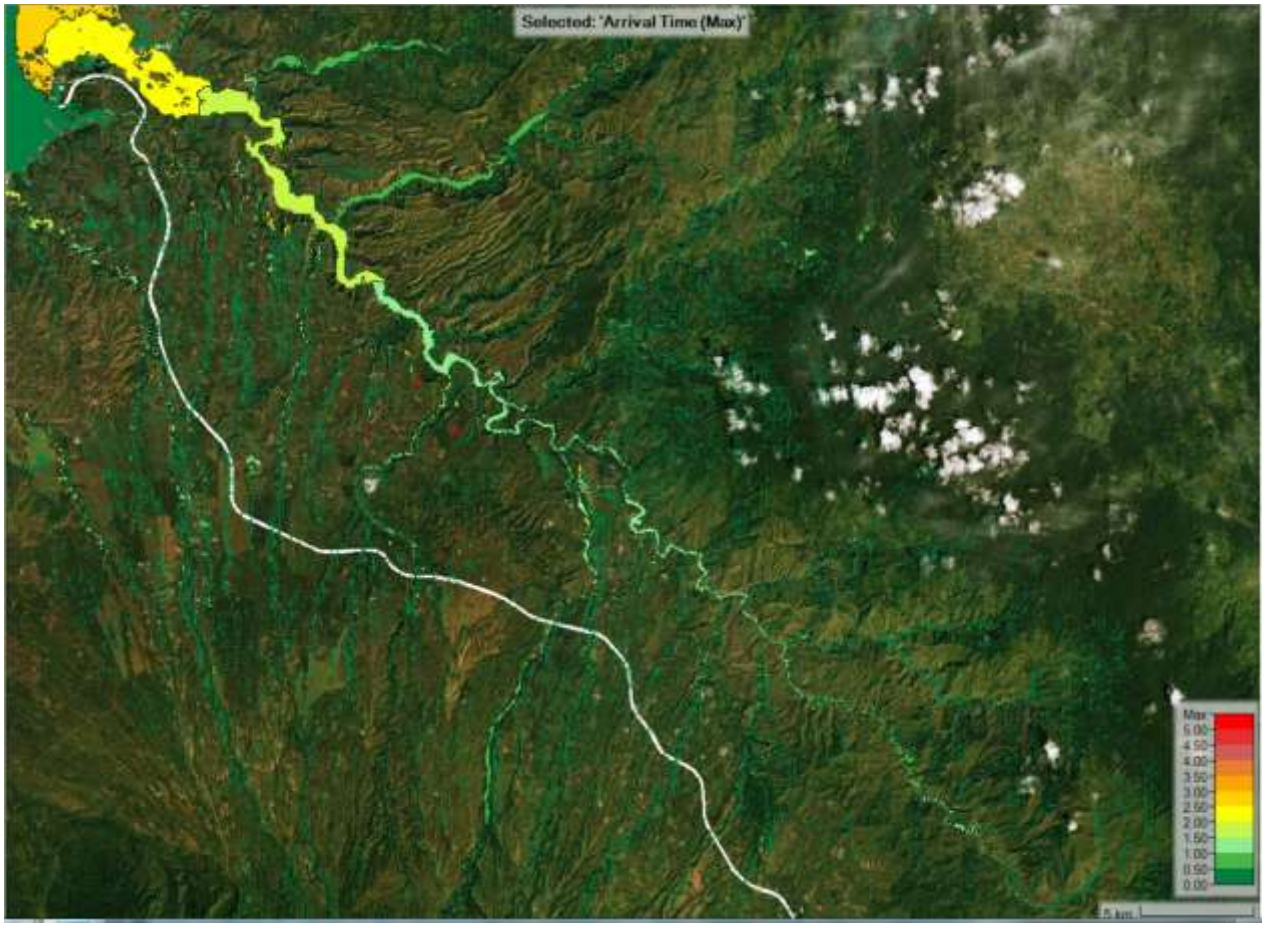
Figure 3-52. Predicted 100-year flood inundation map of the Project site at baseline condition (zoom)



NOTES: in meters

The hourly contours (delineated by white lines in **Figure 3-53**) of peak flood arrival time were generated to visualize the peak arrival times of the flood in the downstream areas starting from the peak of the rainfall event. For example, the peak flood in the area near the coast will arrive in less than 3 hours while it will take less than 1 hour for the maximum flood to reach the midstream area of Tagoloan River. Thus, the maximum floodwaters are predicted to reach the sea in less than 3.5 hours reckoned from the peak hours of rainfall.

Figure 3-53. Estimated arrival times (hr) of flood peaks as it flows downstream for a 100-year storm event



NOTES: in meters

Higher than normal flow velocities are expected with the sudden rush of floodwater due to rainfall-induced storms which may cause major structural damage or collapse of existing flood protection works along the river or scouring of riverbeds, among others. High flow velocities may also delay the response for emergencies and evacuation which may contribute significant losses to life and property within the most flood-vulnerable communities.

The velocity map in **Figure 3-54** shows high flood events occurring at the main channels that are potential hotspots for structural damage or property losses, which in main river sections reach more than 4 meters per second. Different communities near the riverbanks located within the towns traversed by Tagoloan River were predicted to be the most vulnerable to flood water inundation in less than 3 hours after the peak of rainfall are likewise vulnerable to high flood flow velocities.

Figure 3-54. Predicted maximum flood velocity map for a 100-year storm event

NOTES: in meters

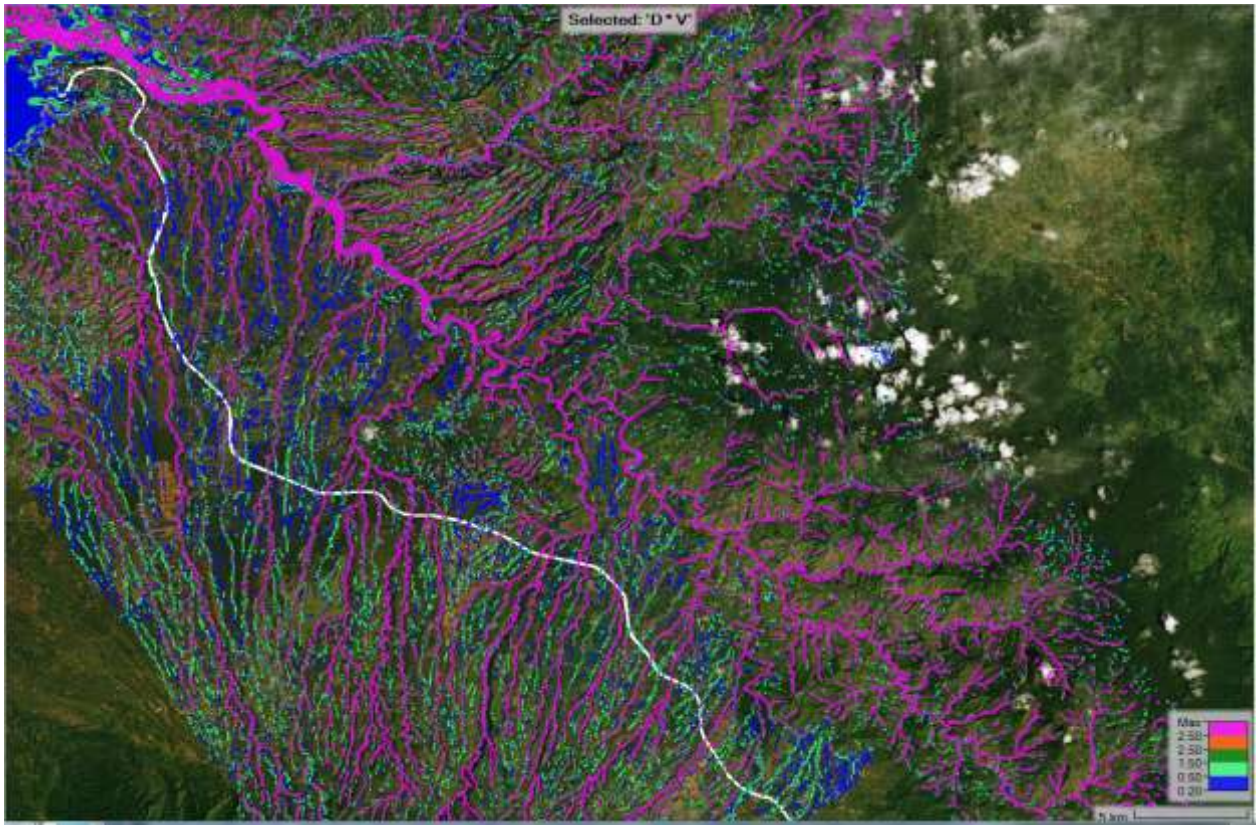
Using the predicted maximum depth and velocity values, the flood severity grid map was derived by multiplying the depth grid times with the velocity grid. The flood severity grid map represents the combined effect of depth and velocity, most often communicated in categories of Low, Medium, High, Very High and Extreme Hazard. As a simplified approach, the Federal Emergency Management Agency (FEMA) uses the depth velocity categories in **Table 3-56**. The resulting flood severity grid map derived from the maximum depth and velocity values predicted by the HEC-RAS model using the FEMA metric is shown in **Figure 3-55.**

Table 3-56. Simplified flood depth and velocity severity grid symbolization categories

Flood Severity Category	Depth Velocity Range (ft^2/sec)	Depth Velocity Range (m^2/sec)
Low	<2.2	<0.2
Medium	2.2 – 5.4	0.2 – 0.5
High	5.4 – 16.1	0.5 – 1.5
Very high	16.1 – 26.9	1.5 – 2.5
Extreme	>26.9	>2.5

Source: FEMA, 2018

Figure 3-55. Flood severity grid map using FEMA categories for the Project area, 100-year storm event



Flood analysis due to climate change – Rainfall is the most important natural factor in flooding. **Table 3-57** shows that climate-change induced changes in rainfall at the headwaters of Tagoloan River are decreasing in trend. The positive change in June, July, and August downstream of Tagoloan River in the area of Misamis Oriental resulted in small rainfall change of 32 mm (or 5.2% increase from 615.7 mm) for the 2050 projection. Thus, climate change impacts on flooding in the area may be considered insignificant.

Table 3-57. Seasonal rainfall changes in 2020 and 2050 under medium-range emission scenario

Province	Observed Baseline (1971-2000) mm				Change in 2020 (2006-2035)				Change in 2050 (2036-2065)			
	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON
Bukidnon	329.7	335.6	653.8	559.5	2.9	-10.3	-4.4	-0.3	-5.1	-13.0	-9.7	-5.8
Lanao del Norte	337.5	350.3	662.5	621.1	9.6	-0.6	-2.2	6.9	2.5	-1.9	1.4	7.1
Misamis Occidental	392.1	323.4	633.1	728.3	9.1	1.4	-6.1	6.1	5.2	0.3	-5.1	4.6
Misamis Oriental	442.5	296.0	615.7	581.1	4.6	10.4	3.7	2.9	1.8	17.8	5.2	0.1

Source: Climate Change in the Philippines", PAGASA, February 2011; NOTES: DJF – December, January, February; MAM – March, April, May; JJA – June July August; SON – September, October, November

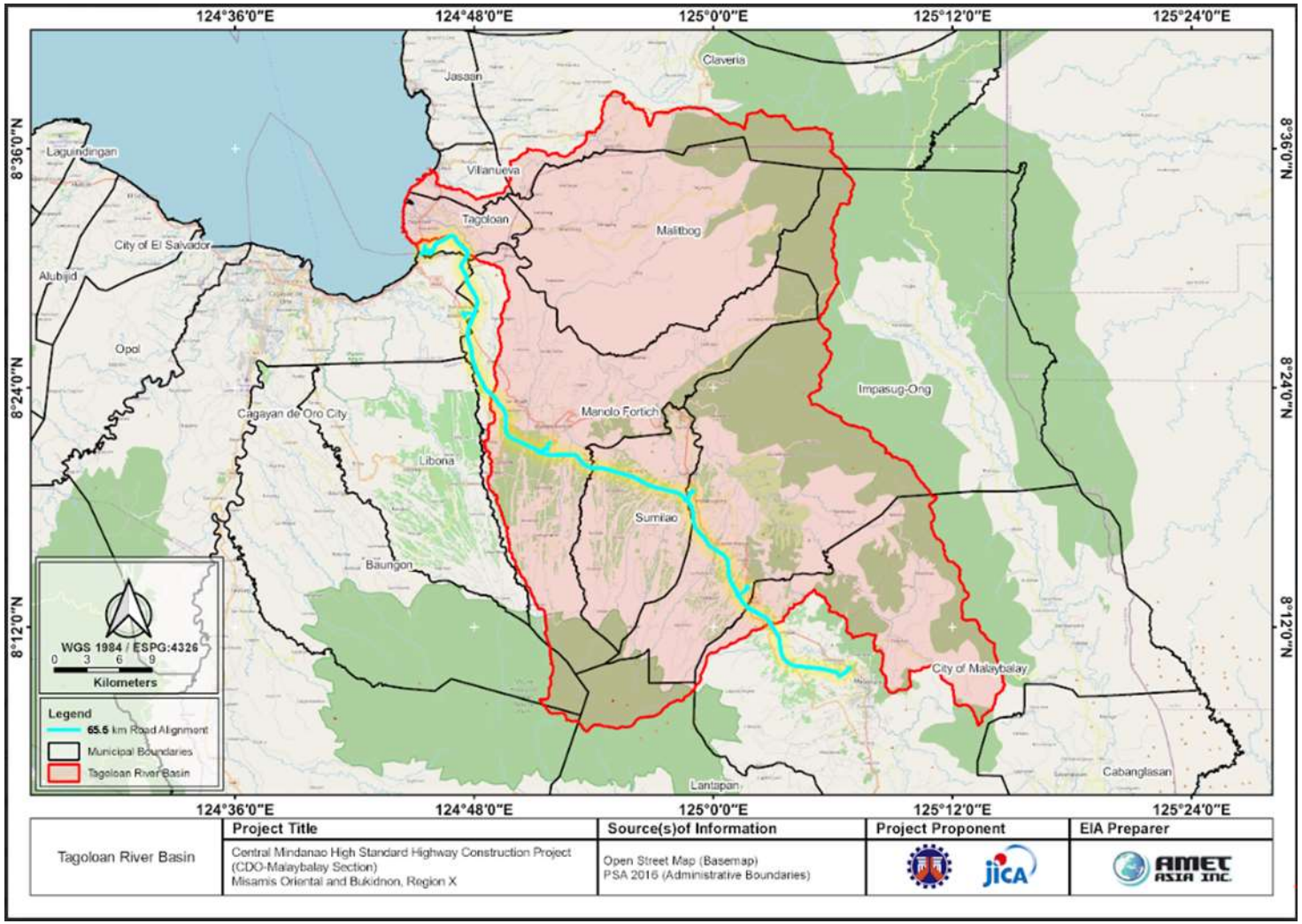
Flood assessment – The flood inundation modeling showed that segments of the CMH alignment will traverse some flooded portions delineated by the 100-year flood of Tagoloan River as well as the construction of new bridges crossing various tributary rivers. Slope protection works for the construction of river crossings has the potential to impact water flow in the river. These waterways are recommended to be examined during the detailed engineering design for any localized flooding problems related to the alignment. Identified problems should be corrected to the extent practicable. The proposed Project will provide an opportunity to construct river crossings and other river improvement works that are more compatible with current DPWH standards for hydraulic structures and other applicable stream management practices.

In addition to stream crossings, it will be necessary to provide small culvert crossings to allow water to drain properly and prevent inducement of flooding. Natural flows in rivers and creeks will be maintained and may be widened or deepened so that flood discharges are not adversely affect upstream areas of highway crossings. Any man-made canals and channel improvement works that may be affected, if any, will be modified to the extent possible to maintain its existing use and capacity. Coordination regarding the river improvement works will be conducted with the DPWH and/or the LGUs concerned. With these interventions, changes in drainage morphology, inducement of flooding and/or reduction in stream flow will be minimized, if not prevented.

3.2.1.3.2 Change in stream depth

Tagoloan River Basin discharge flows - The Tagoloan River Basin where the alignment traverses shown in **Figure 3-56** illustrates the extent of the river basin and the associated tributary network. The river basin is delineated in white while the river channels are in blue lines.

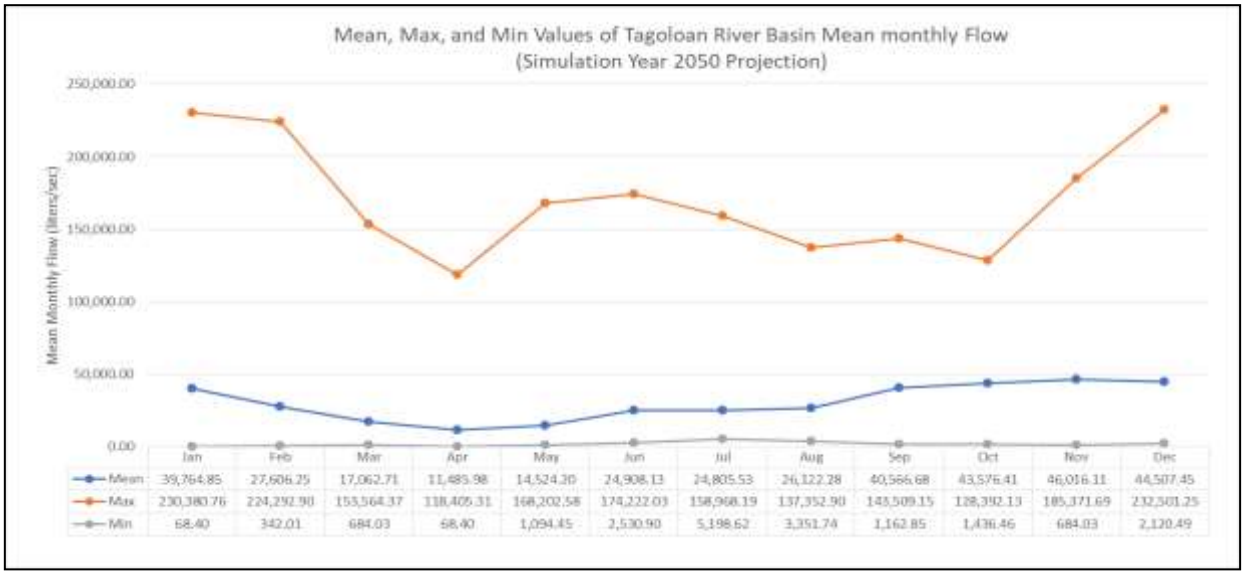
Figure 3-56. Tagoloan River Basin and its tributary network in Northern Mindanao



The monthly discharge flows of Tagoloan River Basin were derived from the monthly water balance results. Preliminary results indicated a decreasing trend in flows from January to April and September to December while an increasing trend may be observed from May to September (**Figure 3-57**). The average monthly flow for the 36-year simulation from 1985 to 2020 is calculated at 41,886.45 liters per second (lps) while the 2050 projection shows an average monthly flow of 30,078.88 lps. The monthly flow estimates for 2020 and 2050 are shown in **Attachment 25**.

Figure 3-57. Average monthly simulated flow of Tagoloan River Basin (simulation year 1995-2020)

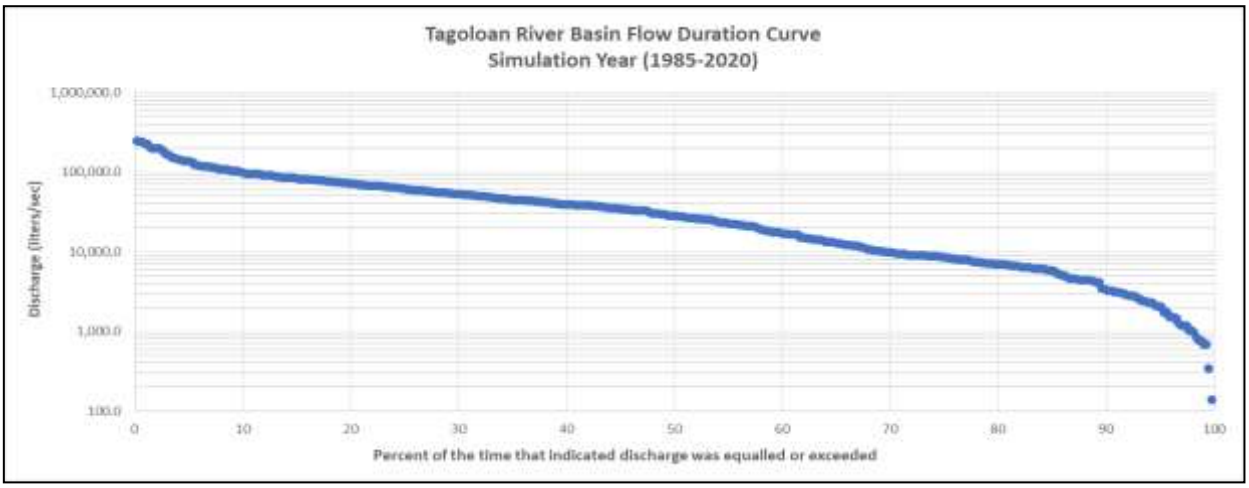
Figure 3-58. Average monthly simulated flow of Tagoloan River Basin (simulation year 2050 projection)



Tagoloan River Basin flow duration analysis - A flow-duration analysis (as post-analysis) was also performed on the monthly simulated stream flows. For every value of exceedance probability (or fraction of time of availability and hence of its dependability), the corresponding amount of flow that at least is available is presented in the flow duration curve. The curve can be used to show the percentage of time river flow that is expected to exceed a design flow of a specified value (e.g., the daily requirement of the Project) or to show the discharge of the stream that occurs or is exceeded some percent of the time (e.g., what is the available flow, say 90% of the time?).

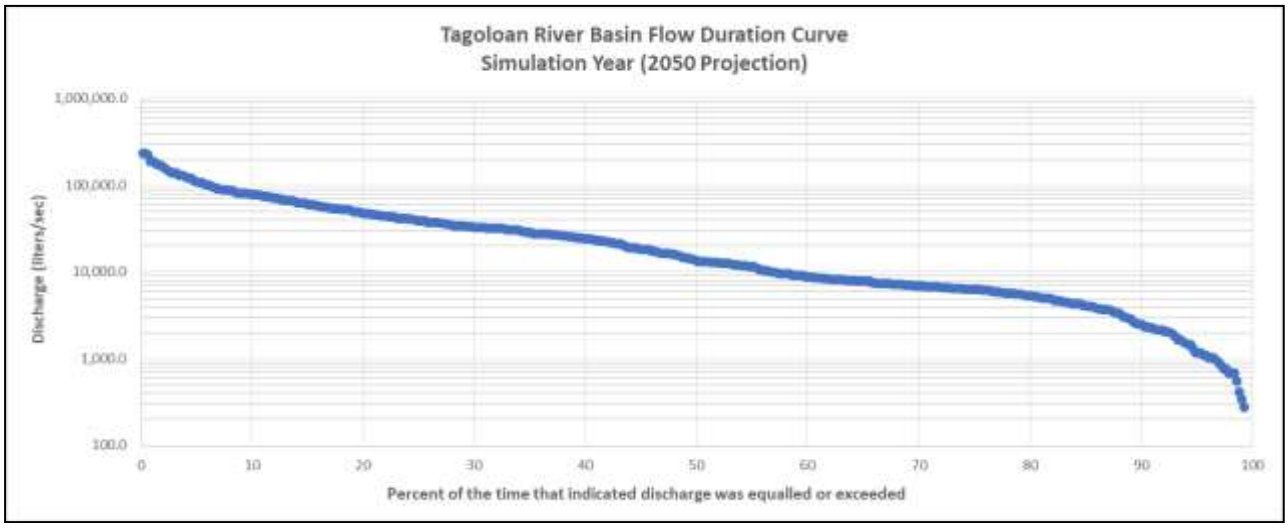
As an illustration, the derived flow duration curve in the **Figure 3-59** shows that for an annual basis, the flow at 50% dependability level of the Tagoloan River Basin is about 27,839.95 liters per second. In the assessment of water permit applications for example, the National Water Resources Board (NWRB) use the discharge of river that equals or exceeds 80% of the time. Applying this concept in the river basin, the 80% dependability level of the basin is around 6,908.69 liters per second.

Figure 3-59. Flow duration curve of Tagoloan River Basin derived from the 1985-2020 runoff simulation



Similarly, the flow duration curve of the Tagoloan River Basin derived from runoff simulations using 2050 PAGASA climate projection showed dependable flows at 50% and 80% of the time are 13,372.75 Lps and 5,267.02 Lps respectively (**Figure 3-60**).

Figure 3-60. Flow duration curve of Tagoloan river basin from the 2050 Projection runoff simulation



Change in stream depth - The alteration of upstream rivers' flow capacities will translate to changes in water levels and flow downstream. The processes involved with building roads and highways often involve adding or removing large masses of dirt and stone along the route. If standard methods of construction are not followed, it is possible that excavated materials and loose soils may end up in the waterways, creeks or stream which will eventually alter its natural topography.

The short-term increase in runoff with sediment may also occur due to the removal of vegetation cover and topsoil of the road alignment. The sediments may get washed into these water sources leading to change in stream depths.

3.2.1.3.3 Water source use and competition

3.2.1.3.3.1 Tagoloan River Basin water balance

Baseline monthly water balance (1985-2020) - Initially, a monthly water balance was simulated using the 1985-2020 observed data to establish a baseline for the following output parameters: potential evapotranspiration (PET); precipitation (P); (P-PET); soil moisture storage (ST); actual evapotranspiration (AET); water deficit (PET-AET); surplus; and total runoff (ROtotal).

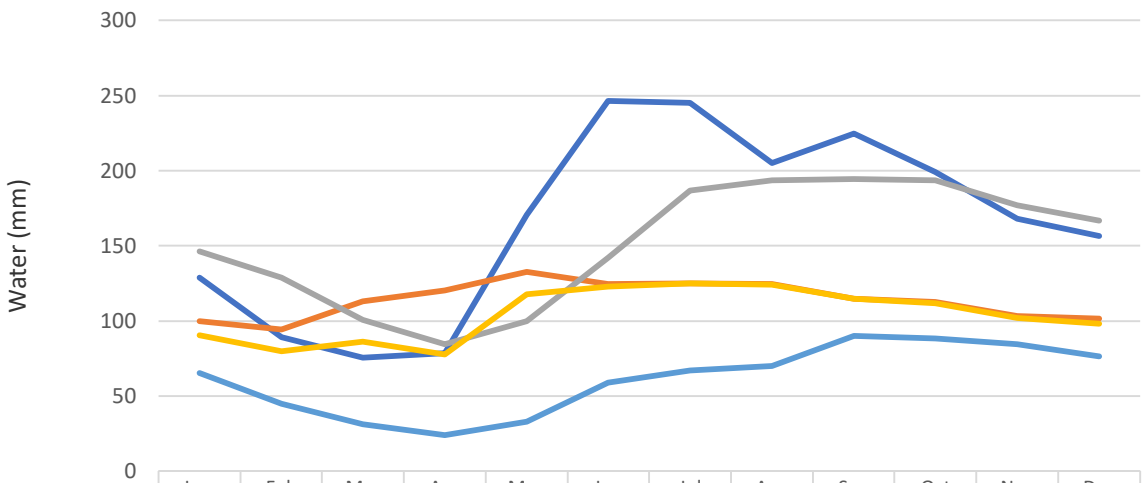
From **Figure 3-61**, the average monthly water balance based on the 1985 to 2020 data generally implied that most part of the precipitation (P) is lost to actual evapotranspiration by an average of 63% while 37% goes to soil moisture and total runoff.

If the sum of P and STW is less than PET, then a water deficit is calculated as (PET–AET). If P exceeds PET, then AET is equal to PET and the water in excess of PET replenishes ST. When ST is greater than Soil-moisture storage Capacity (STC), the excess water becomes surplus (S) and is eventually available for runoff. With reference to **Figure 3-61**, water deficits occur between February to April since precipitation is less than the PET and that PET is generally greater than AET.

Runoff (RO) is generated from the surplus (S), at a specified rate (rfactor). The *rfactor* parameter determines the fraction of surplus that becomes runoff in a month. The remaining surplus is carried over to the following month to compute total S for that month. Direct runoff (DRO), in millimeters, is added directly to the runoff generated from surplus (RO) to compute total monthly runoff (ROtotal), in millimeters. The generated monthly ROtotal may be used to estimate the monthly discharge (Q) of a given catchment area which may be considered in designing the drainage system of the Project.

For example, a catchment area of 100 hectares and an average *ROtotal* of 100 mm in a given month, the corresponding catchment discharge *(Q)* for that month will be 0.039 m^3/sec or 38.58 liters per second (lps).

Figure 3-61. Simulated monthly water balance (1985-2020)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P	128.8	89.4	75.8	78.7	170.6	246.4	245.2	205.2	224.8	199	168.2	156.7
PET	100	94.5	112.9	120.3	132.9	124.8	124.9	124.5	114.8	112.5	103.2	101.5
ST	146.3	129	100.6	84.5	99.8	142	186.8	193.5	194.4	193.7	177.1	166.7
AET	90.4	79.9	86.2	77.9	117.8	122.8	124.9	124.3	114.8	111.7	102.2	98.1
RO Total	65.3	45	31.2	24.1	33.1	59.2	67.3	69.9	90	88.4	84.7	76.6

NOTES: P – Precipitation, PET – Potential Evapotranspiration, AET – Actual Evapotranspiration, ST Soil Moisture Storage, RO_{Total} – Total Runoff

Projected monthly water balance (2050) – The PAGASA 2050 climate change projections highlighted that the annual mean temperatures all over the country are expected to rise by 1.8 to 2.2 °C. In terms of seasonal rainfall change, there is generally a substantial spatial difference in the projected changes in rainfall in 2050 in most parts of the country, with reduction in rainfall in most provinces during the low rainfall (MAM), while rainfall increases are likely in most areas during the southwest monsoon (JJA, SON). **Table 3-58** summarizes the 2050 projections of PAGASA seasonal changes in temperature and rainfall for Northern Mindanao.

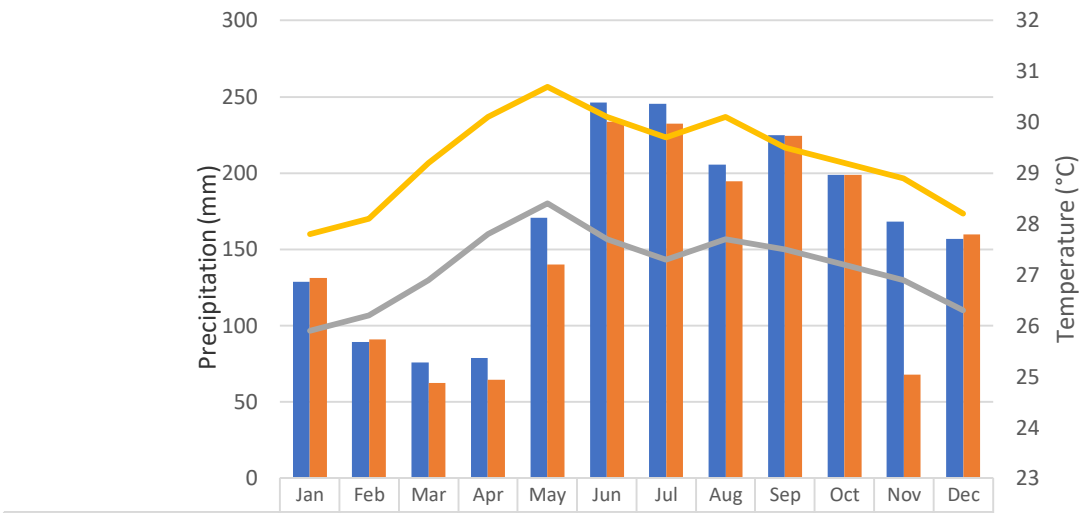
Table 3-58. Climate change projection in 2050 for Region X

Seasonal change*	DJF	MAM	JJA	SON
Seasonal temperature increases (in °C)	1.9	2.3	2.4	2.0
Seasonal rainfall change (in %)	1.8	-17.8	-5.2	-0.1

Source PAGASA: NOTES: *medium-range emission scenario DJF – Dec Jan Feb, MAM – March April May, JJA – June July Aug, SON – Sept Oct Nov

Figure 3-62 illustrates the changes in temperature and rainfall as projected in 2050. Temperature is generally expected to be higher than the observed baseline throughout the year and more marginal precipitation in the months of December, January, and February and lesser precipitation is expected for the rest of the year.

Figure 3-62. Baseline vs 2050 projections on precipitation and temperature

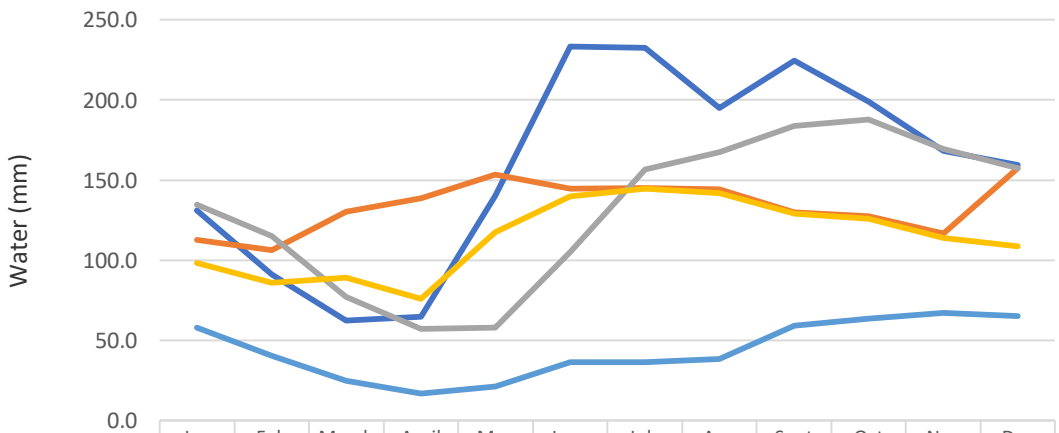


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Baseline (P)	128.8	89.4	75.8	78.7	170.6	246.4	245.2	205.5	224.8	199	168.2	156.7
2050 Projection (P)	131.1	91	62.3	64.7	140.3	233.5	232.4	194.8	224.6	198.8	68.1	159.6
Baseline (Temp)	25.9	26.2	26.9	27.8	28.4	27.7	27.3	27.7	27.5	27.2	26.9	26.3
2050 Projection (Temp)	27.8	28.1	29.2	30.1	30.7	30.1	29.7	30.1	29.5	29.2	28.9	28.2

NOTES: P – precipitation, Temp – temperature

The effect of temperature and rainfall changes on the water balance was examined using the 2050 projections. The effect of higher temperatures consequently raises the potential evaporation (PET) because it is highly dependent on available energy (heat). Likewise, the actual evapotranspiration (AET) became generally higher than the observed baseline. The projected change in rainfall affected both soil moisture storage and runoff. Soil moisture storage and runoff significantly decreased throughout the year. **Figure 3-63** illustrates the 2050 projected monthly water balance for the Tagoloan River Basin.

Figure 3-63. Monthly water balance using temperature and rainfall changes projected in 2050



	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
P	131.1	91.0	62.3	64.7	140.3	233.5	232.4	194.8	224.6	198.8	168.1	159.6
PET	112.5	106.3	130.2	138.8	153.3	144.8	145.0	144.4	129.9	127.4	116.8	157.3
ST	134.5	115.0	77.0	57.1	58.1	105.1	156.6	167.4	184.0	187.8	169.6	157.3
AET	98.4	85.9	89.3	76.1	117.4	139.7	144.7	142.0	129.0	125.7	113.9	108.6
RO Total	58.1	40.4	24.9	16.8	21.2	36.4	36.3	38.2	59.3	63.7	67.3	65.1

Table 3-59 shows the detailed summary of the changes between the baseline and projections. From these results discussed in the earlier section, there is a marginal increase in precipitation for 2050 against the baseline data (in the months of DJF) and because of the increase in ambient temperature affecting evapotranspiration rates, an increase in potential and actual ET by 14.4% and 9.6% was predicted respectively. Likewise, due to predicted increase in evapotranspiration losses in year 2050, a corresponding reduction in soil moisture storage and total runoff by 13.5% and 28.2% respectively was also predicted.

Table 3-59. Summary of changes in P, PET, ST, AET, and RO_{Total} from the 36-year baseline (1985-2020) to 2050

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Precipitation (P)													
Baseline	128.8	89.4	75.8	78.7	170.6	246.4	245.2	205.5	224.8	199.0	168.2	156.7	**1989.2**
2050 Projection	131.1	91.0	62.3	64.7	140.3	233.5	232.4	194.8	224.6	198.8	168.1	159.6	**1901.2**
Potential Evapotranspiration (PET)													
Baseline	100.0	94.5	112.9	120.3	132.9	124.8	124.9	124.5	114.8	112.5	103.2	101.5	**1366.9**
2050 Projection	112.5	106.3	130.2	138.8	153.3	144.8	145.0	144.4	129.9	127.4	116.8	114.2	**1563.7**
Soil Moisture Storage (ST)													
Baseline	146.3	129.0	100.6	84.5	99.8	142.0	186.8	193.5	194.4	193.7	177.1	166.7	**1814.3**
2050 Projection	134.5	115.0	77.0	57.1	58.1	105.1	156.6	167.4	184.0	187.8	169.6	157.3	**1569.5**
Actual Evapotranspiration (AET)													
Baseline	90.4	79.9	86.2	77.9	117.8	122.8	124.9	124.3	114.8	111.7	102.2	98.1	**1251.0**
2050 Projection	98.4	85.9	89.3	76.1	117.4	139.7	144.7	142.0	129.0	125.7	113.9	108.6	**1370.5**
Total Runoff (RO_{Total})													
Baseline	65.3	45.0	31.2	24.1	33.1	59.2	67.3	69.9	90.0	88.4	84.7	76.6	**734.8**
2050 Projection	58.1	40.4	24.9	16.8	21.2	36.4	36.3	38.2	59.3	63.7	67.3	65.1	**527.7**

Baseline annual water balance - The annual water balance for the Tagoloan River Basin based on the hydrologic simulations is summarized **Table 3-60.** The 36-year average showed that about 33% of 1,989.15 mm of precipitation becomes total runoff (or 734.82 mm) and about 63% of precipitation is lost as actual evapotranspiration (about 1,250.99 mm). Around 8% of rainfall (151.19 mm) is retained into the soil that eventually contributes to the groundwater becoming baseflow.

Because the Tagaloan River Basin is large with land cover dominated by cultivated crops, grassland, and brushland, a significant amount of precipitation is lost to actual evapotranspiration and leaves little to be absorbed and infiltrated into the soil column. This was evidenced by the low value of rainfall-runoff ratio of 0.33 (runoff coefficient).

Table 3-60. Annual water balance estimates for the Tagoloan River Basin

Year	(P)	(PET)	(AET)	(ST)	(RO_{Total})	Year	(P)	(PET)	(AET)	(ST)	(RO_{Total})
1985	1,818.80	1,307.30	1,130.90	128.62	551.00	2004	1,144.60	1,364.30	1,225.40	94.48	209.60
1986	1,584.00	1,301.30	1,189.40	146.16	536.80	2005	1,609.30	1,363.10	1,091.90	114.11	381.70
1987	1,093.90	1,338.40	1,075.30	82.60	130.50	2006	1,386.70	1,345.80	1,202.40	138.41	272.20
1988	1,554.50	1,343.50	1,008.70	103.25	354.30	2007	1,640.20	1,340.30	1,145.30	127.88	378.00
1989	2,082.20	1,306.70	1,285.00	181.25	847.70	2008	2,133.00	1,303.10	1,302.40	196.63	810.20
1990	1,964.60	1,340.00	1,118.60	138.53	736.20	2009	2,352.10	1,361.10	1,361.10	174.96	1,044.40
1991	1,416.00	1,327.70	1,211.60	131.14	384.40	2010	1,799.90	1,393.50	1,250.70	129.57	538.50
1992	1,202.90	1,352.10	958.50	101.67	256.80	2011	2,163.80	1,363.20	1,356.20	185.34	684.70
1993	1,831.40	1,310.50	1,075.50	124.10	563.70	2012	1,670.30	1,386.70	1,344.50	146.88	425.10
1994	1,749.90	1,299.20	1,267.50	152.68	672.60	2013	2,067.60	1,366.00	1,350.80	183.56	707.10
1995	1,849.80	1,312.40	1,109.70	127.38	556.60	2014	2,824.10	1,467.70	1,467.70	200.00	1,340.70
1996	1,780.80	1,304.20	1,304.20	189.76	573.10	2015	2,183.40	1,491.70	1,488.40	187.19	676.50

Year	(P)	(PET)	(AET)	(ST)	(RO_{Total})	Year	(P)	(PET)	(AET)	(ST)	(RO_{Total})
1997	1,614.80	1,350.60	1,280.90	138.58	409.60	2016	2,682.20	1,512.60	1,496.80	177.04	1,107.30
1998	1,325.30	1,405.90	968.30	92.80	268.00	2017	4,885.50	1,468.80	1,468.80	200.00	3,242.70
1999	2,306.20	1,314.00	1,314.00	197.65	888.70	2018	3,668.90	1,490.90	1,490.90	194.02	2,321.60
2000	2,094.70	1,320.60	1,320.20	188.45	878.10	2019	2,462.10	1,492.80	1,492.80	193.06	1,102.50
2001	2,000.60	1,332.30	1,262.20	154.63	680.30	2020	2,014.90	1,429.50	1,286.90	145.66	678.70
2002	1,718.30	1,344.50	1,287.30	156.22	596.40	**36-year average**	**1,989.15**	**1,366.87**	**1,250.99**	**151.19**	**734.82**
2003	1,932.10	1,354.90	1,044.90	118.62	647.20						

NOTE: P – Precipitation, PET – Potential Evapotranspiration, AET – Actual Evapotranspiration, ST Soil Moisture Storage, RO_{Total} – Total Runoff

3.2.1.3.3.2 Local sources of water supply

There local water districts supplying the domestic water requirements of concession areas within the areas traversed by the proposed CMH alignment are enumerated and described below and shown **Figure 3-64**. Some water sources lack geographic coordinates and were not included in this plot. The reader is referred to **Annex 6** for additional information about the water districts described below.

1. The Tagoloan Water District covers the eight (8) Barangays of the municipality of Tagoloan, namely: Brgy. Mohon, Santa Cruz of Sihayon left and right, Poblacion, Baluarte, Sogbongcogon, Gracia, Promise Land, and Natumolan. The majority of its water sources come from deep wells with chlorination as the primary mode of treatment and distributed via a Level III water distribution system (water metering). Unfortunately, water production data was not available nor included in the data provided. The same is true for the municipality of Impasug-ong, Bukidnon where it only indicated the two sources of its water supply: from Iglerop spring and a deep well in Barangay Poblacion.

2. The Cagayan de Oro Water District (COWD) service area covers a portion of the municipality of Tagoloan, the City of Cagayan de Oro, and Manolo Fortich. The water sources in the COWD Cagayan de Oro Service area are 31 groundwater production wells, a spring (Malasag Spring), and surface water from Cagayan de Oro Bulk Water, Inc. in Baungon, Bukidnon. From 2018 to 2020, the average annual volume of water distributed in the service area is about 66.56 million cubic meters (MCM) or about 5.55 MCM per month.
3. In the Manolo Fortich service area of the COWD, 20 water sources mainly from groundwater through deep wells and springs using chlorination delivered an annual average of 2.781 MCM of potable water from 2018 to 2020 to.

4. In the Municipality of Sumilao, data from Kisolon-San Vicente Water Supply System showed that the volume of water distributed for 2018-2019 averaged of 532,459.50 cubic meters from the two major water sources, Larok and Kisolon Spring.

5. The Municipal Economic Enterprise Development Office (MEEDO) of Impasug-ong have two springs (Iglerop and Intavas spring in La Fortuna) and a deep well in Poblacion producing water serving the following areas in the municipality: Barangay Poblacion, La Fortuna, Sitio San Juan in Barangay La Fortuna, Sitio Kiasin in Barangay Capitan Bayong, and Sitio Kibangan in Barangay Poblacion. The monthly volume of water distributed by the MEEDO is 0.4428 MCM.

6. Data from the Malaybalay Water District including Primewater Malaybalay showed that its water supply is sourced from five (5) mountain creeks and seven (7) deep well pumping stations. Based on their monthly water production data, the total water produced from these water sources was approximately 8.607 MCM per year from 2018 to 2020.

From the water production data gathered, the total annual average water supplied to various water concession areas is about 78.483 MCM (**Table 3-61**).

Table 3-61. Annual water volume distributed to various water concession areas

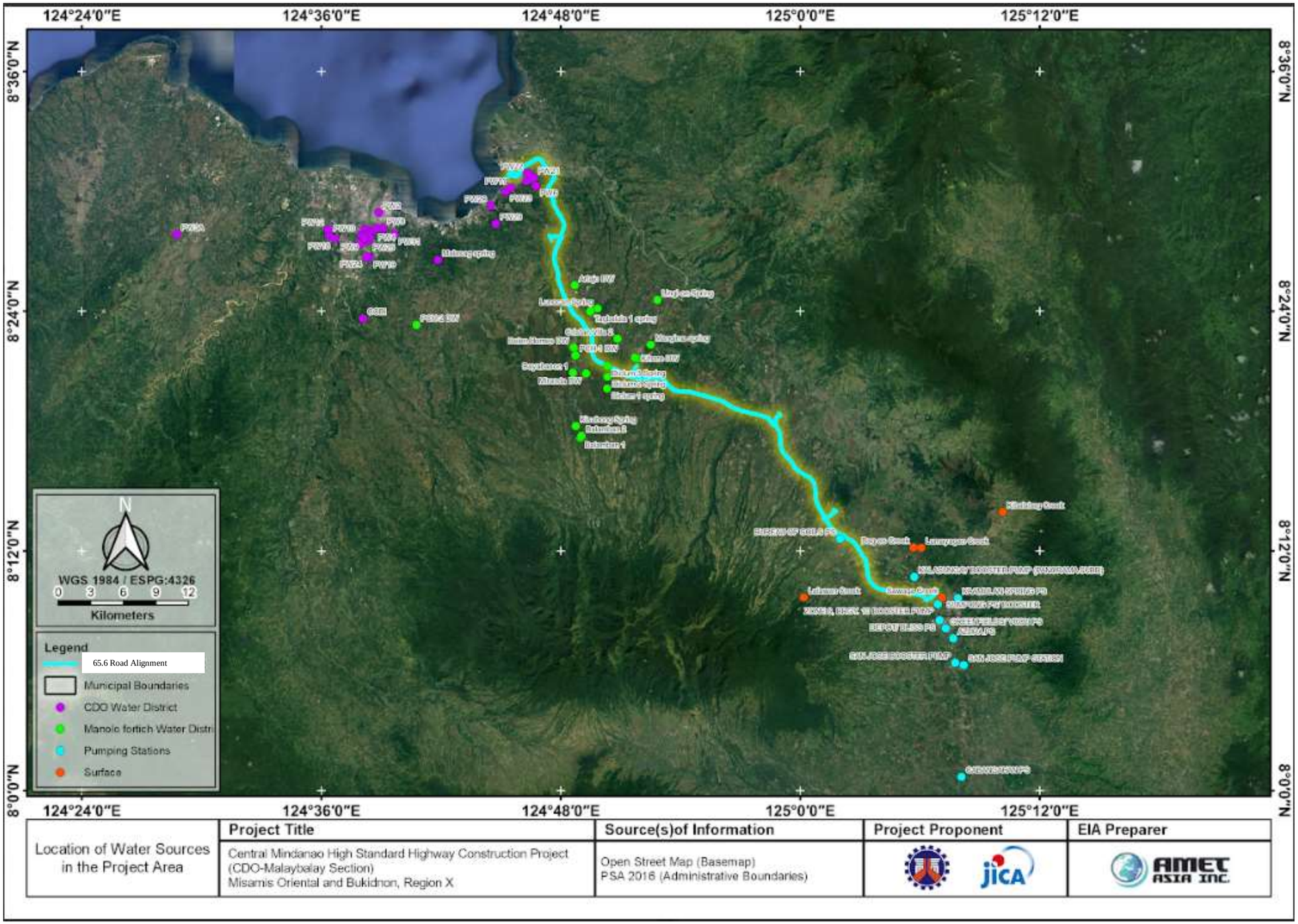
Municipality	Annual Water Distributed*			Annual Average
	2018	2019	2020	
Cagayan de Oro	51,580,308.00	73,215,745.00	74,891,720.00	66,562,591.00
Manolo Fortich	2,556,883.00	2,784,395.00	3,001,935.00	2,781,071.00
Sumilao	485,634.00	579,285.00		532,459.50
Malaybalay	8,223,893.30	8,945,379.66	8,653,009.00	8,607,427.32
Annual total average				78,483,548.82

*in cubic meters

From the flow duration curve, the 80% dependability level of the Tagoloan River Basin is around 6,908.69 liters per second or about 217.87 MCM per year. Comparing this with the volume of water distributed amounting to 78.483 MCM by various water service providers, showed sufficient enough surface water available in the basin for abstraction and use.

In addition, considering that groundwater sources are the primary source of water supply in the area, the water balance analysis previously presented showed that around 8% of rainfall is retained into the soil that eventually contributes to the groundwater becoming baseflow. This translates to about 268.06 MCM of annual rainfall volume that percolates into the soil and replenishes the groundwater table showing more than adequate water supply. Based on this, the Project is not expected to cause depletion and cause undue competition of the water resources in the area.

Figure 3-64. Location of water supply sources in the Project area



3.2.1.3.3.3 Water resource competition

The use of water for the Project is temporary in nature and is needed only during construction. Water abstraction from surface water resources would be used for construction activities and for equipment cleaning, dust control, and staging areas. The proposed Project may temporarily impact surface water volume in locations suitable for water withdrawals. During withdrawals, minimal disruption of the normal access to and use of surface water resources is expected in the proposed RROW and adjacent areas. The water resources affected by Project construction, as well as temporary access roads, would be restored following construction.

Project implementation will not involve installation of new wells for potable water. Instead, water supply requirements for construction personnel, temporary facilities and site offices will rely on existing water service providers and will not compete with the requirements of the domestic water users in the area. Thus, water resource use and competition are considered insignificant for the Project.

3.2.1.4 Proposed mitigation measures

3.2.1.4.1 Change in drainage morphology, inducement of flooding, reduction in stream volumetric flow

Pre-construction – the construction of the proposed Project and its appurtenant structures such as river crossings and slope protection work have the potential to impact water flow in the river altering its drainage morphology, induce flooding risk due to the presence of structures in or along the stream, and the effects of the reduction of flow downstream. The impact of these changes should be addressed and mitigated in the planning and detailed engineering design stage such as examination of any localized flooding problems related to the highway.

In addition to carefully designed stream crossings and slope protection works, it is necessary to provide small culvert crossings to allow water to properly drain and prevent flooding. Natural flows in rivers and creeks will be maintained or may be widened or deepened so that flood discharges would not adversely affect upstream of highway crossings. Any man-made canals and channel improvement works that may be affected by the Project, if any, should be modified to maintain its existing use and capacity. Coordination with the DPWH and/or the LGUs concerned regarding the river improvement works is emphasized.

Construction - Best management practices will be utilized during construction to further minimize changes in drainage morphology and riverine impacts. It is anticipated these practices will include properly installed silt fences, establishment of no intrusion areas during road construction, rapid re-vegetation of side slopes with anti-erosion cover, and the use of appropriate anti-erosion technologies.

Operation - Regular maintenance of drainage canals, pipe culvert, cross drains.

3.2.1.4.2 Change in stream and water depth

Pre-construction – During pre-constrution, staging areas must be located far from surface stream as possible and Spoils Management Plan must be formulated.

Construction - if standard methods of construction are not followed, it is possible that excavated materials and loose soils may end up in the waterways, creeks or streams, eventually altering its natural topography. The short-term increase in runoff with sediment may also occur due to vegetation and topsoil removal at the road alignment. Sediments may get washed into these water sources leading to changes in stream depths.

Disposal of unused or excess fill material during construction will comply with the DPWH standard specifications and other applicable environmental laws, policies and regulations. Disposal will not be allowed in wetlands, floodplains, or other environmentally sensitive areas. Erosion and sedimentation will be

controlled using temporary and permanent erosion and sediment control plans based on DPWH standard specifications and other applicable guidelines.

Earthworks will be conducted in a manner that minimizes disturbance to river sediments and containing sediments that become waterborne. Temporary mitigation measures to minimize physical impacts to the water resource may include floating booms where appropriate to contain sediment plumes and debris to the greatest extent practical within the river. Other erosion control measures for the land side of the Project may include silt fences, temporary sediment basins, diversion dikes, and other common engineering practices.

Operation - Restoration and maintenance of natural drainage traversed by the alignment.

3.2.1.4.3 Water resource use and competition

Construction - the water requirements of the Project deal with the potable water for construction personnel, equipment cleaning, washing, dust suppression, compaction of soil, among others. To minimize competition of water use, site staff shall not be permitted to use any open water body or natural water source adjacent to or within the designated site that are being used by the general populace, for the purposes of bathing or washing of clothes. Construction of wells as source of potable water shall not be allowed, instead the services of water service providers for the water supply requirement of the Project staff shall be engaged.

The water usage of the Project is temporary and is needed only during construction. Water abstraction from surface water resources by the proposed Project would be used for construction processes and would consist of equipment cleaning, dust control, and in the construction barracks. The proposed Project may temporarily impact surface water volume in locations suitable for water withdrawals. During withdrawals, minimal disruption of the normal access to and use of surface water resources would be anticipated in the proposed Project ROW and adjacent areas. The water resources affected by the proposed Project construction, as well as temporary access roads, would be restored following construction.

The Project will not involve installation of new wells for potable water. Instead, water supply requirements for construction personnel, temporary facilities and site offices will rely on existing water service providers and will not compete with the requirements of the domestic water users in the area. Thus, water resource use and competition are deemed insignificant for the Project.

3.2.2 Oceanography

Oceanography is not applicable because the proposed Project or any of its components are not located near the seas. The nearest coastal area to the RROW is more than 800 meters.

3.2.3 Water quality

3.2.3.1 Scope

Gathering of secondary data from various sources combined with primary data gathering through groundwater survey and obtaining samples of surface and groundwater was done in order to determine the baseline data of water quality along the Project site in line with DAO 2021-19 and DAO 2016-08.

3.2.3.2 Methodology

Groundwater quality - A survey was done to determine locations of deep wells or springs near the Project. Grab samples were collected at 10 stations during the high rainfall period (July 26, 27, 29 to 30, 2021). The seuver season was set in consideration of the abundant of water and the availability of sampling of deep wells or springs. All of the groundwater quality stations are utilized for drinking, bathing and washing by the locals. The location and description of the stations are shown in **Table 3-62** and **Figure 3-65**. Photographs of the sampling stations and the laboratory reports are shown in **Appendix 30** and **Annex 5** respectively. The

existing groundwater quality was described by comparing the laboratory results with the DENR Class A WQG values.

Table 3-62. Description of the groundwater water quality sampling stations

Stn.	Groundwater Name	Source type	Coordinates		Barangay	Municipality
			Latitude	Longitude		
GW1	Purok 6 Tubod Casinglot Reservoir	Deep well (Electric pump)	8.51721N	124.76284E	Casinglot	Tagoloan
GW2	Purok 1A Spring	Spring water	8.39112 N	124.83234 E	San Miguel	Manolo Fortich
GW3	Enlapay Spring	Spring water	8.33595 N	124.89176 E	Ticala	
GW4	Lumok Spring	Spring water	8.34294 N	124.91293 E	Puntian	Sumilao
GW5	Briana Spring	Spring water	8.30061 N	124.94921 E	Poblacion	
GW6	Kisolon Reservoir	Spring water	8.31803 N	124.96956 E	Kisolon	
GW7	Kalahi Seeds Reservoir	Spring water	8.26076 N	125.00866 E	Capt. Bayong	Impasug-ong
GW8	Bureau of Soils Reservoir	Deep well (Electric pump)	8.20972 N	125.0334 E	Dalwangan	Malaybalay
GW9	Patpat Waterbrake	Deep well (Electric pump)	8.19605 N	125.05702 E	Patpat	
GW10	Kalasungay Spring	Spring water	8.16255 N	125.11394 E	Kalasungay	

Surface water quality - The existing water quality of the rivers and streams traversing the Project alignment were described by collecting grab samples at ten stations near the alignment from April 25, 28 to 30 and July 26, 27, 29 to 30, 2021 to cover the low- and high rainfall periods (**Table 3-63** and **Figure 3-66**). The survey period was set to one sample for one season in consideration of the annual rainfall trend near project area (the low rain season is from November to May and the high rain season is from June to October). Photographs of the sampling stations and the laboratory reports are shown in **Appendix 29** and **Annex 4**, respectively.

Table 3-63. Description of the surface water quality sampling stations

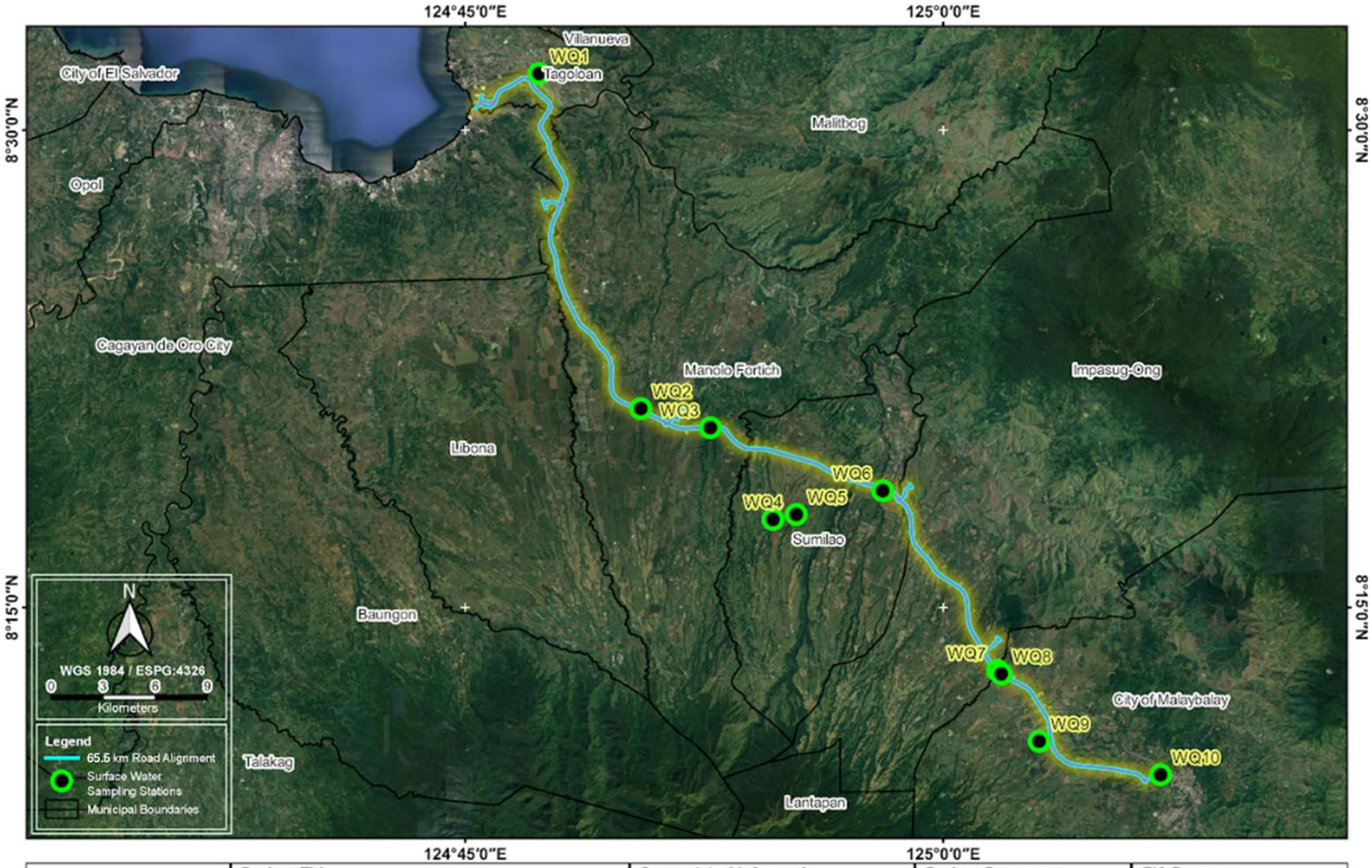
Stn.	Name of river	Coordinates		Barangay	Municipality
		Latitude	Longitude		
WQ1	Tagoloan River	8.52971N	124.788609E	Natumolan	Tagoloan
WQ2	Dicklum River	8.35425N	124.84182E	Dicklum	Manolo Fortich
WQ3	Kumaykay Stream	8.34422N	124.87815E	Ticala	
WQ4	Puntian River	8.29619N	124.91088E	Villa Vista/Puntian	Sumilao
WQ5	Tagalongon River	8.29878N	124.92311E	Culasi/Vista Villa	
WQ6	Mapolo River	8.31123N	124.96838E	Poblacion/ Kisolon	
WQ7	Ipoon River	8.21708N	125.02844E	Impalutao	Impasug-ong
WQ8	Komotal River	8.215275 N	125.030295E	Dalwangan	Malaybalay
WQ9	Sawaga River	8.17999 N	125.05012 E	Patpat	
WQ10	Sawaga River	8.16246 N	125.11364 E	Sumpong	

The sampling procedures and analyses for both groundwater and surface water samples were done according to the Water Quality Guidelines and General Effluent Standards of 2016 (DENR Administrative Order 2016-08).

Figure 3-65. Groundwater quality stations along the Project alignment

	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
Groundwater Sampling Map	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) AAI (Sampling Stations)		

Figure 3-66. Surface water quality stations along the Project alignment



Surface Water Sampling Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
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3.2.3.3 Assessment of key impacts

3.2.3.3.1 Degradation of groundwater quality

The results of the laboratory analysis are shown in **Table 3-64**. The salient findings after comparing the results with the DENR Class A WQG values with reference to **Table 3-65** are enumerated below.

a) The pH in all stations were less than the WQG values except in Stations GW5 GW6, GW9, and GW10 (green cells in **Table 3-65**). The low pH may be caused by minerals and organic decaying matter present in the soil.
b) All other water quality parameters were less than the DENR Class A WQG values.

Project implementation is not expected to affect groundwater quality because water requirements during construction and operation will not be sourced from deep wells.

3.2.3.3.2 Degradation of surface water quality

Low rainfall period - The results of the laboratory analysis are shown in **Table 3-66.** The salient findings after comparing the results with the DENR Class C (assumed) WQG values with reference to **Table 3-67** are enumerated below.

a) Fecal coliform levels at all stations were less than the WQG values except in Station WQ10 - Sawaga River (green cell in **Table 3-67**). The exceedance may be due to the presence of the game farm near the station.
b) The TSS levels at all stations were less than the WQG values except for Stations WQ1 and WQ2 (yellow cells in **Table 3-67**). The TSS WQG values in Stations WQ1 and WQ2 were exceeded by 425 and 18 mg/Li respectively. The high exceedance in Station WQ10 was likely due to the proximity of a sand and gravel quarry to the station.
c) All other water quality parameters were less than the DENR Class C WQG values.

High rainfall period - - The results of the laboratory analysis during the high rainfall period are shown in **Table 3-68.** The salient findings after comparing the results with the DENR Class C (assumed) WQG values with reference to **Table 3-69** are enumerated below.

a) Fecal coliform levels in all stations were less than the WQG values except in Station WQ1 – Tagoloan River, Station WQ2 – Dicklum River and Station WQ5 – Tagolongon River (green cells in **Table 3-69**). The highest was in Station WQ2 with an exceedance of 9000 MPN/100mL. The exceedance in Station WQ1 may be caused by the domestic animals grazing along the riverside while a barnyard and poultry farm were observed upstream of Stations WQ2 and WQ5 respectively.
b) The dissolved oxygen in all stations were higher than the WQG values except for Station WQ2 (orange cell in **Table 3-69**). Possible causes of this low DO level are surface runoff and organic loads entering the river upstream of the station.
c) All other water quality parameters were less than the DENR Class C WQG values.

Table 3-64. Groundwater quality at the sampling stations

Parameter	Unit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10	DENR*
Arsenic	mg/L	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	<0.00697	0.01
BOD	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	3
Cadmium	mg/L	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	<0.000723	0.003
Chromium (hex)	mg/L	<0.00114	<0.00114	ND	ND	ND	ND	ND	<0.00114	<0.00114	<0.00114	0.01
Chlorine (residual)	mg/L	<0.200	<0.200	ND	ND	ND	ND	ND	<0.200	<0.200	<0.200	250
COD	mg/L	4.00	6.00	4.00	7.00	13	14.00	3.00	<2.00	5.00	4.00	NWQV
Fecal Coliform	MPN/100mL	<1.8	27	33	14	<1.8	4.5	<1.8	<1.8	17	2	50
Color	TCU	5	<5	<5	<5	<5	<5	<5	<5	<5	<5	50
Cyanide	mg/L	0.0205	<0.0159	ND	ND	ND	ND	ND	<0.0159	<0.0159	<0.0159	0.07
Lead	mg/L	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	<0.00365	0.01
Mercury	mg/L	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.001
Nitrate	mg/L	0.91	0.68	1.09	1.74	1.03	0.42	0.69	1.19	0.81	0.4	7
Oil and Grease	mg/L	<0.939	<0.939	ND	ND	ND	ND	ND	<0.939	<0.939	<0.939	1
pH	--	7.43	6.57	6.71	6.57	6.48	6.10	7.83	6.90	6.28	5.53	6.5-8.5
Phosphate	mg/L	0.31	0.06	<0.01	0.14	0.01	0.1	0.12	0.04	<0.01	0.1	0.5
Sulfate	mg/L	46	<1	<1	<1	<1	<1	10	2	4	3	250
Surfactants	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.2
TSS	mg/L	<3	<3	<3	<3	<3	<3	<3	<3	3	<3	50

NOTES: NWQG – no WQG value, ND – none detected; *DENR CLASS A values based on DAO 2021-19 (Updated Water Quality Guidelines and General Effluent Standards for Selected Parameters) and DAO 2016-08 (Water Quality Guidelines and Effluent Standards of 2016)

Table 3-65. Existing groundwater quality impacts

Parameter	Unit	GW1	GW2	GW3	GW4	GW5	GW6	GW7	GW8	GW9	GW10
Arsenic	mg/L	0.00303	0.00303	0.00303	0.00303	0.00303	0.00303	0.00303	0.00303	0.00303	0.00303
BOD	mg/L	2	2	2	2	2	2	2	2	2	2
Cadmium	mg/L	0.002277	0.002277	0.002277	0.002277	0.002277	0.002277	0.002277	0.002277	0.002277	0.002277
Chromium (hex)	mg/L	0.00886	0.00886	NAND	NAND	NAND	NAND	NAND	0.00886	0.00886	0.00886
Chlorine (residual)	mg/L	249.8	249.8	NAND	NAND	NAND	NAND	NAND	249.8	249.8	249.8
COD	mg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fecal Coliform	MPN/100mL	48.2	23	17	36	48.2	45.5	48.2	48.2	33	48
Color	TCU	45	45	45	45	45	45	45	45	45	45
Cyanide	mg/L	0.0495	0.0541	NAND	NAND	NAND	NAND	NAND	0.0541	0.0541	0.0541
Lead	mg/L	0.00635	0.00635	0.00635	0.00635	0.00635	0.00635	0.00635	0.00635	0.00635	0.00635
Mercury	mg/L	0.00093	0.00093	0.00093	0.00093	0.00093	0.00093	0.00093	0.00093	0.00093	0.00093
Nitrate	mg/L	6.09	6.32	5.91	5.26	5.97	6.58	6.31	5.81	6.19	6.6
Oil and Grease	mg/L	0.061	0.061	NAND	NAND	NAND	NAND	NAND	0.061	0.061	0.061
pH	--	WR	WR	WR	WR	BLR	BLR	WR	WR	BLR	BLR
Phosphate	mg/L	0.19	0.44	0.49	0.36	0.49	0.4	0.38	0.46	0.49	0.4
Sulfate	mg/L	204	249	249	249	249	249	240	248	246	247
Surfactants	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
TSS	mg/L	47	47	47	47	47	47	47	47	47	47

NOTES: (+) values means no impact; NWQG – no WQG value; NA – not applicable; NAND – not applicable, not detected; WR – within range; AUR – above Upper Range; BLR – below Lower Range

Table 3-66. Stream water quality at the sampling stations (low rainfall sampling period)

Parameter	Unit	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ9	WQ10	DENR*
Arsenic	mg/L	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	<0.00416	0.02
BOD	mg/L	1	1	<1	5	<5	<1	<1	<1	<1	<1	7
Cadmium	mg/L	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	<0.000727	0.005
Chromium (hex)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
COD	mg/L	45	41	44	51	12	21	23	20.1	21	20	NWQG
Fecal Coliform	MPN/100mL	150	170	6.1	27	44	34	47	16	36	280	200
Color	TCU	10	10	10	10	5	5	10	16	10	10	75
Cyanide	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
Dissolve Oxygen	mg/L	5.85	5.6	6.26	5.34	5.86	5.63	6.14	7.7	7.86	5.63	5
Lead	mg/L	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	<0.00517	0.05
Mercury	mg/L	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	<0.00007	0.002
Nitrate	mg/L	0.58	1.11	0.2	0.41	0.72	0.19	0.18	0.18	0.14	0.44	7
Oil and Grease	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
pH	--	7.97	5.6	6.26	7.62	7.4	7.88	7.22	7.22	7.63	7.64	6.5-9.0
Phosphate	mg/L	0.06	0.03	0.04	0.04	0.03	0.07	0.05	0.05	0.05	0.12	0.5
Residual Chlorine	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	350
Sulfate	mg/L	<1	7	<1	5	8	<1	<1	<1	<1	8	275
Surfactants	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1.5
Temperature	°C	33.5	30.7	30.7	25.2	24.3	26.9	32.4	24.6	26.6	23	25-31
TSS	mg/L	505	98	24	11	12	6	13	17	11	8	80

NOTES: NWQG – no WQG value, ND – none detected; *DENR CLASS C values based on DAO 2021-19 (Updated Water Quality Guidelines and General Effluent Standards for Selected Parameters) and DAO 2016-08 (Water Quality Guidelines and Effluent Standards of 2016)

Table 3-67. Existing stream water quality impacts (low rainfall sampling period)

Parameter	Unit	Class C	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ9	WQ10
Arsenic	mg/L	0.02	0.01584	0.01584	0.01584	0.01584	0.01584	0.01584	0.01584	0.01584	0.01584	0.01584
BOD	mg/L	7	6	6	6	2	2	6	6	6	6	6
Cadmium	mg/L	0.005	0.004273	0.004273	0.004273	0.004273	0.004273	0.004273	0.004273	0.004273	0.004273	0.004273
Chlorine (residual)	mg/L	NWQG	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (hex)	mg/L	0.01	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
COD	mg/L	NWQG	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color	TCU	75	65	65	65	65	70	70	65	59	65	65
Cyanide	mg/L	0.1	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
Dissolve Oxygen	mg/L	5	0.85	0.6	1.26	0.34	0.86	0.63	1.14	2.7	2.86	0.63
Fecal coliform	MPN/100mL	200	50	30	193.9	173	156	166	153	184	164	-80
Lead	mg/L	0.05	0.04483	0.04483	0.04483	0.04483	0.04483	0.04483	0.04483	0.04483	0.04483	0.04483
Mercury	mg/L	0.002	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193
Nitrate	mg/L	7	6.42	5.89	6.8	6.59	6.28	6.81	6.82	6.82	6.86	6.56
Oil and Grease	mg/L	2	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
pH	--	6.5 - 9.0	WR	WR	WR	WR	WR	WR	WR	WR	WR	WR
Phosphate	mg/L	0.5	0.44	0.47	0.46	0.46	0.47	0.43	0.45	0.45	0.45	0.38
Sulfate	mg/L	275	274	268	274	270	267	274	274	274	274	267
Surfactants	mg/L	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Temperature	°C	25 - 31	AUR	WR	WR	WR	BLR	WR	AUR	BLR	WR	BLR
TSS	mg/L	80	-425	-18	56	69	68	74	67	63	69	72

NOTES: (+) values means no impact, (-) adverse impact, value is impact magnitude; NWQG – no WQG value; NA – not applicable; NAND - not applicable, not detected; WR – within range; AUR – above Upper Range; BLR – below Lower Range

Table 3-68. Surface water quality at the stations (high rainfall sampling period)

Parameter	Unit	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ9	WQ10	DENR*
Arsenic	mg/L	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	<0.0035	0.0035	<0.0035	<0.0035	<0.0035	0.02
BOD	mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	7
Cadmium	mg/L	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	<0.00028	0.005
Chlorine (residual)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	350
Chromium (hex)	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01
COD	mg/L	ND	ND	14	5.00	3.00	4.00	ND	3.00	4.00	4.00	NWQG
Color	TCU	5	10	10	5	<5	5	10	10	5	15	75
Cyanide	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1
Dissolve Oxygen	mg/L	6.9	4.97	7.79	6.14	5.03	6.48	5.43	5.27	5.46	5.25	5
Fecal Coliform	MPN/100mL	350	9200	53	40	350	55	55	21	11	8.2	200
Lead	mg/L	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	<0.0026	0.05
Mercury	mg/L	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	<0.000070	0.002
Nitrate	mg/L	0.03	0.41	0.13	0.26	0.44	0.12	0.05	0.03	<0.01	0.03	7
Oil and Grease	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2
pH	--	8.36	7.23	7.42	7.59	7.1	8.08	7.69	8.00	7.09	7.81	6.5 – 9.0
Phosphate	mg/L	0.08	0.11	0.03	0.03	<0.01	0.04	<0.01	0.12	<0.01	0.04	0.5
Sulfate	mg/L	<1	8	2	4	<1	<1	11	<1	20	<1	275
Surfactants	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	1.5
Temperature	°C	27.9	26.1	26.7	24.30	24.8	23.00	20.7	26.8	23.7	24.7	25 – 31
TSS	mg/L	47	50	13	4	<3	3	10	4	<3	5	80

NOTES: NWQG – no WQG value, ND – none detected; *DENR CLASS C values based on DAO 2021-19 (Updated Water Quality Guidelines and General Effluent Standards for Selected Parameters) and DAO 2016-08 (Water Quality Guidelines and Effluent Standards of 2016)

Table 3-69. Existing stream water quality impacts (high rainfall sampling period)

Parameter	Unit	Class C	WQ1	WQ2	WQ3	WQ4	WQ5	WQ6	WQ7	WQ8	WQ9	WQ10
Arsenic	mg/L	0.02	0.01650	0.01650	0.01650	0.01650	0.01650	0.01650	0.01650	0.01650	0.01650	0.01650
BOD	mg/L	7	6	6	6	6	6	6	6	6	6	6
Cadmium	mg/L	0.005	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472	0.00472
Chlorine (residual)	mg/L	350	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
Chromium (hex)	mg/L	0.01	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
COD	mg/L	NWQG	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Color	TCU	75	70	65	65	70	70	70	65	65	70	60
Cyanide	mg/L	0.1	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
Dissolve Oxygen	mg/L	5	1.9	-0.03	2.79	1.14	0.03	1.48	0.43	0.27	0.46	0.25
Fecal Coliform	MPN/100mL	200	-150	-9000	147	160	-150	145	145	179	189	191.8
Lead	mg/L	0.05	0.0474	0.0474	0.0474	0.0474	0.0474	0.0474	0.0474	0.0474	0.0474	0.0474
Mercury	mg/L	0.002	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193	0.00193
Nitrate	mg/L	7	6.97	6.59	6.59	6.74	6.56	6.88	6.95	6.97	6.99	6.97
Oil and Grease	mg/L	2	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND	NAND
pH	--	6.5 – 9.0	WR	WR	WR	WR	WR	WR	WR	WR	WR	WR
Phosphate	mg/L	0.5	0.42	0.39	0.39	0.47	0.49	0.46	0.49	0.38	0.49	0.46
Sulfate	mg/L	275	274	267	275	271	274	274	264	274	255	274
Surfactants	mg/L	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Temperature	°C	25 – 31	WR	WR	WR	BLR	BLR	BLR	BLR	WR	BLR	BLR
TSS	mg/L	80	33	30	67	76	77	77	70	76	77	75

NOTES: NWQG – no WQG value; NA – not applicable; NAND – not applicable, not detected; WR – within range; AUR – above Upper Range; BLR – below Lower Range

3.2.3.4 Proposed mitigation measures

The proposed mitigating measures to minimize ground and surface water pollution in the different Project phases are presented below.

Pre-construction phase

a) Prepare plans for drainage and sediment ponds at the staging areas and active construction sites; and
b) Prepare a Water Quality Monitoring Plan for the construction and operation phases.

Construction phase

a) Strict implementation of Construction Plan specifications for each Project component;
b) Provide sanitary facilities at the staging areas and active construction sites;
c) Provide adequate drainage leading to siltation ponds;
d) Implement the Water Quality Monitoring Plan during construction phase; and
e) Best housekeeping practices.

Operation phase

a) Provision of sanitation facilities, e.g., septic vaults in the offices;
b) Maintain drainage system leading to siltation ponds;
c) Implement the Water Quality Monitoring Plan during operation phase; and
d) Best housekeeping practices.

3.2.4 Freshwater ecology

3.2.4.1 Scope

This section described the existing aquatic ecology of the freshwater waterbodies and assessment of potential Project impacts. The existing aquatic ecology was described by 14 (low rain period) and 17 (high rain period) sampling sites at the rivers and streams traversed by or adjacent to the proposed CMH alignment. The objectives of the assessment are enumerated below.

1. Determine species composition, diversity, abundance, distribution, and seasonality of plankton, fishes and macrobenthic fauna, and aquatic insects;
2. Assess endemism and conservation status of aquatic species based on DAO 2004-15 and DAO 2007-1 as amended in DAO 2007-24 and IUCN/CITES Appendix I and II criteria;
3. Identify, assess, and propose mitigation measures of the potential impacts of the Project to local aquatic biodiversity and ecological conditions in relation to Fisheries Act (RA 10654), Wildlife Resources Conservation and Protection Act (2001), and DENR Memorandum Circular 2007-2 (Critical Habitats);

3.2.4.2 Methodology

The assessment done from April 28 to May 7, 2021 (low rain period) and July 25 to August 5, 2021 (high rain period), determined species composition, diversity, abundance, distribution, and seasonality of aquatic ecology using the 17 stations Site (**Table 3-70** and **Figure 3-67**). In-situ water quality analysis and streamflow measurements were also done at the sampling areas. **Appendix 31** shows the photo documentation of the ecological assessment. As for the ecology sampling period,

Table 3-70. Locations of aquatic ecology sampling stations

Station	Coordinates		Water body	Station	Coordinates		Water body
	Latitude	Longitude			Latitude	Longitude	
A1	8.523545°	124.791755°	Tagoloan River	A10	8.304605°	124.978894°	Atugan River

Station	Coordinates		Water body	Station	Coordinates		Water body
	Latitude	Longitude			Latitude	Longitude	
A2	8.510598°	124.791472°	Bugo Stream	A11	8.263309°	125.001386°	Atugan River
A3	8.399158°	124.810456°	Alae River	A12	8.217137°	125.028438°	Ipoon River
A4	8.353080°	124.841668°	Dicklum River	A13	8.215390°	125.030989°	Komotal River
A5	8.344272°	124.878038°	Kumaykay River	A14	8.187729°	125.050267°	Sawaga River
A6	8.295869°	124.910720°	Puntian River	A15	8.183277°	125.056200°	Sawaga River
A7	8.298831°	124.923080°	Tagolongon River	A16	8.162573°	125.110856°	Sawaga River
A8	8.316260°	124.953292°	Kulaman River	A17	8.162461°	125.113840°	Sawaga River
A9	8.312597°	124.968263°	Mapolo River				

Figure 3-67. Aquatic ecology sampling stations along the Project alignment

Stream measurements and in-situ water quality analysis

Discharge rate - Streamflow measurements were done using a transect meter and a digital water velocity meter (Xylem, USA). The streamflow was calculated using the Velocity Area Method (EMB-DENR Manual for Ambient Water Quality Monitoring Vol I).

In situ water quality analysis – the pH, Dissolved Oxygen (DO), Electrical Conductivity, and Total Dissolved Solids (TDS) at each station were determined using a calibrated portable water quality meter.

Aquatic ecological assessment

Plankton - Plankton samples were collected using 4-inch diameter plankton sieves with 20-µm and 90-µm mesh sizes to filter phytoplankton and zooplankton, respectively, from 16 L river or stream water samples. The filtrate was carefully rinsed with filtered water and stored in carefully labelled plastic containers. Phytoplankton and zooplankton samples were fixed *in situ* using 5% buffered formalin solution and 95% ethanol respectively. Three replicate samples were collected for phytoplankton analysis and one composite sample for zooplankton from three sub-stations. The average plankton density was determined using two aliquots per sample examined microscopically using a Sedgewick-Rafter counting cell with 1-ml volume. Plankton organisms were identified down to the lowest taxa where possible using plankton guides and references. Photomicrographs of plankton representatives were taken using a digital camera for documentation.

Fishes and macrobenthic fauna - Fishes and macrobenthic fauna were collected from upstream, midstream and downstream sections of a river or stream using a Dip net for three minutes by vigorously agitating the bottom. Samples were emptied into a white basin and sieved through a 100-µm metal sieve to remove plant litter and other organic debris. Samples were sorted into fishes, mollusks, crustaceans, and aquatic insects, and stored in 15-mL screw-capped, centrifuge tubes, preserved with 95% ethanol, and labeled with date, station number, and stream section.

3.2.4.3 Assessment of key impacts

3.2.4.3.1 Threat to existence of important local species, abundance, frequency and distribution of important species

3.2.4.3.1.1 Stream measurements and in-situ water quality

In situ water quality analysis – The Dissolved Oxygen (DO, mg/L) content was relatively high ranging from 8.8 to 15.9 ppm during the high rainfall period and 9.8–14.5 ppm during the low rainfall. The pH was slightly basic ranging from 7.1 to 8.0 and 6.8–7.9 during the during the low and high rainfall periods respectively. Water temperatures, depending on time of measurements ranged from 22.4–28.4 °C and 22.4–32 °C during the low and high rainfall periods respectively. Electrical conductivity values in the 17 stations ranged from 54–188 µS/cm (low rainfall) and 46–174 µS/cm (high rainfall). The Total Dissolved Solids (TDS) readings ranged from 27 – 94 mg/L during low rainfall and 23 – 88 mg/L during high rainfall. DO and pH values are within parameter limits specified under DAO 2016-08. **Figure 3-68** and **Figure 3-69** shows the water quality and discharge rates at the aquatic ecology assessment during the low and high rainfall periods.

Figure 3-68. In-situ water quality (DO, pH, temperature, EC) at the aquatic sampling stations

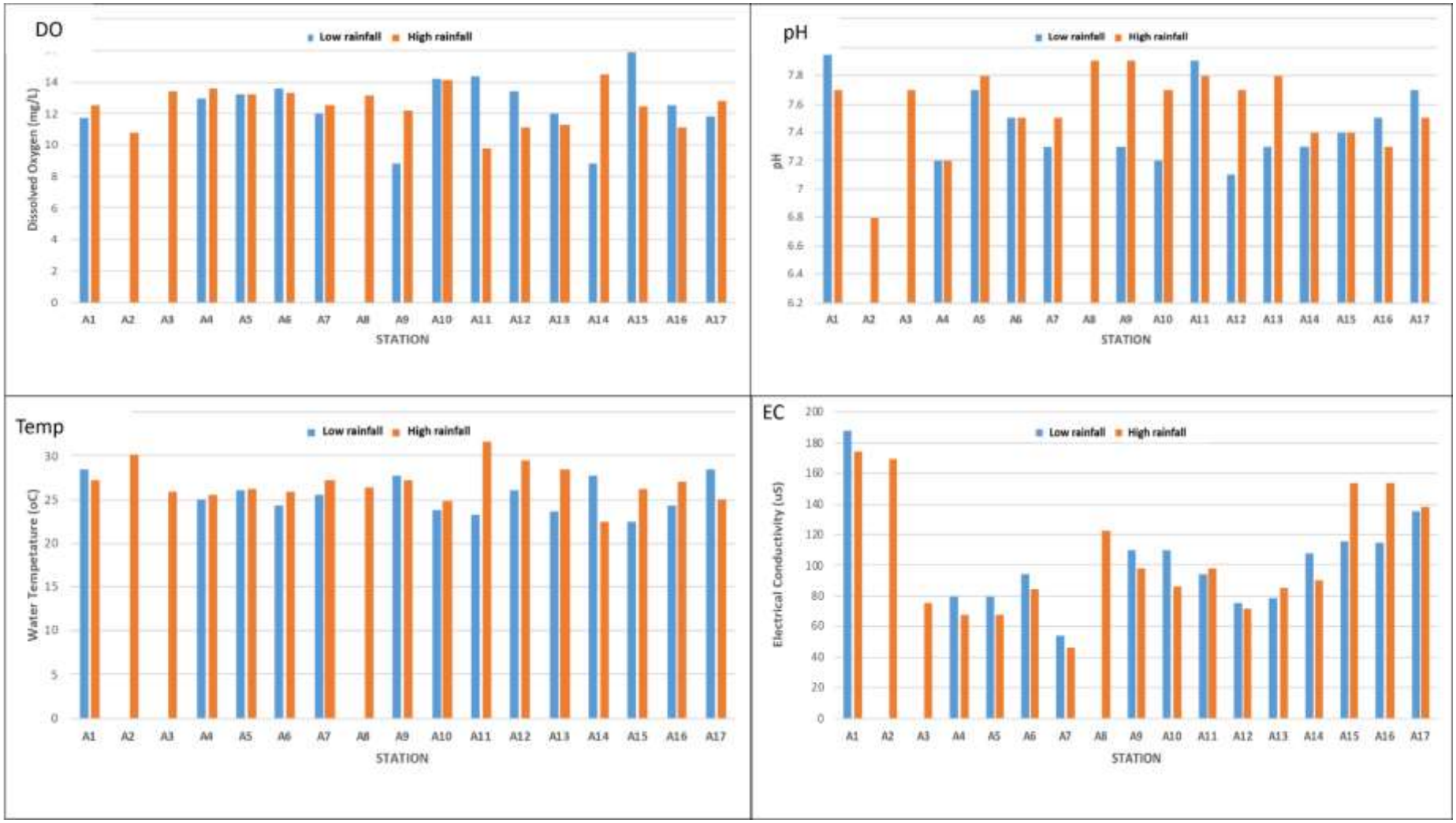
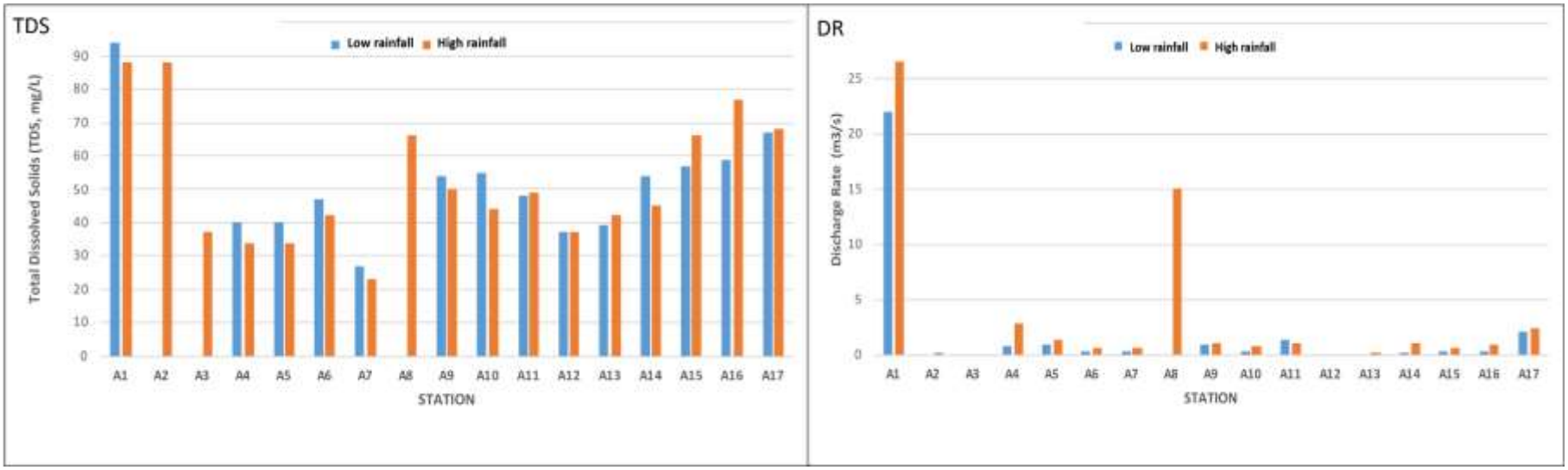


Figure 3-69. In-situ Total Dissolved TDS and discharge rate at the aquatic sampling stations



Discharge rate - Discharge rates of rivers and streams representing natural ecological flows ranged from 0.024 – 21.979 m^3/s and 0.04 – 26.562 m^3/s the low and high rainfall period, respectively. The highest discharge rate during low rainfall period was recorded in Station A1 (Tagoloan River) at 21.979 m^3/s and Station A17 (Sawaga River) at 2.095 21.979 m^3/s while the lowest discharge rate was recorded at Station A12 (Ipoon river) with 0.0024 m^3/s.

The highest discharge rate during the high rain period was also recorded at Station A1 at 26.562 m^3/s followed by Station A8 (Kulaman river) at 15.105 m^3/s while the lowest discharge rate was also recorded at Station A12 at 0.04 m^3/s (Ipoon river). Discharge rates increased during the high rain period that was brought about by monsoon rains.

3.2.4.3.1.2 Phytoplankton

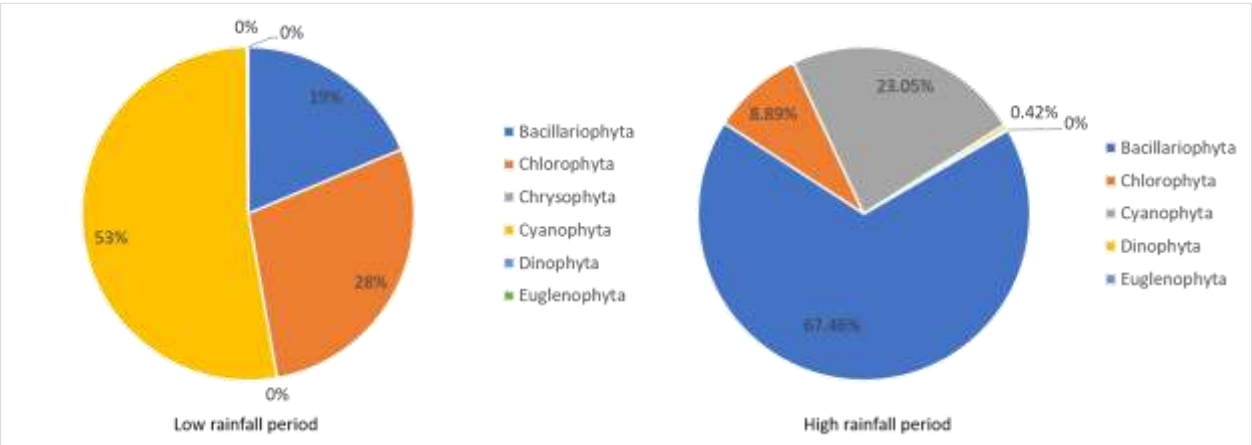
Dominant major phytoplankton groups - A total of 54 taxa in six major phytoplankton groups were recorded during the low rainfall period and 42 taxa in five major phytoplankton groups during the high rainfall period. Cyanobacteria (blue-green algae) was the most dominant group observed during the low rainfall period with mean relative abundance of 52.66%, while diatoms (Bacillariophyta) were the most abundant group with mean relative abundance of 67.46% on the high rainfall period (**Table 3-71** and **Figure 3-70**).

Table 3-71. Density* and relative abundance of major phytoplankton groups

Low rainfall period			High rainfall period		
Phylum	**Density**	**RA (%)**	**Phylum**	**Density**	**RA (%)**
Bacillariophyta	4657	18.71	Bacillariophyta	4200	67.46
Chlorophyta	7090	28.49	Chlorophyta	554	8.89
Chrysophyta	2	0.01	Cyanophyta	1437	23.05
Cyanophyta	13107	52.66	Dinophyta	28	0.42
Dinophyta	24	0.09	Euglenophyta	12	0.18
Euglenophyta	9	0.03	**Total**	**6225**	**100**
Total	**4657**	**100**	Note: RA – relative abundance		

NOTE: *in cells/L, RA – relative abundance

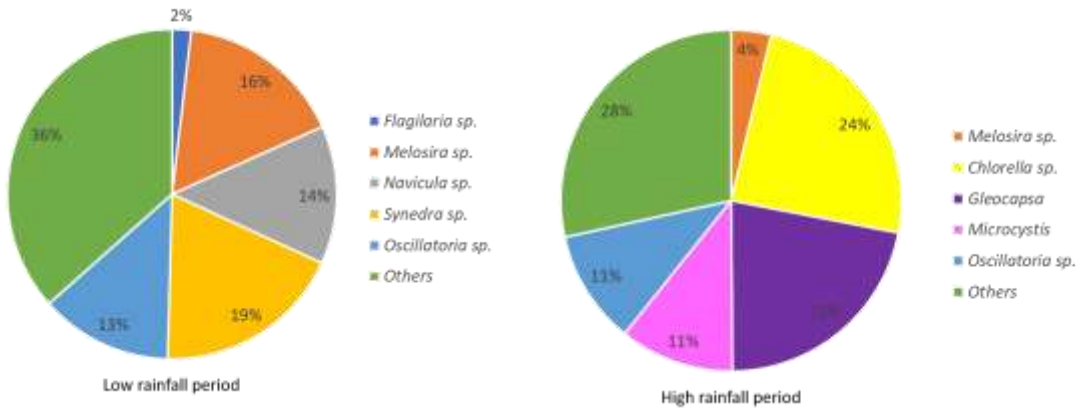
Figure 3-70. Relative abundance of major phytoplankton groups



Dominant phytoplankton genera - Chlorella sp., a green alga (Chlorophyta) was the most abundant taxa during the low rainfall period with a mean relative abundance of 24.60% followed by *Gleocapsa sp.*, a blue-green algae (Cyanobacteria) with a mean relative abundance of 21.68%. During the high rainfall period, *Fragillaria sp.* and *Synedra sp.,* both diatoms (Bacillariophyta), were the most abundant phytoplankton having mean relative abundances of 17.57% and 15.61% respectively (**Figure 3-71**). Other phytoplankton major groups and taxa were poorly represented in the samples. The species composition of phytoplankton is shown in **Appendix 32.**

The phytoplankton communities present in these stations were diverse and showed seasonality. The blue-green algae (*Cyanobacteria*) dominated during the low rainfall period, but the green alga *Chlorella sp.* (*Chlorophyta*) was the most abundant phytoplankton during this time period (**Figure 3-71**). As fresh influx of freshwater increases during the high rainfall period, the diatoms (*Bacillariophyta*) become the dominant group that is dominated by *Fragillaria sp*., *Synedra sp., Melosira sp.,* and *Navicula sp.* in the plankton samples (**Figure 3-71**). A blue-green alga (Cyanobacteria), *Oscillatoria sp.* was the fifth most abundant taxa during the high rainfall period. The variations in abundances between taxa and phytoplankton groups was mainly governed by the influx of freshwater and residence times.

Figure 3-71. Relative abundance of dominant phytoplankton genera



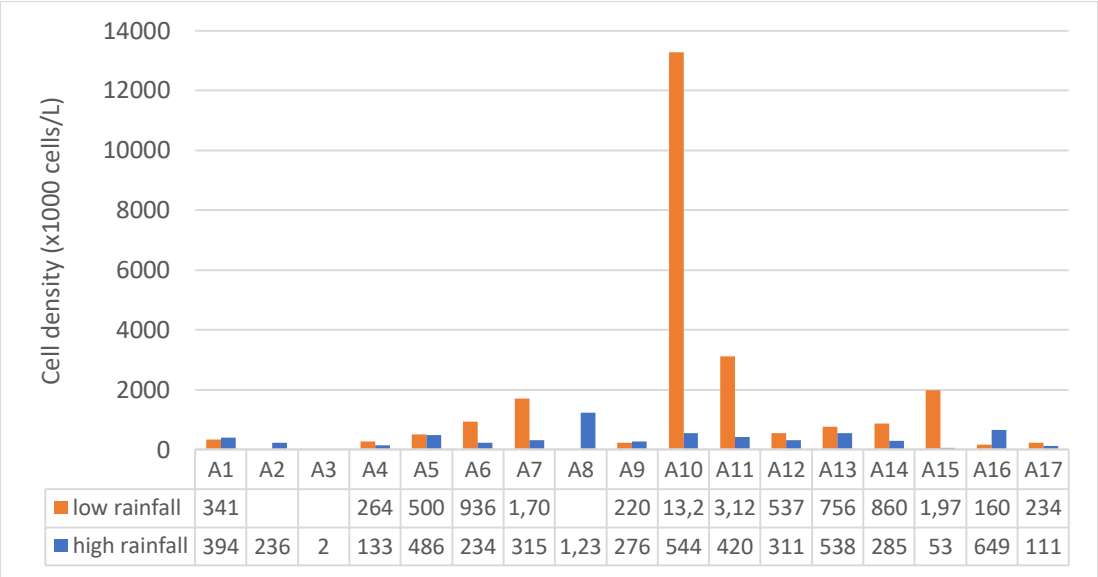
Comparative abundance of phytoplankton per rainfall periods - **Figure 3-72** and **Figure 3-73** illustrates the comparative abundance of phytoplankton organisms across the aquatic ecology stations. During the low rainfall period, Aquatic Station 10 (Atugan river) had the highest total phytoplankton density of 13,277 cells/L while the lowest was Aquatic Station 16 (Sawaga river) with only 160 cells/L. Aquatic Stations 11 (Atugan river), A15 (Sawaga river), and A7 (Tagolongon river) had relatively high phytoplankton densities of 3,125 cells/L, 1,970 cells/L and 1,704 cells/L respectively. All other stations had densities below 1,000 cells/L. Phytoplankton densities during the high rainfall sampling period were comparatively lower, with the highest phytoplankton count of only 1,238 cells/L in aquatic station 8 (Kulaman river) and the lowest density was at station 3 (Alae River) with only 2 cells/L phytoplankton density. These values were considerably higher than those observed in the head waters of Alanib River, Mt. Kitanglad, Bukidnon (Opiso et. Al. 2014). The relatively higher densities observed during these assessment periods can be explained by nutrient influx from domestic origins and runoff coming from the surrounding agricultural lands (Bertomen et. al., 2017).

The influx of freshwater during the high rainfall period disrupts the proliferation and population growth of phytoplankton due to increased water volume and flow leading to lesser residence times of phytoplankton (dilution effect) and increased turbidity. Phytoplankton population growth lags the influx of freshwater despite the influx of nutrients into the aquatic environment which needs sufficient time to proliferate. Flowing waters generally have lower phytoplankton densities compared to stagnant waters due to higher residence times that promote higher population densities. This explains why stagnant pools of water, ponds, and lakes are visibly greener than flowing streams or rivers. During heavy rains, silt and clay particles are carried into streams and rivers which lower water clarity due to higher turbidity impeding light penetration that is needed by these photosynthetic organisms in order to grow and reproduce.

In general, the phytoplankton communities present in these rivers and streams are diverse in terms of major groups and species composition. Higher diversity and higher phytoplankton densities are experienced during the low rainfall period than in high rainfall period (**Figure 3-72** and **Figure 3-73**). The observed phytoplankton densities were relatively lower compared to stagnant pools, ponds and lakes but this shows that even in clear

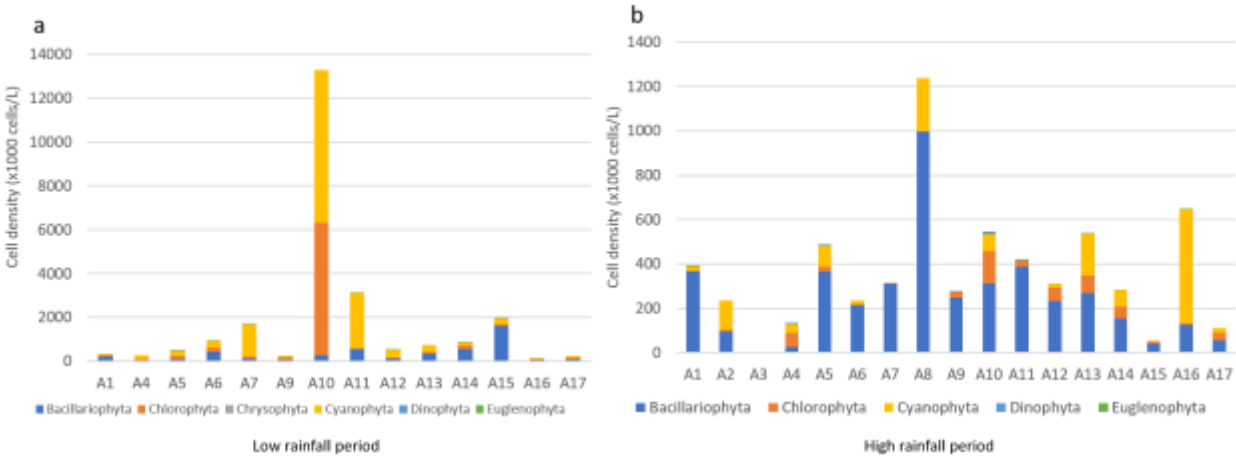
and flowing bodies of water, a healthy community of microscopic phytoplankton grows and thrives. Some of the representative phytoplankton taxa

Figure 3-72. Comparative abundance of phytoplankton organisms across aquatic ecology stations



	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17
low rainfall	341			264	500	936	1,70		220	13,2	3,12	537	756	860	1,97	160	234
high rainfall	394	236	2	133	486	234	315	1,23	276	544	420	311	538	285	53	649	111

Figure 3-73. Species composition of phytoplankton across stations



3.2.4.3.1.3 Zooplankton

Dominant major zooplankton groups – the zooplankton community observed across all stations was relatively diverse, with eight taxa in four major groups - Amoebozoa, Arthropods, Nematoda, and Rotifera. Amoebozoa was the most abundant group during low rain period with a mean relative abundance of 54.29%, followed by Nematoda (round worms) and Rotifera with mean relative abundance of 20%, and Arthropoda (*Diaptomus* sp.) with only 6.05% mean relative abundance (**Table 3-72** and **Figure 3-74**). **Appendix 32** shows the representative zooplankton species.

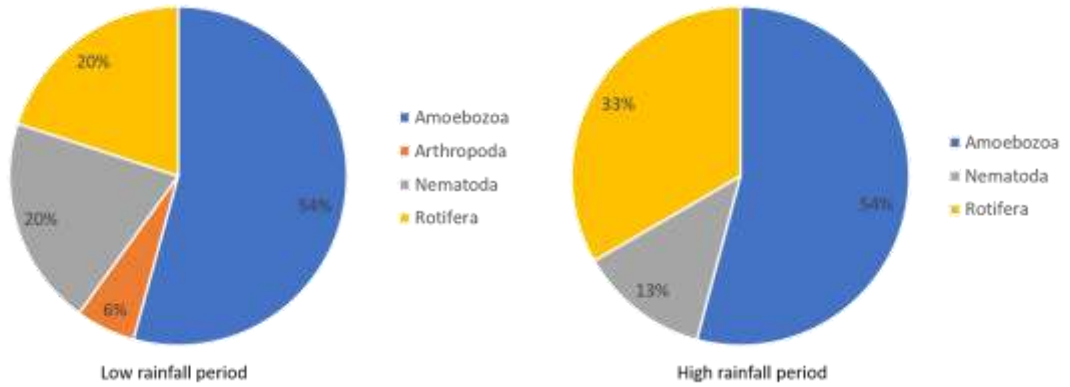
Only five zooplankton taxa in three (3) major groups were recorded during high rain period. Amoabozoa (*Arcella sp.* and *Centropyxis sp.*) was also the most dominant group with a mean relative abundance of 52.99%, followed by Rotifera (*Asplanchna sp.* and *Lecane sp.*), with 32.61%, and Nematoda (Nematodes) with only 12.23% mean relative abundance (**Table 3-72** and **Figure 3-74**).

Table 3-72. Composition and relative abundance of major zooplankton groups

Phylum	Abundance	RA (%)	Phylum	Abundance	RA (%)

Phylum	Abundance	RA (%)	Phylum	Abundance	RA (%)
Amoebozoa	19	54.28	Amoebozoa	13	54.17
Arthropoda	2	5.71	Nematoda	3	12.50
Nematoda	7	20.00	Rotifera	8	33.33
Rotifera	7	20.00	**Total**	**24**	**100**
Total	**35**	**100.00**	Note: F – frequency, RA – relative abundance		

Figure 3-74. Relative abundance of major zooplankton groups during low and high rainfall periods

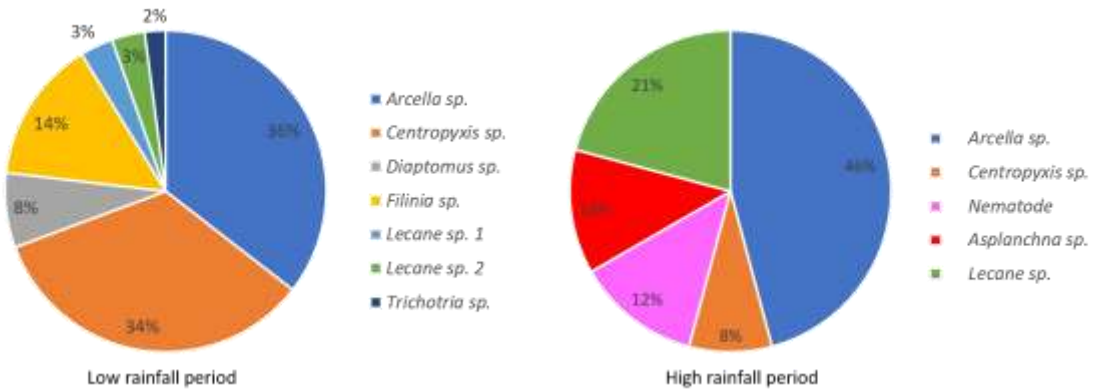


Dominant zooplankton genera - With regards to the dominant taxa, *Arcella* sp. was the most abundant during the low rainfall period with 16.62% followed by *Centropyxis* sp. with 15.84%. *Arcella* sp. is also the most abundant species during the high rainfall period with 45.83% followed by *Lecane* sp. with 20.83% (**Table 3-73** and **Figure 3-75**)

Table 3-73. Composition and relative abundance of zooplankton per genera

Low rainfall period			Low rainfall period		
Zooplankton Genera	**Abundance**	**RA (%)**	**Zooplankton Genera**	**Abundance**	**RA (%)**
Arcella sp.	9	16.62	*Arcella sp.*	11	45.83
Centropyxis sp.	10	15.84	*Centropyxis sp.*	2	8.33
Diaptomus sp.	2	3.52	Nematode	3	12.50
Filinia sp.	4	6.74	*Asplanchna sp.*	0	12.50
Lecane sp. 1	1	1.56	*Lecane sp.*	3	20.83
Lecane sp. 2	1	1.56	**Grand Total**	**24**	**100.00**
Trichotria sp.	1	0.98	Note: F – frequency, RA – relative abundance		
Grand Total	**35**	**100.00**			

Figure 3-75. Relative abundance of zooplankton genera during low and high rainfall periods



Comparative abundance of phytoplankton per rainfall periods – The zooplankton density per station was relatively low with the highest density of only 11 individuals/L (Station A1) observed during the low rain period and 8 individuals/L (Station A8) during the high rain period. Zooplankton density during the low rain period ranged from 1 – 11 individuals/L compared to 0 – 8 individuals/L during the high rain period (**Figure 3-76** and **Figure 3-77**). These zooplankton densities were low compared to standing bodies of water where densities often reach hundreds of individuals per liter. These values are considered normal due to the relatively low phytoplankton densities observed in streams and rivers.

Figure 3-76. Species composition of zooplankton across stations

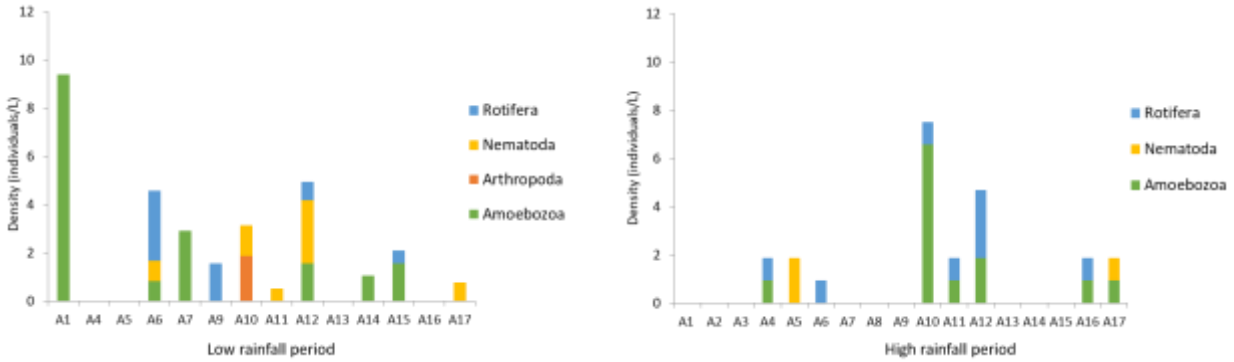
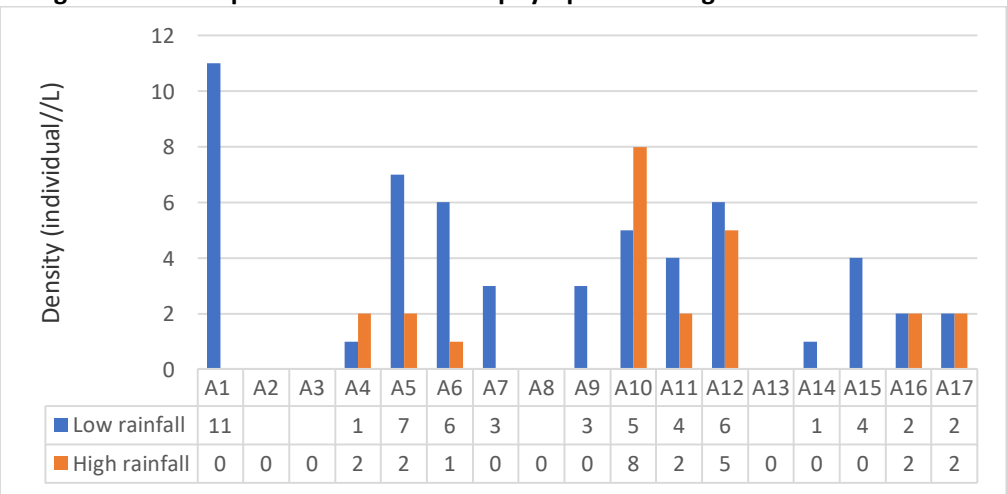


Figure 3-77. Comparative abundance of phytoplankton organisms across stations



3.2.4.3.1.4 Fishes and Macrobenthic Fauna

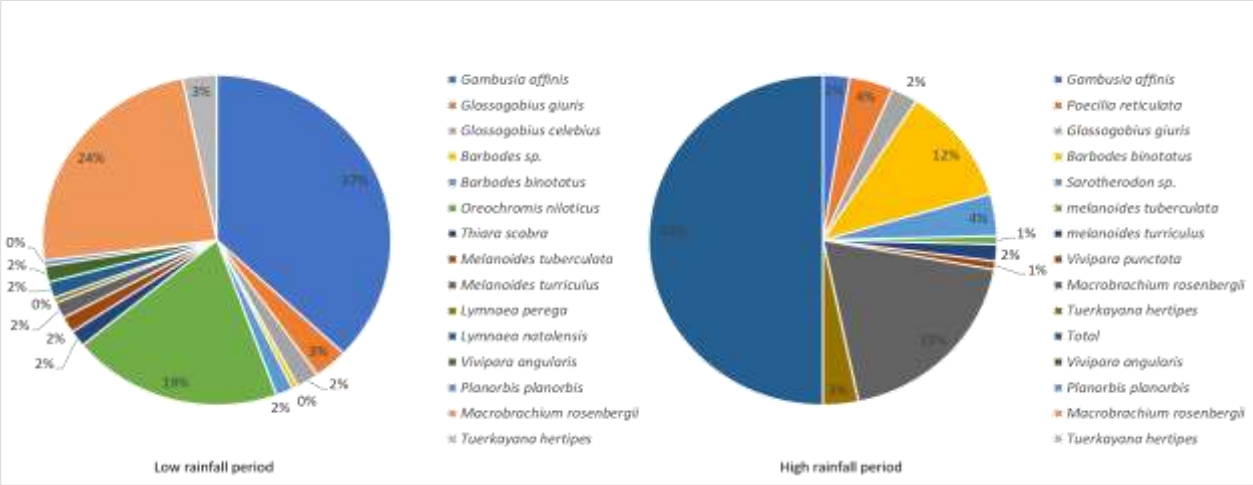
A total of 189 individuals of fishes and macrobenthic fauna were collected during low rain period across stations resolved into 10 families and 15 species. The most abundant species was *Gambusia affinis* (mosquito fish, introduced) with a relative abundance of 37.04%, followed by *Macrobrachium rosenbergii* (native) and *Oreochromis niloticus* (tilapia, aquaculture species, introduced), with relative abundance of 23.81% and 19.58%, respectively (**Table 3-74** and **Figure 3-78**).

Only 69 individuals were collected during high rain period sampling representing eight families and 10 species, dominated by *Barbodes binotatus* with a relative abundance of 22.95%, followed by *Macrobrachium rosenbergii* and *Poecilia reticulata/Sarotherodon* sp. with relative abundances of 37.7 and 8.20%, respectively (**Table 3-74** and **Figure 3-78**). Commercial species were absent in all stations except *Tilapia nioloticus. Macrobrachium rosenbergii* is being propagated as a commercial aquaculture species. Representative species and macrobenthic fauna are shown in **Appendix 37.**

Table 3-74. Composition and relative abundance of fishes and macrobenthos

Low rainfall period			High rainfall period		
Species Name	**Abundance**	**RA (%)**	**Species Name**	**Abundance**	**RA (%)**
Gambusia affinis	70	37.04	*Gambusia affinis*	3	4.92
Glossogobius giuris	6	3.17	*Poecilia reticulata*	5	8.2
Glossogobius celebius	4	2.12	*Glossogobius giuris*	3	4.92
Barbodes sp.	1	0.53	*Barbodes binotatus*	14	22.95
Barbodes binotatus	3	1.59	*Sarotherodon sp.*	5	8.2
Oreochromis niloticus	37	19.58	*Melanoides tuberculata*	1	1.64
Thiara scabra	3	1.59	*Melanoides turriculus*	2	3.28
Melanoides tuberculata	3	1.59	*Vivipara punctata*	1	1.64
Melanoides turriculus	3	1.59	*Macrobrachium rosenbergii*	23	37.7
Lymnaea perega	1	0.53	*Tuerkayana hertipes*	4	6.56
Lymnaea natalensis	3	1.59	Total	61	100
Vivipara angularis	3	1.59	Note: RA – relative abundance		
Planorbis planorbis	1	0.53			
Macrobrachium rosenbergii	45	23.81			
Tuerkayana hertipes	6	3.17			
Total	**189**	**100**			

Figure 3-78. Relative abundance of fishes and macrobenthos during low and high rainfall periods



Species endemicity and conservation status – **Table 3-75** shows that majority of the species captured were native species except *Gambusia affinis, Oreochromis niloticus, Lymnaea natalensis, Poecilia reticulata, Glossogobius giuris* (introduced species) and one Philippine endemic (*Vivipara angularis*). All of the identified fishes and macrobenthos up to species level were under the Least Concern except for *Thiara scabra* which is under Not Evaluated. All species recorded were not included in the DAO 2019-09 list.

Table 3-75. Endemicity and conservation status of fish and macrobenthos during low and high rain periods

Common Name	Species name	Residency	IUCN	DAO 2019-09
Mosquito fish	*Gambusia affinis*	I	LC	NI
White goby	*Glossogobius giuris*	N	LC	NI
Celebes goby	*Glossogobius celebius*	N	LC	NI
--	*Barbodes sp.*		--	--
Spotted barb	*Barbodes binotatus*	N	LC	NI
Tilapia	*Oreochromis niloticus*	I	LC	NI
Pagoda thiara	*Thiara scabra*	N	NE	NI

Common Name	Species name	Residency	IUCN	DAO 2019-09
Red rimmed melania	*Melanoides tuberculata*	N	LC	NI
Fawn melania	*Melanoides turriculus*	N	LC	NI
Wondering pond snail	*Lymnaea peregra*	N	LC	NI
Big-eared radix	*Lymnaea natalensis*	I	LC	NI
Igi	*Vivipara angularis*	PE	LC	NI
Ram's horn snail	*Planorbis planorbis*	I	LC	NI
Gian river prawn	*Macrobrachium rosenbergii*	N	LC	NI
--	*Tuerkayana hertipes*	N	LC	NI
Guppy	*Poecilia reticulata*	I	LC	NI
Bareye goby	*Glossogobius giuris*	I	LC	NI
--	*Sarotherodon sp.*	--	--	--

NOTES: N=Native, I=Introduced, LC = Least Concern, NE=Not Evaluated, NI=Not Included

3.2.4.3.1.5 Aquatic insects

A total of 105 individuals resolved into 10 families and five orders were recorded during low rain period and 91 individuals in 14 families and five orders during high rain period. The Order *Odonata* (Dragonflies and Damselflies) was the most dominant group during low rainfall period with 50 individuals and a mean relative abundance of 47.93% (orange cell in **Table 3-76** and **Figure 3-79**). Ephemoptera dominated the high rainfall period with 38 individuals and a mean relative abundance of 41.67% (blue cell in **Table 3-76** and **Figure 3-79**). The *Calopterygidae* (Damselflies) had the highest count during the low rain period with a mean relative abundance of 35.24% (orange cell in **Table 3-77** and **Figure 3-80**) followed by *Vellidae* (Broad-shouldered Water strider) with mean relative abundance of 19.05%. Dominance shifted to *Baetidae* and *Ephemerellidae* during high rain period with a mean relative abundance of 20.88% (blue cell in **Table 3-77** and **Figure 3-80**).

Pollution-sensitive species identified during low rainfall period were *Ephemoptera* and *Trichoptera* (14.65%), while pollution tolerant species (*Hemiptera*) represented 34.55% of the total population count (**Table 3-76**).

The pollution-sensitive species *Ephemoptera* and *Trichoptera* during the high rainfall period increased to 57.23% of the total population of aquatic insects, suggesting an indication of good water quality across all stations especially in Stations 8 to 15. Families under *Coleoptera* and *Hemiptera* that were considered to be pollution-tolerant organisms constituted 37.23% of the population indicating relatively polluted areas in Aquatic Stations 5, 13, and 16.

Macroinvertebrates such as aquatic insects were classified based on their tolerance to pollution and are widely used as bio-indicators of ecological assessments because they have unique responses to anthropogenic activities (Albutra et al., 2017, Tampus et al., 2012). *Ephemoptera*, *Plecoptera* and *Trichoptera* (EPT) are classified to be pollution-sensitive organisms while *Hemiptera* are tolerant to pollution and environmental extremes (Argouridis et al., 2015, Opiso et al., 2014).

Table 3-76. Composition and relative abundance of aquatic insects per Order

Low rainfall period			High rainfall period		
Order	Abundance	RA (%)	Order	Abundance	RA (%)
Coleoptera	3	3.00	Coleoptera	11	11.96
Ephemeroptera	15	14.00	Ephemoptera	38	41.30
Hemiptera	37	35.00	Hemiptera	24	26.09
Odonata	50	47.00	Odonata	5	5.43
Trichoptera	1	1.00	Trichoptera	14	15.22
Grand Total	106	100	Grand Total	92	100.00

Note: RA – relative abundance

Figure 3-79. Relative abundance of aquatic insect Orders between the two sampling periods

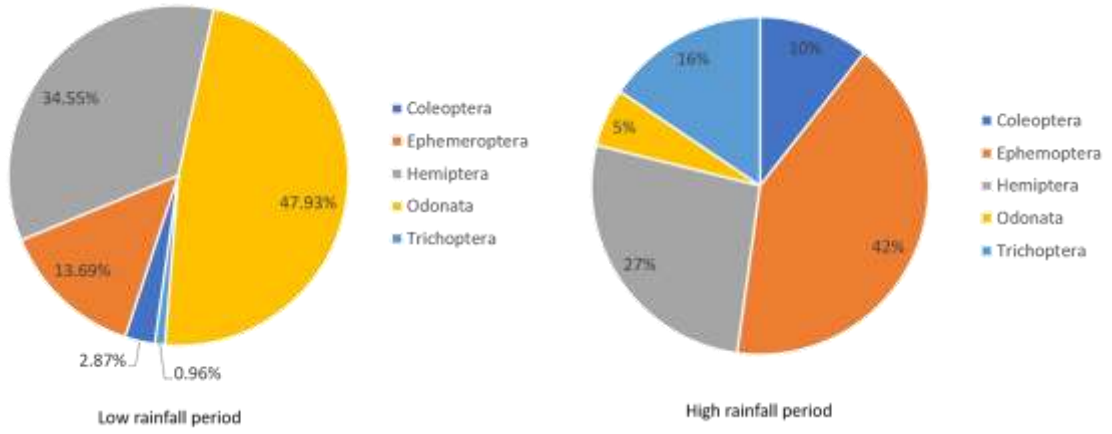
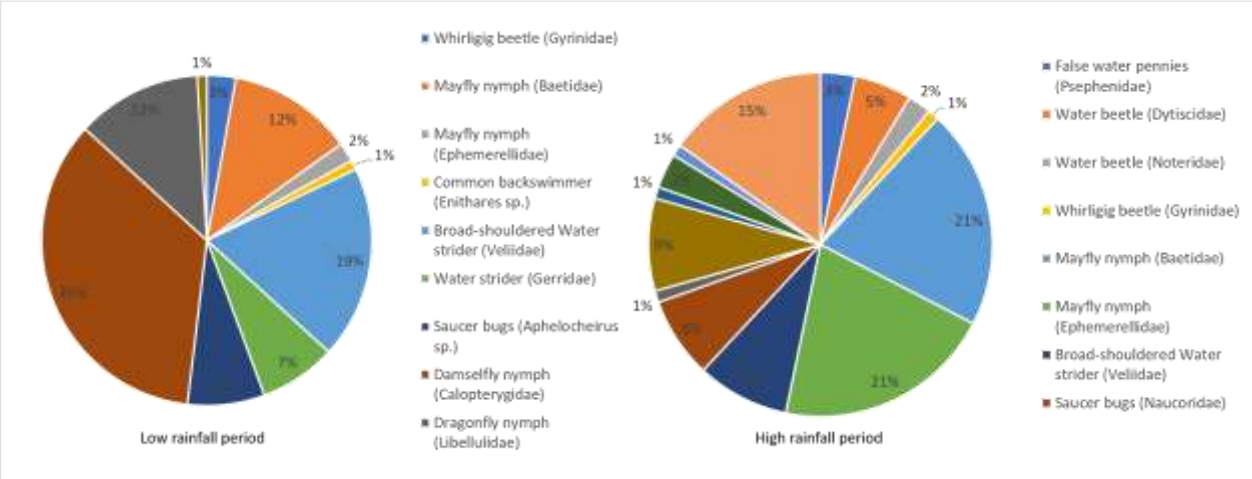


Table 3-77. Family composition and relative abundance of aquatic insects

Low rainfall period			High rainfall period		
Family name	**Abundance**	**RA (%)**	**Family name**	**Abundance**	**RA (%)**
Whirligig beetle (Gyrinidae)	3	2.83	False water pennies (Psephenidae)	3	3.26
Mayfly nymph (Baetidae)	13	12.26	Water beetle (Dytiscidae)	5	5.43
Mayfly nymph (Ephemerellidae)	2	1.89	Water beetle (Noteridae)	2	2.17
Common backswimmer (*Enithares sp.*)	1	0.94	Whirligig beetle (Gyrinidae)	1	1.09
Broad-shouldered Water strider (Veliidae)	20	18.87	Mayfly nymph (Baetidae)	19	20.65
Water strider (Gerridae)	8	7.55	Mayfly nymph (Ephemerellidae)	19	20.65
Saucer bugs (*Aphelocheirus sp.*)	8	7.55	Broad-shouldered Water strider (Veliidae)	8	8.70
Damselfly nymph (Calopterygidae)	37	34.91	Saucer bugs (Naucoridae)	7	7.61
Dragonfly nymph (Libellulidae)	13	12.26	Water scorpion (Nepidae)	1	1.09
Caddisfly nymph (Rhyacophilidae)	1	0.94	Water strider (Gerridae)	8	8.70
Grand Total	**106**	**100**	Dragonfly nymph (Aeshnidae)	1	1.09
			Dragonfly nymph (Libellulidae)	3	3.26
			Dragonfly nymph (Macromiidae)	1	1.09
			Caddisfly nymph (Rhyacophilidae)	14	15.22
			Grand Total	**91**	**100.00**

Note: RA – relative abundance

Figure 3-80. Relative abundance of aquatic insect species between the two sampling periods



Comparative abundance of aquatic insects per rainfall periods – Among the sites, Station A12 (Ipoon river) scored the highest count of aquatic insects with a total of 18 individuals during low rainfall period followed by Station A13 (Komotal river) with 17 individual counts (**Figure 3-81** and **Figure 3-82**). Stations A1, A2, A3, A5, A8, A11, A14, and A17 (8 stations) yielded no aquatic insects. Station A13 had the highest count of aquatic insects during high rain period with 13 individuals followed by Station A9 and Station 15 with 12 and 11 individuals respectively. There were no aquatic insects recorded in Stations A1, A3, A7, and A17 (4 stations).

Figure 3-81. Aquatic insect composition across stations

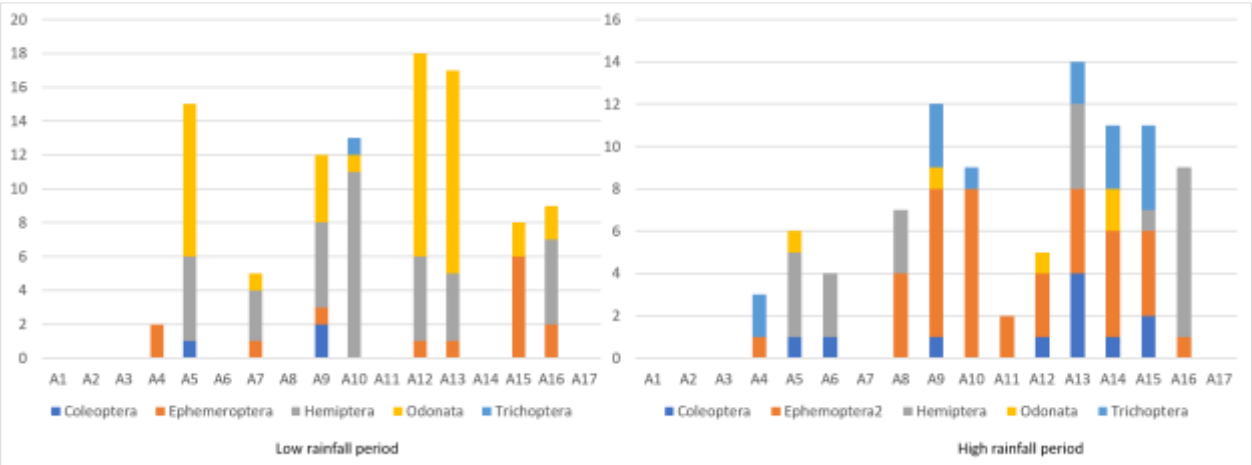
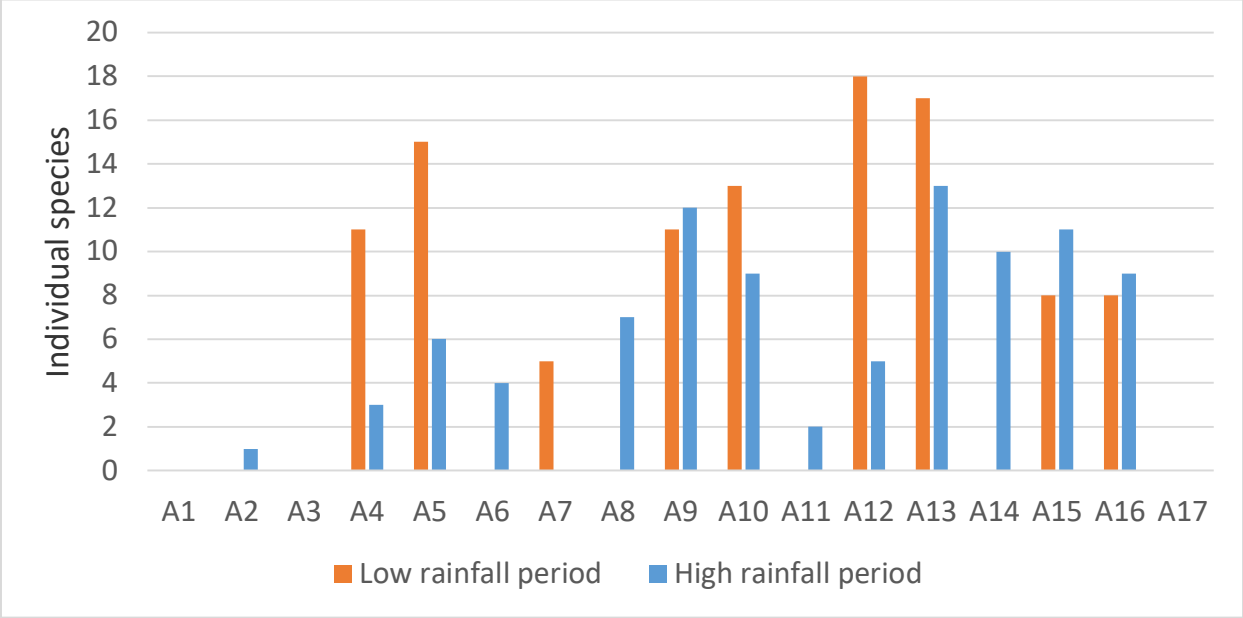


Figure 3-82. Comparative abundance of phytoplankton organisms across stations



3.2.4.3.1.6 Impact to the aquatic ecology

Direct major impacts of the proposed Project to river and stream ecology emanate from road and bridge construction activities that generate loose materials. During runoff, these loose materials can potentially increase TSS levels in rivers and streams if not properly contained. Pollution-sensitive aquatic insects (*Ephemoptera and Trichoptera*), *Macrobrachium rosenbergii*, and plankton species are particularly vulnerable to siltation. Loss of species is not expected; only localized displacement of species.

Habitat loss from siltation especially during construction may displace local aquatic species or interfere in their natural reproductive cycles, which may impact abundance, frequency, and distribution of aquatic species, particularly the pollution-sensitive aquatic insects, *Epheromoptera* and *Trichoptera*.

3.2.4.4 Proposed mitigating measures

Construction - Major impacts of the Project to river and stream biota are potential siltation and oil pollution. Siltation and oil slicks can be minimized by constructing drainage canals and silt ponds and installation of geotextiles, silt traps, and silt curtains to prevent runoff towards rivers and streams during a heavy downpour. Oil pollution can be minimized by installing oil-water separators at the staging areas and motor pools. Bunded area for tanked fuels, lubricants, etc. located at the staging areas must contain drainage leading to oil-water separator. On-site sanitation facilities must also be established during construction and run-off from the construction areas must be contained with silt traps or curtains.

Monitoring of phytoplankton, zooplankton, fishes and macrobenthic fauna, and aquatic insects during the low and high rain periods in conjunction with water quality is recommended to detect changes in diversity and abundance of aquatic species.

3.2.5 Marine ecology

Similar to the oceanography module, marine ecology is not applicable because the proposed Project or any of its components are not located near the seas. The nearest coastal area to the RROW is more than 800 meters.

3.3 THE AIR

3.3.1 Meteorology

3.3.1.1 Methodology

This section describes the existing meteorological conditions at the Project area using available primary and secondary data. Emphasis was placed on parameters relevant to the assessment of air pollution impacts and contribution to climate change in terms of greenhouse gas (GHG) emissions.

Regional and local meteorology

The regional meteorological conditions were described using records from the PAGASA stations at the Lumbia Airport Station in Misamis Oriental and Malaybalay City in Bukidnon (**Figure 3-83**). Records and data used were a) climatological normals (**Table 3-78**, **Table 3-79**), b) climate extremes (**Table 3-80, Table 3-81**) c) the modified Coronas climate map of the Philippines (**Figure 3-84)**; d) wind rose analysis data; and e) tropical cyclone risk and frequency maps (**Figure 3-85**).

Figure 3-83. PAGASA stations nearest to the Project alignment

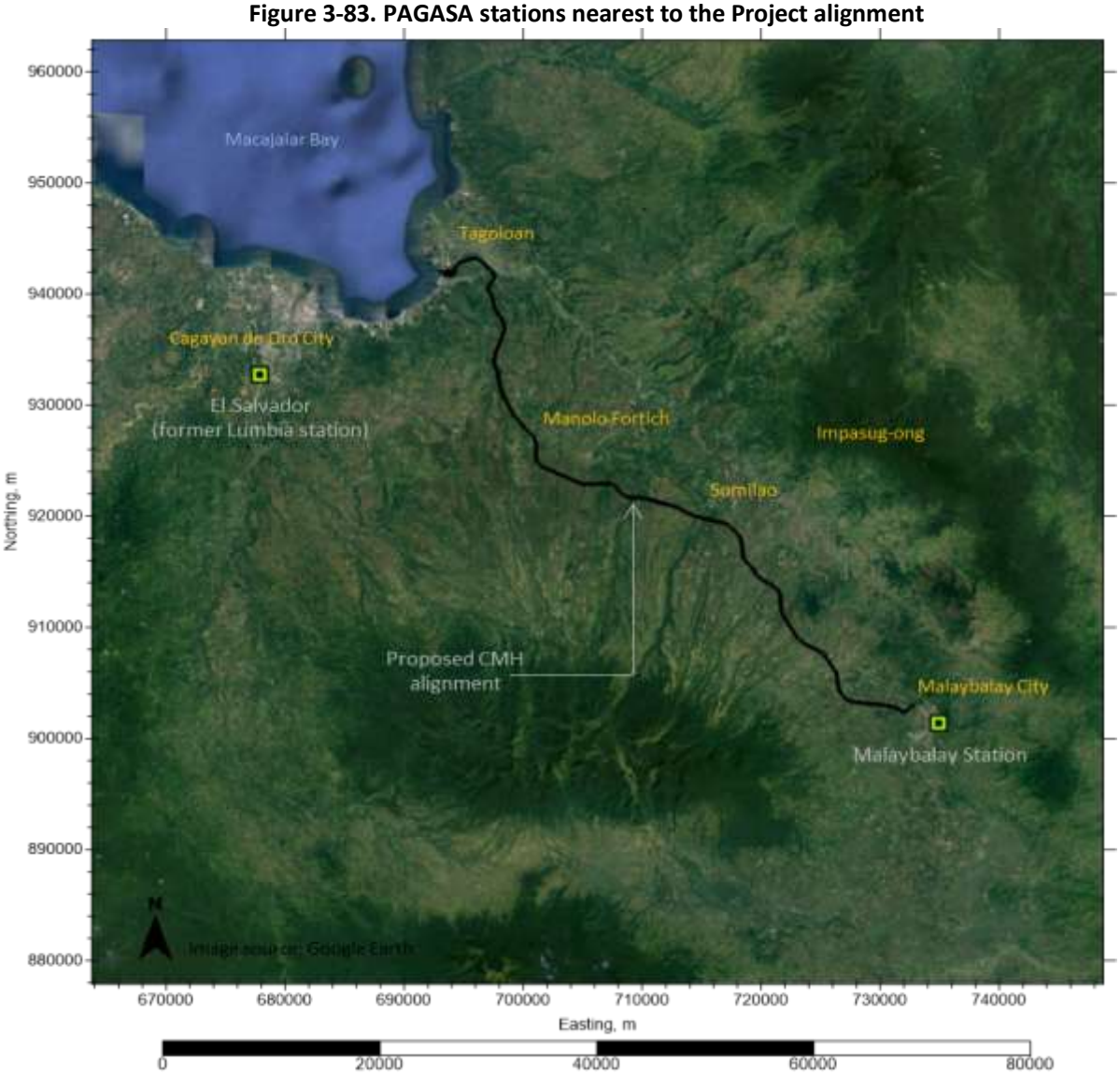


Table 3-78. Climatological normal records at the Lumbia Airport Station, Misamis Oriental (1981-2010)

Month	Rainfall		Temperature						VP	RH	MSLP	Wind		Cloud cover
	Amount	No. of RD	Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.				Direction	Speed	
	mm	#	°C	°C	°C	°C	°C	°C	mbs	%	mbs	16 pt	m/s	okta
JAN	98.9	12	29.6	21.6	25.6	25	23	22.2	26.7	84	1010.7	N	2	5
FEB	68	8	30.2	21.4	25.8	25.2	22.9	22	26.3	82	1011	N	2	5
MAR	49.8	6	31.3	21.6	26.5	25.9	23.3	22.3	26.8	80	1010.7	N	2	4
APR	52.6	5	32.5	22.4	27.5	26.9	23.8	22.6	27.3	77	1009.8	N	2	4
MAY	125	10	32.9	23.2	28	27.3	24.3	23.2	28.3	78	1009.2	N	2	5
JUN	212.7	17	32	22.8	27.4	26.5	24	23.1	28.1	81	1009.4	S	2	6
JUL	245.6	18	31.6	22.4	27	26.1	23.8	22.9	27.9	83	1009.5	S	2	6
AUG	195.8	15	32.1	22.5	27.3	26.4	23.8	22.8	27.7	80	1009.4	S	2	6
SEP	219.7	16	31.8	22.3	27.1	26.1	23.7	22.8	27.6	82	1009.8	S	2	6
OCT	185.9	16	31.4	22.3	26.9	26.1	23.8	22.9	27.9	83	1009.5	S	2	5
NOV	136	12	30.9	22.1	26.5	25.9	23.7	22.9	27.8	83	1009.3	S	2	5
DEC	113.2	11	30.1	21.8	26	25.5	23.4	22.6	27.3	84	1010	N	2	5
ANNUAL	**1703.3**	**148**	**31.4**	**22.2**	**26.8**	**26.1**	**23.6**	**22.7**	**27.5**	**81**	**1009.9**	**N**	**2**	**5**

Source: PAGASA; RD – rainy days; VP – vapor pressure; RH – relative humidity; MSLP – Mean Sea Level Pressure; mbs – millibars

Table 3-79. Climatological normal records at the Malaybalay Station, Bukidnon (1981-2010)

Month	Rainfall		Temperature						VP	RH	MSLP	Wind		Cloud cover
	Amount	No. of RD	Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.				Direction	Speed	
	mm	#	°C	°C	°C	°C	°C	°C	mbs	%	mbs	16 pt	m/s	okta
JAN	142.5	16	29	17.9	23.4	23	21.2	20.4	23.9	85	1009.4	S	1	6
FEB	106.1	13	29.4	17.6	23.5	23.1	21.2	20.4	23.9	84	1009.9	E	1	6
MAR	112.5	13	30.6	17.6	24.1	23.9	21.5	20.5	24	81	1005.4	S	1	5
APR	115.6	12	31.7	18.1	24.9	24.6	22	20.9	24.6	80	1008.9	S	1	5
MAY	224.8	10	31.2	19.1	25.1	24.9	22.7	21.8	26.1	83	1006	S	1	6
JUN	313.5	23	29.8	19.2	24.5	24.1	22.4	21.7	25.9	86	1008.9	S	1	6
JUL	323.3	24	29	18.9	24	23.6	22.1	21.5	25.6	88	1008.8	S	1	7
AUG	294.4	22	29.1	18.8	23.9	23.5	22	21.4	25.4	88	1009	S	1	7
SEP	315.7	24	29.5	18.7	24.1	23.6	22.1	21.5	25.6	88	1009.1	S	1	7
OCT	314.7	23	29.6	18.9	24.2	23.7	22.2	21.6	25.7	88	1008.9	S	1	6
NOV	176.1	18	30	18.6	24.3	23.8	22.1	21.4	25.4	86	1008.6	S	1	6
DEC	130.7	16	29.5	18.3	23.9	23.5	21.6	20.8	24.5	85	1009.1	S	1	6
ANNUAL	**2569.9**	**222**	**29.9**	**18.5**	**24.2**	**23.8**	**21.9**	**21.1**	**25**	**85**	**1008.5**	**S**	**1**	**6**

Source: PAGASA; RD – rainy days; MSLP – Mean Sea Level Pressure; SPD- wind speed in meters per second; TSTM – thunderstorm; LTNG - lightning

Table 3-80. Climatological extremes at the Lumbia Airport Station, Misamis Oriental (as of 2019)

Month	Temperature (°C)				Greatest daily rainfall (mm)		Strongest winds (mps)			Sea level pressures (mbs)			
	High	Date	Low	Date	Amount	Date	Spd	Dir	Date	High	Date	Low	Date
JAN	36.2	01-08-2016	16.1	01-03-1991	104.4	01-13-2009	14	WNW	01-28-2017	1018.1	01-27-1983	982.8	01-21-1989
							14	NNE	01-27-2019				
FEB	36.0	02-14-2003	17.1	02-05-1980	107.8	02-05-1999	14	N	02-02-1993	1018.8	02-25-2016	1001.6	02-24-1980
							14	N	02-02-2015				
							14	N	02-12-2017				
MAR	37.6	03-28-1998	17.1	03-10-1992	84.2	03-19-1982	13	ENE	03-26-1984	1018.9	03-07-1981	1002.0	03-19-1982
APR	37.0	04-11-1998	18.0	04-13-1983	88.4	04-14-2014	20	NNW	04-29-1983	1017.3	04-14-1993	1002.8	04-01-2000
MAY	38.2	05-07-1998	20.7	05-28-1984	94.3	05-21-1990	18	W	05-27-1998	1015.6	05-10-2016	1003.3	05-05-2002
JUNE	38.4	06-06-2009	20.0	06-11-1992	124.2	06-21-2016	18	WNW	06-10-1997	1015.6	06-20-1982	1002.4	06-17-2007
JULY	36.2	07-11-2002	20.0	07-17-1994	142.0	07-13-1999	22	W	07-31-1999	1016.0	07-22-2015	1001.0	07-03-2001
			20.0	07-02-2015									
AUG	37.8	08-28-1990	19.4	08-26-1995	129.3	08-21-1998	25	SW	08-05-1997	1015.6	08-11-1997	1002.9	08-17-1990
SEP	36.7	09-02-1992	19.0	09-23-1991	117.0	09-09-2017	24	NNW	09-23-1996	1016.1	09-26-1982	983.8	09-16-1988
OCT	35.2	10-20-2015	19.0	10-31-1982	114.1	10-20-1980	18	SW	10-04-2014	1017.5	10-04-2015	1001.4	10-29-1995
			19.0	10-25-2015									
NOV	34.7	11-30-2006	18.0	11-25-1992	237.1	11-24-2009	18	NW	11-20-1990	1016.3	11-17-1982	1000.7	11-06-1996
DEC	34.4	12-08-1996	17.8	12-31-1990	180.9	12-16-2011	34	S	12-04-2012	1017.8	12-28-2015	1001.0	12-22-2017
ANNUAL	38.4	06-06-2009	16.1	01-03-1991	237.1	11-24-2009	34	S	12-04-2012	1018.9	03-07-1981	982.8	01-21-1989
Period	1979 - 2019				1977 - 2019		1979 - 2019			1979 - 2019			

Source: PAGASA; Spd – speed; Dir – direction; mbs - millibars

Table 3-81. Climatological extremes at the Malaybalay Station, Bukidnon (as of 2019)

Month	Temperature (°C)				Greatest daily rainfall (mm)		Strongest winds (mps)			Sea level pressures (mbs)			
	High	Date	Low	Date	Amount	Date	Spd	Dir	Date	High	Date	Low	Date
JAN	34.0	01-23-1988	11.7	01-16-1956	140.6	01-14-2014	22	NE	01-07-1974	1020.5	01-28-1949	987.0	01-07-1972
FEB	35.2	02-05-2002	10.0	02-04-1973	109.2	02-07-1962	19	NE	02-10-1974	1019.4	02-19-1949	998.1	02-28-1972
MAR	35.5	03-31-1990	12.0	03-01-1949	170.6	03-19-1982	14	NE	03-01-1992	1019.6	03-26-1949	998.9	03-17-1970
APR	36.4	04-15-2016	12.5	04-02-1996	184.2	04-06-1999	21	NW	04-05-1966	1019.2	04-27-1949	996.6	04-24-1971
MAY	36.2	05-16-1998	14.0	05-08-2010	126.3	05-15-1991	18	WNW	05-05-1966	1019.9	05-02-1949	997.9	05-25-1971
JUNE	34.5	06-14-2017	13.0	06-26-1962	130.4	06-07-2002	18	N	06-20-1985	1019.6	06-11-1949	999.4	06-14-1974
JULY	33.0	07-15-2001	14.0	07-04-2017	138.2	07-26-2018	15	S	07-28-1992	1015.3	07-22-2015	997.4	07-04-1967
	33.0	07-15-2016											
AUG	33.5	08-07-2000	15.0	08-24-2010	113.6	08-01-1978	22	SW	08-28-1984	1016.2	08-11-1997	998.0	08-23-1967
			15.0	08-10-2016									
SEP	34.0	09-03-2007	15.3	09-21-1986	128.6	09-29-2010	18	NW	09-02-1971	1015.9	09-30-1997	998.6	09-20-1971
OCT	34.0	10-31-1995	14.9	10-30-1968	195.9	10-08-1979	20	N	10-21-1982	1016.3	10-11-1997	960.6	10-12-1970
NOV	34.8	11-29-1968	13.1	11-29-1967	144.8	11-20-1993	19	SW	11-22-1973	1015.9	11-07-1997	996.1	11-20-1973
DEC	33.6	12-08-2002	12.5	12-06-2009	112.4	12-21-2017	14	NE	12-21-1973	1017.4	12-12-2002	998.2	12-24-1954
ANNUAL	**36.4**	**04-15-2016**	**10.0**	**02-04-1973**	**195.9**	**10-08-1979**	**22**	**NE**	**01-07-1974**	**1020.5**	**01-28-1949**	**960.6**	**10-12-1970**
							22	**SW**	**08-28-1984**				
Period	**1949 - 2019**				**1952 - 2019**		**1966 - 2019**			**1949 - 2019**			

Source: PAGASA; Spd – speed ; Dir – direction; mbs - millibars

Figure 3-84. Modified Coronas classification of Philippine climate showing the Project

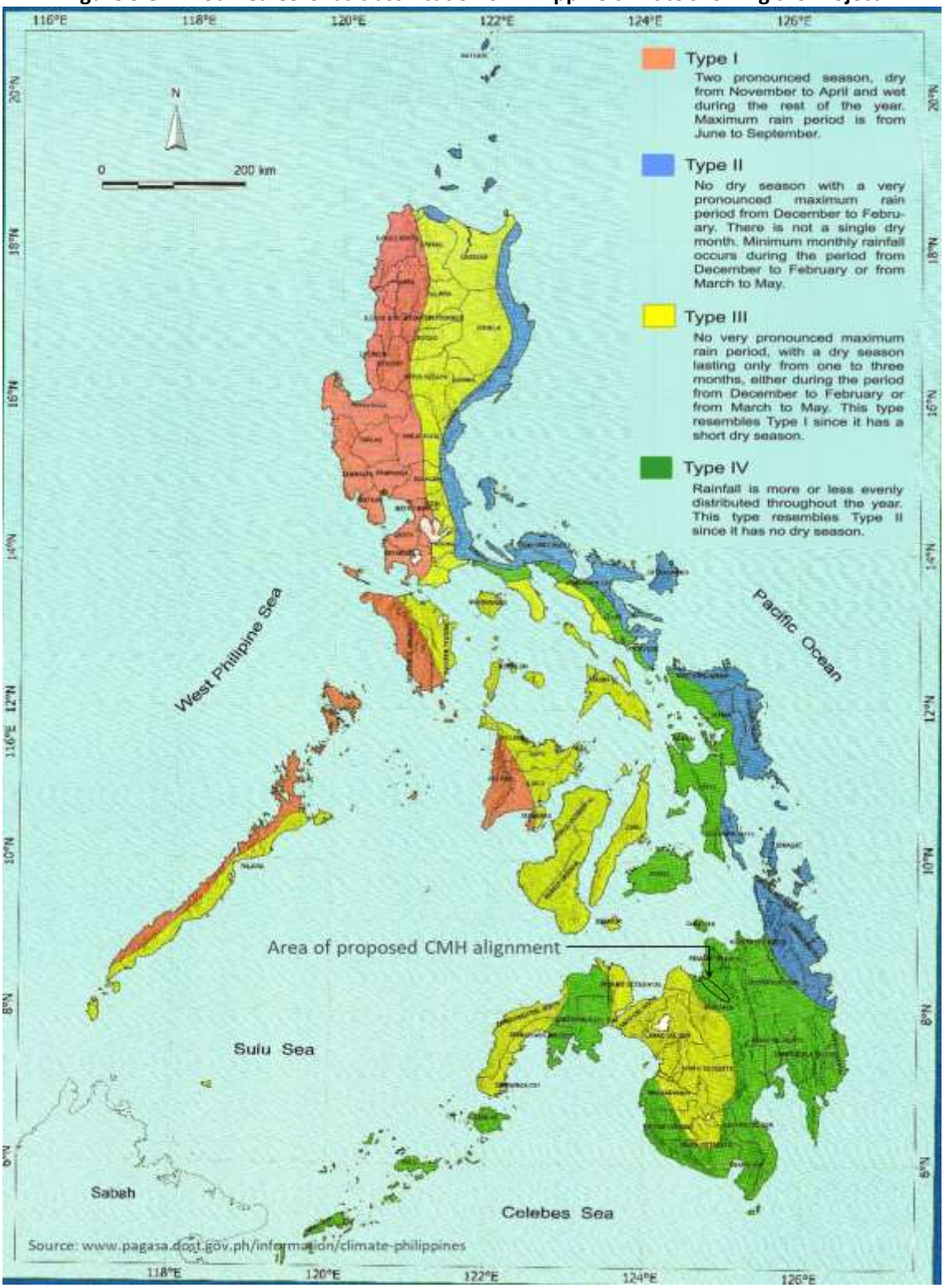
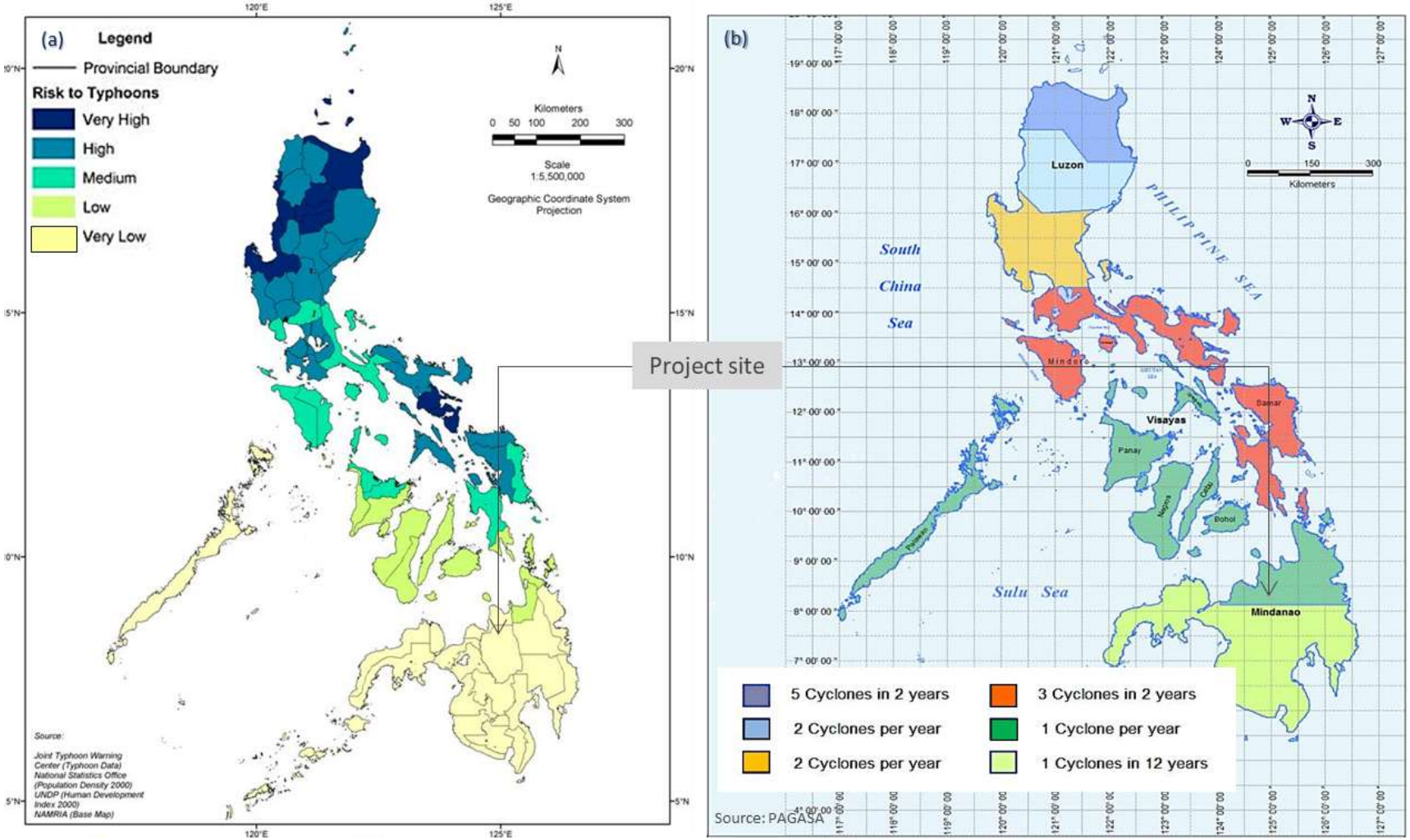


Figure 3-85. Tropical cyclone frequency map of the Philippines showing the Project



Impact assessment

Climate change projections - Climate change projections on rainfall and temperatures in 2020 and 2050 was based on the paper "*Climate Change in the Philippines 2011*" published by the PAGASA. The projections were based on the normal data using the medium-range emission scenario (A1B) defined by the IPCC as:

> *A1: The A1 storyline and scenario family describe a future world of very rapid economic growth, a global population that peaks mid-century and declines thereafter, and a rapid introduction of new and more efficient technologies. Major underlying themes are convergence among regions, capacity building, and increased cultural and social interactions, with a substantial reduction in regional differences in per capita income. The A1 scenario family is further developed into three groups that describe alternative directions of technological change in the energy system. The three A1 groups are distinguished by their technological emphasis: fossil-intensive (A1FI), non-fossil energy sources (A1T), or balanced across all sources (A1B) (where balanced is defined as not relying too heavily on one particular energy source, on the assumption that similar improvement rates apply to all energy supply and end use technologies).*

Greenhouse gas (GHG) emissions – Significant GHG emissions are expected during the opening of the proposed Project to the public. The emission factors used to estimate the GHG from vehicle emissions and its equivalent Global Warming Potential (GWP) are shown in **Table 3-82**. The traffic projections of the four scenarios *Baseline* (Sayre 2020), *No Project* (Sayre 2040), *Project only* (CMH 2040), and *ALL* (both Sayre and CMH 2040 in **Table 3-83** were used to estimate the GHG emissions. The detailed estimation of the traffic projections is presented in *Annex8 – Air Dispersion Modelling Methodology*. Vehicle Type wise GHGs is caliculated following formular.

Vehicle Type wise GHG,i in Target Year= [GHG-ef,i] ×[TV,i,y] ×L (Unit :ton/year)

i	:Vehicle type（Car, Jeepney, Bus, Truck）
GHG -ef,i	: GHG emission factors for each vehicle type (SeeTable 3-82) (unit: mg/km or g/km)
TV,i,y	: Annual Traffic volume of each vehicle type in target year (See Table 3-83) (unit: vehicle/year)
L	: Travel length of road (Syare Hygyway or CMH) (unit: km)

Table 3-82. GHG emission factors used and corresponding GWP values

GHG	Car	Jeepney	Bus	Truck	GWP (c)
CO2 (a)	60	80	95	95	1
N2O (b)	0.7	4	30	30	265
CH4 (b)	0	0	70	70	28

Sources: IPCC, JICA for GHG emission factors; IPCC for GWP; NOTES: (a) g/km with speeds greater than 20kph; (b) mg/km travelled; (d) mean of Light Duty Gas and Diesel vehicles; (c) 100-year Global Warming Potential (IPCC Fifth Assessment Report, 2014)

Table 3-83. Scenarios and total annual number of vehicles for estimating GHG

Scenario	Year	CAR	JPY	BUS	TRU	TOTAL
Baseline (a)	2020	7,609,506	1,315,404	281,454	7,381,854	16,588,218
No Project (b)	2040	7,234,356	1,448,262	154,818	671,610	9,509,046
Project only (c)	2040	14,807,994	0	3,316,326	15,430,194	33,554,514
ALL (d)	2040	22,042,350	1,448,262	3,471,144	16,101,804	43,063,560

NOTES: (a) Sayre 2020; (b) Sayre 2040; (c) CMH 2040; (d) Sayre and CMH 2040; JPY – jeepney; TRU – truck

3.3.1.2 Assessment of key impacts

3.3.1.2.1 Change in the local microclimate

Regional meteorology

The Project site falls under a Type IV climate (**Figure 3-84**). A Type IV climate has a relatively even distribution of rainfall throughout the year and resembles a Type II climate because it has no dry season. Generally, November to May is considered the low rain season, while June to October is regarded as the high rain season, and PAGASA officially declares the onset of the rainy season.

The potential meteorology at the proposed alignment was described using the mean values (**Table 3-84**) of normal records at the Misamis Oriental and Bukidnon stations of PAGASA derived from **Table 3-78** and **Table 3-79**.

***Rainfall* -** The proposed alignment may experience a monthly rainfall range of 81.2 (February) to 284.5 mm (July) with an annual rainfall of 2,137 mm. The number of rainy days may range from eight to 21 days in a month with an annual frequency of 51 percent. The rainfall trend in **Figure 3-86 a** shows the absence of a distinct dry season resembling the Type II climate. The trend also shows low and high rainfall periods from November to May and June to October respectively. The site may experience an extreme daily rainfall range of 195 to 237mm in October and November respectively (**Table 3-80, Table 3-81**).

Surface temperatures - The highest mean temperature at the alignment may reach 27°C in May with a low of 24.5 ^{o}C in January (**Figure 3-86 b**) resulting to a normal difference of about two degrees and an annual mean of 26 degrees Celsius. The site may experience an extreme daily temperature range of 38.4 in June to 36.4 degrees Celsius in April (**Table 3-80, Table 3-81**).

Relative humidity - Relative humidity is expressed in percentage of water vapor present in air using psychrometric charts with the dry- and wet-bulb temperatures as input. The Project alignment may experience a relative humidity range of 78 to 86 percent (**Figure 3-86 c**) with an annual average of 83 percent.

Cloud cover - The monthly cloud cover at the alignment may range from four to six okta (**Figure 3-86 d**). The site may be generally cloudy from June to September (cloud cover ≥ 6 okta) which coincides with the high rainfall period.

Table 3-84. Average climate normal records of Misamis Oriental and Bukidnon stations

Month	Rainfall		Temperature						VP	RH	MSLP	Wind		Cloud cover
	Amount	No. of RD	Max	Min	Mean	Dry Bulb	Wet Bulb	Dew Pt.				Direction	Speed	
	mm	#	°C	°C	°C	°C	°C	°C	mbs	%	mbs	16 pt	m/s	okta
JAN	120.7	14.0	29.3	19.8	24.5	24.0	22.1	21.3	25.3	84.5	1010.1	N,S	1.5	5.5
FEB	87.1	10.5	29.8	19.5	24.7	24.2	22.1	21.2	25.1	83.0	1010.5	N,E	1.5	5.5
MAR	81.2	9.5	31.0	19.6	25.3	24.9	22.4	21.4	25.4	80.5	1008.1	N,S	1.5	4.5
APR	84.1	8.5	32.1	20.3	26.2	25.8	22.9	21.8	26.0	78.5	1009.4	N,S	1.5	4.5
MAY	174.9	10.0	32.1	21.2	26.6	26.1	23.5	22.5	27.2	80.5	1007.6	N,S	1.5	5.5
JUN	263.1	20.0	30.9	21.0	26.0	25.3	23.2	22.4	27.0	83.5	1009.2	S,S	1.5	6.0
JUL	284.5	21.0	30.3	20.7	25.5	24.9	23.0	22.2	26.8	85.5	1009.2	S,S	1.5	6.5
AUG	245.1	18.5	30.6	20.7	25.6	25.0	22.9	22.1	26.6	84.0	1009.2	S,S	1.5	6.5
SEP	267.7	20.0	30.7	20.5	25.6	24.9	22.9	22.2	26.6	85.0	1009.5	S,S	1.5	6.5
OCT	250.3	19.5	30.5	20.6	25.6	24.9	23.0	22.3	26.8	85.5	1009.2	S,S	1.5	5.5
NOV	156.1	15.0	30.5	20.4	25.4	24.9	22.9	22.2	26.6	84.5	1009.0	S,S	1.5	5.5
DEC	122.0	13.5	29.8	20.1	25.0	24.5	22.5	21.7	25.9	84.5	1009.6	N,S	1.5	5.5
ANNUAL	**2136.6**	**185.0**	**30.7**	**20.4**	**25.5**	**25.0**	**22.8**	**21.9**	**26.3**	**83.0**	**1009.2**	N,S	**1.5**	**5.5**

Figure 3-86. Regional normal rainfall, temperature, relative humidity, and cloud cover at the Project site

Surface winds - The mean normal records showed potential wind speeds at the Project site ranging from one to two meters per second (average of 1.5) with prevailing directions in the North (Dec to May) and South (Jun to Nov) (**Figure 3-90 a**). The alignment area may experience an extreme wind speed range of 22 in August to 34 meters per second in December (**Table 3-80, Table 3-81**).

Further processing of the wind rose analysis records from 1981 to 2010 at the Misamis Oriental and Bukidnon stations showed a more detailed potential wind speed distribution at the Project site. About 50 percent of the wind speeds ranged from 1.25 to 1.6 meters per second after discarding outliers (**Figure 3-90 b**). In addition, about 74 percent of the wind speeds ranged from 1.2 to two meters per second (**Figure 3-90 c**).

Tropical cyclones - In general, cyclone frequency in the country is highest from June to December. These tropical cyclones are associated with the occurrence of low pressures areas (LPA) normally originating over the Northwestern Pacific Ocean side of the Philippine Area of Responsibility (PAR) and generally moving northwestward. Tropical cyclones also originate in the South China Sea or at the western part of the country, having unusual motions, and quite rare with 52 occurrences in 50 years (Perez, 2001). In general, from 1948-1993, PAGASA has determined an annual average of 20 tropical cyclones in the PAR, nine of these making landfall. Overall, PAGASA had tracked 917 cyclones within the PAR, with 415 (45.3%) crossing the archipelago and 120 (22.5%) considered disastrous.

The Project alignment is located in an area with very low typhoon risk and visited by two cyclones every year (**Figure 3-87**). The tracks of tropical cyclones crossing the provinces of Misamis Oriental and Bukidnon are shown in **Figure 3-88** and **Figure 3-89**. Aggregating the data of the two provinces showed that tropical depressions, tropical storms, and typhoons **(Figure 3-87 b**) may cross the Project area with the highest frequency in December, November, and March (**Figure 3-87 a**).

Figure 3-87. Aggregated tropical cyclone crossings at the Project area

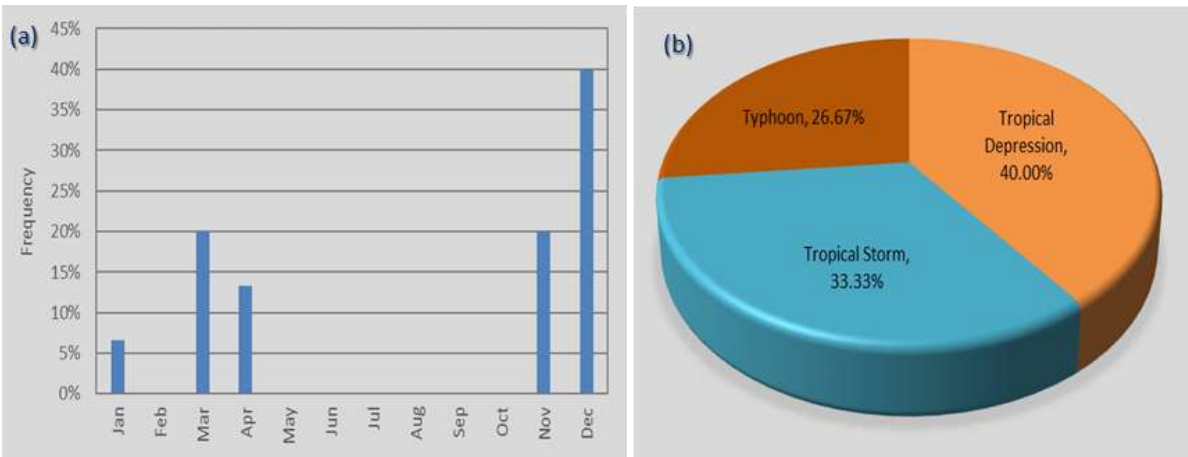


Figure 3-88. Tropical cyclones crossing the province of Misamis Oriental (1948-2019)

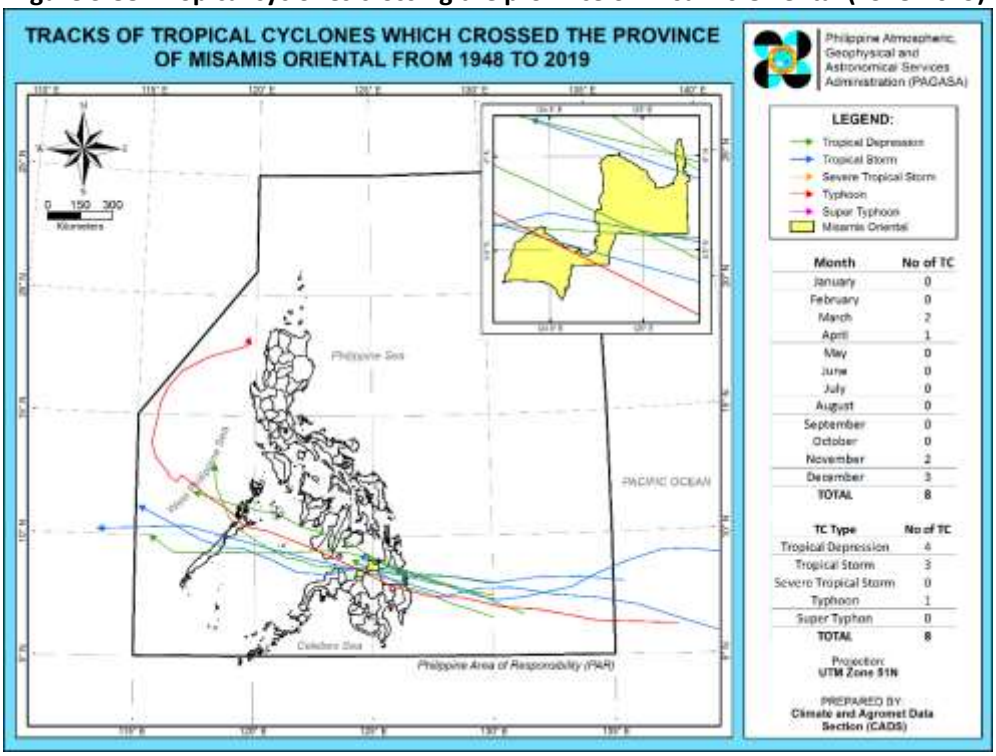


Figure 3-89. Tropical cyclones crossing the province of Bukidnon (1948-2019)

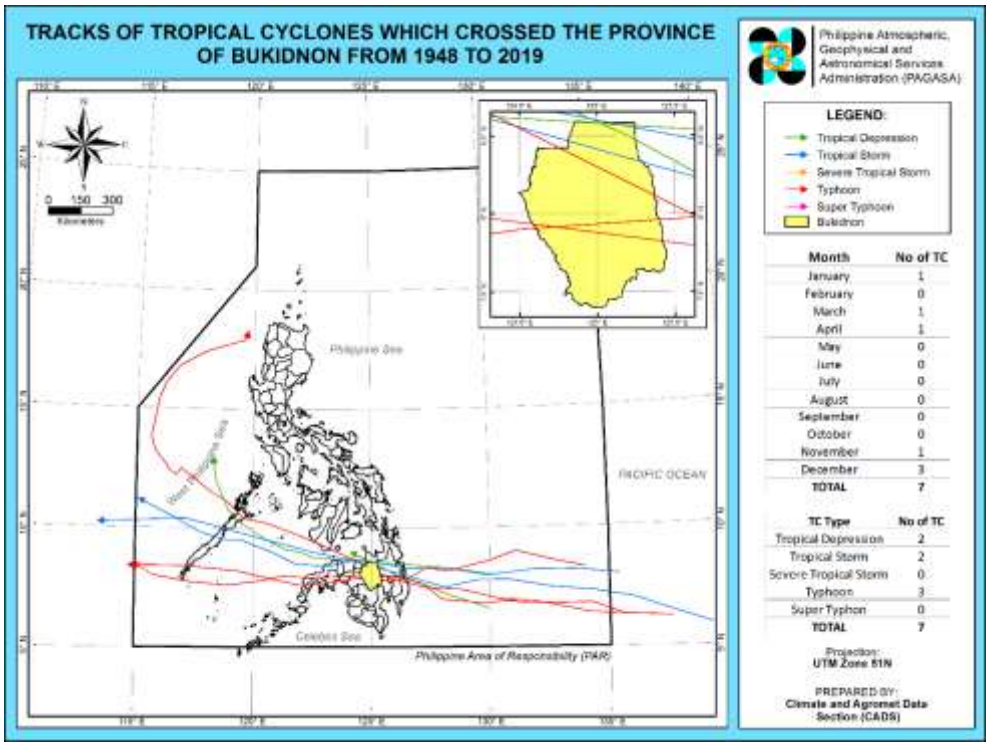
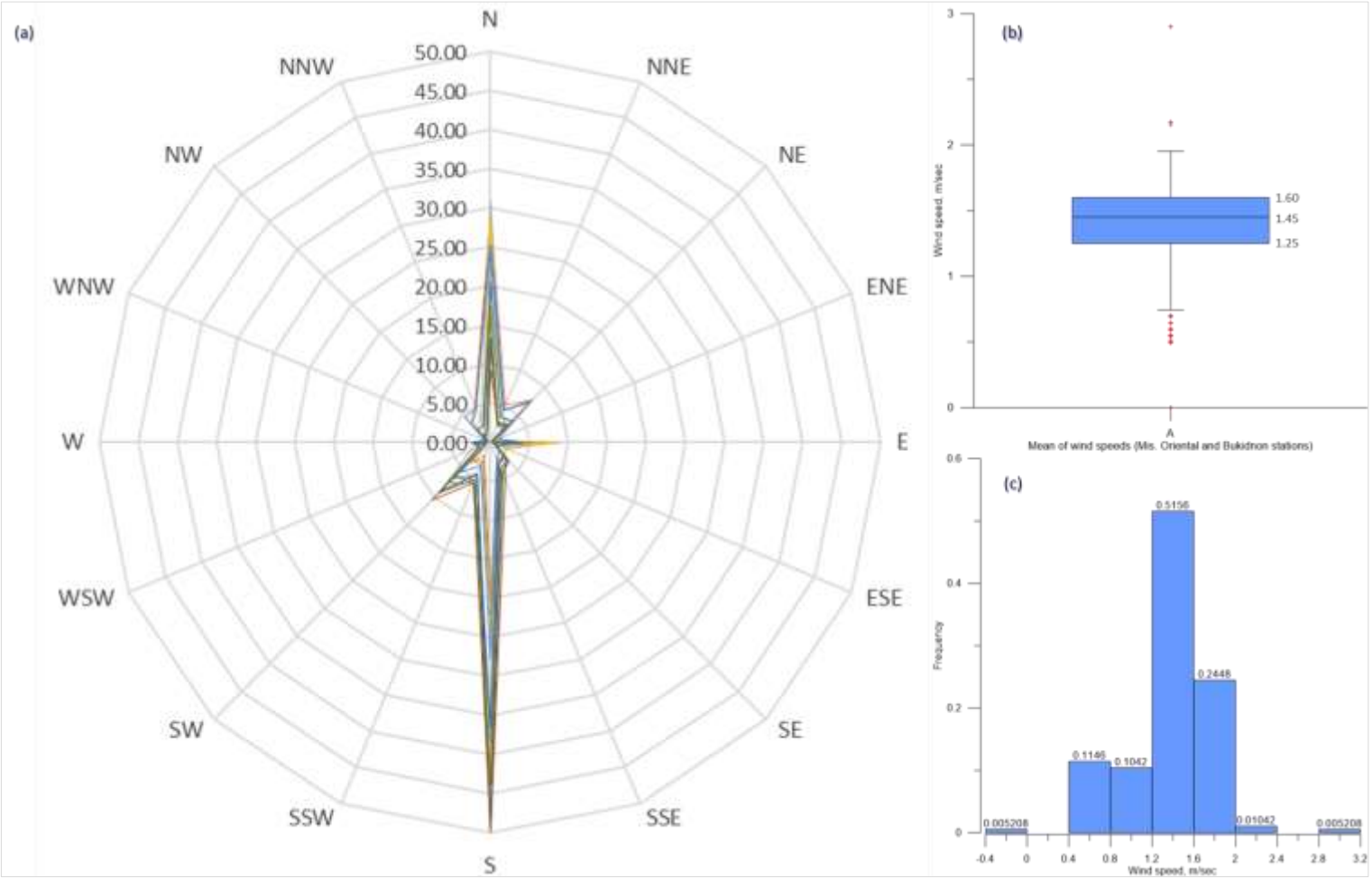


Figure 3-90. Regional wind direction and mean speeds at the Project alignment



Prognostic meteorology

The prognostic meteorology data set derived from modeling using global weather records as input to the air dispersion model was also used to describe the meteorology at the Project alignment. Compared to PAGASA data, the 2020 Prognostic meteorology data has the data needed for the model run. Future weather changes from current prognostic meteorological data are small or insignificant. These are also observed in predicted GLCs from near-ground releases.

Rainfall - The data set showed similar low and high rain periods from November to May and June to October respectively (**Figure 3-91**). The major differences were high and very low predicted rainfalls in December and April respectively.

Temperature and humidity - Similarly, local surface temperatures and relative humidity also followed the monthly PAGASA trend (**Figure 3-92, Figure 3-93, Table 3-88**). The predicted temperatures, however, were lower than the PAGASA normal records by two to three degrees. In addition, the predicted humidities had an average difference of about two percent.

Figure 3-91. Comparison of prognostic and PAGASA rainfall data

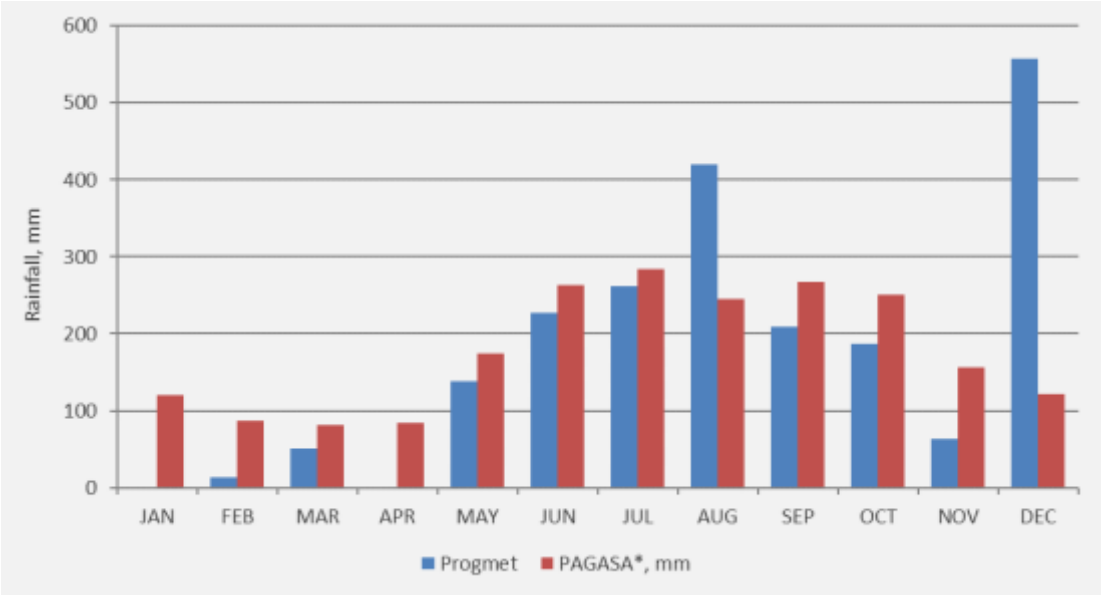


Figure 3-92. Comparison of prognostic and PAGASA surface temperatures

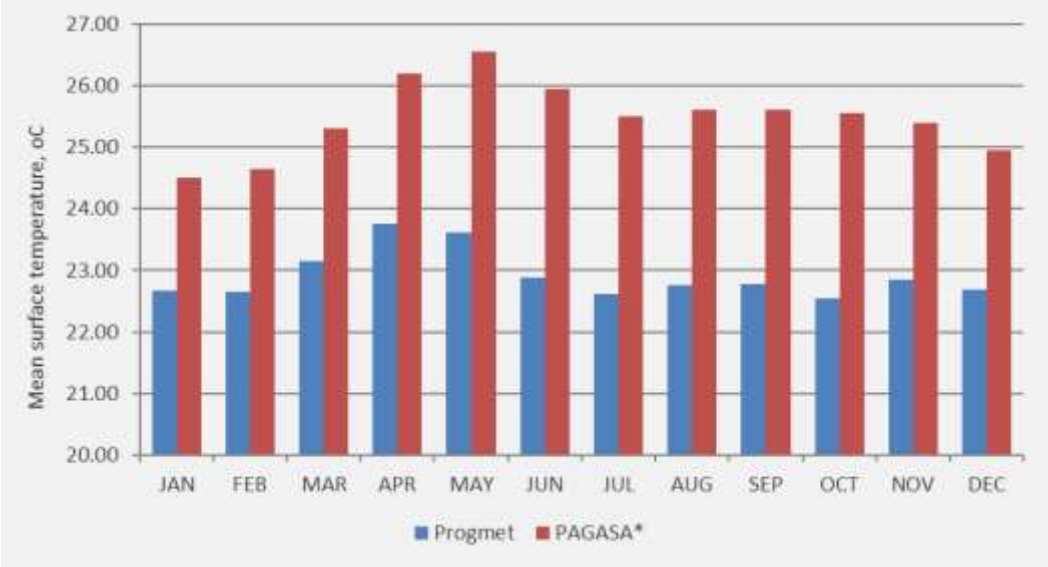
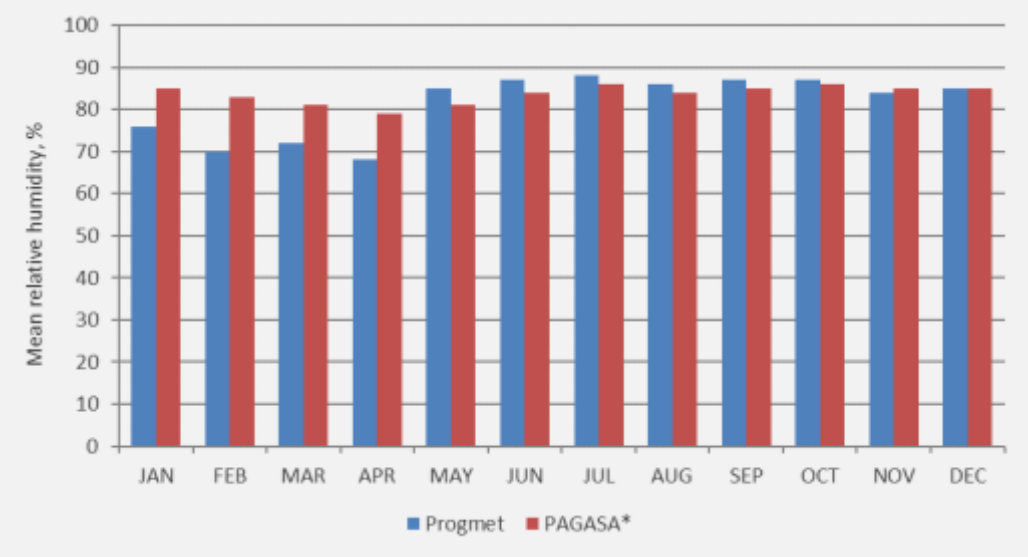


Figure 3-93. Comparison of prognostic and PAGASA humidity values



The salient findings of the processed prognostic wind speeds and directions representing the low and high rain periods in **Figure 3-95** and **Figure 3-96,**respectively, are enumerated below.

<u>Low rain period (November to May)</u>

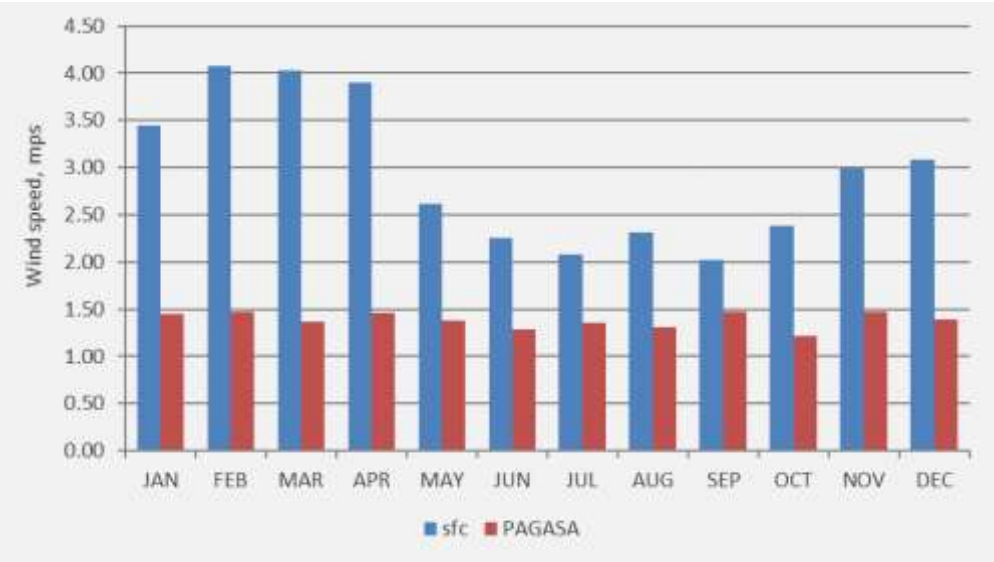
a) South-southeast wind direction prevailing
b) Calm conditions (wind speeds less than 0.5 m/sec) occur 14 percent of the time
c) Wind speeds of 1 to 4 meters per second occur 50 percent of the time
d) Wind speeds of 4 to 8 meters per second occur 34 percent of the time

<u>High rain period (June to October)</u>

a) Prevailing North-Northwest and South-southeast wind directions
b) Calm conditions (wind speeds less than 0.5 m/sec) occur 23 percent of the time
c) Wind speeds of 1 to 4 meters per second occur 67 percent of the time
d) Wind speeds of 4 to 8 meters per second occur 10 percent of the time

Wind profile - Comparison of prognostic and PAGASA wind records shows differences in values but a relatively similar monthly pattern (**Figure 3-94**). A high proportion of higher wind speeds were recorded and predicted during the low rainfall months compared to the high rainfall months of June to October.

Figure 3-94. Comparison of prognostic and PAGASA wind speeds



NOTE: sfc - surface meteorology file derived from prognostic modelling. The data contains hourly resolution by AERMET, the meteorological processor of the AERMOD model. The variables included in the surface file are sensible heat flux, friction velocity, convective velocity, vertical temperature gradient in the first 500m above the planetary boundary layer, extents of the convective and mechanical boundary layers, the Monin-Obukhov length, surface roughness, Bowen ratio, albedo, wind speed, wind direction, anemometer height, temperature, and thermometer height.

Figure 3-95. Wind rose and class frequency distribution during low rain period (Nov to May)

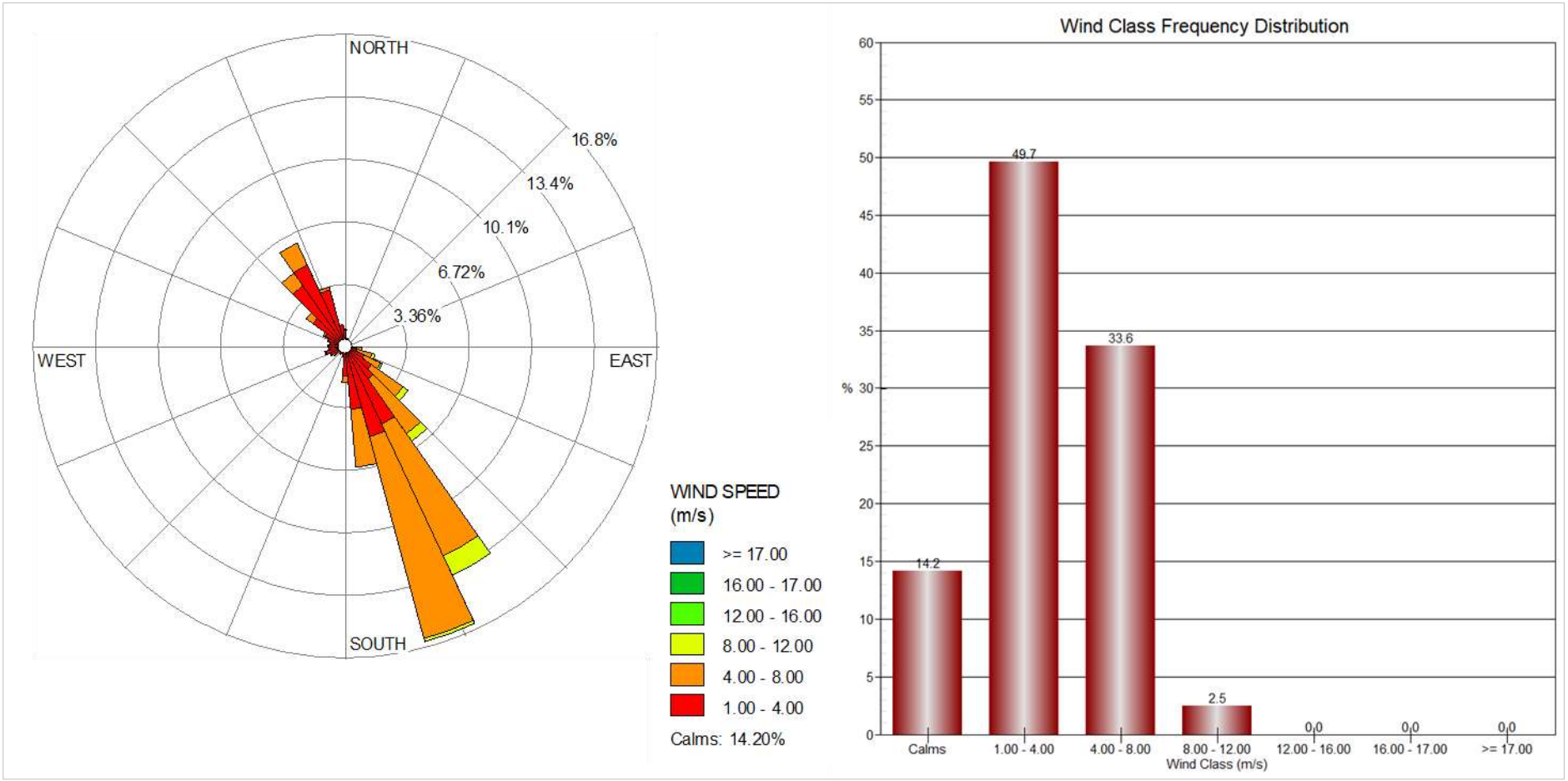
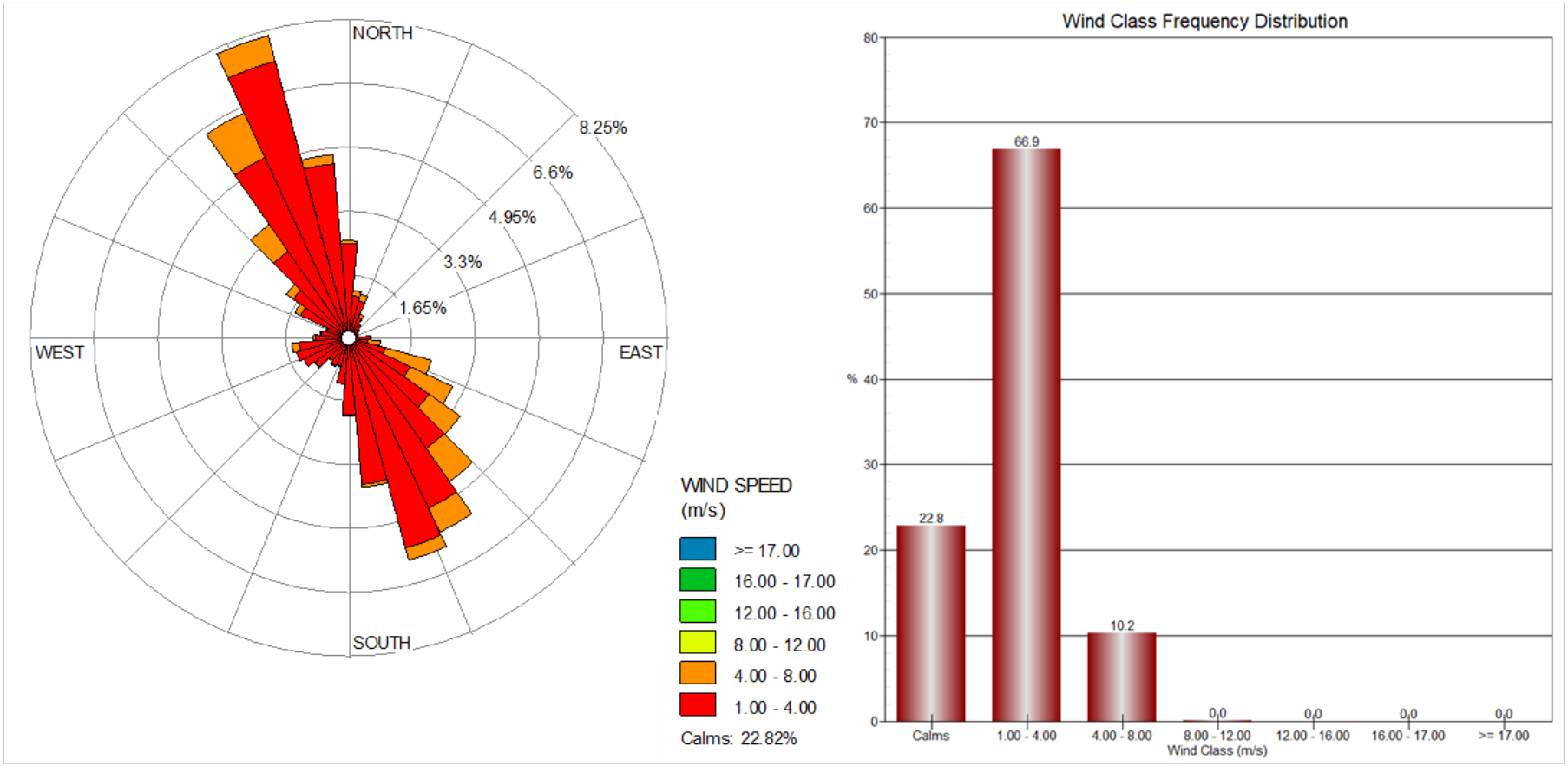


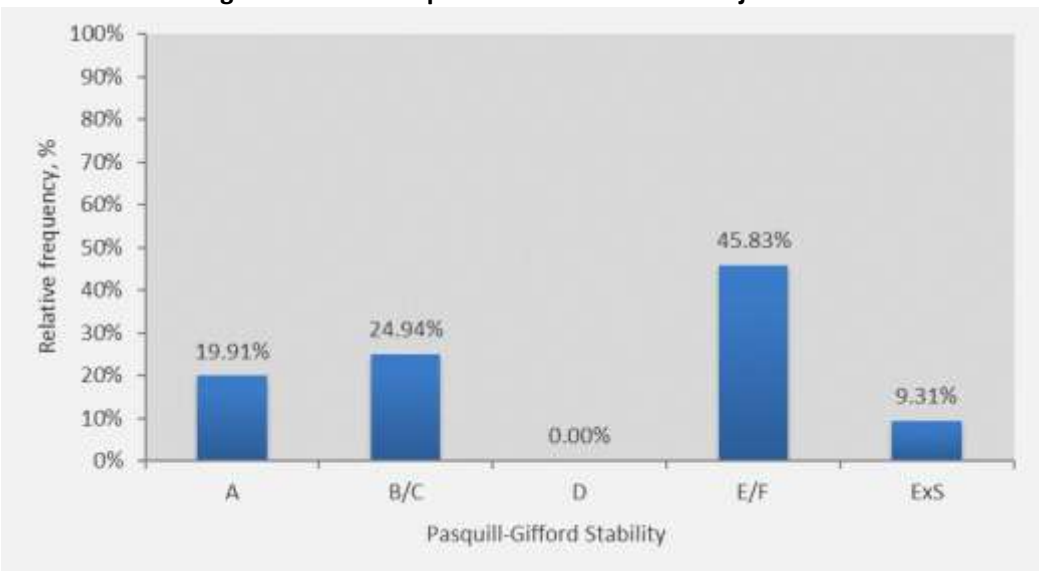
Figure 3-96. Wind rose and class frequency distribution during high rain period (Jun to Oct)



Stability - The atmospheric stabilities at the site, derived by converting the Monin-Obukhov Length scalars in the prognostic data to the Pasquill-Gifford stability classification showed the prevalence of a stable atmosphere (E - slightly stable, F - stable, ExS - extremely stable) at 55 percent followed by unstable atmospheres (A – Extremely unstable, B - unstable /C - slightly unstable) at the Project alignment (**Figure 3-97**). Unstable atmospheres occur during daytime due to insolation while a stable atmosphere occurs during nighttime. The descriptions of the prevailing stabilities are described below.

a) A stability (very unstable): daytime; strong insolation and wind < 3 m/s or moderate insolation and wind < 2 m/s
b) B stability (unstable): daytime; strong insolation with wind speed between 3 and 5 m/s or moderate insolation with wind speed between 2 and 4 m/s or slight insolation and wind < 2 m/s
c) C stability slightly unstable: daytime; strong insolation and wind speed >5 m/s or moderate insolation with wind between 4 and about 5.5 m/s or slight insolation and wind between 2 and 5 m/s
d) E stability (slightly stable): nighttime; thin overcast or > 50% cloud cover and wind < 3 m/s; < 50% cloud cover and wind between 3 and 5 m/s
e) F stability (stable): nighttime; < 50% cloud cover and wind < 3 m/s

Figure 3-97. Atmospheric stabilities at the Project area



PAGASA climate projections

Surface temperatures - Since 1971 the country in general has experienced an increase in mean, maximum, and minimum temperatures by 0.14°C per decade (IPCC, 2007). Studies by Tibig (2004) and Manton et al. (2001) reported departures of 0.61, 0.34 and 0.89 degrees from the annual mean, maximum, and minimum temperatures, respectively, of the 1961–1990 normal values (ADB, 2009).

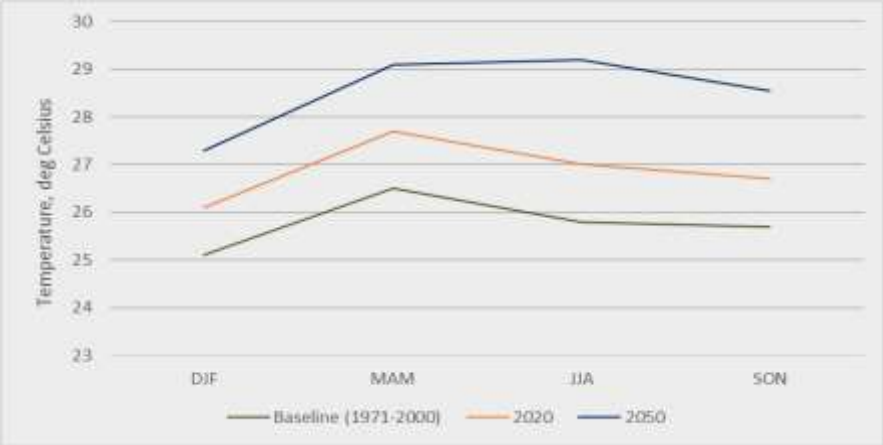
The aggregated PAGASA projections for the provinces of Misamis Oriental and Bukidnon under a medium range scenario showed surface temperature increases of 0.8 to 2.46 degrees in 2020 and 2050 respectively. With these projections, the Project area may experience mean surface temperatures from 26.1 to 27.7 degrees in 2020 and 27.3 to 29.2 degrees in 2050 (**Table 3-85**). The projections followed the trend of the baseline temperatures where temperatures peaks in the months of March, April, and are lowest in December, January, and February (**Figure 3-98**).

Table 3-85. Mean temperature projections in Bukidnon and Misamis Oriental

Quarter	Bukidnon	Mis. Oriental	Mean of Bukidnon & Mis. Oriental		
	Baseline (1971-2000)		Baseline	2020	2050
DJF	25.10	25.4	25.25	26.10	27.30
MAM	26.50	26.8	26.65	27.70	29.10
JJA	25.80	26.8	26.30	27.00	29.20
SON	25.70	26.5	26.10	26.70	28.55
		Annual mean	26.08	26.88	28.54

Source: derived from the PAGASA report *Climate Change in the Philippines*; NOTES: *1971-2000; DJF – Dec, Jan, Feb, MAM – Mar, Apr, May, JJA – Jun, Jul, Aug, SON, Sep, Oct, Nov

Figure 3-98. Trend of projected temperatures at the Project area



Rainfall - In contrast to the projected temperature increase, the mean annual rainfall and the number of rainy days in the country has increased since 1960. The country also experienced variability in the onset of the rainy season. The trend has been toward decreasing rainfall over Luzon and parts of Mindanao and increasing rainfall over the central western part of the country (Anglo, 2006).

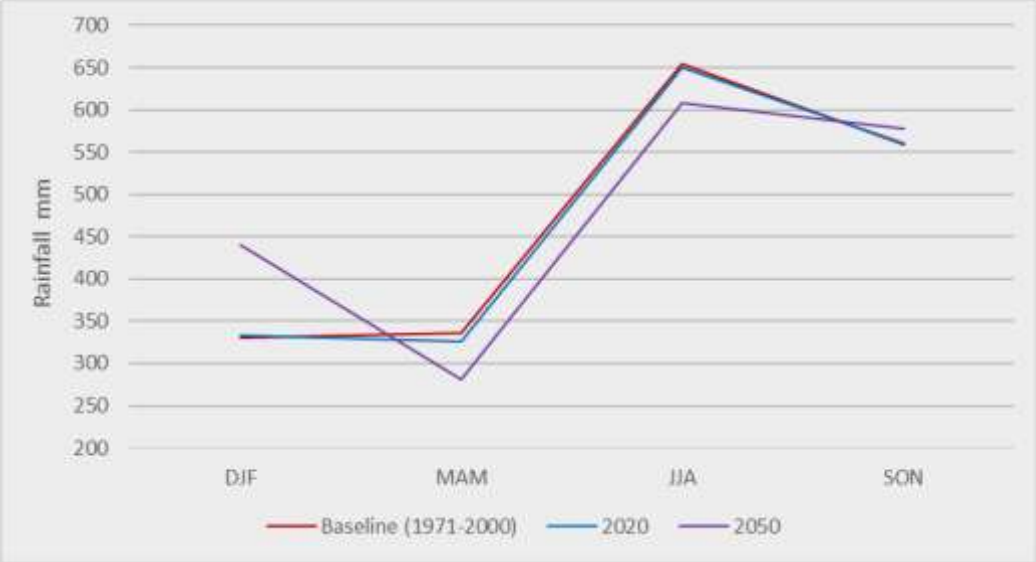
The aggregated PAGASA predictions for the medium-ranged scenario showed both rainfall decreases and increases in 2020 and 2050 from the observed baseline. The highest increase from the baseline were projected the months of June, July, and August 2020 with an increase of 15mm while the 55mm in December, January, and February 2050. There was a predicted decrease in the annual 2020 rainfall by about 38mm and a small increase of 1mm in 2050 (**Table 3-86**). Similar to projected temperatures, the rainfall projections also followed the baseline trend with the lowest rainfall in March, April, and May and highest in June, July, and August **(Figure 3-99**).

Table 3-86. Mean rainfall projections in Bukidnon and Misamis Oriental

Quarter	Bukidnon	Mis. Oriental	Mean of Bukidnon & Mis. Oriental		
	Baseline (1971-2000)		Baseline	2020	2050
DJF	329.70	442.5	386.10	333.45	440.85
MAM	335.60	296	315.80	325.25	280.60
JJA	653.80	615.7	634.75	649.75	608.25
SON	559.50	581.1	570.30	560.80	578.15
		Annual total	1,906.95	1,869.25	1,907.85

Source: derived from the PAGASA report *Climate Change in the Philippines*; NOTES: ***1971-2000;** DJF – Dec, Jan, Feb, MAM – Mar, Apr, May, JJA – Jun, Jul, Aug, SON, Sep, Oct, Nov

Figure 3-99. Trend of projected rainfall at the Project area



3.3.1.2.2 Change in greenhouse gas emissions

The GHG estimates and corresponding GWP from vehicle emissions for the different scenarios are shown in **Table 3-87**. The estimated GHG emissions from the operation of Sayre Highway only in 2040 is 9,522 MT (megatonnes) with a corresponding GWP of 9,726 MT CO_2e (megatonnes of carbon dioxide equivalent) (orange cells in **Table 3-87**). The GHG emissions from CMH only in 2040 was estimated at 35,715MT and a GWP of 38,200MT CO_2-e (green cells in **Table 3-87**). This estimated GHG and corresponding GWP for both (CMH and Sayre) in 2040 is 45,238MT and 47,927 MT respectively (purple cells in **Table 3-87**). The CMH was predicted to contribute about four times GHG compared to Sayre Highway emissions in 2040. The distribution of the estimates by vehicle type shows that trucks have the highest GHG emissions followed by cars when the Project will open to the public in 2026 (green cells in **Table 3-88**).

Table 3-87. Estimates of GHG emissions and GWP

		GHG, MT				GWP, MT			
Scenario	Year	CO_2	N_2O	CH_4	TOTAL	CO_2	N_2O	CH_4	TOTAL
Baseline (a)	2020	18,652	3.52	7.88	18,663	18,652	933	221	19,806
No Project (b)	2040	9,520	0.65	1.16	9,522	9,520	173	32	9,726
Project only (c)	2040	35,690	7.63	17.43	35,715	35,690	2,022	488	38,200
ALL (d)	2040	45,211	8.28	18.58	45,238	45,211	2,195	520	47,927

NOTES: GHG emissions and GWP are in MT;(a) Sayre 2020; (b) Sayre 2040; (c) CMH 2040; (d) Sayre and CMH 2040

Table 3-88. Distribution of annual total GHG estimates by vehicle type

Scenario	Year	CAR	JPY	BUS	TRU
Baseline (a)	2020	6,636.98	1,314.97	403.11	10,308.01
No Project (b)	2040	6,230.24	1,722.00	314.35	1,255.62
Project only (c)	2040	11,968.92	0.00	4,200.12	19,546.44
ALL (d)	2040	18,199.16	1,722.00	4,514.47	20,802.05

NOTES: GHG emissions in MT; (a) Sayre 2020; (b) Sayre 2040; (c) CMH 2040; (d) Sayre and CMH 2040; JPY – jeepney; TRU – truck

While it is anticipated that traffic volume will increase from 2020 to 2040, a comparison between scenarios where the future traffic conditions are the same (continuation of the use of the existing road network) and scenarios involving the bypass effect of CMH development (realization of congestion relief through road development) reveals that congestion relief is expected in the latter case, allowing for the maintenance of

high speeds. Generally, as the emission intensity of greenhouse gases is higher for slower vehicles, the effects of congestion relief enable comfortable driving at higher speeds, leading to an anticipated reduction in CO2 emissions.

3.3.1.3 Proposed mitigating measures

The contribution of the Project to the enhancement of climate change was described by estimating the vehicle GHG emissions and the corresponding GWP. The new road alignment is mostly located in agricultural land and forested areas further away. With few GHG emissions sources along the alignment except at its start and end, existing vegetation can act as carbon sinks for the additional GHG emissions from motor vehicles using the new highway.

To further increase and provide a controllable carbon sink, allocating unused portions of the road ROW to tree planting is recommended. The carbon sequestered by different tree land covers using the available area for tree planting estimated at 298 hectares[29] is shown in **Figure 3-89**. The table shows that using fast-growing species like *Mahogany, dipterocarps, Gmelina, A. auricoliformis, P. falcataria, T. grandis, Pinus kesia, Acacia, Eucalyptus citrodora, E. cloeziana, E. pellita, E. tereticornis* has the largest carbon sequestration potential among the different tree land covers (orange cell in Figure 3-89).

Table 3-89. Carbon sequestration rates and GHG absorbed by RROW area

Land cover	Carbon sequestration rate ($Mgha^{-1}yr^{-1}$)*	GHG sequestered by available area, MT
Protection Forest [PF]	1.5	447
Second-growth forest [SGF]	2.2	655
Tree Plantations [TP]	4	1,191
Agroforestry [AF]	2.7	804
Tree Plantations (fast growing)* [FGTP]	17.5	5,212

* Lasco, R.D. et. al., 2000; *Mahogany, dipterocarps, Gmelina, A. auricoliformis, P. falcataria, T. grandis, Pinus kesia, Acacia, Eucalyptus citrodora, E. cloeziana, E. pellita, E. tereticornis

The areas needed to sequester GHG emissions for the four scenarios are shown in **Table 3-90**. The table also shows the carbon reduction by using the available area along the RROW (298ha) as a carbon sink using different vegetation types.

Using fast-growing tree species at the available area appeared to have the highest carbon reduction for the four scenarios, despite needing additional areas for full sequestration. The additional areas to fully sequester the carbon estimates in **Table 3-91** showed that again, fast-growing tree species had the lowest areas needed (orange cells). An additional area of 2,287 hectares will be required for a 100 percent carbon sequestration from the Sayre Highway and CMH assuming the available RROW area is also planted with the fast-growing species and traffic projections and emission factors used hold.

It is important to note that while the fast-growing trees have the highest potential for GHG sequestration, these are not endemic and invasive. Planting endemic and native tree species is highly recommended and prioritized.

[29] Calculated using a RROW of 60m, actual road width of 14.6m, and road length of 65.6km

Table 3-90. Carbon reduction using different vegetation land covers

			C sequestration rate ($Mgha^{-1}yr^{-1}$)	PF	SGF	TP	AF	FGTP**
	Scenario	Year	Total GHG, MT	1.5	2.2	4	2.7	17.5
Area needed as carbon sink, ha	Baseline (a)	2020	18,663	12,442	8,483	4,666	6,912	1,066
	No Project (b)	2040	9,522	6,348	4,328	2,381	3,527	544
	Project only (c)	2040	35,715	23,810	16,234	8,929	13,228	2,041
	ALL (d)	2040	45,238	30,158	20,563	11,309	16,755	2,585
GHG sequestered in available area*	Baseline (a)	2020	18,663	2.39%	3.51%	6.38%	4.31%	27.93%
	No Project (b)	2040	9,522	4.69%	6.88%	12.51%	8.44%	54.73%
	Project only (c)	2040	35,715	1.25%	1.83%	3.34%	2.25%	14.59%
	ALL (d)	2040	45,238	0.99%	1.45%	2.63%	1.78%	11.52%

NOTES: (a) Sayre 2020; (b) Sayre 2040; (c) CMH 2040; (d) Sayre and CMH 2040; PF - Protection Forest; SGF - Second-growth forest; TP - Tree Plantations; AF – Agroforestry; FGTP - Fast growing tree Plantations; *percent reduction of GHG by available plantable area along the CMH RROW; **Mahogany, dipterocarps, Gmelina, A. auricoliformis, P. falcataria, T. grandis, Pinus kesia, Acacia, Eucalyptus citrodora, E. cloeziana, E. pellita, E. tereticornis

Table 3-91. Additional area needed for carbon sequestration, ha

Scenario	Year	PF	SGF	TP	AF	FGTP
Baseline (a)	2020	12,144	8,185	4,368	6,614	769
No Project (b)	2040	6,050	4,030	2,083	3,229	246
Project only (c)	2040	23,512	15,936	8,631	12,930	1,743
ALL (d)	2040	29,861	20,265	11,012	16,457	2,287

NOTES: Assuming available area in RROW is fully planted; (a) Sayre 2020; (b) Sayre 2040; (c) CMH 2040; (d) Sayre and CMH 2040; PF - Protection Forest; SGF - Second-growth forest; TP - Tree Plantations; AF – Agroforestry; FGTP - Fast growing tree Plantations, e.g., Mahogany, dipterocarps, Gmelina, A. auricoliformis, P. falcataria, T. grandis, Pinus kesia, Acacia, Eucalyptus citrodora, E. cloeziana, E. pellita, E. tereticornis

3.3.2 Ambient air quality (& Noise)

This section presents the existing ambient air quality along the alignment and its vicinities in the context of the applicable ambient air guideline values. The ambient air guideline values of the Philippines, Japan, and IFC relevant to the project are summarized **Table 3-92**. Except for suspended particulates (TSP), guideline values for SO_2 and NO_2 in Japan are expressed in parts per million (ppm) to make them independent of ambient temperature.

Table 3-92. Impact assessment criteria for the Project

Pollutant	AT	NAAQGV	JAPAN	IFC
TSP	24h	230	0.1 (a)	None
	Annual	90	None	None
PM10	24h	150	None	150
	Annual	60	None	70
SO_2	24h	180	0.04 (b)	125
	Annual	80	None	None
NO_2	24h	150	0.04 - 0.06 (c)	200

NOTES: AT – averaging time; NAAQGV – Philippine DENR National Ambient Air Quality Guideline Values, units are in ug/ncm; JAPAN - Environmental Quality Standards in Japan - Air Quality (env.go.jp); IFC - IFC Environmental, Health, and Safety Guidelines, General EHS Guidelines: Environmental Air Emissions and Ambient Air Quality, units are in ug/m3; (a) mg/m^3; (b) in ppm. Equivalent to 55 ug/ncm upon conversion; (c) in ppm. Equivalent to 39 to 59 ug/ncm upon conversion

Air dispersion modeling was done to determine the ambient air quality impacts when the proposed CMH opens.

3.3.2.1 Methodology

3.3.2.1.1 Air quality

The existing ambient air quality was characterized by measuring the 24h concentrations of NO_2, SO_2, TSP, PM10 in ten locations along and at the vicinities of the proposed road alignment during the low and high rain periods (**Figure 3-100**, **Table 3-93**) in consideration of the annual rainfall trend near project area (the low rain season is from November to May and the high rain season is from June to October). The methods for sampling and analysis conformed to methods prescribed in Sec. 1(b) Rule VII Part II of the Clean Air Act Implementing Rules and Regulation (IRR). The sampling results were compared to the National Ambient Air Quality Guidelines Values (NAAQGV), Rule VII, Part II to determine the existing ambient air quality impacts**.**

The ambient air quality impacts during the Project implementation, specifically during the opening of the new road to the public was assessed by conducting air dispersion modelling and comparing model results to the CAA NAAQGV. Comparison with other averaging times is for reference only. The major activities of the impact assessment are enumerated below.

1. Predicted the 98th percentile ground-level concentrations (GLC) of NO_2, SO_2, TSP, and PM10 from vehicle emissions along the existing Sayre Highway (near the alignment) and the new CMH;
2. Compared model results with the NO_2, SO_2, TSP, and PM10 ambient air guideline values;
3. Identified air pollution “hotspots”, i.e., areas where 98th percentile GLCs were predicted to occur or greater than 50% of the NAAQGV but no exceedance; and
4. Proposed mitigating measures to minimize the significant ambient air quality impacts.

Tier 4 of the EMB Air Dispersion Modeling Guidelines (EMB Memorandum Circular 2008-003) was used to predict the GLCs of NO_2, SO_2, TSP, and PM10 from vehicle emissions and travel on paved roads. The Breeze^{TM} AERMOD v10.0.0.15 Pro Plus software using the latest U.S. EPA 21112 executable was used for the simulations.
The scenarios for predicting the incremental impacts of the Project were a) Baseline (Sayre 2020), b) No project (Sayre 2040), c) Project Only (CMH 2040), and d) Cumulative (Sayre 2040 and CMH 2040. A total of 120 runs were done to predict the 98p GLC of NO_2, SO_2, TSP, and PM10 from the Sayre Highway and CMH emissions.

The model logic diagram for the air dispersion modeling and the ADM procedure are shown in
and **Annex 8,** respectively.

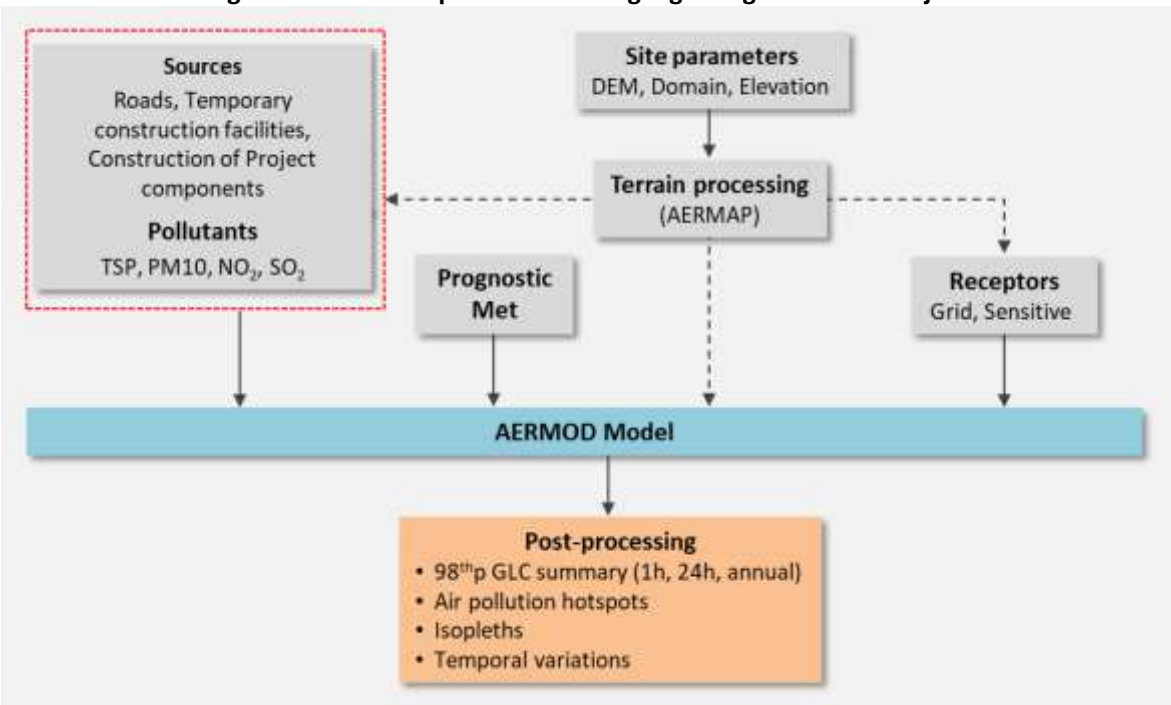
Figure 3-100. EIA ambient air quality sampling stations

Air Quality Sampling Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries) AAI (Sampling Stations)	JICA	AMET ASIA INC.

Table 3-93. Description of the AAQ sampling stations

Station ID	Barangay	Municipality/ City	Typical land use	Longitude (degrees)	Latitude (degrees)
AQ1	Zone 2B, Casinglot	Tagoloan	Residential	124.757942	8.515825
AQ2	Purok 7, Mambatangan	Manolo Fortich	Residential	124.800872	8.463833
AQ3	Zone 4, Alae		Agricultural	124.804962	8.412193
AQ4	Zone 1, Diclum		Residential	124.852996	8.371687
AQ5	Purok 4, San Roque	Sumilao	Residential	124.933255	8.329792
AQ6	San Antonio	Impasug-ong	Agro-industrial	124.983626	8.312317
AQ7	Purok 7, La Fortuna		Agricultural	124.996892	8.266137
AQ8	Zone 3, Impalutao		Agricultural	125.028944	8.23260
AQ9	Zone 9, Patpat	Malaybalay	Agro-industrial	125.053188	8.195157
AQ10	Casanova St. Kalasungay		Residential	125.11344	8.165801

Figure 3-101. Air dispersion modeling logic diagram of the Project



3.3.2.1.2 Noise

The existing sound profile along the alignment and its vicinities was determined by taking sound measurements every five minutes for 24h at the ambient air quality sampling stations in **Figure 3-100.** The noise descriptors shown in **Table 3-94** were derived from the measurements to describe the existing sonic profile at the Project area. The existing noise impacts were determined by comparing the noise descriptors and modelling results with the DENR Environmental Quality Standards for Noise in General Areas (**Table 3-95**, **Table 3-96**)[30], Japan Environmental Quality Standards for Noise (**Table 3-97**, **Table 3-98**), and IFC Noise Standards (**Table 3-99**).

Table 3-94. Noise descriptors for describing the existing sonic profile at the Project area

Descriptor	Description
L10	Noise level exceeded 10% of the time of the measurement period.
L50	Noise level exceeded 50% of the time. It is statistically the midpoint of the noise readings representing the median of the fluctuating noise levels.
L90	Noise level exceeded 90% of the time and represents the background levels.
Lmax	Highest recorded sound level
Lmin	Lowest recorded sound level

Table 3-95. Environmental Quality Standards for noise in general areas (dB(A))

Category	Daytime	Morning/Evening	Night-time
AA	50	45	40
A	55	50	45
B	65	60	55
C	70	65	60
D	75	70	65

NOTE: Morning: 5am-9am; Daytime: 9am-6pm; Evening: 6pm-10pm; Night-time 10pm-5am
Category description:
AA 100 m from schools, nurseries, hospitals, home of the aged
A residential area
B commercial area
C light industrial area
D heavy industrial area

Table 3-96. Environmental Quality Standards for noise in areas facing 4-lane roads (dB(A))

Category	Daytime	Morning/Evening	Night-time
AA	55	50	45
A	60	55	50
B	70	65	60
C	75	70	65
D	80	75	70

NOTE: Morning: 5am-9am; Daytime: 9am-6pm; Evening: 6pm-10pm; Night-time 10pm-5am
Category description:
AA 100 m from schools, nurseries, hospitals, home of the aged
A residential area
B commercial area
C light industrial area
D heavy industrial area

[30] NPCC Memorandum Circular No. 002 issued May 12, 1980 (amending Section 78 of Presidential Decree 984)

For areas corresponding to the ones mentioned in the following table (hereinafter referred to as "areas facing roads"), the standard values in this table shall be applied instead of the table above.

Table 3-97. Japan Environmental Quality Standards for Noise (dB(A))

Type of area	Daytime (6am – 10pm)	Night-time (10pm – 6am)
AA	50 dB or less	40 dB or less
A and B	55 dB or less	45 dB or less
C	60 dB or less	50 dB or less

Source: Ministry of Environment, Government of Japan (https://www.env.go.jp/en/air/noise/noise.html)
NOTES: a) Area category AA shall be applied to areas where quietness is specially required, such as those where convalescent facilities and welfare institutions are concentrated; b) Area category A shall be applied to areas used exclusively for residences; c) Area category B shall be applied to areas used mainly for residences; d) Area category C shall be applied to areas used for commerce and industry as well as for a significant number of residences.

Table 3-98. Japan Environmental Quality Standards for Noise in areas facing or adjacent to roads (dB(A))

Area category	Daytime (6am – 10pm)	Night-time (10pm – 6am)
Area A facing roads with two or more lanes	60 dB or less	55 dB or less
Area B facing roads with two or more lanes	65 dB or less	60 dB or less
Area C facing a road with one or more lanes		
Space adjacent to a road carrying arterial traffic*	70 dB or less	65 dB or less

Source: Ministry of Environment, Government of Japan (https://www.env.go.jp/en/air/noise/noise.html)
NOTES: "Lane" refers to a longitudinal strip of road with uniform width to enable a single line of cars to travel safely and without hindrance; *as an exception regardless of the for areas facing roads

Table 3-99. IFC General EHS Guidelines: Environmental Noise Level

Receptor	Daytime (0700 – 2200)	Nighttime (2200 – 0700)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: IFC Noise Level Guidelines of General EHS Guidelines; NOTE: Noise impacts should not exceed the levels presented in the following table, or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site

The noise impacts during construction were assessed by predicting the sound propagated by typical construction equipment typically used during construction comparing predicted values with the DENR criteria for construction noise (**Table 3-100**).

Predicting sound generation from the equipment was done using the point source attenuation rate for geometric spreading. Sound from a small, localized source (approximating a point source) radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates at a rate of six decibels for each doubling of distance. This decrease, due to the geometric spreading of the energy over an increasing area, is referred to as the inverse square law. The law states that the mean-square sound pressure level varies inversely as the square of the distance from the source. The general rule of thumb is that under ideal conditions (no reflecting surfaces or other background sound or interference), sound level drops six decibels for every doubling of the distance from the source. The inverse square law is represented by the formula:

$$\Delta D = 10\log\left(\frac{d_1}{d_2}\right)^2$$

where d_1 and d_2 are the distances and ΔD is the decibel difference.

Table 3-100. Maximum noise levels allowed during construction[31]

Class	Construction activities	Limit, dB(A)
1	Pile drivers (excluding manual type), riveting hammers or combination thereof. Does not include pile drivers used in combination with earth augers.	90
2	Rock drills, or similar equipment like jack hammers or pavement breakers	85
3	Air compressors (limited to compressors which use power other than electric motors with a rated output of 15kW or more). Air compressors power rock drills, jack hammers, and pavement breakers are excluded.	75
4	Batching plant operation (limited to those with mixer capacities of 200kg or more. Batching plants for mortar-making are excluded.	75

NOTE: No construction in Class AA, A, B areas (except during emergencies, calamities, disasters) from 7pm to 7am for Class 1&2 construction activities and from 9pm to 7am for Class 3&4 construction activities

The potential noise impacts from motor vehicles were assessed for three scenarios: *Baseline* (Sayre Highway 2020); *No Project* (Sayre Highway 2040), and *With Project* (CMH and Sayre Highway 2040) using the CUSTIC software and comparing the results to the limits in **Table 3-95** to **Table 3-99**. The noise modelling methodology is shown in **Annex 10.**

3.3.2.2 Assessment of key impacts

3.3.2.2.1 Degradation of air quality

Sources of air emissions

The major sources of emissions within the model domain are roads and urban centers of the six LGUs. The existing Sayre Highway is the major source of vehicle emissions followed by the city, municipal, and barangay roads.

Gaseous pollutants (SO_2, NO_2, CO) and particulates (TSP, PM10) are emitted by motor vehicles travelling these roads. Fugitive particulates are also generated in unpaved roads. Domestic activities like household cooking, backyard waste burning, and burning of agricultural wastes also contribute to the emissions within the mode domain.

Existing ambient air quality

The results of the 24h sampling showed levels of SO_2, NO_2, TSP, and PM10 that were less than the CAA guideline values except for a single instance of TSP exceedance in Station AQ1 during the high rain period (orange cell in **Table 3-101**, **Figure 3-102**). The likely source of the TSP exceedance in Station AQ1 are motor vehicle emissions and fugitive particulates.

The SO_2 and NO_2 concentrations were very low (most were below the method detection limit of the analytic method for SO_2) at both sampling periods (green cells in **Table 3-101**). The particulate detections (TSP and PM10) were likely due to fugitive dust from the roads and vehicle emissions.

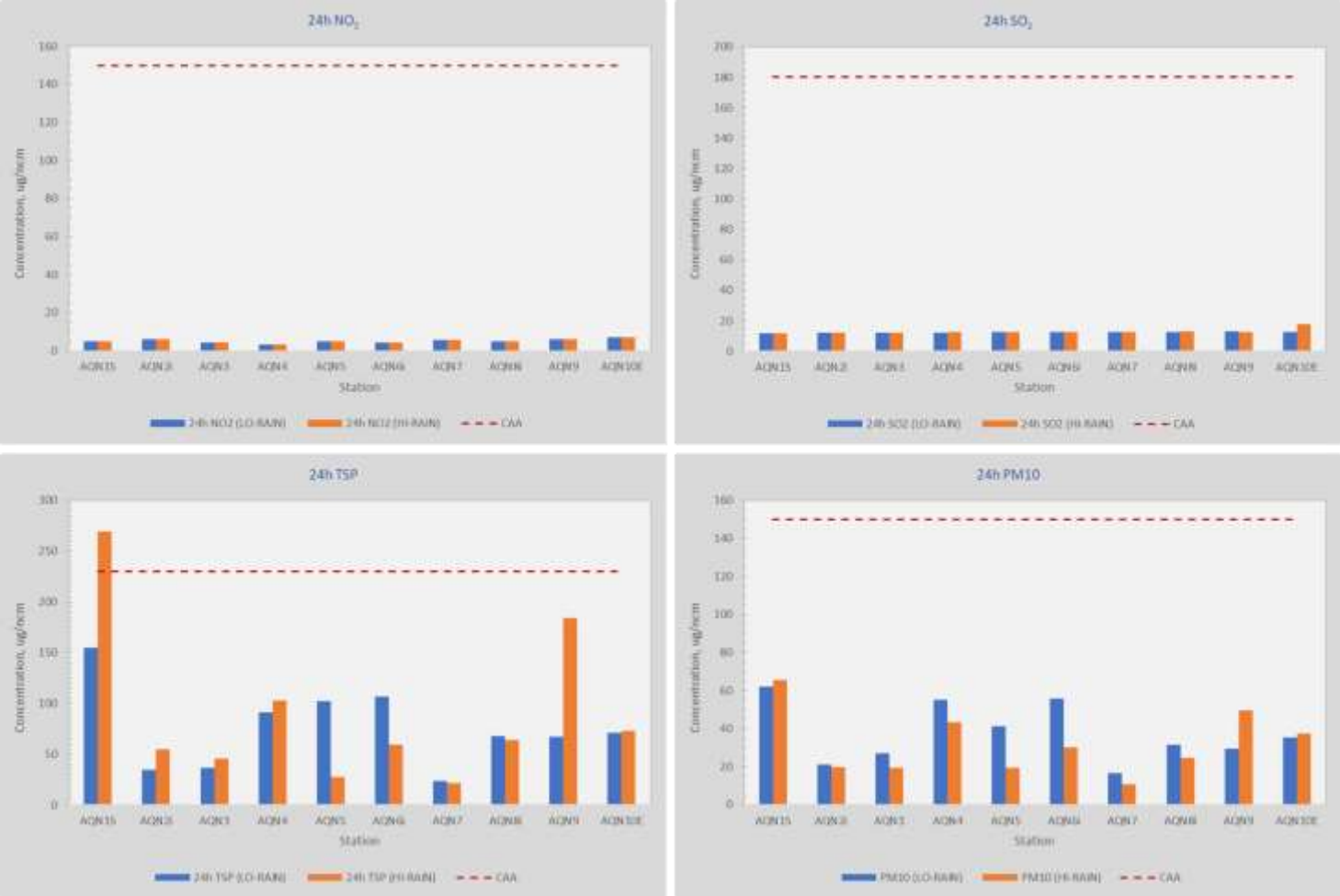
[31] measured at 30m

Table 3-101. Existing pollutant levels at the Project area

	24h NO_2		24h SO_2		24h TSP		24h PM10	
Station	LO-RAIN*	HI-RAIN*	LO-RAIN*	HI-RAIN*	LO-RAIN*	HI-RAIN*	LO-RAIN*	HI-RAIN*
AQ1	8.56	5.02	<11.8**	<11.9**	155	269.0	62.1	65.6
AQ2	6.41	6.2	<12.1**	<12.2**	34.3	54.5	21.0	19.7
AQ3	4.88	4.44	<12.3**	<12.4**	36.7	45.8	27.0	19.5
AQ4	6.57	<3.27**	<12.4**	<12.5**	91	103	55.1	43.5
AQ5	3.88	5.03	<12.5**	<12.6**	102	27.6	41.4	19.3
AQ6	6.61	4.5	<12.5**	<12.6**	107	59.2	55.8	30.0
AQ7	3.94	5.64	<12.7**	<12.7**	23.3	21.5	16.5	10.8
AQ8	6.76	4.91	<12.8**	<12.9**	67.9	63.5	31.7	24.5
AQ9	5.69	6.25	<12.9**	<12.8**	67.3	184	29.5	49.7
AQ10	3.37	7.19	<12.7**	18	71.2	73	35.4	37.6
CAA	150	150	180	180	230	230	150	150

Units are in ug/Ncm; CAA – CAA NAAAQGV; * ; ** below the Method Detection Limit

Figure 3-102. Graph of existing AAQ at the proposed alignment and its vicinities



Predicted pollutant levels

The impact assessment focused on the effect of vehicle emissions using the new CMH alignment and the existing Sayre Highway on ambient air quality. Construction phase emissions are expected to be temporary, unsteady (i.e., emissions only during active construction), and local to a particular active construction area. On the hand, emissions from motor vehicles using both the new CMH and existing Sayre Highway will be constant and long term.

The ambient AQ impacts of vehicle emissions using the existing Sayre and new CMH road were presented by showing statistical summaries of the predicted 98th percentile (*98p*) GLCs at the grid and AQ sampling stations as sensitive receptors. Grid receptors are points within the model domain with equal resolutions where the GLCs were calculated. An ***Index***, i.e., ratio of maximum 98p GLCs and the corresponding CAA standard or guideline value and averaging time, was used to determine whether or not the CAA was exceeded.

A significant AQ impact was defined as an index exceeding unity using the 24-hour averaging time. Other averaging times were used as reference only.

The simulations showed that NO_2 was the pollutant of concern because of the predicted exceedances. Other criteria pollutants (SO_2, TSP, PM10) were less than their corresponding CAA standards and guideline values. Sample model and post-processing files are shown in the following attachments in **Annex 7**

- **Attachment 1** Sample AERMOD Meteorological Input File (*.sfc/.pfl*)
- **Attachment 2**. Sample DEM for AERMOD
- **Attachment 3** Sample AERMAP output file
- **Attachment 4** AERMOD 98th percentile output file (*.pco*)
- **Attachment 5** Sample Spreadsheet of processing model outputs

1. Nitrogen dioxide (NO_2)

The predicted 98p 1h and 24h GLCs (**Table 3-102**) from vehicle emissions at the grid receptors across scenarios showed no exceedances to the CAA 1h standard and 24h guideline value except for the Project Only and Cumulative scenarios with indices greater than unity (red text in **Table 3-102**). Vehicles emissions from the CMH had the higher contribution to the NO_2 concentrations in 2040 (14 years after its opening) with 1h and 24h concentrations of 272.08 and 78.59 ug/ncm respectively (green cells in **Table 3-102**). Traffic emissions from the CMH contributed about 86 percent to the 24h ambient NO_2 concentration from both the CMH and Sayre Highway emissions.

Table 3-102. Summary of predicted 98p NO_2 GLCs at the grid receptors

	Maximum GLC		CAA		Index		% exceed	
Scenario	1h	24h	1h	24h	1h	24h	1h	24h
Baseline (a)	137.16	54.61	260	150	0.53	0.36	0.00%	0.00%
Without Project (b)	97.25	32.84	260	150	0.37	0.22	0.00%	0.00%
Project Only (c)	272.08	78.59	260	150	1.05	0.52	0.23%	0.00%
Cumulative (d)	311.01	91.20	260	150	1.20	0.61	0.23%	0.00%

NOTES: (a) Baseline - Sayre only 2020; (b) Sayre only 2040; (c) CMH only 2040; (d) Sayre and CMH 2040; Max GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA; %Ex – percentage of receptors where GLC > CAA; 1h, 2h – averaging time

There was no predicted exceedance to either 1h and 24h NO_2 standard and guideline value across scenarios at the sensitive receptors. The highest predicted 1h and 24h NO_2 GLCs at the sensitive receptors from both CMH and Sayre Highway traffic emissions 247.6 and 114.23 ug/ncm respectively in Station AQ2 (green cells in **Table 3-103**).

Table 3-103. Summary of predicted 98p NO_2 GLCs at the sensitive receptors

		Maximum GLC					Index			
AT	Receptor	BASE	NP	PO	ALL	CAA	BASE	NP	PO	ALL
1h	Station AQ1	21.85	15.06	143.16	153.24	260	0.08	0.06	0.55	0.59
	Station AQ2	36.14	25.14	224.79	247.60	260	0.14	0.10	0.86	0.95
	Station AQ3	18.93	12.58	138.81	146.53	260	0.07	0.05	0.53	0.56
	Station AQ4	99.95	85.16	61.08	143.69	260	0.38	0.33	0.23	0.55
	Station AQ5	6.78	4.34	117.20	121.05	260	0.03	0.02	0.45	0.47
	Station AQ6	60.12	48.89	90.36	131.41	260	0.23	0.19	0.35	0.51
	Station AQ7	16.89	11.48	149.81	153.26	260	0.06	0.04	0.58	0.59
	Station AQ8	74.05	43.53	73.46	115.08	260	0.28	0.17	0.28	0.44
	Station AQ9	100.93	30.13	158.12	185.68	260	0.39	0.12	0.61	0.71
	Station AQ10	90.07	27.08	39.89	66.76	260	0.35	0.10	0.15	0.26
24h	Station AQ1	6.34	4.49	45.13	48.89	150	0.04	0.03	0.30	0.33
	Station AQ2	10.77	7.79	106.17	114.23	150	0.07	0.05	0.71	0.76
	Station AQ3	4.88	3.60	50.38	52.13	150	0.03	0.02	0.34	0.35
	Station AQ4	33.11	27.46	18.42	45.17	150	0.22	0.18	0.12	0.30
	Station AQ5	1.94	1.39	33.02	33.96	150	0.01	0.01	0.22	0.23
	Station AQ6	19.78	15.11	26.84	41.06	150	0.13	0.10	0.18	0.27
	Station AQ7	5.39	3.26	70.09	71.18	150	0.04	0.02	0.47	0.47
	Station AQ8	24.95	15.04	22.19	36.32	150	0.17	0.10	0.15	0.24
	Station AQ9	31.29	9.74	52.15	60.11	150	0.21	0.06	0.35	0.40
	Station AQ10	26.90	8.68	12.77	20.78	150	0.18	0.06	0.09	0.14

NOTES: AT - averaging time; BASE - Baseline (Sayre only 2020); NP - Sayre only 2040; PO - CMH only 2040; ALL - Sayre and CMH 2040; Maximum GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA

2. Sulfur dioxide (SO_2)

The simulations showed that ambient concentrations of SO_2 at the grid and sensitive receptors across scenarios and averaging times were less than its CAA standards and guideline values at both grid and sensitive receptors (**Table 3-104**, **Table 3-105**). Traffic emissions from the CMH contributed about 99 percent to the 24h ambient SO2 concentration across averaging times.

Similar to NO_2, the highest 98p SO_2 GLCs at the grid receptors were due to cumulative traffic emissions from both CMH and Sayre Highway with 1h, 24h, and annual values of 121.15, 35.47, and 14.49 ug/ncm respectively (green cells in **Table 3-104**).

The highest cumulative 98p SO_2 GLCs at the sensitive receptors from both CMH and Sayre Highway traffic emissions were also predicted in Station AQ2 with values of 185, 74.27, and 30 ug/ncm for the 1h, 24h, and annual averaging times respectively (green cells in **Table 3-105**).

Table 3-104. Summary of predicted 98p SO_2 GLCs at the grid receptors

	Maximum GLC			CAA			Index			% exceed		
Scenario	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann
Baseline (a)	83.60	29.09	13.31	340	180	80	0.25	0.16	0.17	0.00%	0.00%	0.00%
Without Project (b)	16.64	5.74	2.49	340	180	80	0.05	0.03	0.03	0.00%	0.00%	0.00%
Project Only (c)	120.61	35.25	14.43	340	180	80	0.35	0.20	0.18	0.00%	0.00%	0.00%
Cumulative (d)	121.15	35.47	14.49	340	180	80	0.36	0.20	0.18	0.00%	0.00%	0.00%

NOTES: (a) Baseline - Sayre only 2020; (b) Sayre only 2040; (c) CMH only 2040; (d) Sayre and CMH 2040; Max GLC and CAA are in ug/ncm; Ann – annual averaging time; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA; %Ex – percentage of receptors where GLC > CAA; 1h, 24h, Ann – averaging times

Table 3-105. Summary of predicted 98p SO_2 GLCs at the sensitive receptors

		Maximum GLC					Index			
AT	Receptor	BASE	NP	PO	ALL	CAA	BASE	NP	PO	ALL
1h	Station AQ1	9.84	0.83	98.27	98.90	340	0.03	0.00	0.29	0.29
	Station AQ2	17.85	2.76	182.05	184.99	340	0.05	0.01	0.54	0.54
	Station AQ3	9.99	2.01	89.96	90.75	340	0.03	0.01	0.26	0.27
	Station AQ4	52.47	12.93	28.87	40.79	340	0.15	0.04	0.08	0.12
	Station AQ5	3.81	0.31	51.31	51.57	340	0.01	0.00	0.15	0.15
	Station AQ6	39.37	3.76	40.87	43.29	340	0.12	0.01	0.12	0.13
	Station AQ7	9.95	0.62	107.19	107.29	340	0.03	0.00	0.32	0.32
	Station AQ8	43.33	2.21	33.55	35.54	340	0.13	0.01	0.10	0.10
	Station AQ9	42.12	0.31	68.29	68.60	340	0.12	0.00	0.20	0.20
	Station AQ10	37.83	0.31	17.34	17.56	340	0.11	0.00	0.05	0.05
24h	Station AQ1	2.96	0.23	28.59	28.73	180	0.02	0.00	0.16	0.16
	Station AQ2	5.19	0.83	73.49	74.27	180	0.03	0.00	0.41	0.41
	Station AQ3	2.57	0.52	30.56	30.70	180	0.01	0.00	0.17	0.17
	Station AQ4	17.77	4.13	8.87	13.13	180	0.10	0.02	0.05	0.07
	Station AQ5	1.05	0.11	16.14	16.21	180	0.01	0.00	0.09	0.09
	Station AQ6	12.69	1.20	12.35	13.38	180	0.07	0.01	0.07	0.07
	Station AQ7	3.07	0.21	41.12	41.26	180	0.02	0.00	0.23	0.23
	Station AQ8	15.07	0.79	10.20	10.90	180	0.08	0.00	0.06	0.06
	Station AQ9	13.48	0.12	22.51	22.61	180	0.07	0.00	0.13	0.13
	Station AQ10	12.10	0.11	5.55	5.64	180	0.07	0.00	0.03	0.03
Annual	Station AQ1	1.06	0.07	11.53	11.60	80	0.01	0.00	0.14	0.15
	Station AQ2	1.99	0.29	29.37	29.66	80	0.02	0.00	0.37	0.37
	Station AQ3	0.67	0.13	12.64	12.77	80	0.01	0.00	0.16	0.16
	Station AQ4	8.99	1.92	2.75	4.67	80	0.11	0.02	0.03	0.06
	Station AQ5	0.32	0.03	5.88	5.91	80	0.00	0.00	0.07	0.07
	Station AQ6	5.52	0.44	3.70	4.13	80	0.07	0.01	0.05	0.05
	Station AQ7	1.04	0.06	20.46	20.52	80	0.01	0.00	0.26	0.26
	Station AQ8	6.56	0.33	3.28	3.61	80	0.08	0.00	0.04	0.05
	Station AQ9	5.95	0.04	8.10	8.14	80	0.07	0.00	0.10	0.10
	Station AQ10	3.30	0.03	1.39	1.42	80	0.04	0.00	0.02	0.02

NOTES: AT - averaging time; BASE - Baseline (Sayre only 2020); NP - Sayre only 2040; PO - CMH only 2040; ALL - Sayre and CMH 2040; Maximum GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA

3. Total Suspended Particulates (TSP)

Similar to SO_2, the predicted TSP GLCs across scenarios and averaging times were less than the CAA standards and guideline values at both grid and sensitive receptors (indices less than unity in **Table 3-106**, **Table 3-107**) with higher predicted GLCs at the sensitive receptors. Traffic emissions from the CMH contributed about 94 percent to the 24h ambient TSP concentration across averaging times.

The highest predicted 98p TSP GLCs at the grid receptors from both CMH and Sayre Highway traffic emissions in 2040 were 2.23, 1.74, and 0.58 ug/ncm respectively (green cells in **Table 3-106**).

The highest predicted 98p TSP GLCs at the sensitive receptors from both CMH and Sayre Highway traffic emissions in 2040 were predicted in Station AQ2 with values of 7.06, 4.51, and 1.0 ug/ncm for the 1h, 24h, and annual averaging times respectively (green cells in **Table 3-107**).

Table 3-106. Summary of predicted 98p TSP GLCs at the grid receptors

	Maximum GLC			CAA			Index			% exceed		
Scenario	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann
Baseline (a)	2.09	0.95	0.35	300	230	90	0.0070	0.0041	0.0039	0.00%	0.00%	0.00%
Without Project (b)	1.77	0.66	0.26	300	230	90	0.0059	0.0029	0.0029	0.00%	0.00%	0.00%
Project Only (c)	2.10	1.63	0.54	300	230	90	0.0070	0.0071	0.0060	0.00%	0.00%	0.00%
Cumulative (d)	2.23	1.74	0.58	300	230	90	0.0074	0.0076	0.0064	0.00%	0.00%	0.00%

NOTES: (a) Baseline - Sayre only 2020; (b) Sayre only 2040; (c) CMH only 2040; (d) Sayre and CMH 2040; Max GLC and CAA are in ug/ncm; Ann – annual averaging time; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA; %Ex – percentage of receptors where GLC > CAA; 1h, 24h, Ann – averaging times

Table 3-107. Summary of predicted 98p TSP GLCs at the sensitive receptors

		Maximum GLC					Index			
AT	**Receptor**	**BASE**	**NP**	**PO**	**ALL**	**CAA**	**BASE**	**NP**	**PO**	**ALL**
1h	Station AQ1	0.54	0.38	0.57	0.90	300	0.0018	0.0013	0.0019	0.0030
	Station AQ2	0.78	0.63	6.88	7.06	300	0.0026	0.0021	0.0229	0.0235
	Station AQ3	0.79	0.73	0.93	1.32	300	0.0026	0.0024	0.0031	0.0044
	Station AQ4	2.82	2.19	0.32	2.37	300	0.0094	0.0073	0.0011	0.0079
	Station AQ5	0.10	0.09	0.67	0.74	300	0.0003	0.0003	0.0022	0.0025
	Station AQ6	0.71	0.54	0.17	0.73	300	0.0024	0.0018	0.0006	0.0024
	Station AQ7	0.20	0.18	2.09	2.12	300	0.0007	0.0006	0.0070	0.0071
	Station AQ8	0.24	0.19	0.38	0.54	300	0.0008	0.0006	0.0013	0.0018
	Station AQ9	0.46	0.20	0.59	0.74	300	0.0015	0.0007	0.0020	0.0025
	Station AQ10	0.16	0.06	0.06	0.13	300	0.0005	0.0002	0.0002	0.0004
24h	Station AQ1	0.27	0.19	0.50	0.64	230	0.0012	0.0008	0.0022	0.0028
	Station AQ2	0.28	0.28	4.35	4.51	230	0.0012	0.0012	0.0189	0.0196
	Station AQ3	0.24	0.21	0.37	0.48	230	0.0010	0.0009	0.0016	0.0021
	Station AQ4	2.40	1.77	0.10	1.82	230	0.0105	0.0077	0.0004	0.0079
	Station AQ5	0.04	0.04	0.24	0.27	230	0.0002	0.0002	0.0010	0.0012
	Station AQ6	0.31	0.31	0.10	0.33	230	0.0014	0.0013	0.0004	0.0014
	Station AQ7	0.10	0.09	1.78	1.80	230	0.0004	0.0004	0.0078	0.0078
	Station AQ8	0.13	0.11	0.14	0.21	230	0.0005	0.0005	0.0006	0.0009
	Station AQ9	0.29	0.11	0.25	0.32	230	0.0012	0.0005	0.0011	0.0014
	Station AQ10	0.07	0.02	0.02	0.04	230	0.0003	0.0001	0.0001	0.0002
Annual	Station AQ1	0.05	0.04	0.15	0.19	90	0.0006	0.0004	0.0017	0.0021
	Station AQ2	0.08	0.06	0.94	1.00	90	0.0009	0.0006	0.0105	0.0111
	Station AQ3	0.11	0.08	0.13	0.21	90	0.0012	0.0008	0.0014	0.0023
	Station AQ4	0.82	0.59	0.03	0.62	90	0.0091	0.0066	0.0003	0.0069
	Station AQ5	0.01	0.01	0.07	0.08	90	0.0001	0.0001	0.0008	0.0009
	Station AQ6	0.10	0.07	0.02	0.09	90	0.0011	0.0008	0.0002	0.0010
	Station AQ7	0.04	0.03	0.67	0.69	90	0.0004	0.0003	0.0074	0.0077
	Station AQ8	0.06	0.04	0.04	0.08	90	0.0006	0.0004	0.0004	0.0008
	Station AQ9	0.11	0.04	0.07	0.11	90	0.0012	0.0004	0.0008	0.0012
	Station AQ10	0.01	0.00	0.00	0.01	90	0.0002	0.0001	0.0000	0.0001

NOTES: AT - averaging time; BASE - Baseline (Sayre only 2020); NP - Sayre only 2040; PO - CMH only 2040; ALL - Sayre and CMH 2040; Maximum GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA

4. Particulate Matter-10 (PM10)

The predicted PM10 GLCs across scenarios and averaging times were less than the CAA standards and guideline values at both grid and sensitive receptors (**Table 3-108**, **Table 3-109**) with higher predicted GLCs at

the sensitive receptors. Traffic emissions from the CMH contributed about 77 to 89 percent to the 24h ambient PM10 concentration across averaging times.

The highest predicted 98p PM10 GLCs at the grid receptors from both CMH and Sayre Highway traffic emissions in 2040 were 16.91, 5.07, and 2.45 ug/ncm for the 1h, 24h, and annual averaging times respectively (green cells in **Table 3-108**).

The highest predicted 98p PM10 GLCs at the sensitive receptors from both CMH and Sayre Highway traffic emissions in 2040 were predicted in Station AQ7 with values of 15.93, 6.02, and 5.90 ug/ncm for the 1h, 24h, and annual averaging times (green cells in **Table 3-109**).

Table 3-108. Summary of predicted 98p PM10 GLCs at the grid receptors

	Maximum GLC			CAA			Index			% exceed		
Scenario	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann
Baseline (a)	10.70	3.89	1.74	200	150	60	0.053	0.026	0.029	0.00%	0.00%	0.00%
Without Project (b)	4.73	1.76	0.77	200	150	60	0.024	0.012	0.013	0.00%	0.00%	0.00%
Project Only (c)	15.04	4.49	1.88	200	150	60	0.075	0.030	0.031	0.00%	0.00%	0.00%
Cumulative (d)	16.91	5.07	2.45	200	150	60	0.085	0.034	0.041	0.00%	0.00%	0.00%

NOTES: (a) Baseline - Sayre only 2020; (b) Sayre only 2040; (c) CMH only 2040; (d) Sayre and CMH 2040; Max GLC and CAA are in ug/ncm; Ann – annual averaging time; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA; %Ex – percentage of receptors where GLC > CAA; 1h, 24h, Ann – averaging times

Table 3-109. Summary of predicted 98p PM10 GLCs at the sensitive receptors

		Maximum GLC					Index			
AT	**Receptor**	**BASE**	**NP**	**PO**	**ALL**	**CAA**	**BASE**	**NP**	**PO**	**ALL**
1h	Station AQ1	0.69	0.54	6.41	6.73	200	0.0035	0.0027	0.0321	0.0336
	Station AQ2	1.27	1.06	13.00	13.86	200	0.0064	0.0053	0.0650	0.0693
	Station AQ3	0.58	0.41	8.59	8.73	200	0.0029	0.0020	0.0430	0.0437
	Station AQ4	6.89	4.94	2.17	6.87	200	0.0344	0.0247	0.0109	0.0343
	Station AQ5	0.16	0.14	8.38	8.49	200	0.0008	0.0007	0.0419	0.0424
	Station AQ6	2.98	2.72	4.57	6.88	200	0.0149	0.0136	0.0229	0.0344
	Station AQ7	0.69	0.57	15.74	15.93	200	0.0034	0.0029	0.0787	0.0796
	Station AQ8	3.56	2.54	2.80	5.34	200	0.0178	0.0127	0.0140	0.0267
	Station AQ9	4.72	1.52	7.57	8.84	200	0.0236	0.0076	0.0378	0.0442
	Station AQ10	3.75	1.21	1.30	2.40	200	0.0188	0.0060	0.0065	0.0120
24h	Station AQ1	0.22	0.16	1.79	1.94	150	0.0015	0.0011	0.0120	0.0129
	Station AQ2	0.42	0.35	5.38	5.72	150	0.0028	0.0023	0.0359	0.0381
	Station AQ3	0.15	0.11	2.95	2.99	150	0.0010	0.0008	0.0197	0.0199
	Station AQ4	2.27	1.62	0.81	2.32	150	0.0152	0.0108	0.0054	0.0154
	Station AQ5	0.05	0.05	2.74	2.78	150	0.0004	0.0003	0.0183	0.0186
	Station AQ6	1.05	0.90	1.58	2.45	150	0.0070	0.0060	0.0105	0.0163
	Station AQ7	0.22	0.18	5.91	6.02	150	0.0015	0.0012	0.0394	0.0402
	Station AQ8	1.25	0.93	0.93	1.80	150	0.0084	0.0062	0.0062	0.0120
	Station AQ9	1.51	0.49	2.58	3.02	150	0.0100	0.0033	0.0172	0.0201
	Station AQ10	1.32	0.42	0.48	0.86	150	0.0088	0.0028	0.0032	0.0057
Annual	Station AQ1	0.10	0.06	0.77	0.06	60	0.0016	0.0011	0.0128	0.0010
	Station AQ2	0.19	0.12	2.14	0.27	60	0.0031	0.0021	0.0356	0.0046
	Station AQ3	0.05	0.03	1.26	1.29	60	0.0008	0.0005	0.0210	0.0215
	Station AQ4	1.12	0.75	0.31	1.06	60	0.0187	0.0125	0.0051	0.0176
	Station AQ5	0.02	0.01	1.16	1.20	60	0.0003	0.0002	0.0193	0.0199
	Station AQ6	0.47	0.35	0.47	1.31	60	0.0078	0.0058	0.0079	0.0218
	Station AQ7	0.08	0.05	2.92	5.90	60	0.0013	0.0008	0.0487	0.0983

		Maximum GLC					Index			
AT	Receptor	BASE	NP	PO	ALL	CAA	BASE	NP	PO	ALL
	Station AQ8	0.57	0.39	0.33	1.27	60	0.0095	0.0065	0.0055	0.0212
	Station AQ9	0.71	0.22	0.95	1.20	60	0.0119	0.0037	0.0158	0.0200
	Station AQ10	0.37	0.12	0.12	0.24	60	0.0062	0.0020	0.0019	0.0040

NOTES: AT - averaging time; BASE - Baseline (Sayre only 2020); NP - Sayre only 2040; PO - CMH only 2040; ALL - Sayre and CMH 2040; Maximum GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA

Air pollution hotspots

The predicted 98p GLCs of the criteria pollutants SO_2, NO_2, TSP, and PM10 at the all receptors, i.e., grid and sensitive, were processed to determine the air pollution hotspots, defined as locations within the model domain where a particular CAA standard or guideline value was exceeded (*potential hotspot*) or where predicted GLCs are greater than 50% of the CAA standard or guideline value with no exceedance (*area of concern*).

The matrix of the hotspot evaluation in **Table 3-110** showed two *Potential Hotspots* for the 1h NO_2 (red cells) due to traffic emissions from the CMH only and both CMH and Sayre Highway in 2040 (Scenarios PO and ALL in **Table 3-110**. The dominant land use at the Potential Hotspots is agricultural with small clusters of houses.

There were also three *Areas of Concern* for NO_2 (green cells in **Table 3-110**) for the Scenarios BASE (Sayre only 2o20), PO (CMH Only 2040), and ALL (CMH and Sayre 2040). There were neither *Potential Hotspots* nor *Areas of Concern* for SO_2, TSP, and PM10. The isopleths in **Figure 3-103** to **Figure 3-106** show the 24h GLCs of NO_2, NO_2, TSP and PM10 from traffic emissions for all scenarios. High pollutant concentrations near the roads are expected because vehicle emissions are near ground-level with insignificant buoyant flux that prohibits long range dispersion.

Table 3-110. Hotspot matrix of criteria pollutants

		Maximum GLC			CAA			Index			Hotspots		
CP	Scenario	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann	1h	24h	Ann
NO_2	BASE	137.16	54.61	NS	260	150	NGV	0.53	0.36	n/a	AOC	NONE	n/a
	NP	97.25	32.84	NS	260	150	NGV	0.37	0.22	n/a	NONE	NONE	n/a
	PO	272.08	78.59	NS	260	150	NGV	1.05	0.52	n/a	PH	AOC	n/a
	ALL	311.01	91.20	NS	260	150	NGV	1.20	0.61	n/a	PH	AOC	n/a
SO_2	BASE	83.60	29.09	13.31	340	180	80	0.25	0.16	0.17	NONE	NONE	NONE
	NP	16.64	5.74	2.49	340	180	80	0.05	0.03	0.03	NONE	NONE	NONE
	PO	120.61	35.25	14.43	340	180	80	0.35	0.20	0.18	NONE	NONE	NONE
	ALL	121.15	35.47	14.49	340	180	80	0.36	0.20	0.18	NONE	NONE	NONE
TSP	BASE	2.09	0.95	0.35	300	230	90	0.0070	0.0041	0.0039	NONE	NONE	NONE
	NP	1.77	0.66	0.26	300	230	90	0.0059	0.0029	0.0029	NONE	NONE	NONE
	PO	2.10	1.63	0.54	300	230	90	0.0070	0.0071	0.0060	NONE	NONE	NONE
	ALL	2.23	1.74	0.58	300	230	90	0.0074	0.0076	0.0064	NONE	NONE	NONE
PM10	BASE	10.70	3.89	1.74	200	150	60	0.053	0.026	0.029	NONE	NONE	NONE
	NP	4.73	1.76	0.77	200	150	60	0.024	0.012	0.013	NONE	NONE	NONE
	PO	15.04	4.49	1.88	200	150	60	0.075	0.030	0.031	NONE	NONE	NONE
	ALL	16.91	5.07	2.45	200	150	60	0.085	0.034	0.041	NONE	NONE	NONE

NOTES: CP – criteria pollutant; BASE - Baseline (Sayre only 2020); NP - Sayre only 2040; PO - CMH only 2040; ALL - Sayre and CMH 2040; Maximum GLC and CAA are in ug/ncm; CAA – Clean Air Act ambient air quality standards or guideline value; Index = ratio of max GLC and CAA; 1h, 24h, Ann are averaging times; PH – potential hotspot; AOC – area of concern

Figure 3-103. Isopleths of 24h NO_2 GLCs from vehicle emissions

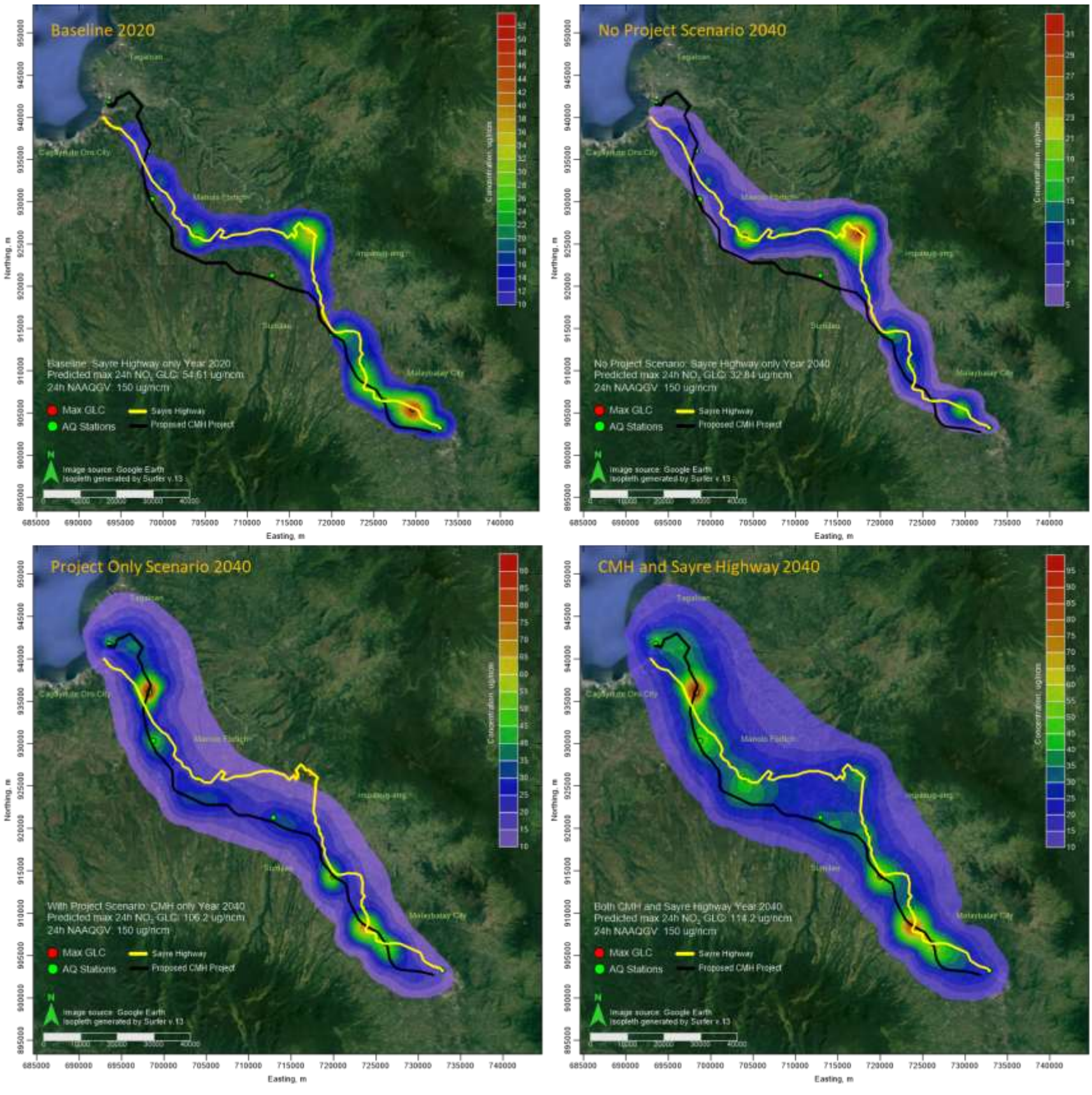


Figure 3-104. Isopleths of 24h SO_2 GLCs from vehicle emissions

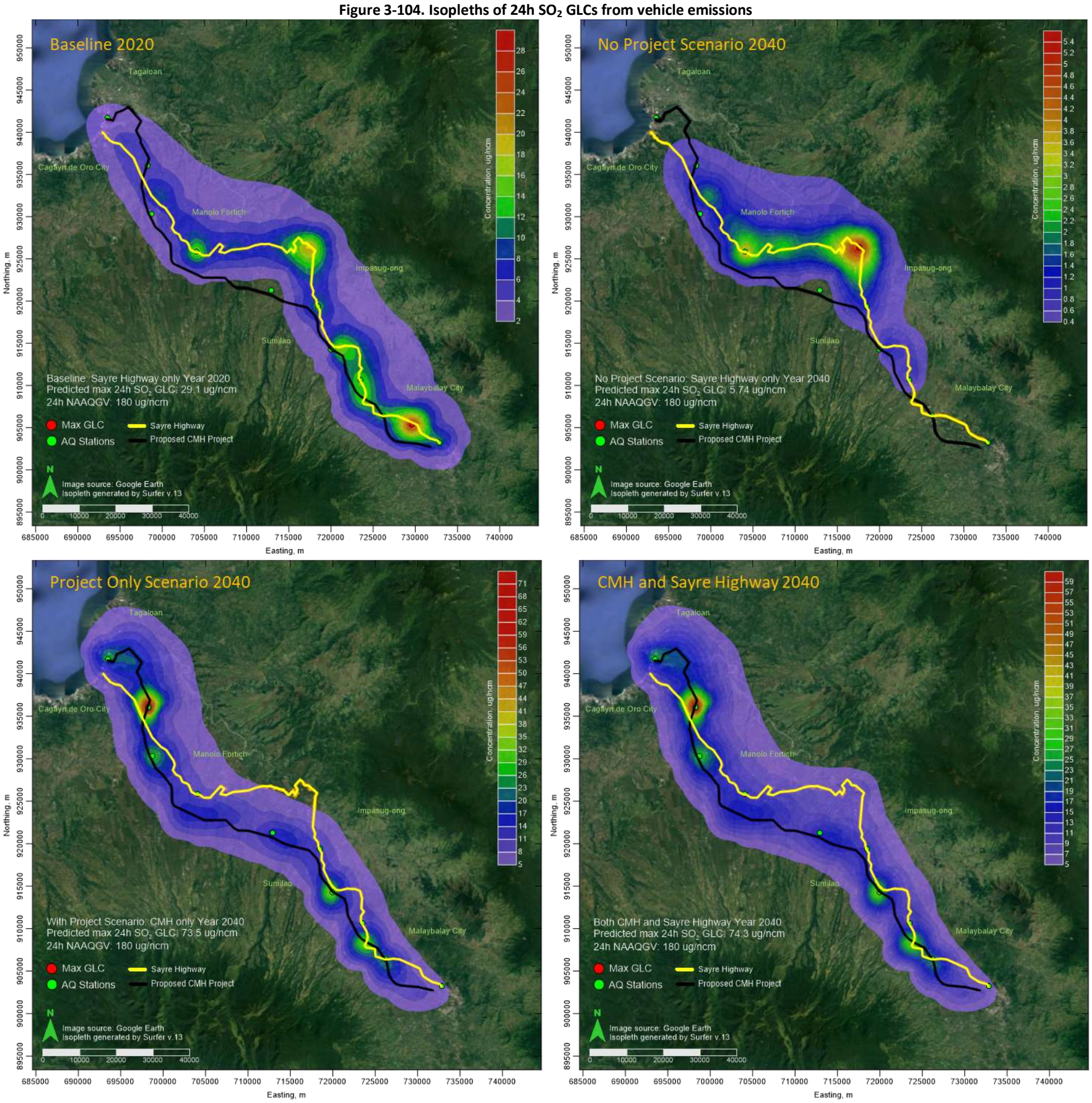


Figure 3-105. Isopleths of 24h TSP GLCs from vehicle emissions

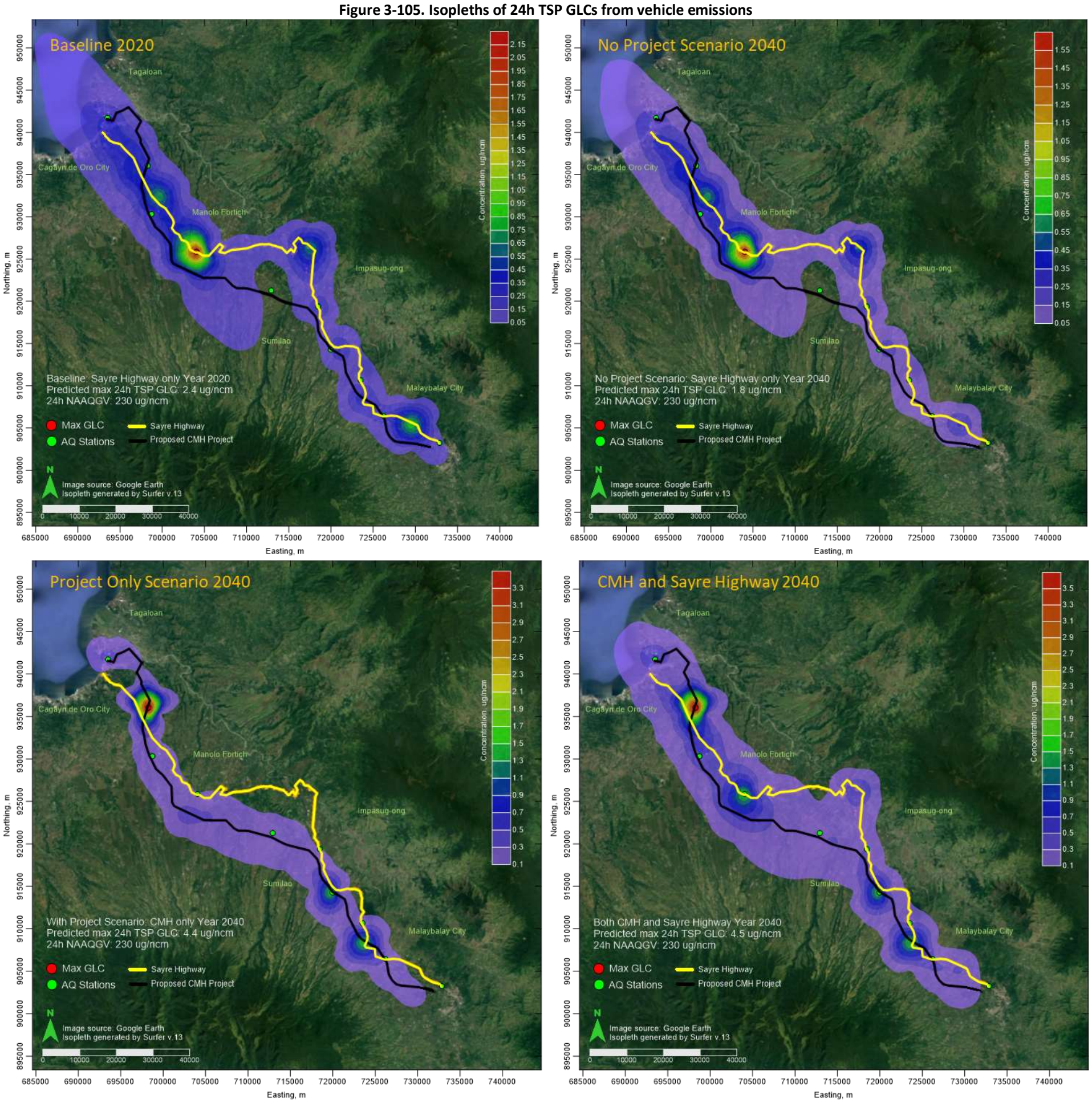
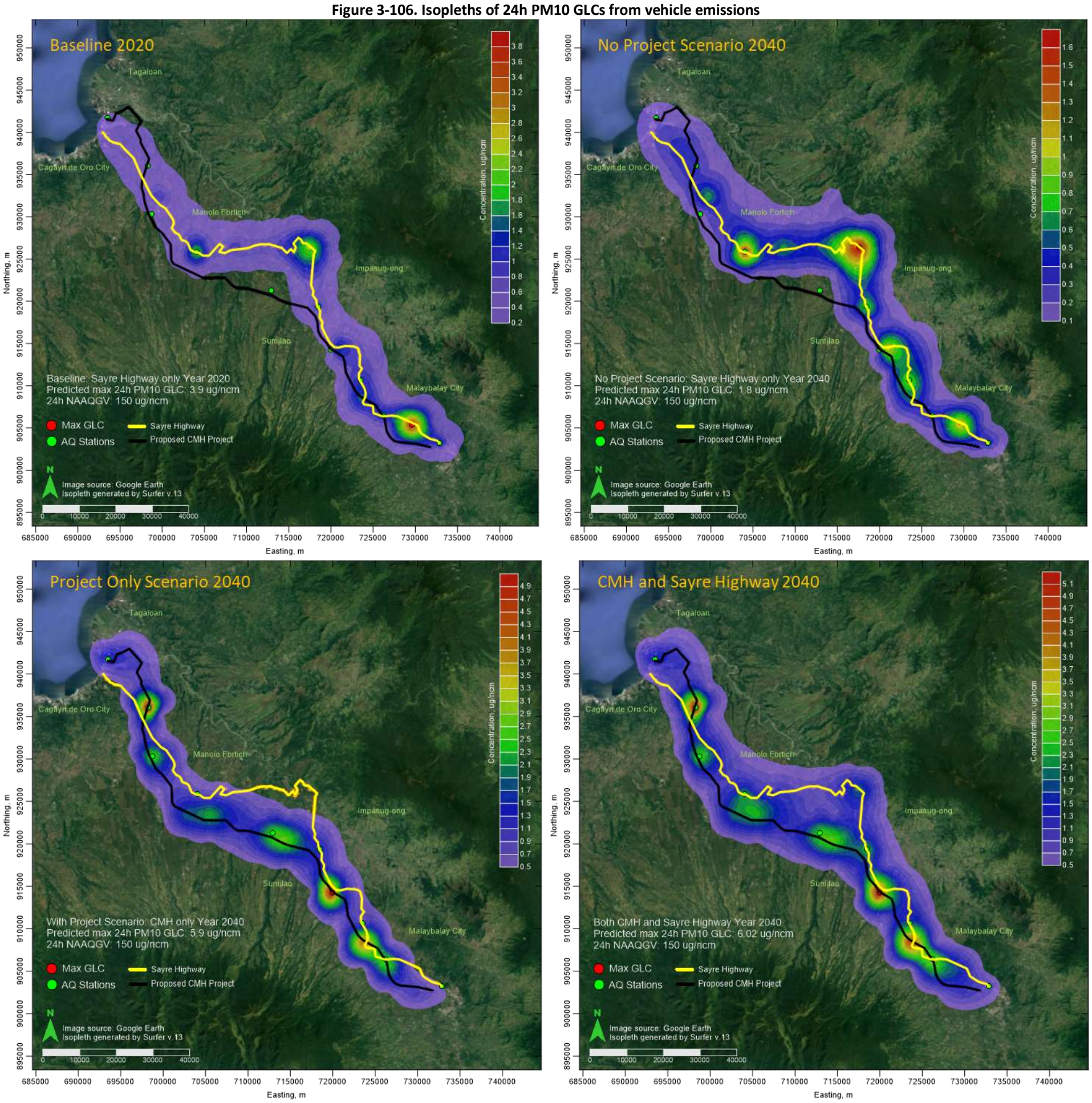


Figure 3-106. Isopleths of 24h PM10 GLCs from vehicle emissions



3.3.2.2.2 Noise pollution

Existing sound levels and noise impacts

The salient findings of processing the sound measurements during the low and high rain periods along the CMH alignment are enumerated below. The noise descriptors and existing impacts are shown in **Table 3-111** and **Table 3-112,** respectively. The diurnal sound level trends at the ten stations are shown in **Figure 3-107** to **Figure 3-111.**

a) The major sound sources at the ten stations were motor vehicles, e.g., motorcycles with loud mufflers.

b) The lowest sound levels (*Lmin*) across the stations and rain periods ranged from 24 to 59 decibels.

c) The peak sound levels (*Lmax*) across the stations and rain periods ranged from 44 to 79 decibels.

d) The background sound levels (*L90*) ranged from 34 to 59 decibels.

e) Stations with highest descriptors

- *Lmin* (59dB) - Station AQN9, evening, low-rain period
- *L90* (59dB) - Station AQN9, evening; Station AQN10, Morning, Daytime, low- and high-rain periods
- *Lmax* (79dB) – Station AQN1, daytime, low rain period
- *Leq* (66dB) – Station AQN1, daytime, low rain period; Station AQN9, evening, high rain period

f) Baseline sound levels in some stations exceeded the Philippine Noise Standards during low rain and/or high rain periods.

g) Baseline sound levels in some stations exceeded Japan and IFC General EHS Guidelines during low rain and/or high rain periods.

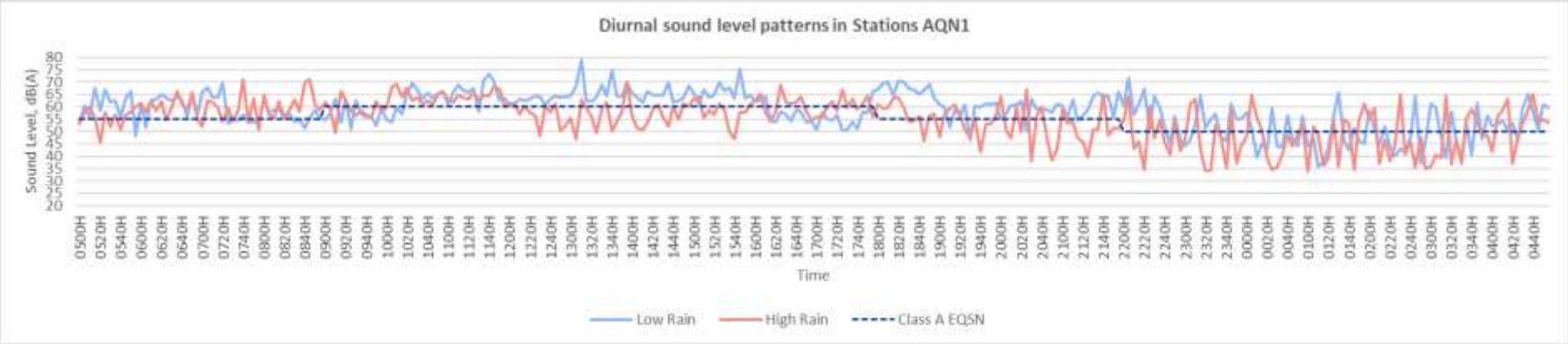
Table 3-111. Existing noise descriptors along the Project alignment and vicinities

Station	Location	Category	Timeframe	Low rain period						High rain period					
				Lmin	L90	L50	L10	Lmax	Leq	Lmin	L90	L50	L10	Lmax	Leq
AQN1S	Casinglot, Tagoloan	A	Morning	48	53	59	66	70	62	46	53	59	65	71	62
		A	Daytime	51	54	63	69	79	66	47	52	60	66	70	62
		A	Evening	47	56	61	68	71	64	38	45	54	62	67	58
		A	Night time	36	42	51	61	72	58	34	36	48	61	65	46
AQN2	Mambatangan, Manolo Fortich	A	Morning	35	39	41	46	52	43	24	26	32	34	56	42
		A	Daytime	35	37	40	49	56	45	25	28	40	45	57	43
		A	Evening	25	35	39	43	48	40	32	38	39	45	53	42
		A	Night time	34	34	35	39	44	36	26	29	32	40	47	36
AQN3	Alae, Manolo Fortich	A	Morning	40	42	48	58	61	53	41	41	42	46	69	53
		A	Daytime	35	39	44	54	60	50	38	40	46	60	73	58
		A	Evening	39	39	40	43	47	41	41	41	42	44	46	43
		A	Night time	39	39	40	46	65	50	41	41	41	43	49	42
AQN4	Dicklum, Manolo Fortich	A	Morning	50	52	56	64	71	60	48	50	55	62	70	59
		A	Daytime	47	52	58	64	70	61	45	50	54	62	68	57
		A	Evening	49	50	56	62	71	59	48	48	52	58	65	55
		A	Night time	49	50	52	61	71	58	48	48	49	55	64	53
AQN5	San Roque, Sumilao	AA	Morning	48	49	50	58	60	54	36	38	42	43	51	42
		AA	Daytime	34	35	42	50	58	46	26	38	44	51	73	57
		AA	Evening	57	58	58	58	59	58	38	39	42	45	56	45
		AA	Night time	48	49	53	58	60	54	42	42	42	43	45	42
AQN6i	La Fortuna, Impasug-ong	A	Morning	46	50	57	70	74	65	45	47	50	63	70	60
		A	Daytime	40	50	55	65	74	62	45	47	53	64	74	61
		A	Evening	50	51	53	62	70	59	42	44	55	63	69	60
		A	Night time	47	48	51	59	72	57	38	45	48	62	67	57
AQN7	Poblacion, Impasug-ong	A	Morning	31	37	46	59	68	57	44	45	46	53	63	51
		A	Daytime	38	42	44	54	71	49	25	33	43	52	67	50
		A	Evening	37	37	43	48	56	47	43	44	49	54	62	52
		A	Night time	36	36	38	45	66	43	34	43	45	48	62	48
AQN8	Impalutao, Impasug-ong	A	Morning	46	50	57	70	74	65	33	37	52	60	70	58
		A	Daytime	40	50	55	65	74	62	31	36	50	62	67	57
		A	Evening	50	51	53	62	70	59	33	34	42	55	67	54
		A	Night time	47	48	51	59	72	57	31	32	35	48	58	45
AQN9	Patpat, Malaybalay	A	Morning	56	57	59	63	76	63	49	52	58	65	71	62

Station	Location	Category	Timeframe	Low rain period						High rain period					
				Lmin	L90	L50	L10	Lmax	Leq	Lmin	L90	L50	L10	Lmax	Leq
		A	Daytime	54	56	60	67	77	65	45	53	59	68	73	64
		A	Evening	59	59	61	65	72	63	49	53	59	69	78	66
		A	Night time	54	57	58	62	71	61	48	49	53	62	73	60
AQN10E	Kalasungay, Malaybalay	AA	Morning	58	59	61	63	66	62	34	46	57	61	66	58
		AA	Daytime	55	57	59	62	72	62	55	59	63	67	72	64
		AA	Evening	56	56	61	66	71	63	56	58	63	65	67	63
		AA	Night time	52	58	61	65	68	62	48	55	57	64	67	60

Lmin – lowest sound level; L90 – background sound levels; L50 – median sound level; L10 – sporadic or intermittent sound level; Lmax – peak sound level

Figure 3-107. Diurnal sound level patterns in Stations AQN1 and AQN2



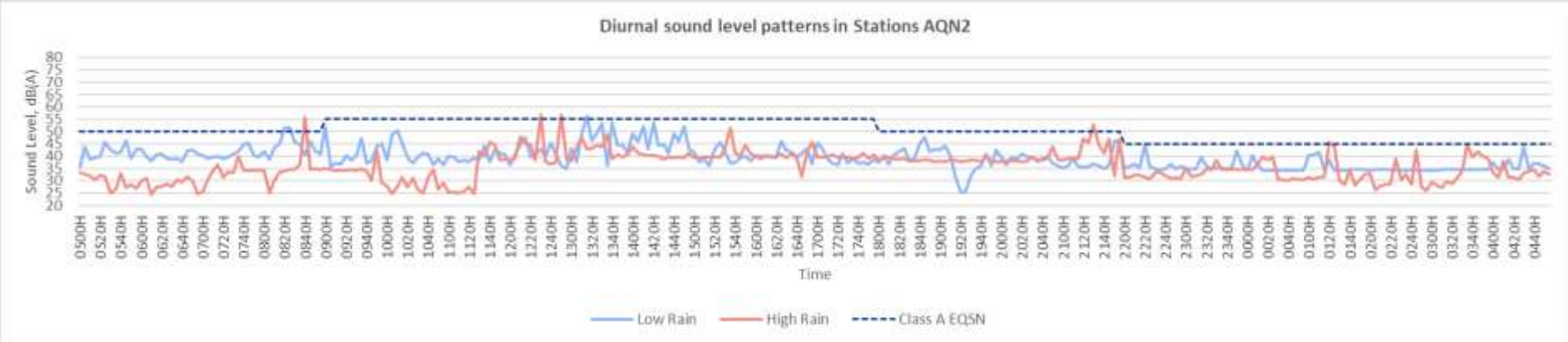
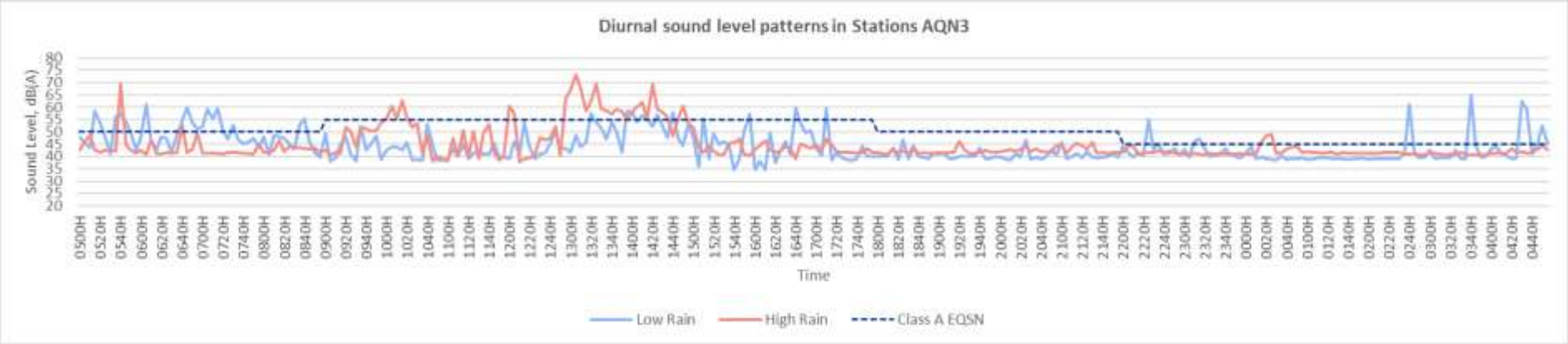


Figure 3-108. Diurnal sound level patterns in Stations AQN3 and AQN4



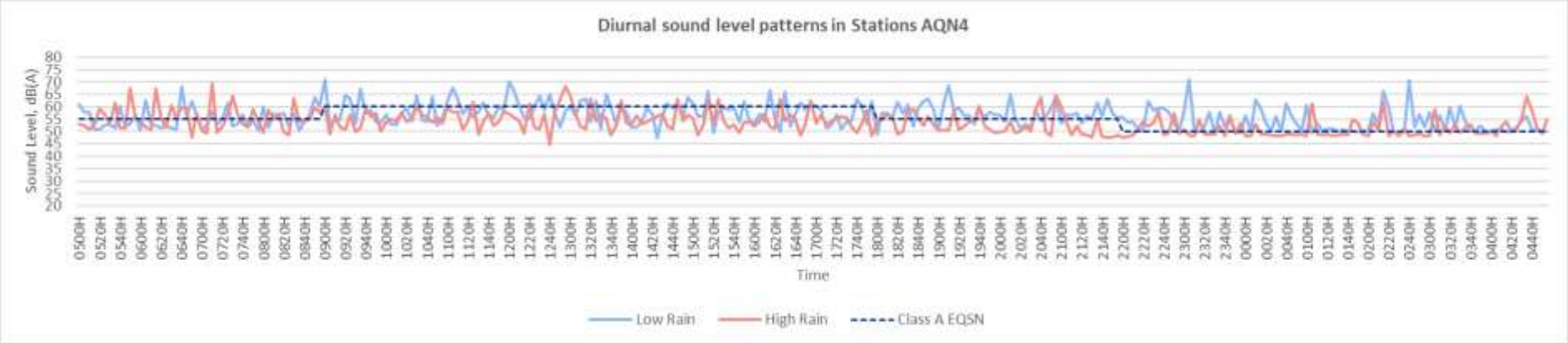
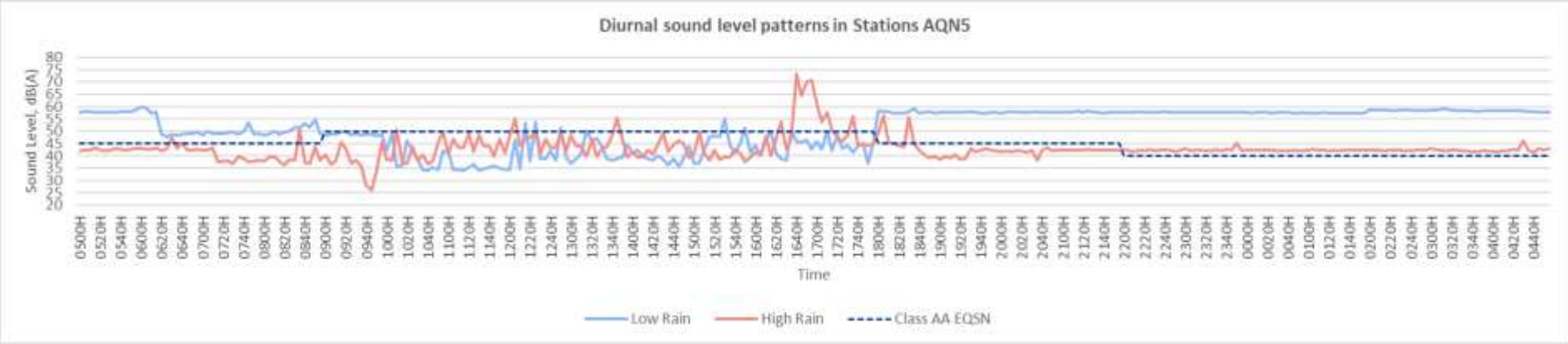


Figure 3-109. Diurnal sound level patterns in Stations AQN5 and AQN6



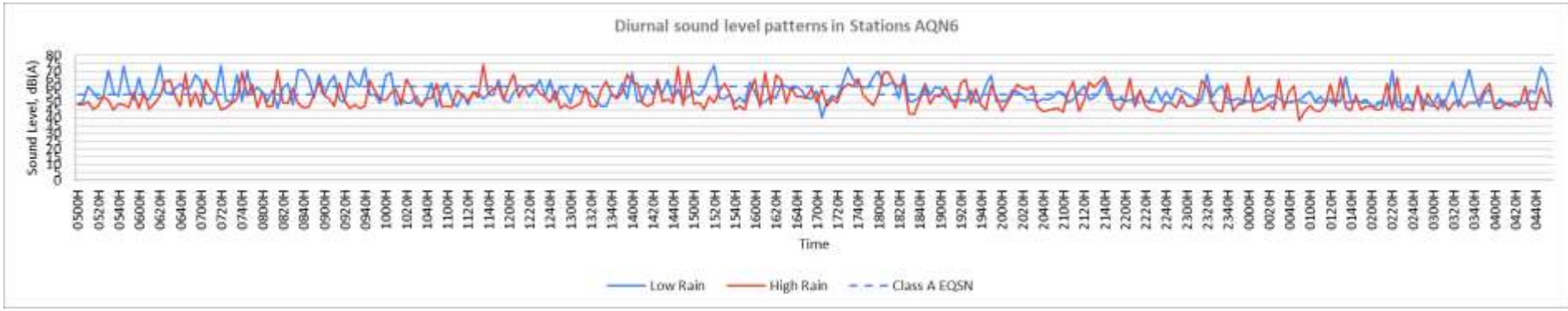


Figure 3-110. Diurnal sound level patterns in Stations AQN7 and AQN8

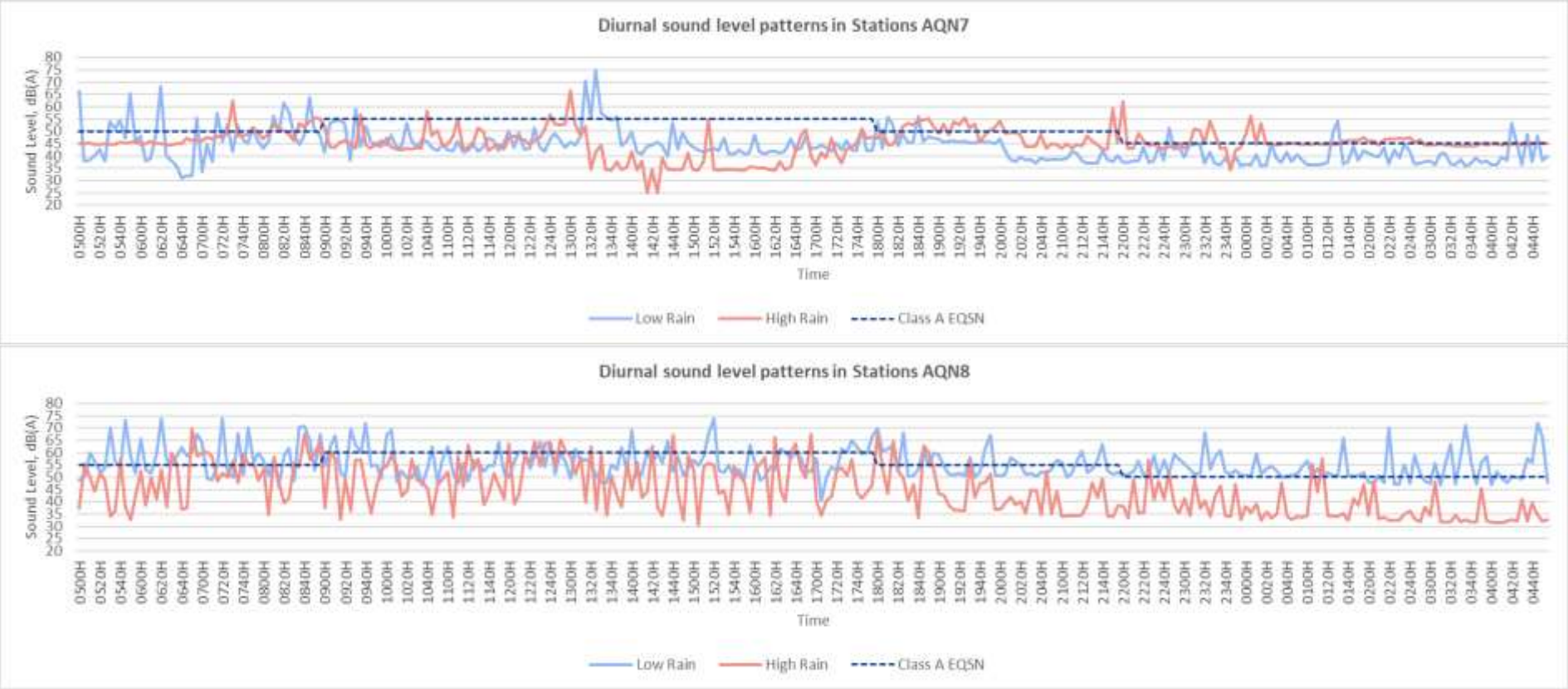


Figure 3-111. Diurnal sound level patterns in Stations AQN9 and AQN10

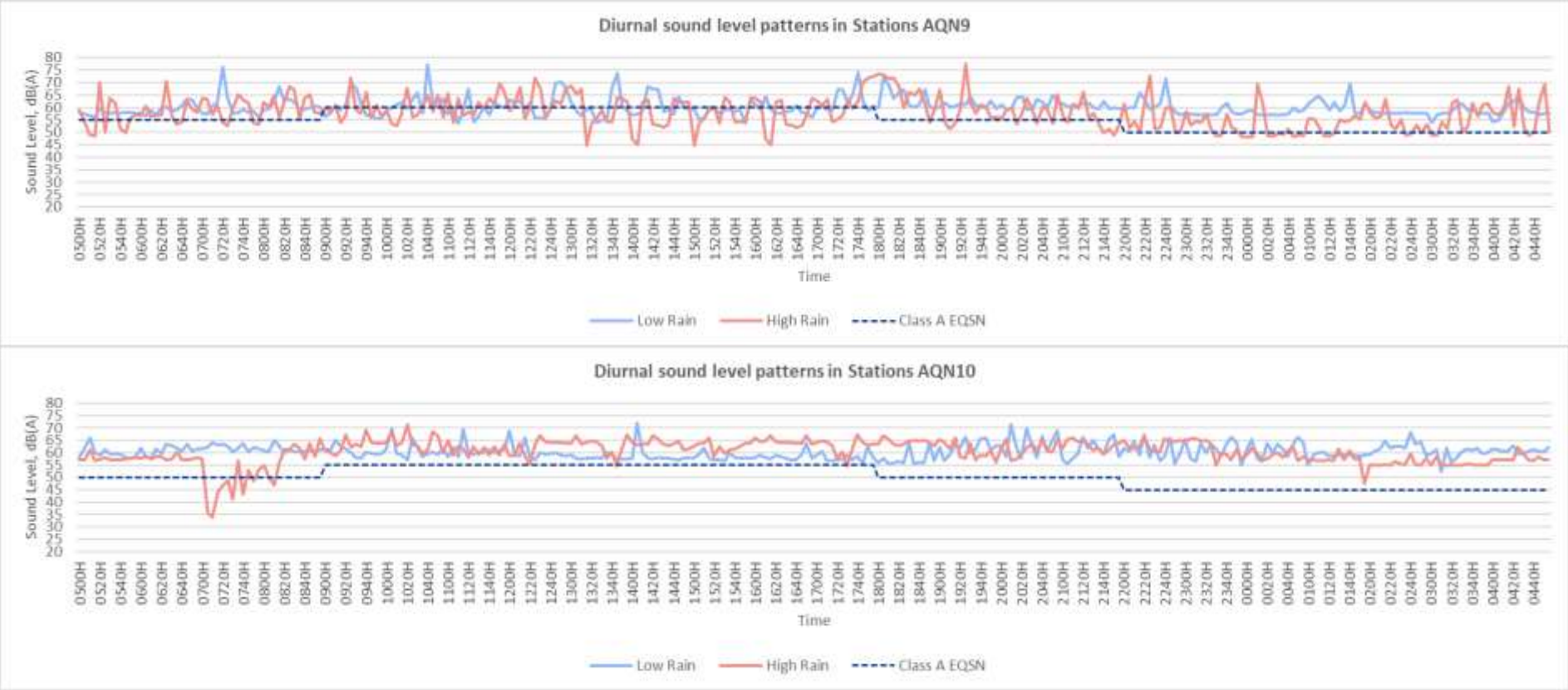


Table 3-112 shows existing noise levels during daytime and nighttime compared to Japan Environmental Quality Standard for Noise (EQSN) and IFC General EHS Guidelines. AQN10E exceeded both daytime and nighttime for both standards. AQN2, AQN3 (daytime), AQN6i (daytime), AQN7 (daytime), AQN8 (daytime) and AQN9 (daytime) are within the standards of both Japan EQSN and IFC General EHS Guidelines.

Table 3-112. Existing Noise Levels compared to Japan EQSN and IFC General EHS Guidelines

Station	Location	Timeframe	Japan (Leq:dB)			IFC (Leq:dB)		
			Low Rain	High Rain	Japan EQSN	Low Rain	High Rain	General EHS Guidelines
AQN1S	Casinglot, Tagoloan	Daytime	65.30	61.92	65	65.08	61.54	55
		Nighttime	59.30	56.16	60	59.91	57.15	45
AQN2	Mambatangan, Manolo Fortich	Daytime	44.36	42.35	55	44.13	42.78	55
		Nighttime	37.88	35.29	45	38.22	34.90	45
AQN3	Alae, Manolo Fortich	Daytime	50.39	56.45	60	49.34	56.16	70
		Nighttime	50.56	50.12	50	51.21	49.81	70
AQN4	Dicklum, Manolo Fortich	Daytime	60.30	57.58	65	60.12	57.23	55
		Nighttime	57.92	54.52	60	58.20	55.40	45
AQN5	San Roque, Sumilao	Daytime	51.74	55.09	55	52.97	54.80	55
		Nighttime	57.98	42.40	45	57.66	42.54	45
AQN6i	La Fortuna, Impasug-ong	Daytime	62.71	60.93	65	61.96	60.72	70
		Nighttime	60.72	56.16	60	61.49	56.90	70
AQN7	Poblacion, Impasug-ong	Daytime	55.95	50.63	60	55.15	50.94	70
		Nighttime	50.18	47.75	50	52.06	47.57	70
AQN8	Impalutao, Impasug-ong	Daytime	62.49	57.61	65	61.72	56.77	70
		Nighttime	60.72	46.09	60	61.49	51.83	70
AQN9	Patpat, Malaybalay	Daytime	63.98	64.24	65	63.89	63.87	70
		Nighttime	60.20	60.07	60	60.18	60.38	70
AQN10E	Kalasungay, Malaybalay	Daytime	61.26	63.04	55	61.89	63.24	55
		Nighttime	61.64	59.89	45	61.61	59.72	45

Note: Japan, Daytime:06:00-22:00, Nightime:22:00—6:00
IFC General EHS Guidelines , Daytime:7:00-22:00, Nighttime:22:00-7:00

Noise impacts during construction phase

Various equipment emits different levels of sound, the degree of disturbance dependent on distance of the source to the receptor, nature of activity, schedule and duration of activity, and type of equipment used. The USEPA defined noise as any undesirable sound that interferes with speech and hearing, and intense enough to damage hearing, or is otherwise annoying. Another definition of noise is airborne sound that is loud, unpleasant, unexpected, or undesired, and may be classified as a more specific group of sounds (California DOT, 2000). The calculated sound levels at 30 meters from different construction equipment in **Table 3-113** using the inverse square law exceeded the Classes 1, 2, 3, and 4 limits by a maximum noise impact magnitude of 7, 12, 22, and 22 decibels respectively (red cells in **Table 3-114**).

Table 3-113. Noise impacts from construction equipment[32]

Classification	Equipment	SPL range dB(A)	Predicted sound levels, dB(A)				
			30m	60m	120m	240m	960m
Earth-moving	Cranes	70-94	64-88	58-82	52-76	46-70	34-58
	Backhoe	74-92	68-86	62-80	56-74	50-68	38-56
	Front loader	77-94	71-88	65-82	59-76	53-70	41-58
	Dozer	70-95	64-89	58-83	52-77	46-71	34-59
	Grader	72-92	66-86	60-80	54-74	48-68	42-62
	Scraper	76-98	70-92	64-86	58-80	52-74	40-62
	Truck	84-93	78-87	72-81	66-75	60-69	48-57

[32] Measured at 15m; Source: Canter, 1996, American Road Builders Association (1973)

Classification	Equipment	SPL range dB(A)	Predicted sound levels, dB(A)				
			30m	60m	120m	240m	960m
	Compactor	72-74	66-68	60-62	54-56	48-50	36-38
Materials handling	Concrete mixer	75-85	69-79	63-73	57-67	51-61	39-49
	Concrete pump	81-83	74-76	68-70	62-64	56-58	44-46
	Cranes, derrick	88-90	82-84	76-78	70-72	64-66	52-54
	Cranes, movable	75-85	69-79	63-73	57-67	51-61	39-49
Stationary	Pump	69-71	63-65	57-59	51-53	45-47	33-35
	Generator	73-83	67-77	61-71	55-65	49-59	37-47
	Compressor	70-93	64-87	58-81	52-75	46-69	34-57
Impact activities	Jackhammer	82-97	76-91	70-85	64-79	58-73	46-61
	Pile driver	97-105	91-99	85-93	79-87	73-81	61-69

NOTES: *SPL – sound pressure level measured at 15m

As previously presented, construction activities are only allowed from 7am to 7pm (12h) for the construction activity classes in Class A areas. However, most of the areas traversed by the alignment have no residential within 30m of the Project components. The interchanges are the Project components proximate to residential areas.

It is emphasized that the model results were conservative, i.e., overestimates, because it was assumed that all construction equipment were operating simultaneously at steady state. The assumption was made as worst-case scenario and because the actual type, usage factors, and location of construction equipment were unavailable at this time. Noise levels during actual construction are likely to be lower than estimated values.

Table 3-114. Noise impacts from typical construction activities

Construction activity	SPL		Max noise levels*			
	15m	30m	1	2	3	4
Earth-moving	95	89	90	85	75	75
Materials handling	87.1	81	90	85	75	75
Stationary	90	84	90	85	75	75
Impact activities	102	96	90	85	75	75
Concrete batching plant	83	77	90	85	75	75
TOTAL	103	97	90	85	75	75

NOTES: SPL – sound pressure level measured at 15m; *per Construction Activity Class

Noise impacts during operation phase

The results of the simulation for the Project (Sayre Highway and CMH Highway) in 2040 at the sensitive receptors are presented in Table 3-115. At stations 2, 3, 5, and 7, which currently are not facing/near the road, the noise situation will change due to the operation of the new highway. The forecasted results at stations 2, 3, 5, and 7 exceed the IFC standards by within 3 dB from the background level (Base Line level)."
When comparing the forecasted result in daytime and evening time (or nighttime and morning time) at stations 2, 3, 5, and 7 to the daytime standards (6:00-22:00; 70dB(A)) (or nighttime standards (22:00-6:00; 65dB(A)) in Japan for space adjacent to a road carrying arterial traffic, the forecasting result will be satisfied.

Table 3-115. Comparison of noise impacts at sensitive receptor

Station	Location	Timeframe *	Baseline (dB(A)) **	Standard for Baseline (dB(A))	Basis ***	Forecast Result (dB(A))	Standard for Forecast (dB(A))	Basis ***
AQN1S (Class A Area, facing four lane)	Casinglot, Tagoloan	Morning	62	55	2	62	65	3
		Daytime	64	60	2	65	67	3
		Evening	61	55	2	61	64	3
		Night time	52	50	2	61	55	3
AQN2 (Class A Area)	Mambatangan, Manolo Fortich	Morning	43	50	1	63	55	2
		Daytime	44	55	1	66	60	2
		Evening	41	50	1	62	55	2
		Night time	36	45	1	62	50	2
AQN3 (Class A Area)	Alae, Manolo Fortich	Morning	53	50	1	63	56	3
		Daytime	54	55	1	65	55	2
		Evening	42	50	1	61	50	2
		Night time	46	45	1	61	49	3
AQN4 (Class A Area, facing four lane)	Dicklum, Manolo Fortich	Morning	60	55	2	55	63	3
		Daytime	59	60	2	54	60	2
		Evening	57	55	2	52	60	3
		Night time	56	50	2	50	59	3
AQN5 (Class AA Area)	San Roque, Sumilao	Morning	48	45	1	60	51	3
		Daytime	52	50	1	63	55	3
		Evening	52	45	1	59	55	3
		Night time	48	40	1	59	51	3
AQN6i (Class A Areaa, facing four lane)	La Fortuna, Impasug-ong	Morning	63	55	2	60	66	3
		Daytime	62	60	2	62	65	3
		Evening	60	55	2	59	63	3
		Night time	57	50	2	58	60	3
AQN7 (Class A Area)	Poblacion, Impasug-ong	Morning	54	50	1	63	57	3
		Daytime	50	55	1	66	55	2
		Evening	50	50	1	62	53	3
		Night time	46	45	1	61	49	3
AQN8 (Class A Areaa, facing four lane)	Impalutao, Impasug-ong	Morning	62	55	2	56	65	3
		Daytime	60	60	2	54	63	3
		Evening	57	55	2	52	60	3
		Night time	51	50	2	46	54	3
AQN9 (Class A Areaa, facing four lane)	Patpat, Malaybalay	Morning	63	55	2	63	66	3
		Daytime	65	60	2	66	68	3
		Evening	65	55	2	63	68	3
		Night time	61	50	2	62	64	3
AQN10E (Class AA	Kalasungay, Malaybalay	Morning	60	50	1	56	63	3
		Daytime	63	55	1	59	66	3

Station	Location	Timeframe *	Baseline (dB(A)) **	Standard for Baseline (dB(A))	Basis ***	Forecast Result (dB(A))	Standard for Forecast (dB(A))	Basis ***
Areaa, facing four lane)		Evening	63	50	1	58	66	3
		Night time	61	45	1	56	64	3

Note: * NOTE: Morning: 5:00-9:00, Daytime: 9:00-18:00, Evening: 18:00-22:00, Night-time 22:00-5:00
**Baseline is average of low rain season and high wain season.
***Basis – 1: Standard for General Areas, 2: Standard for areas directly facing four-lane roads, 3: IFC Standard EHS Guideline within 3 dB from the background level (Base Line) (dBA) / Red numbers indicate exceeding the criteria.

3.3.2.3 Proposed mitigating measures

Degradation of air quality

Construction phase - Fugitive dust is expected to be the dominant source of air pollution during the construction phase. Sources of these include access roads, staging areas, and active road construction sites. The common dust suppression measures to control particulate emissions and their reduction efficiencies are summarized in **Table 3-116**.

Table 3-116. Particulate reduction from water suppression and speed restriction

Component	% Red	Mitigation
Construction phase	61	Applying water within construction site (3.2-hour interval)
	57	Speed restriction
Unpaved roads	55	2x/day water application
	44	Speed <=40kph

Source: WRAP Fugitive Dust Handbook; %Red – Percent reduction

Air pollution from heavy equipment and motor vehicle emissions are also expected during the construction of the alignment and other components site preparation and structure erection. Other mitigation measures to minimize air pollution during construction are enumerated below.

a) Replacement of vegetation in non-structure areas to minimize wind erosion of topsoil;
b) Compacting of exposed soil surfaces;
c) Provide tarpaulin cover on trucks loaded with construction materials; and
d) Hauling of spoils/excavated earth materials immediately after excavation.
e) Regular maintenance of heavy equipment and motor vehicles; and
f) Use of low-sulfur fuel

Operation phase - Public health concerns have increased due to the rising number of studies linking adverse health effects with exposures to traffic-related pollution near large roadways. Several studies have investigated the use of roadside vegetation because this method is often one of the few short-term options available to reduce near-road air pollution (USEPA). Roadside vegetation can include the preservation of existing trees and bushes as well as planting new ones. This mitigation method can complement existing pollution control programs and regulations as well as provide measures to reduce impacts from sources that are difficult to control such as brake and tire wear and re-entrained road dust (EPA, 2016).

Roadside vegetation also has other potential benefits such as improved aesthetics, increased property values, reduced heat, control surface water runoff, and reduce noise pollution. It can, however, also affect driver sight lines, protrude into clear zones along highway rights-of-way, contribute to debris on roads, present fire hazards, and act as pathways for pests and invasive species. It is important to consider the benefits and unintended consequences of roadside vegetation as a mitigating measure for reducing roadside air pollution. The factors to be considered in designing effective roadside vegetative barriers are shown in **Table 3-117**.

Table 3-117. Factors affecting the effectiveness of vegetation for mitigating roadside air pollution

Characteristic	Recommendation	Description
Physical characteristic		
Height	Five meters or higher or extend one meter above an existing solid barrier	The higher the vegetative barrier the greater the pollutant reduction. A minimum of five meters should be enough to be above typical emission elevations for vehicles on the road. Heights of 10 meters or more however, would likely provide additional pollutant reductions.
Thickness	10 meters or more	The thicker the vegetative barrier, the greater the pollutant reduction. A minimum thickness of 10 meters should provide enough to remove particulate and enhance dispersion. However, gaps in the barrier should be avoided. Multiple rows of different types of vegetation (e.g., bushes, shrubs, trees) should be considered for maximum coverage and pollutant removal.
Porosity	0.5 to 0.9	Porosity should not be too high to allow pollutants to easily pass through the barrier or cause wind stagnation. As the porosity gets lower, the vegetation barrier will perform similarly to a solid barrier, limiting the amount of particulate removal because air is forced up and around the plants.
Length	Minimum of 50 meters	Extending the barrier beyond the area of concern protects against pollutant meandering around edges. Constructing the barrier perpendicular from the road depending on land availability may also be considered.
Vegetation characteristics		
Seasonal effects	Vegetation that is not affected by seasonal changes	Vegetative barrier characteristics must be consistent throughout all season and climatic conditions to ensure effective pollutant reduction.
Leaf surface	Complex waxy and/or hairy surfaces with high surface area	Leaf surfaces with complex and large surface areas will capture and contain more particulate pollutants as air passes through.
Resistance to pollution and stress	Resistant to effects of air pollution and other stressors	Vegetation must be able to survive and maintain its integrity under the high pollution levels and stress that can occur near roads to provide effective pollution reduction from traffic emissions.
Other considerations		
Maintenance	A plan must be in place to properly maintain the vegetative barrier	Proper vegetation maintenance must be provided for the barrier to survive and maintain its integrity.
Drought resistant	Choose species resistant to drought and flooding	The vegetative barrier must maintain its integrity under drought conditions to provide effective pollution reduction.
Native species	Choose native species	Native species will be more robust and resistant to climatic conditions in the area of interest.
Non-invasive	Choose non-invasive species	Non-invasive species will ensure effective pollutant reduction without potential unintended consequences from invasive species adversely effecting nearby areas.
Non-poisonous	Choose non- poisonous species if sensitive populations are nearby	Non-poisonous species are strongly encouraged and should be used if the barrier will be located with sensitive populations, such as schools, parks, and recreation areas.

Characteristic	Recommendation	Description
Roadway safety	Maintains safety for drivers on the road; conforms to local safety and permit requirements	Prior to planting, ensure vegetation plan will meet all safety and other local permit requirements to preserve sight-lines and vegetation compatibility while avoiding potential wildlife/auto accidents.

Source: Roadside Vegetation Design to Improve Local, Near-Road Air Quality, USEPA, 2018.

Noise pollution

Construction phase - An important option in construction noise control strategies is controlling sound at the source. Source control techniques may be approached from two ways: (a) muffler requirements and (b) maintenance and operational requirements.

Most construction noise originates from equipment powered by either gasoline or diesel engines. A large part of the noise emitted is due to the intake and exhaust portions of the engine cycle. One remedy for controlling much of the engine noise is the use of adequate muffler systems. Reductions of 10 dBa or more can be achieved with optimal muffler systems (US Department of Transportation). Muffler requirements can be easily integrated in contract specifications with simple enforcement.

Poor equipment maintenance may also cause high noise levels, e.g., faulty or damaged mufflers, loose engine parts, rattling screws, bolts, or metal plates, as well as careless or improper handling and operation of equipment. Specifications such as regular inspection of equipment in the maintenance area and proper training of equipment operators can be included in the Contractor contract.

Another effective approach in reducing noise impacts is using time and activity constraints. Construction activity noise is disruptive during leisure hours, sleeping hours, and any time where loud continuous noises affect certain special activities. Construction activities can be limited during daytime and avoided at night. Other measures are establishment of barriers and shielding stationary vibrating equipment and provision of buffer zones.

Operation and maintenance phase – Transport noise is conventionally mitigated by either insulation or absorption techniques. Sound insulation prevents the transmission of noise by the introduction of an acoustical shield while sound absorption reduces the amount of energy reflected into the environment through a dissipating mechanism. Examples of these include noise barriers, facade insulation, porous asphalt pavements, and other widely known techniques.

Noise barriers can be constructed from earth, concrete, masonry, wood, metal, and other materials. The material chosen must be rigid and sufficiently dense (at least 20 kilograms/square meter) to effectively reduce sound transmission through the barrier. All noise barrier material types are equally effective, acoustically, if they have this density[33]. Examples of noise barriers are shown in **Figure 3-112**.

Noise barriers are generally seen to be an effective way of attenuating roadway noise. A noise barrier will reduce noise levels by three to seven decibels depending on design and height (Arenas, 2008). Barriers can be constructed with a large range of materials including, wood, steel, aluminum, acrylic sheeting, concrete, masonry block and rubber mats.

Earth berms are the dominant type of noise barrier used in roadways (Bendtsen et al., 2010). An earth berm in general produces 3 dB more attenuation than a wall of the same height (Wilson, 2006).

The Texas Transportation Institute (1997) stated that depressed sections of a roadway provide the greatest reduction in traffic noise in areas near and far from the roadway, especially if the walls of the depression are

[33] https://www.fhwa.dot.gov/environment/noise/noise_barriers/design_construction/keepdown.cfm

sloped and acoustically treated. They determined that noise is best attenuated in elevated roadways by using solid concrete guardrails. At-grade sections of the CMH alignment produce the highest noise levels and the addition of solid guardrails, median rails, and the use of smooth texture pavements should reduce noise generated.

Vegetation can also be used as a noise barrier. However, their effectiveness in attenuating noise is minimal (e.g., a 10m depth of vegetation results to a 1dB reduction in noise). Their real value however, is in terms of psychoacoustic performance: people cannot see the noise source but see greenery instead it tends to lead to a subjective reduction in annoyance and disturbance (Yang et al., 2011).

To ensure the most effective attenuation is achieved, the following can be considered in the design of the CMH regarding noise attenuation (Mahon, 2013):

a) The barrier must be sufficiently tall to block the line of sight between the source and receiver. The higher the noise barrier, the better the insertion loss, assuming the sound insulation performance of the barrier is adequate;

b) The length of the noise barrier must be sufficient to cover an angle of at least 160 degrees from the receiver. Alternatively, the distance between the receiver and the barrier end should be at least four times the perpendicular distance from the receiver to the barrier;

c) Barriers should be solid and continuous and should overlap if a break is unavoidable. The break sections of the barrier should ideally be finished with sound absorbing material and the overlap should be at least four times the opening width;

d) Barrier placement in relation to the road and receiver is critical. Optimal noise attenuation is obtained if the barrier is as close as possible to either the noise source or the receiver because it maximizes the path length difference;

e) Barriers should have no leaks due to holes, cracks, and gaps because it severely compromises its acoustic effectiveness. For example, a gap occupying just three percent of the surface area of a noise barrier will have an actual transmission loss of 9 dB (Government of Hong Kong,2003).

Figure 3-112. Examples of barriers to reduced road noise

Source: www.skyscrapercity.com

3.3.3 Vibration

3.3.3.1 Methodology

Baseline data collection was made together with noise, ambient air and traffic data collection. The sampling sites, typically spread along the length or primary impact area of the project, cover various features of the landscape, relevant environmental receptors and significant components of the project. The approach used in the baseline study follows the prescription of the British Standard 7385 (1993) standards. The procedure for assessing the vibration impact is illustrated in **Figure 3-113.**

Figure 3-113. Vibration impact assessment methodology

A Vibron Seismograph is used for data collection, each unit is programmed to continuously record ground vibration from triaxial vibration sensors with a natural frequency of 4.5 Hz. Sampling frequency is set at 200 samples per second for the two horizontal and one vertical sensors. The various observable sources of vibration during the monitoring period are also noted and correlated to data during processing.

For each dataset collected, VdB, velocity and acceleration are calculated and graphed to show temporal variability of vibration levels. Percentile statistical values are identified with 24-hour data representation per channel trace per 10-minute time slice to illustrate the likelihood of encountering different vibration levels at specific times of the day. Percentile levels L10, L50 and L90 (24-hour) are utilized to determine vibration levels exceeding 90%, 50% and 10% of each time slice.

The location of the ten sites and schedules for the survey were a-priori defined and are located from Tagoloan to Bukidnon. The sites are predominantly sub-urban areas. The list of the survey sites with its respective geographic coordinates is same as the air quality stations shown in **Table 3-93.** For each site, some notable features can be distinguished indicating in some instances the human activity that causes the background vibration. Vibration data was processed with reference velocity of 1x10^-6 per second.

3.3.3.2 Baseline environmental conditions

The salient findings of processing the sound measurements during the low and high rain periods along the CMH alignment are enumerated below. The vibration descriptors are shown in **Annex 11.** The summary of observed peak values for vibration (VdB), velocity (cm/s), acceleration (cm/s^2) is also shown in **Annex 11** which shows the maximum levels for each of the stations during certain periods of the day.

a) Observations of vibration at the sites indicate that the sites vary in levels of vibration from a low of 41 VdB to a high of 57 VdB. These values are generally lower than active roads and are not considered as annoyance to residential areas.
b) Two types of observation sites can be seen from the data, one in farmlands or forested areas which have very low ambient vibration values ranging from 49 VdB to 52VdB and the sites which are near the roads with values ranging from 53 VdB to 57 VdB.
c) Heavy rainfall can also be observed through the charts as one of the contributors to the changes in vibration levels at certain sites.
d) Observation sites that are situated near pedestrian lanes have the most impact on the background vibration levels at the sites that are closer to the Malabalay City proper.
e) The main sources of vibration that are frequent in most of the sites are generally from large cargo trucks and pedestrians respectively.
f) Temporal patterns indicate that these high vibration levels occur during peak hours in the morning and during daytime.
g) In all sites, the range of vibration levels may reach from 40 VdB which is the typical background vibration and go beyond 50 VdB which is the threshold of human perception of vibration.

The measured background levels of vibration along the alignment of the project indicate that the sites are already affected by vibration from road traffic. Thus, the impact of vibration in these areas will be minimal, since the expected levels of vibration from the project will be of the same or just slightly elevated level as what is existing now. This is particularly true for the areas where the road alignment traverses the areas where roads exist.

In areas where roads are not yet existent and will now be traversed by the road project's alignment, the impact will be moderate. This will be particularly felt in the residential areas that are beyond the reach of the road networks, and thus in the more distant edges of the villages and in isolated communities. It should be noted that in these areas, the environmental items and human habitation exposed to vibration are few and far apart. Likewise, areas where no road traffic had reached before are mostly agricultural land or otherwise open areas where road vibration may be of least concern.

Furthermore, the expected level of induced vibration from the project shall be very low, since road-traffic vibration tend to dissipate within tens of meters of the ground and is not expected to go beyond 100m from the road. The uniformity of the geological foundation all along the road alignment – being all underlain by volcanic materials of medium to hard soil in consistency – suggest that the attenuation of vibration on the ground will be severe and is not expected to cause amplification nor channeling/focusing of vibration energy into certain sites such as can be observed in alluvial soils. The fact that the road system will also be designed and constructed using concrete structures both in the surface covering and on bridges / elevated roadways further indicate that vibration will be mostly absorbed by the ground and not efficiently transmitted to the surrounding areas.

There are three potential sites where elevated levels of vibration are to be expected: the quarry areas where explosives and rock breaking activities are routine, in sites where the slopes need to be cut, whereby the rocks are removed to clear the alignment, and in the construction of piles or columns for the construction of bridges and elevated roadways. In these areas, the level of vibration shall be disruptive to the people at rest, and to certain facilities where tranquility is essential such as hospitals, churches and schools.

When conducting quarry operations, rock breaking, pile driving, or even heavy equipment operation near or around these vulnerable facilities, it is necessary to implement vibration mitigating measures to reduce the impact on the environment.

The impact of vibration caused by the quarry operations, rock breaking, pile driving, and heavy equipment activities are expected only during the construction phase of the project. After the construction, all the sources of vibration are expected to cease, and the levels shall revert to background levels.

Over the medium and long term, the level of vibration shall increase and be elevated to a slightly higher level along the roadway. The transit of vehicles on the new road, particularly the big trucks and heavy equipment, shall cause this change. However, the vibration is expected to dissipate quickly on the ground and will not exceed beyond 100m away from the road. The right of way clearance along the path of the road shall be mostly sufficient to ensure that no residential areas will have adverse effect of vibration over the medium and long term.

3.3.3.3 Impact analysis and proposed mitigating measures

Most of the areas traversed by the proposed road alignment are on agricultural land use. There are a few built-up areas, mostly as narrow communities along roads that will be traversed by the alignment. In most of these roads and built-up areas, the presence of an existing roadway already elevates the background level of vibration, and the contribution of the Project to the existing vibration level is insignificant.

There were no vibration sensitive areas nor receptors encountered during the surveys, nor were there identified to be vibration sensitive facilities like hospitals, laboratories, and the like within 300m of the proposed road alignment. If during the construction phase a site may complain or is found to be adversely affected by vibration, real time vibration monitoring may be done with the objective of detecting exceedances to levels prescribed as safe in the known vibration standards. The use of heavy equipment and explosives around these areas are then to be allowed only if known not to exceed the prescribed levels.

The most significant effect of vibration during construction are expected around the heavy equipment depot, quarries for aggregates, rock crushing and batching plants and along the truck routes. To avert localized impact of vibration to the existing communities, it is best that these facilities and their temporary access points be located at a distance from residential and developed areas. It is also prudent to avoid unstable areas that may experience ground movement due to vibration, such as steep slopes and those underlain by loose sediments.

3.3.3.4 Proposed mitigation measures

For vibration impact management, the best practice solution is a combination of the following measures:

- Proper choice of sites for operating vibrating machinery such as rock crushers, truck depot, etc.
- Distribution of heavy equipment activity, either by use of more vehicles that are lighter instead of fewer heavy units
- Distribution of heavy equipment activity over time and not clustering movement of many units in a short period
- Locating heavy equipment routes more distant from residential and commercial communities
- Proper maintenance of heavy equipment to ensure optimal condition during operation
- Proper maintenance of road surfaces to avoid bumps and holes that create ground impact from moving vehicles
- Scheduled use of road compactors only during working hours and weekdays
- Use pile-driving work should use the less vibrating methods to prevent intense ground vibration

3.4 THE PEOPLE

3.4.1 Scope

The provisions of the technical scoping checklist defined the scope of the people component. This section presented the key baseline conditions of the LGUs traversed by the alignment in terms of socioeconomic parameters relevant to the impacts specified in the technical scoping checklist.

3.4.2 Methodology

This EIA for the people components employed a concurrent triangulation design where both qualitative and quantitative research were use and both data collected simultaneously in one phase. The design is also defined as the use of multiple observers, interpretive points of views, and levels of forms of empirical materials in the construction of interpretation (Denzin, 1989:270). The purpose of this method is to confirm and cross-validate or corroborate results so that the weakness in one method is overcome with the strength of another (Creswell & Plano, 2011). The qualitative and quantitative data in this case however, were analyzed separately and the findings compared and combined.

The quantitative methods used for the study were the a) socioeconomic survey using a standardized survey and b) key informant interviews (KII) of key barangay officials and multisectoral stakeholders (e.g., NGO, business, religious, women, youth, academe). The survey covered the 30 barangays in six cities/municipalities traversed by the CMH alignment listed below.

a) Barangays Natumolan and Casinglot, Municipality of Tagoloan;
b) Barangays Bugo and Puerto, Cagayan de Oro City;
c) Barangays Alae, Dicklum, Damilag, Tangkulan, Ticala, Sankanan, San Miguel, and Mambatangan, Municipality of Manolo Fortich;
d) Barangays Puntian, Kisolon, Vista Villa, Culasi, San Roque, and Poblacion, Municipality of Sumilao;
e) Barangays Poblacion, Kibenton, Impalutao, La Fortuna, Cawayan, and Capitan Bayong, Municipality of Impasug-ong; and
f) Barangays, Dalwangan, Kalasungay, and Patpat, City of Malaybalay.

The survey sample size of 390 was determined using the 2020 Philippine Statistics Authority (PSA) household population, a confidence level of 95 percent, and used proportional sampling while the KII involved 93 participants. **Table 3-118** shows the distribution of the survey respondents and KII participants. The survey and KIIs were conducted from May 28 to June 4, 2021.

The Statistical Package for the Social Sciences (SPSS) used a standard survey instrument to determine the socio-economic profile of the respondents, their acceptability of the Project, and identify issues and concerns. The instrument was adapted from DAO 2017-15 (Guidelines on Public Participation under the Philippine EIS system) and translated into Cebuano to ensure efficient communication.

SPSS is a software package utilized for logical statistical analysis. It can take data from almost any type of file and use them for generating tabulated reports, charts as well as plots of distributions and trends, descriptive statistics and conduct complex statistical analyses.

The face-to-face survey interviews were conducted with trained data enumerators strictly following the COVID-19 protocols (physical distancing, face masks, face shields, washing of hands) of the Department of Health (DOH).

Table 3-118. Research areas by city/municipality and barangay sampling sites

Province	City/municipality	Barangay	HH Population	Percentage	Sample Size	No. of key informants
Misamis Oriental	Cagayan de Oro	Bugo	7, 021	1.67	60	13
		Balubal	1, 072	0.84	9	
		Puerto	3, 254	0.89	29	
	Tagoloan	Casinglot	2, 207	0.91	20	13
		Natumolan	1, 924	0.88	17	
Bukidnon	Malaybalay	Barangay 10	640	0.94	6	15
		Sumpong	2, 022	0.89	18	
		Dalwangan	1, 523	0.85	13	
		Kalasungay	1, 798	0.88	16	
		Patpat	833	14.28	7	
	Sumilao	Puntian	340	0.88	3	13
		Kisolon	2, 507	0.88	22	
		Kulasi	138	0.72	1	
		Poblacion	1, 023	0.88	9	
		San Roque	275	0.73	2	
		Vista Villa	551	0.91	5	
	Manolo Fortich	Alae	2, 076	0.87	18	24
		Diclum	917	0.87	8	
		Damilag	2, 662	0.90	24	
		Tangkulan	1, 980	0.90	18	
		Ticala	289	1.03	3	
		Sankanan	849	0.94	8	
		San Miguel	1, 106	0.90	10	
		Mambatangan	988	0.91	9	
	Impasug-ong	Poblacion	2, 452	0.86	21	15
		Kibenton	922	0.54	5	
		Impalutao	1, 344	0.82	11	
		La Fortuna	948	0.84	8	
		Cawayan	452	0.88	4	
		Capitan Bayong	679	0.88	6	
		Total	**44,792**	**0.87**	**390**	**93**

NOTE: HH - household

Table 3-119. Number of key informant respondents host LGU

Municipality	Sample Size
Tagoloan	13
Cagayan de Oro	13
Manolo Fortich	24
Sumilao	13
Impasug-ong	15
Malaybalay	15
Total	**93**

The qualitative methods analyzed secondary data and literature study that included the a) Ancestral Domain Sustainable Development Plan (2014), b) Cagayan de Oro City Mayor's Annual Report (2018), and c) CLUPs of Cagayan de Oro City, Tagoloan, Manolo Fortich, Impasug-ong, Sumilao, and Malaybalay City.

3.4.3 Socio-economic perception survey (SPS)

The results of the social perception survey are presented in the succeeding sub-sections. The survey instrument was formulated to determine respondent demographics, household profiles, housing information, aspirations, and perception and attitude towards the Project.

3.4.3.1 Demographic information of the respondents

Sex – Majority (~67 percent) of the respondents were female and remaining male (**Table 3-120**); likely due to husbands at work with wives staying at home.

Table 3-120. Sex of the respondents

LGU	Number			% Distribution	
	Male	Female	Total	Male	Female
CDO	34	64	98	34.7	65.3
Malaybalay	20	40	53	33.3	66.7
Tagoloan	19	18	36	51.4	48.6
Sumilao	11	31	41	26.2	73.8
Manolo Fortich	33	65	98	33.7	66.3
Impasug-ong	12	43	55	21.8	78.2
TOTAL	**129**	**261**	**390**	**33.1**	**66.9**

Socio-economic and Perception Survey

Age distribution – The age distribution of the respondents from 16 to 60 years and above is shown in **Table 3-121**. The minimum age of more than 80 percent of the respondents were 30 years old, showing the maturity level of the respondents. Only 0.8 and 16.7percent of the respondents were between 16-19 and 20 to 29 years old respectively.

Table 3-121. Age of the respondents

Age	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
16 – 19	0	0.00	0	0.00	2	5.60	1	2.40	0	0.00	0	0.00	3	0.80
20 – 29	14	14.60	10	17.50	4	11.10	8	19.50	19	20.00	8	14.50	63	16.60
30 – 39	25	26.00	20	35.10	6	16.70	10	24.40	24	25.30	17	30.90	102	26.80
40 – 49	21	21.90	7	12.30	9	25.00	9	22.00	17	17.90	19	34.50	82	21.60
50 – 59	19	19.80	9	15.80	7	19.40	7	17.10	25	26.30	7	12.70	74	19.50
60 & above	17	17.70	11	19.30	8	22.20	6	14.60	10	10.50	4	7.30	56	14.70
Total	**96**	**100**	**57**	**100**	**36**	**100**	**41**	**100**	**95**	**100**	**55**	**100**	**380**	**100**

Source: Socio-economic and Perception Survey, NOTES: Missing/ No answer=10 (Cagayan de Oro City – 2, Sumilao – 1, Malaybalay – 3, Manolo Fortich – 3, Tagoloan – 1)

Civil status **–** Majority of the respondents were married (70%) followed by 17 percent single and seven percent with common-law partners (**Table 3-122**). The survey showed that single-parent households were comprised of 6.2 percent widowed and 0.3 percent separated.

Table 3-122. Civil status of the respondents

Civil status	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Single	25	26.00	8	17.40	5	14.70	9	24.30	10	11.20	2	3.70	59	16.60
Married	56	58.30	36	78.30	27	79.40	24	64.90	58	65.20	48	88.90	249	69.90
Widow	7	7.30	2	4.30	1	2.90	2	5.40	8	9.00	2	3.70	22	6.20
CLP	8	8.30	0	0.00	1	2.90	1	2.70	13	14.60	2	3.70	25	7.00
Separated	0	0.00	0	0.00	0	0.00	1	2.70	0	0.00	0	0.00	1	0.30
Total	96	100	46	100	34	100	37	100	89	100	54	100	356	100

Source: Socio-economic and Perception Survey, NOTE: CLP – Common Law Partner; Missing/ No answer= 34 (Cagayan de Oro City – 2, Sumilao – 5, Malaybalay – 14, Manolo Fortich – 9, Tagoloan – 3, Impasug-ong – 1)

Educational attainment – More than three-fourths (76.5%) of the respondents had either elementary (38.7%) or secondary (37.8%) education. Respondents with college education were mostly from Malaybalay City while college graduates from Manolo Fortich (19.3%) and Impasug-ong (19.2%). Respondents with vocational education comprise 3.9 percent of the respondents. **Table 3-123** summarizes the educational attainment distribution of the respondents.

Table 3-123. Educational attainment of the respondents

Educational attainment	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Elementary Level	20	20.80	5	10.40	4	11.40	1	2.40	13	14.80	5	9.60	48	13.30
Elementary Graduate	5	5.20	1	2.10	7	20.00	4	9.80	2	2.30	4	7.70	23	6.40
High School Level	25	26.00	12	25.00	2	5.70	12	29.30	24	27.30	8	15.40	83	23.10
High School Graduate	10	10.40	6	12.50	10	28.60	6	14.60	11	12.50	13	25.00	56	15.60
College Level	14	14.60	21	43.80	6	17.10	10	24.40	18	20.50	9	17.30	78	21.70
College Graduate	17	17.70	2	4.20	5	14.30	7	17.10	17	19.30	10	19.20	58	16.10
Vocational	5	5.20	1	2.10	1	2.90	1	2.40	3	3.40	3	5.80	14	3.90
Total	96	100	48	100	35	100	41	100	88	100	52	100	360	100

Source: Socio-economic and Perception Survey, NOTE: No answer = 30 (Cagayan de Oro City – 2, Sumilao – 1, Malaybalay – 12, Manolo Fortich – 10, Tagoloan – 2, Impasug-ong – 3)

Nature of occupation – In general, the top five occupations comprising about 67 percent of the respondents were entrepreneurs, e.g., *sari-sari* store owners, *carinderia* owners, vendors, (27.7%) followed by the housewives/housekeepers (16.3%), barangay employees (11%), drivers (5.9%), and government employees (5.9%). The rest (33.39%) were engaged in manual or non-manual work. The distribution of the respondents' occupation is shown in **Table 3-124**.

Table 3-124. Occupation distribution of the respondents

Occupation	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Businesspersons	25	25.77	13	24.07	12	34.29	11	30.56	27	27.84	15	28.30	103	27.69
Housewife	17	17.53	6	11.11	0	0.00	9	25.00	18	18.56	10	18.87	60	16.13
Barangay Employees	1	1.03	5	9.26	4	11.43	1	2.78	18	18.56	12	22.64	41	11.02
Driver	6	6.19	2	3.70	6	17.14	0	0.00	5	5.15	3	5.66	22	5.91
Govt. Employee	2	2.06	13	24.07	1	2.86	3	8.33	2	2.06	1	1.89	22	5.91
Retired/ Pensioner	6	6.19	2	3.70	3	8.57	1	2.78	5	5.15	1	1.89	18	4.84
Teacher	5	5.15	0	0.00	3	8.57	3	8.33	2	2.06	3	5.66	16	4.30
Student	2	2.06	0	0.00	1	2.86	2	5.56	4	4.12	0	0.00	9	2.42
Private Employee	0	0.00	6	11.11	0	0.00	2	5.56	0	0.00	0	0.00	8	2.15
Farmer	1	1.03	1	1.85	1	2.86	0	0.00	2	2.06	2	3.77	7	1.88
Labor	3	3.09	2	3.70	0	0.00	1	2.78	0	0.00	1	1.89	7	1.88
Construction worker/Welder	2	2.06	1	1.85	2	5.71	0	0.00	0	0.00	0	0.00	5	1.34
Parttime/ Contractual	1	1.03	0	0.00	0	0.00	0	0.00	3	3.09	1	1.89	5	1.35
Sales Lady	1	1.03	0	0.00	0	0.00	0	0.00	3	3.09	0	0.00	4	1.08
Midwife/ Therapist/ Nurse	1	1.03	1	1.85	0	0.00	0	0.00	1	1.03	4	7.55	7	1.89
Security Guard/ Watch man	2	2.06	0	0.00	1	2.86	0	0.00	0	0.00	0	0.00	3	0.81
Delivery	2	2.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.54
None/child/old age	1	1.03	0	0.00	0	0.00	0	0.00	1	1.03	0	0.00	2	0.54
Electrician	0	0.00	0	0.00	1	2.86	0	0.00	1	1.03	0	0.00	2	0.54
Pastor	0	0.00	1	1.85	0	0.00	0	0.00	1	1.03	0	0.00	2	0.54
Del Monte Worker	1	1.03	0	0.00	0	0.00	0	0.00	1	1.03	0	0.00	2	0.54
Scrap buyer/seller	2	2.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.54
Vet Med	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Dentist/Dental Technician	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Mason/ Carpenter	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Overseas Filipino Worker (OFW)	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Nail technician	0	0.00	0	0.00	0	0.00	1	2.78	0	0.00	0	0.00	1	0.27
Engineer	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Child Development Worker	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
SK Chairman	0	0.00	0	0.00	0	0.00	1	2.78	0	0.00	0	0.00	1	0.27

Occupation	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Automotive	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Dress making	0	0.00	0	0.00	0	0.00	1	2.78	0	0.00	0	0.00	1	0.27
Caretaker	0	0.00	1	1.85	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Factory Worker	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Vulcanizer	0	0.00	0	0.00	0	0.00	0	0.00	1	1.03	0	0.00	1	0.27
Repair man	0	0.00	0	0.00	0	0.00	0	0.00	1	1.03	0	0.00	1	0.27
Helper	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Golf Coach	0	0.00	0	0.00	0	0.00	0	0.00	1	1.03	0	0.00	1	0.27
Packer (House)	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Printing Shop Owner	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Aircon Technician	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Butcher	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
On call dishwasher	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Boat Operator	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Parking caretaker	1	1.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.27
Total	**97**	**100**	**54**	**100**	**35**	**100**	**36**	**100**	**97**	**100**	**53**	**100**	**372**	**100**

Source: Socio-economic and Perception Survey; NOTE: No answer = 18 (Cagayan de Oro City – 1, Sumilao – 6, Malaybalay – 6, Manolo Fortich – 1, Tagoloan – 2, Impasug-ong – 2)

Years of residency – Majority (63.1%) of the respondents have been residents for six to over 40 years with about 28 percent residents since birth (considered as native in the area) (orange cells in **Table 3-125**). Respondent who has been residents for less than 5 years comprised five percent.

Table 3-125. Residency profile of respondents

Years of stay	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Since birth/ native	12	13.20	22	40.70	13	37.10	12	30.80	18	20.20	22	46.80	99	27.90
Below 5	14	15.40	6	11.10	2	5.70	4	10.30	4	4.50	2	4.30	32	9.00
6 – 10	6	6.60	2	3.70	4	11.40	2	5.10	9	10.10	7	14.90	30	8.50
11 – 15	8	8.80	2	3.70	2	5.70	1	2.60	7	7.90	5	10.60	25	7.00
16 – 20	10	11.00	2	3.70	1	2.90	6	15.40	8	9.00	3	6.40	30	8.50
21 – 25	8	8.80	3	5.60	1	2.90	1	2.60	9	10.10	3	6.40	25	7.00
26 – 30	10	11.00	6	11.10	5	14.30	5	12.80	11	12.40	1	2.10	38	10.70
31 – 35	7	7.70	6	11.10	1	2.90	2	5.10	7	7.90	1	2.10	24	6.80
36 – 40	7	7.70	4	7.40	2	5.70	1	2.60	5	5.60	1	2.10	20	5.60
41 & above	9	9.90	1	1.90	4	11.40	5	12.80	11	12.40	2	4.30	32	9.00
Total	**91**	**100**	**54**	**100**	**35**	**100**	**39**	**100**	**89**	**100**	**47**	**100**	**355**	**100**

Source: Socio-economic and Perception Survey, NOTE: No answer = 35 (Cagayan de Oro City – 7, Sumilao – 3, Malaybalay – 6, Manolo Fortich – 9, Tagoloan – 2, Impasug-ong – 8)

Religious affiliation – The respondents were predominantly Roman Catholic (79.5%) followed by the Baptists (7.8%) and Born-Again Christians (3.4%) (orange cells in **Table 3-126**). The dominance of the Catholics displayed the typical religious affiliation of many Filipinos. There were two Islam respondents in Cagayan de Oro and Impasug-ong with rest either Iglesia ni Cristo, Latter Day Saints, Assembly of God, Jehova Witnesses, Christian and Missionary Alliance Churches of the Philippines, or Christian.

Table 3-126. Religious profile of the respondents

Religion	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Roman Catholic	79	82.29	43	72.88	34	94.44	33	80.49	79	80.61	38	69.09	306	79.48
Baptist	4	4.17	10	16.95	0	0.00	3	7.32	8	8.16	5	9.09	30	7.79
Born Again	6	6.25			0	0.00	0	0.00	2	2.04	5	9.09	13	3.38
SDA	5	5.21	2	3.39	0	0.00	0	0.00	1	1.02	1	1.82	9	2.34
Iglesia Filipinista	0	0.00	1	1.69	0	0.00	2	4.88	2	2.04	2	3.64	7	1.82
Protestant	0	0.00	3	5.08	0	0.00	0	0.00			1	1.82	4	1.04
Mormons	0	0.00	0	0.00	1	2.78	0	0.00	3	3.06	0	0.00	4	1.04
Islam	1	1.04	0	0.00	0	0.00	0	0.00	0	0.00	1	1.82	2	0.52
Others:	1	1.04	0	0.00	1	2.78	3	7.32	3	3.06	2	3.64	10	2.60
Total	96	100	59	100	36	100	41	100	98	100	55	100	385	100

Source: Socio-economic and Perception Survey, NOTE: No answer = 5 (Cagayan de Oro City -2, Tagoloan – 1, Malaybalay – 1, Sumilao – 1); SDA - Seventh Day Adventist

Primary source of income – Salaries (34.4%), business or buy and sell (28.8%), and driving (10.3%) were the top three primary income sources of the respondents (orange cells in **Table 3-127**). Other sources included pensions (4.9%) farming (4.9%) and doing labor (3.3%) with the rest deriving income from dress making, furniture selling, pineapple harvesting, online job, golf coaching, dishwashing, fishing, mechanical working, and watch-making.

Table 3-127. Primary sources of income of the respondents

Primary income source	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Salary/ Honoraria	22	23.66	29	53.70	8	22.22	19	50.00	26	27.08	22	43.14	126	34.24
Business	31	33.33	9	16.67	12	33.33	11	28.95	30	31.25	13	25.49	106	28.80
Driver	11	11.83	4	7.41	6	16.67	3	7.89	11	11.46	3	5.88	38	10.33
Pension	3	3.23	3	5.56	2	5.56	1	2.63	7	7.29	2	3.92	18	4.89
Farming	2	2.15	6	11.11	1	2.78	2	5.26	4	4.17	3	5.88	18	4.89
Labor	6	6.45	0	0.00	1	2.78	0	0.00	0	0.00	5	9.80	12	3.26
H/SC	3	3.23	2	3.70	1	2.78	1	2.63	0	0.00	3	5.88	10	2.72
Construction	2	2.15	0	0.00	1	2.78	0	0.00	2	2.08	0	0.00	5	1.36
Factory Worker	1	1.08	0	0.00	0	0.00	0	0.00	3	3.13	0	0.00	4	1.09
Welding	0	0.00	1	1.85	2	5.56	0	0.00			0	0.00	3	0.82
Allotment	0	0.00	0	0.00	2	5.56	0	0.00	1	1.04	0	0.00	3	0.82
SB/S	3	3.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.82
Bgy. Volunteer	0	0.00	0	0.00	0	0.00	0	0.00	4	4.17	0	0.00	4	1.09
Electrician	1	1.08	0	0.00	0	0.00	0	0.00	1	1.04	0	0.00	2	0.54
OFW	2	2.15	0	0.00	0	0.00	0	0.00			0	0.00	2	0.54
Others	6	6.45	0	0.00			1	2.63	7	7.29	0	0.00	14	3.80
Total	93	100	54	100	36	100	38	100	96	100	51	100	368	100

Source: Socio-economic and Perception Survey; NOTES: No answer = 22 (Cagayan de Oro City – 5, Sumilao – 4, Malaybalay – 6, Manolo Fortich – 2, Tagoloan – 1, Impasug-ong – 4); H/SC - Husband/ Support by Children; SB/S - Scrap Buyer/Seller

Secondary source of income – The top three additional income sources of the respondents were business/buy and sell, driving, and farming (orange cells in **Table 3-128**). Driving, identified both for the primary and secondary income sources, signified that transport was an important income source. Other secondary income sources were dress making, working at Del Monte, massage, nail technician, in delivery and construction.

Table 3-128. Respondent secondary sources of income

Secondary income source	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Business	3	15.79	6	66.67	3	33.33	4	40.00	4	16.00	9	42.86	29	31.18
Driver	3	15.79	0	0.00	2	22.22	2	20.00	2	8.00	2	9.52	11	11.83
Farming	0	0.00	0	0.00	0	0.00	2	20.00	3	12.00	3	14.29	8	8.60
Salary	2	10.53	0	0.00	1	11.11	0	0.00	1	4.00	3	14.29	7	7.53
Pension	1	5.26	0	0.00	0	0.00	0	0.00	4	16.00	0	0.00	5	5.38
Honorarium	0	0.00	3	33.33	0	0.00	1	10.00	0	0.00	0	0.00	4	4.30
Barangay worker	0	0.00	0	0.00	0	0.00	0	0.00	4	16.00	0	0.00	4	4.30
BHW	1	5.26	0	0.00	0	0.00	0	0.00	1	4.00	1	4.76	3	3.23
Laborer	1	5.26	0	0.00	1	11.11	0	0.00	0	0.00	1	4.76	3	3.23
None	1	5.26	0	0.00	0	0.00	0	0.00	0	0.00	1	4.76	2	2.15
Pastor			0	0.00	0	0.00	1	10.00	0	0.00	1	4.76	2	2.15
Electrician	1	5.26	0	0.00	0	0.00	0	0.00	1	4.00	0	0.00	2	2.15
Vendor	1	5.26	0	0.00	1	11.11	0	0.00	0	0.00	0	0.00	2	2.15
Wife (abroad)	1	5.26	0	0.00	1	11.11	0	0.00	0	0.00	0	0.00	2	2.15
Barangay Captain	0	0.00	0	0.00	0	0.00	0	0.00	1	4.00	0	0.00	1	1.08
Others	4	21.05	0	0.00	0	0.00	0	0.00	4	16.00	0	0.00	8	8.60
Total	19	100	9	100	9	100	10	100	25	100	21	100	93	100

Source: Socio-economic and Perception Survey

Household monthly income – About 22% of the respondents declared an income range of Php8,001 to P11,000 while a greater number (~43%) had incomes below the poverty line (below PhP5,000 or PhP5,001.00 to P8,000.00). The average monthly poverty threshold for a family of five is Php8,022.00 (Official Gazette, 2014). This amount is sufficient to cover a single family's basic food and non-food needs. **Table 3-129** summarizes the household incomes of the respondents.

Table 3-129. Household monthly income of respondents

Monthly income	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Below Php. 5,000	21	22.30	10	18.50	11	32.40	5	12.50	15	16.00	12	22.60	74	20.10
Php. 5,001–P8,000	11	11.70	13	24.10	5	14.70	8	20.00	25	26.60	12	22.6%	74	20.10
Php. 8,001–P11,000	22	23.40	13	24.10	8	23.50	9	22.50	20	21.30	11	20.80	83	22.50
Php. 11,001–P14,000	14	14.90	3	5.60	4	11.80	3	7.50	7	7.40	4	7.50	35	9.50
Php. 14,001–P17,000	3	3.20	4	7.40	2	5.90	3	7.50	4	4.30	2	3.80	18	4.90
Php. 17,001–P20,000	6	6.40	3	5.60	0	0.00	4	10.00	3	3.20	3	5.70	19	5.10
Php. 20,001 and above	17	18.10	8	14.80	4	11.80	8	20.00	20	21.30	9	17.00	66	17.90
Total	94	100	54	100	34	100	40	100	94	100	53	100	369	100

Source: Socio-economic Survey, NOTES: HH- household, No answer = 21 (Cagayan de Oro City – 4, Sumilao – 2, Malaybalay – 6, Manolo Fortich – 4, Tagoloan -3, Impasug-ong – 2)

Number of household members – Most respondent households had three to four members (43%) followed by 27.2 percent with five to six (orange cells in **Table 3-130**), signifying the typical family size of a Filipino family. It is interesting to note that there were respondents with seven or more household members.

Table 3-130. Household members of respondents

Number	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
1-2	19	20.00	6	10.00	9	24.30	6	14.30	14	14.30	2	3.60	56	14.50
3-4	41	43.20	26	43.30	13	35.10	14	33.30	52	53.10	20	36.40	166	42.90
5-6	25	26.30	19	31.70	4	10.80	13	31.00	20	20.40	24	43.60	105	27.10
7-8	10	10.50	7	11.70	7	18.90	6	14.30	9	9.20	8	14.50	47	12.10
9 & above	0	0.00	2	3.30	4	10.80	3	7.10	3	3.10	1	1.80	13	3.40
Total	95	100	60	100	37	100	42	100	98	100	55	100	387	100

Source: Socio-economic Survey, NOTES: HH- household, No answer = 3 (Cagayan de Oro City – 3)

3.4.3.2 Profile of the household members

The succeeding sections presents the profile of the respondent household members in terms of age, sex, education, and civil status.

Household composition – The survey showed that respondent households had extended families where relatives such as in-laws and nieces/nephews and cousins and parents stay together with the married child (**Table 3-131**).

Table 3-131. Household composition (relationship to the respondent)

Relation	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Respondent	98	26.13	59	23.32	36	23.23	42	22.58	98	23.84	55	21.15	388	23.66
Son	71	18.93	5	22.13	25	16.13	40	21.51	87	21.17	73	28.08	352	21.46
Daughter	65	17.33	52	20.55	25	16.13	35	18.82	84	20.44	55	21.15	316	19.27
Husband	38	10.13	28	11.07	10	6.45	21	11.29	38	9.25	32	12.31	167	10.18
Wife	15	4.00	12	4.74	14	9.03	6	3.23	22	5.35	11	4.23	80	4.88
Grandson /daughter	17	4.53	8	3.16	16	10.32	9	4.84	13	3.16	10	3.85	73	4.45
Mother	15	4.00	7	2.77	4	2.58	6	3.23	10	2.43	5	1.92	47	2.87
Brother	14	3.73	8	3.16	4	2.58	8	4.30	9	2.19	3	1.15	46	2.80
Common Law Partner	10	2.67	5	1.98	2	1.29	3	1.61	12	2.92	3	1.15	35	2.13
Nephew/ Niece	14	3.73	2	0.79	3	1.94	2	1.08	10	2.43	2	0.77	33	2.01
Sister	6	1.60	8	3.16	6	3.87	6	3.23	2	0.49	2	0.77	30	1.83
Father	4	1.07	5	1.98	3	1.94	4	2.15	9	2.19	4	1.54	29	1.77
Son/Daughter-in-law	2	0.53	2	0.79	4	2.58	2	1.08	2	0.49	1	0.38	13	0.79
Father/Mother-in-law	2	0.53	0	0.00	1	0.65	1	0.54	4	0.97	2	0.77	10	0.61
Sister / brother-in-law	2	0.53	1	0.40	0	0.00	1	0.54	5	1.22	0	0.00	9	0.55
Relatives (Cousin, Aunt)	1	0.27	0	0.00	2	1.29	0	0.00	1	0.24	2	0.77	6	0.37
Helper	1	0.27	0	0.00	0	0.00	0	0.00	2	0.49	0	0.00	3	0.18
Others (Step Mother, Employer)	0	0.00	0	0.00	0	0.00	0	0.00	3	0.73	0	0.00	3	0.18
Total	375	100	253	100	155	100	186	100	411	100	260	100	1640	100

Source: Socio-economic Survey

Age of household members – The ages of other family members ranged from less than five years to 60 years old and above showing the wide age variation within the respondent households (**Table 3-132**).

Table 3-132. Age of the household members

Age	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Below 5	24	6.42	26	10.12	15	9.32	23	12.04	28	7.04	22	8.30	138	8.38
6 – 10	45	12.03	26	10.12	10	6.21	16	8.38	49	12.31	31	11.70	177	10.75
11 – 15	26	6.95	33	12.84	8	4.97	16	8.38	34	8.54	36	13.58	153	9.30
16 – 19	28	7.49	20	7.78	19	11.80	15	7.85	21	5.28	21	7.92	124	7.53
20 – 29	61	16.31	42	16.34	33	20.50	50	26.18	85	21.36	46	17.36	317	19.26
30 – 39	64	17.11	42	16.34	20	12.42	19	9.95	61	15.33	37	13.96	243	14.76
40 – 49	45	12.03	21	8.17	22	13.66	24	12.57	45	11.31	39	14.72	196	11.91
50 – 59	41	10.96	23	8.95	14	8.70	15	7.85	47	11.81	16	6.04	156	9.48
60. & above	40	10.70	24	9.34	20	12.42	13	6.81	28	7.04	17	6.42	142	8.63
Total	374	100	257	100	161	100	191	100	398	100	265	100	1646	100

Source: Socio-economic Survey

Sex of the household members – The sex distribution within the respondent households were almost equal (49.8% females, 50.2% males) (**Table 3-133**).

Table 3-133. Sex of the household members

Sex	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Female	195	50.78	117	50.43	82	50.62	88	46.56	212	51.33	126	47.37	820	49.82
Male	189	49.22	115	49.57	80	49.38	101	53.44	201	48.67	140	52.63	826	50.18
Total	384	100	232	100	162	100	189	100	413	100	266	100	1646	100

Source: Socio-economic Survey

Civil status of the household members – A little more than half (54.9%) of the household members were single likely composed of the young and unmarried children (**Table 3-134**). About 38.7% were married followed by those with common-law partners (3.6%), widows (2.5%), and separated (0.33%). The survey showed diversity of civil status within the respondent households.

Table 3-134. Civil status of the other household members of respondents

Civil status	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Single	203	55.31	119	59.20	77	51.68	105	60.34	198	51.30	142	54.41	844	54.88
Married	130	35.42	78	38.81	64	42.95	64	36.78	149	38.60	110	42.15	595	38.69
CLP	16	4.36	0	0.00	4	2.68	2	1.15	28	7.25	6	2.30	56	3.64
Widow	17	4.63	4	1.99	2	1.34	2	1.15	10	2.59	3	1.15	38	2.47
Separated	1	0.27	0	0.00	2	1.34	1	0.57	1	0.26	0	0.00	5	0.33
Total	**367**	**100**	**201**	**100**	**149**	**100**	**174**	**100**	**386**	**100**	**261**	**100**	**1538**	**100**

Source: Socio-economic Survey; NOTE: CLP – Common Law Partner

Educational attainment of household members – The survey showed varied levels of educational attainment of the respondent household members from day care/kindergarten to the college levels. Most of them had either elementary level (25.7%) or high school level education (25.9%). Household members with college education (16.2%) were mostly respondents from Malaybalay, Tagoloan, Manolo Fortich and Sumilao. The summary of the educational attainment of household members is shown in **Table 3-135**.

Table 3-135. Highest educational attainment of the household members

Educational attainment	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Day Care/Kinder	3	0.87	0	0.00	3	2.11	2	1.23	9	2.72	3	1.35	20	1.45
Pre-school	1	0.29	0	0.00	0	0.00	1	0.61	0	0.00	3	1.35	5	0.36
Elementary Level	126	36.63	43	25.15	20	14.08	21	12.88	89	26.89	54	24.22	353	25.69
Elementary Graduate	14	4.07	6	3.51	14	9.86	15	9.20	5	1.51	12	5.38	66	0.07
High School Level	83	24.13	51	29.82	29	20.42	54	33.13	84	25.38	56	25.11	357	25.98
High School Graduate	27	7.85	14	8.19	31	21.83	22	13.50	27	8.16	35	15.70	156	11.35
College Level	41	11.92	40	23.39	25	17.61	28	17.18	58	17.52	30	13.45	222	16.16
College Graduate	37	10.76	14	8.19	18	12.68	16	9.82	53	16.01	23	10.31	161	11.72
Vocational	12	3.49	3	1.75	2	1.41	4	2.45	6	1.81	7	3.14	34	2.47
Total	**344**	**100**	**171**	**100**	**142**	**100**	**163**	**100**	**331**	**100**	**223**	**100**	**1374**	**100**

Source: Socio-economic Survey

3.4.3.3 Housing information

Type of dwelling – Majority (86.7%) of the respondents resided in single or bungalow type of dwelling followed by two-storey houses (6%), duplexes (4.8%), and apartments (3.3%) (**Table 3-136**). Some live inside their business office and on huts or "*payag*" (out of wood and boxes).

Table 3-136. Dwelling units of respondents

Dwelling type	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Single (bungalow)	71	74.70	48	87.30	34	97.10	38	92.70	84	87.50	51	94.40	326	86.70
Duplex	8	8.40	1	1.80	1	2.90	2	4.90	5	5.20	1	1.90	18	4.80
Apartment	0	0.00	2	3.60	0	0.00	0	0.00	2	2.10	0	0.00	4	1.10
Two-storey	11	11.60	3	5.50	0	0.00	1	2.40	5	5.20	2	3.70	22	5.90
Inside the Business Office	2	2.10	1	1.80	0	0.00	0	0.00	0	0.00	0	0.00	3	0.80
Payag (huts)	3	3.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.80
Total	95	100	55	100	35	100	41	100	96	100	54	100	376	100

Source: Socio-economic Survey; NOTE: No answer = 14 (Cagayan de Oro City – 3, Sumilao – 1, Malaybalay – 5, Manolo Fortich – 2, Tagoloan – 2, Impasug-ong – 1)

Type of housing materials – The houses of the respondents were mostly made of concrete (41%) followed by both wood and concrete (32.4 %), and wood (22.5%) (**Table 3-137**). A small number of respondents resided on houses made of cogon or bamboo (4.2%).

Table 3-137. Housing materials of respondents

Material	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Concrete	49	50.00	23	41.10	13	36.10	15	36.60	42	43.30	15	27.30	157	41.00
Wood and concrete	23	23.50	21	37.50	8	22.20	18	43.90	30	30.90	24	43.60	124	32.40
Wood	22	22.40	10	17.90	15	41.70	6	14.60	21	21.60	12	21.80	86	22.50
Cogon/ bamboo	4	4.10	2	3.60	0	0.00	2	4.90	4	4.10	4	7.30	16	4.20
Total	98	100	56	100	36	100	41	100	97	100	55	100	383	100

Source: Socio-economic Survey; NOTE: No answer = 7 (Malaybalay – 4, Sumilao – 1, Tagoloan – 1, Manolo Fortich – 1)

House ownership – In terms of dwelling ownership, 59% of the respondents owned both the house and lot while 21% owns the house only and 3.7% were either renting or staying with relatives (**Table 3-138**). The rest stayed in a communal house, works as caretaker in the house they are residing, or have deeds of donation rights only.

Table 3-138. Ownership of respondent dwellings

Housing ownership	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Owns both house and lot	55	56.10	32	57.10	15	41.70	27	65.90	62	64.60	34	61.80	225	58.90
Owns the house only	17	17.30	18	32.10	11	30.60	8	19.50	15	15.60	10	18.20	79	20.70
Renting	14	14.30	3	5.40	7	19.40	4	9.80	9	9.40	5	9.10	42	11.00
Residing w/ relatives	1	1.00	2	3.60	0	0.00	0	0.00	8	8.30	3	5.50	14	3.70
Communal House	2	2.00	0	0.00	0	0.00	2	4.90	1	1.00	0	0.00	5	1.30
House Caretaking	5	5.10	1	1.80	2	5.60	0	0.00	1	1.00	2	3.60	11	2.90

Housing ownership	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Deed of Donation/ Rights	4	4.10	0	0.00	1	2.80	0	0.00	0	0.00	1	1.80	6	1.60
Total	98	100	56	100	36	100	41	100	96	100	55	100	382	100

Source: Socio-economic Survey; NOTES: No answer = 8 (Malaybalay –4, Sumilao – 1, Tagoloan – 1, Manolo Fortich – 2)

Fuel for cooking – The fuel mostly used by respondent households was firewood or charcoal (58.1%) followed by liquefied petroleum gas (31.3%), electric stoves (4.9%) and kerosene (5.7%). **Table 3-139** summarizes the cooking fuel used by respondent households.

Table 3-139. Cooking fuel used by household respondents

Cooking fuel	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Firewood/ charcoal	45	45.90	34	58.60	19	52.80	30	71.40	58	59.20	39	70.90	225	58.10
LPG	42	42.90	16	27.60	13	36.10	8	19.00	28	28.60	14	25.50	121	31.30
Electric stove	5	5.10	3	5.20	3	8.30	1	2.40	5	5.10	2	3.60	19	4.90
Kerosene	6	6.10	5	8.60	1	2.80	3	7.10	7	7.10	0	0.00	22	5.70
Total	98	100	58	100	36	100	42	100	98	100	55	100	387	100

Source: Socio-economic Survey; NOTE: No answer = 3 (*Malaybalay – 2, Tagoloan – 1)*

Household lighting– Almost all of the respondent households used electricity (93.2%) for lighting (**Table 3-140**). However, there were households still using kerosene/gas, candle, solar, or battery for lighting.

Table 3-140. Type of lighting used by respondent households

Lighting	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Electricity	93	94.90	55	94.80	32	91.40	38	92.70	90	93.80	49	89.10	357	93.20
Candle	3	3.10	1	1.70	2	5.70	1	2.40	3	3.10	0	0.00	10	2.60
Kerosene/ gas	2	2.00	1	1.70	0	0.00	1	2.40	2	2.10	2	3.60	8	2.10
Solar/battery	0	0.00	1	1.70	1	2.90	1	2.40	1	1.00	4	7.30	8	2.10
Total	98	100	58	100	35	100	41	100	96	100	55	100	383	100

Source: Socio-economic Survey; NOTE: No answer = 7 (Malaybalay – 2, Sumilao – 1, Tagoloan – 2, Manolo Fortich – 2)

Source of domestic water – The domestic water requirements of respondent households were mostly supplied by the local water district (80.5%) followed by springs (**Table 3-141**). Other households get potable water from the deep well, river, pitcher pump, rainwater and others (communal sources from barangay and Del Monte Corporation).

Table 3-141. Source of domestic water of respondent households

Domestic water	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Water district	78	80.40	49	84.50	23	63.90	30	71.40	87	88.70	43	79.60	310	80.50
Deep/dug well	9	9.20	6	10.30	4	11.1	1	2.40	1	1.00	1	1.90	22	5.7
Pitcher pump	6	6.20	1	1.70	2	5.60	0	0.00	1	1.00	0	0.00	10	2.60
Private pump	0	0.00	0	0.00	2	5.60	1	2.40	1	1.00	1	1.90	5	1.30
Spring	0	0.00	1	1.70	2	5.60	8	19.00	0	0.00	7	13.00	18	4.70
River	0	0.00	1	1.70	3	8.30	1	2.40	0	0.00	0	0.00	5	1.30
Rainwater	0	0.00	0	0.00	0	0.00	1	2.40	0	0.00	0	0.00	1	0.30

Domestic water	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Others:	4	4.10	0	0.00	0	0.00	0	0.00	8	8.20	2	3.70	14	3.60
Total	97	100	58	100	36	100	42	100	98	100	54	100	385	100

Source: Socio-economic Survey; NOTE: No answer = 5 (Cagayan de Oro City – 1, Tagoloan Mis. Occ. – 1, Malaybalay – 2, Impasug-ong – 1)

Method of SW disposal – Majority (89.3%) of the respondent households disposed their solid wastes through the house-to-house collection by the municipality/city (**Table 3-142**). Other households disposed their SW by burning (4.70%), burying (3.90%), dumping to another place (1%) and placing in a hole (1%).

Table 3-142. Solid waste disposal of respondent households

Disposal method	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
LGU collection	87	89.70	53	89.80	30	83.30	37	92.50	92	93.90	44	81.50	343	89.30
Burning	8	8.20	2	3.40	1	2.80	1	2.50	1	1.00	5	9.30	18	4.70
Burying	2	2.10	3	5.10	2	5.60	1	2.50	3	3.10	4	7.40	15	3.90
Dumping	0	0.00	1	1.70	1	2.80	1	2.50	0	0.00	1	1.90	4	1.00
Placing in a hole	0	0.00	0	0.00	2	5.60	0	0.00	2	2.00	0	0.00	4	1.00
Total	97	100	59	100	36	100	40	100	98	100	54	100	384	100

Source: Socio-economic Survey; NOTE: No answer = 6, (Cagayan de Oro City – 1, Sumilao – 2, Malaybalay – 1, Impasug-ong – 1, Tagoloan - 1)

Toilet facility – Majority (82.8%) of the respondents mostly coming from Malaybalay, Sumilao and Impasug-ong have water-sealed toilets in their houses followed by the flush-type toilet (**Table 3-143**). The rest used public toilets, Antipolo type commodes, common toilet, or the toilet of relatives.

Table 3-143. Toilet facility used by respondent households

Toilet facility	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Water sealed	59	64.1	51	92.7	29	80.6	34	91.9	83	88.3	48	90.6	304	82.83
Flush type	23	25	3	5.5	6	16.7	3	8.1	10	10.6	3	5.7	48	13.08
Antipolo type	4	4.3	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	1.09
Public toilet	3	3.3	1	1.8	0	0.00	0	0.00	1	1.1	0	0.00	5	1.36
Toilet of relatives	2	2.2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.54
Common	1	1.1	0	0.00	1	2.8	0	0.00	0	0.00	2	3.8	4	1.09
Total	92	100	55	100	36	100	37	100	94	100	53	100	367	100

Source: Socio-economic Survey; NOTE: No answer = 23 (Cagayan de Oro City – 6, Sumilao – 5, Malaybalay – 5, Manolo Fortich – 4, Tagoloan -1, Impasug-ong – 2)

3.4.3.4 Perceptions towards the Project

Awareness of the proposed Project - Majority of the respondents were aware of the proposed Project (63%) with only 37.4 percent unaware (**Table 3-144**). This showed most of the them knew about the plan to establish the CMH Project in their locality. The respondents in municipalities of Manolo Fortich and Malaybalay have higher awareness (67% and 65.3% respectively) compared with the rest of the host LGUs indicating that the IEC campaign and information dissemination must have been relatively more effective in these areas.

Table 3-144. Awareness of the proposed Project

Awareness	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	62	63.30	40	66.70	24	64.90	25	61.00	64	65.30	28	51.90	243	62.60
No	36	36.70	20	33.30	13	35.10	16	39.00	34	34.70	26	48.10	145	37.40
Total	**98**	**100**	**60**	**100**	**37**	**100**	**41**	**100**	**98**	**100**	**54**	**100**	**388**	**100**

Source: Socio-economic Survey; NOTE: No answer = 2 (Sumilao – 1, Impasug-ong – 1)

Source of project information - The survey showed that Project information came from both formal and informal sources. More than a third (39%) of the respondents knew about the Project from the local government employees. Informal sources such as neighbors, relatives, and friends comprised 23.4 percent of the respondents (**Table 3-145**). Other sources of Project information mentioned by the respondents were DPWH Project employees/City Engineers/JICA (9.4%) and neighbors and LGU combined (8%). The rest mentioned mass media such as the radio and television or from the survey/interviewer, family member and other sources.

Table 3-145. Respondent sources of information regarding the Project

Information Source	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Barangay/Municipal/ City Officials	22	35.48	21	52.50	4	16.67	12	50.00	24	37.50	11	37.93	94	38.68
Neighbors/Relatives/ Friends	16	25.81	6	15.00	8	33.33	9	37.50	15	23.44	3	10.34	57	23.46
DPWH/City Engineers/Project employees	3	4.84	5	12.50	2	8.33	0	0.00	9	14.06	4	13.79	23	9.47
Neighbor and Barangay/Municipal Officials	5	8.06	0	0.00	2	8.33	0	0.00	5	7.81	7	24.14	19	7.82
Radio	6	9.68	0	0.00	4	16.67	0	0.00	0	0.00	1	3.45	11	4.53
Interviewer/Survey	1	1.61	4	10.00	1	4.17	0	0.00	3	4.69	1	3.45	10	4.12
Television	3	4.84	2	5.00	0	0.00	0	0.00	2	3.13	0	0.00	7	2.88
Barangay/Municipal Officials and DPWH Project employees	2	3.23	0	0.00	0	0.00	0	0.00	3	4.69	2	6.90	7	2.88
Family Member	1	1.61	1	2.50	2	8.33	1	4.17	1	1.56	0	0.00	6	2.47
Poster/social media/ Radio & Television	2	3.23	1	2.50	0	0.00	0	0.00	2	3.13	0	0.00	5	2.06
Others (Customer/ Parish Priest)	1	1.61	0	0.00	1	4.17	2	8.33	0	0.00	0	0.00	4	1.65
Total	**62**	**100**	**40**	**100**	**24**	**100**	**24**	**100**	**64**	**100**	**29**	**100**	**243**	**100**

Source: Socio-economic Survey

Initials thoughts about the Project – The respondents' initial reactions and thoughts when hearing about the Project were a) benefits to residents and community (77.1%); none; nothing can be done; not sure; it's enough (15.7%); many problems/complaints against the Project (4.7%); trees will be cut and conversion of private/ agricultural lands (0.6%); houses affected (0.6%); good with big trucks able to pass (0.6%); big help to motorists (0.6%); and loss of livelihood near the highway/roads (0.3%) (**Table 3-146**). These reactions typified a combination of positively- and negatively inclined answers with the predominance of the former with Malaybalay City recognizing the benefits with 91.8 percent. There were those pleased with the Project because big trucks can pass and beneficial to motorists in general. On the other hand, respondents with negative reactions/thoughts need attention with regards to socioeconomic and environmental problems and complaints.

Table 3-146. Initial reactions or thoughts when first heard about the project

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Plenty of benefits to residents and community	72	75.00	45	91.80	18	52.90	31	100	73	76.00	37	71.20	276	77.10
None; nothing can be done/no choice; not sure; It's enough	17	17.70	0	0.00	11	32.40	0	0.00	15	15.60	13	25.00	56	15.7
Many problems/ complaints against the project	6	6.30	4	8.20	2	5.90	0	0.00	4	4.20	1	1.90	17	4.70
Trees will be cut and conversion of private/ agricultural lands	0	0.00	0	0.00	0	0.00	0	0.00	2	2.10	0	0.00	2	0.60
Houses affected	1	1.00	0	0.00	0	0.00	0	0.00	1	1.00	0	0.00	2	0.60
Good with big trucks able to pass	0	0.00	0	0.00	1	2.90	0	0.00	0	0.00	1	1.90	2	0.60
Big help to motorists	0	0.00	0	0.00	2	5.90	0	0.00	0	0.00	0	0.00	2	0.60
Loss of livelihood near the highway/ roads	0	0.00	0	0.00	0	0.00	0	0.00	1	1.00	0	0.00	1	0.30
Total	**96**	**100**	**49**	**100**	**34**	**100**	**31**	**100**	**96**	**100**	**52**	**100**	**358**	**100**

Source: Socio-economic Survey; NOTE: No answer = 32 (Cagayan de Oro City – 2, Sumilao – 11, Malaybalay – 11, Manolo Fortich – 2, Tagoloan -3, Impasug-ong – 3)

Opinion towards the Project – The survey showed that 90.3 percent of the respondents stated that the Project will significantly help the community and local residents (orange cell in **Table 3-147**). About three percent stated that the Project will be either detrimental or will not help the community at all.

Table 3-147. Opinions regarding the proposed Project

Opinion	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Will help the community a lot	92	94.80	52	86.70	27	77.10	38	92.70	85	89.50	50	94.30	344	90.30
Will be able to help but not much	3	3.10	5	8.30	6	17.10	3	7.30	6	6.30	0	0.00	23	6.00
Will be detrimental to the community	1	1.00	3	5.00	1	2.90	0	0.00	2	2.10	2	3.80	9	2.40
Will not help the community	0	0.00	0	0.00	0	0.00	0	0.00	2	2.10	1	1.90	3	0.80
In between	1	1.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Others: Gov't will benefit	0	0.00	0	0.00	1	2.90	0	0.00	0	0.00	0	0.00	1	0.30
Total	**97**	**100**	**60**	**100**	**35**	**100**	**41**	**100**	**95**	**100**	**53**	**100**	**381**	**100**

Source: Socio-economic Survey; Note: No answer = 9 (Cagayan de Oro City – 1, Sumilao – 1, Tagoloan – 2, Manolo Fortich – 3, Impasug-ong – 2

3.4.3.5 Environmental change

The survey revealed several environmental changes perceived by the respondents in the past five years on air, land, water, forest, population, and solid waste management. Respondents who perceived "more changes" conveyed the top three issues as population/migration, traffic congestion, and land conversion into subdivisions (green cells in **Table 3-148**). Respondents who cited "less changes" indicated the top three environmental as solid waste, flooding in lowlands, and forest cover issues (orange cells in **Table 3-148**).

With regards to the changes considered as having the most effect on the community and daily life, the top five responses included impact of COVID-19 pandemic (17.4%), financial crisis/no income/business down/high prices of goods (15.2%), traffic congestion (10.8%), okay/no problem (9.2%), and population growth/migration (9.2%) (orange cells in **Table 3-149**). A close look at the data revealed that while the COVID19 pandemic was not mentioned, it emerged as having the most expected effect with Cagayan de Oro City (23.5%) and Impasug-ong (20.4%). It is worthy to note that during the interviews, Cagayan de Oro City was placed in modified enhanced community quarantine (MECQ). The municipality of Impasug-ong had also a high COVID19 infection rate and strictly observe health protocols amidst the atmosphere of anxiety and fear. The economic slowdown is considered the next change that would affect the community and the household daily affairs with Malaybalay posting the highest at 24.4% and closely followed by Sumilao (20.7%). Population issue resurfaced as the expected change that would affect the constituents. The other responses included air pollution, combination of problems (traffic, flooding, pollution and water problem), solid waste management, flooding, less farm income due to lease of lots to companies, and many more others (denuded forest cover/landslide/ schooling of children affected /no source of electricity).

Perceived beneficial effects of the Project – Respondent opinions on Project effects to their community varied. Beneficial effects were mostly economic such as local employment (35.7%), community projects (20.1%), industrialization of the community (19%), and revenue/income accruing to the locality (13.2%). Some mentioned social related issues such as community solidarity and traffic system. **Table 3-150** summarizes the opinions of the respondents regarding perceived beneficial effects of the Project.

Table 3-148. Changes observed in the community during the past five years

Response	Cagayan de Oro				Malaybalay				Tagoloan				Sumilao				Manolo Fortich				Impasug-ong				Total			
	More		Less		More		Less		More		Less		More		Less		More		Less		More		Less		More		Less	
Factories/ power plants/ industries	13	4.15	27	6.98	4	1.99	28	10.53	16	12.31	4	2.4	4	3.2	14	7.73	31	7.85	23	6.34	9	5.77	24	7.69	77	5.83	120	7.16
Lands converted into subdivision	39	12.46	36	9.3	21	10.45	29	10.9	12	9.23	21	12.57	10	8	23	12.71	69	17.47	21	5.79	11	7.05	35	11.22	162	12.27	165	9.84
Farm harvest	15	4.79	57	14.73	16	7.96	32	12.03	4	3.08	27	16.17	18	14.4	18	9.94	45	11.39	35	9.64	19	12.18	32	10.26	117	8.86	201	11.99
Flooding in low lands	26	8.31	50	12.92	8	3.98	39	14.66	12	9.23	20	11.98	8	6.4	22	12.15	28	7.09	48	13.22	6	3.85	41	13.14	88	6.67	220	13.13
Forest cover	11	3.51	57	14.73	18	8.96	30	11.28	4	3.08	23	13.77	17	13.6	15	8.29	21	5.32	53	14.6	18	11.54	28	8.97	89	6.74	206	12.29
Population/ migration	70	22.36	14	3.62	36	17.91	20	7.52	32	24.62	4	2.4	30	24	9	4.97	77	19.49	10	2.75	36	23.08	17	5.45	281	21.29	74	4.42
Water pollution	23	7.35	50	12.92	21	10.45	26	9.77	9	6.92	19	11.38	8	6.4	21	11.6	27	6.84	47	12.95	16	10.26	32	10.26	104	7.88	195	11.63
Air/noise pollution	38	12.14	37	9.56	25	12.44	19	7.14	17	13.08	13	7.78	12	9.6	18	9.94	35	8.86	39	10.74	19	12.18	29	9.29	146	11.06	155	9.25
Traffic congestion	59	18.85	15	3.88	32	15.92	15	5.64	19	14.62	12	7.19	10	8	19	10.5	43	10.89	32	8.82	16	10.26	33	10.58	179	13.56	126	7.52
Solid wastes	19	6.07	44	11.37	20	9.95	28	10.53	5	3.85	24	14.37	8	6.4	22	12.15	19	4.81	55	15.15	6	3.85	41	13.14	77	5.83	214	12.77
Total	**313**	**100**	**387**	**100**	**201**	**100**	**266**	**100**	**130**	**100**	**167**	**100**	**125**	**100**	**181**	**100**	**395**	**100**	**363**	**100**	**156**	**100**	**312**	**100**	**1320**	**100**	**1676**	**100**

Source: Socio-economic Survey; NOTE; Multiple Responses

Table 3-149. Changes having the most effect on the community and daily life

Changes having the most effect on the community	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Impact of pandemic	19	23.46	5	11.90	3	10.34	5	17.24	13	15.29	10	20.41	55	17.41
Financial crisis; no income; business down; high prices of goods	14	17.28	10	23.81	2	6.90	6	20.69	10	11.76	6	12.24	48	15.19
Traffic congestion	12	14.81	3	7.14	8	27.59	3	10.34	7	8.24	1	2.04	34	10.76
Okay; no problem	5	6.17	0	0.00	1	3.45	0	0.00	7	8.24	16	32.65	29	9.18
More Population/ Migration	3	3.70	5	11.90	1	3.45	0	0.00	17	20.00	3	6.12	29	9.18
Air pollution (e.g., factories)	2	2.47	3	7.14	4	13.79	4	13.79	14	16.47	1	2.04	28	8.86
Combination of problems: traffic, flooding, pollution and water problem	8	9.88	2	4.76	2	6.90	1	3.45	6	7.06	3	6.12	22	6.96
Solid waste management	2	2.47	6	14.29	0	0.00	1	3.45	2	2.35	1	2.04	12	3.80
Flooding	10	12.35	0	0.00	1	3.45	0	0.00	0	0.00	0	0.00	11	3.48
Less farm income due to lease of lots to companies	0	0.00	2	4.76	2	6.90	1	3.45	3	3.53	0	0.00	8	2.53
Others	1	1.23			2	6.90	3	10.34	1	1.18	1	2.03	8	2.53
Destroyed roads	0	0.00	0	0.00	2	6.90	3	10.34	0	0.00	1	2.04	6	1.90
Water Pollution	2	2.47	0	0.00	0	0.00	1	3.45	1	1.18	2	4.08	6	1.90
Problem of water supply	3	3.70	1	2.38	0	0.00	0	0.00	1	1.18	0	0.00	5	1.58
Noise pollution	0	0.00	0	0.00	0	0.00	0	0.00	2	2.35	2	4.08	4	1.27
Farm conversion to subdivision	0	0.00	1	2.38	0	0.00	1	3.45	1	1.18	0	0.00	3	0.95
Drugs and heavy alcohol drinking	0	0.00	2	4.76	0	0.00	0	0.00	0	0.00	1	2.04	3	0.95
Traffic accident, accident prone	0	0.00	1	2.38	1	3.45	0	0.00	0	0.00	0	0.00	2	0.63
Farm to Market Road	0	0.00	1	2.38	0	0.00	0	0.00	0	0.00	1	2.04	2	0.63
Total	**81**	**100**	**42**	**100**	**29**	**100**	**29**	**100**	**85**	**100**	**49**	**100**	**315**	**100**

Source: Socio-economic Survey; NOTE: No answer = 75 **(**Cagayan de Oro City – 17, Sumilao – 13, Malaybalay – 18, Manolo Fortich – 13, Tagoloan. -8, Impasug-ong – 6)

Table 3-150. Perceived positive and beneficial impacts of the Project

Positive Effects/ Impacts	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Employment for some local residents	61	39.35	38	30.89	18	34.62	25	33.78	53	37.59	29	22.31	224	35.73
Assisting community projects/development	30	19.35	26	21.14	7	13.46	16	21.62	25	17.73	22	16.92	126	20.10
Industrialization of the community	19	12.26	28	22.76	8	15.38	17	22.97	23	16.31	24	18.46	119	18.98
Income/revenue to the barangay/municipality/city/province	17	10.97	19	15.45	5	9.62	10	13.51	14	9.93	18	13.85	83	13.24
None/ not sure/ Nothing to narrate	13	8.39	0	0.00	7	13.46	0	0.00	14	9.93	11	8.46	45	7.18
Community solidarity	12	7.74	12	9.76	4	7.69	6	8.11	10	7.09	25	19.23	21	3.35
Help ease out traffic	3	1.94	0	0.00	3	5.77	0	0.00	1	0.71	0	0.00	7	1.12
Others	0	0.00	0	0.00	0	0.00	0	0.00	1	0.71	1	0.77	2	0.32
Total	**155**	**100**	**123**	**100**	**52**	**100**	**74**	**100**	**141**	**100**	**130**	**100**	**627**	**100**

NOTE: Multiple responses; Source: Socio-economic survey

Perceived adverse impacts of the Project – The top five perceived adverse impacts comprising about 57 percent of the responses were traffic congestion, noise pollution, decrease in farm harvest, air pollution, and flooding (orange cells in **Table 3-151**). More than a third (34.6%) had no response and not sure of any adverse impacts (green cell in **Table 3-151**). Other environment-related issues mentioned were decrease in ground water resources, health hazard, peace and order issues, water pollution, affected by road widening and others.

Table 3-151. Perceived adverse impacts of the Project

Impact	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
None/ not sure	51	41.46	0	0.00	20	43.48	0	0.00	46	39.66	38	61.29	155	34.60
Traffic congestion	19	15.45	9	14.75	6	13.04	9	22.50	21	18.10	1	1.61	65	14.51
Noise pollution/ disturb residents	13	10.57	10	16.39	8	17.39	8	20.00	17	14.66	7	11.29	63	14.06
Decrease in farm harvest	5	4.07	15	24.59	2	4.35	11	27.50	22	18.97	5	8.06	60	13.39
Air pollution	13	10.57	8	13.11	5	10.87	6	15.00	2	1.72	4	6.45	38	8.48
Flooding	11	8.94	10	16.39	1	2.17	2	5.00	2	1.72	2	3.23	28	6.25
Decrease in ground water resources	1	0.81	4	6.56	1	2.17	1	2.50	4	3.45	1	1.61	12	2.68
Health hazard	2	1.63	1	1.64	3	6.52	0	0.00	1	0.86	2	3.23	9	2.01
Peace and order hazard	1	0.81	3	4.92	0	0.00	2	5.00	1	0.86	1	1.61	8	1.79
Water pollution	3	2.44	1	1.64	0	0.00	1	2.50	0	0.00	1	1.61	6	1.34
Affected by road widening	2	1.63	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.45
Others	2	1.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.44
Total	**123**	**100**	**61**	**100**	**46**	**100**	**40**	**100**	**116**	**100**	**62**	**100**	**448**	**100**

Source: Socio-economic Survey

3.4.3.6 Aspiration

More than three-fourths (79.8%) of the respondents wanted to work for the Project if given the chance while the rest were either were unwilling or not sure (**Table 3-152**). The responses indicated that the residents view the Project as a generator of work or employment and an economic opportunity.

Table 3-152. Opinion on working for the proposed Project

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	77	79.40	53	88.30	27	73.00	37	88.10	74	76.30	41	75.90	309	79.80
No	13	13.40	3	5.00	8	21.60	3	7.10	11	11.30	11	20.40	49	12.70
Not sure	7	7.20	4	6.70	2	5.40	2	4.80	12	12.40	2	3.70	29	7.50
Total	**97**	**100**	**60**	**100**	**37**	**100**	**42**	**100**	**97**	**100**	**54**	**100**	**387**	**100**

Source: Socio-economic Survey; Note: No answer = 3 (Cagayan de Oro City – 1, Manolo Fortich – 1, Impasug-ong – 1)

Table 3-153 summarizes the reasons for the positive response regarding the job opportunities. Most of the reasons were primarily economic where almost half (49%) conveyed the Project as an additional income source. Almost a third (32.3%) recognized employment/work for the residents' children and with the Project

providing access. On the other hand, the negative response regarding job opportunity were focused on business (33.3%), have existing work (33.1%), not good senior citizens (11.1%), no one can work; underage children; women (11.1%), allergy to dust and health issues (6.7%), and absence of skill (6.7%). These were the reasons why the respondents were uninterested in working with the Project underscoring presence of work, age and health matters, and absence of skill. In addition, the reasons given for the "*not sure*" responses were COVID19 pandemic, farming as work, and not good as the reasons behind uncertainty.

Table 3-153. Opinion on allowing oneself or a household member to work for the proposed Project

Affirmative reasons	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Additional income source; help financial difficulties; able to buy rice	29	39.73	20	45.45	15	60.00	18	52.94	30	44.78	26	66.67	138	48.94
Employment/work for residents/children/ work accessible to residents	27	36.99	17	38.64	5	20.00	7	20.59	24	35.82	11	28.21	91	32.27
Yes; accept; good	6	8.22	2	4.55	0	0.00	7	20.59	2	2.99	0	0.00	17	6.03
Others: it depends if there is something for us; we are all women	8	10.96	3	6.82	1	4.00	1	2.94	3	4.48	1	2.56	17	6.03
High salary	2	2.74	1	2.27	2	8.00	0	0.00	3	4.48	0	0.00	8	2.84
Progress/development	1	1.37	0	0.00	1	4.00	0	0.00	5	7.46	1	2.56	8	2.84
Others: Business advantage/Support schooling of children	0	0.00	1	2.27	1	4.00	1	2.94	0	0.00	0	0.00	3	1.06
Total	**73**	**100**	**44**	**100**	**25**	**100**	**34**	**100**	**67**	**100**	**39**	**100**	**282**	**100**
Negative reasons	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Focus on business	7	58.3	0	0.00	1	14.3	2	66.7	2	20	3	27.3	15	33.3
Have work already	0	0.00	0	0.00	1	14.3	1	33.3	5	50	7	63.6	14	31.1
Not good with our old age; senior	3	25	0	0.00	1	14.3	0	0.00	0	0.00	1	9.1	5	11.1
No one can work; underage children; women	0	0.00	2	100	1	14.3	0	0.00	2	20	0	0.00	5	11.1
Allergy to dust; health issue	0	0.00	0	0.00	3	42.9	0	0.00	0	0.00	0	0.00	3	6.7
No skill	2	16.7	0	0.00	0	0.00	0	0.00	1	10	0	0.00	3	6.7
Total	**12**	**100**	**2**	**100**	**7**	**100**	**3**	**100**	**10**	**100**	**11**	**100**	**45**	**100**
Reason for Not Sure response	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Might have another work/have work	4	57.14	2	50.00	1	50.00	0	0.00	1	8.33	1	50.00	9	30.00
It depends the type of work	1	14.29	1	25.00	1	50.00	0	0.00	3	25.00	0	0.00	6	20.00
Focus on business	1	14.29	0	0.00	0	0.00	2	66.67	2	16.67	0	0.00	5	16.67
Can’t accommodate; child still young and schooling	1	14.29	0	0.00	0	0.00	0	0.00	3	25.00	1	50.00	5	16.67
Partner is elderly	0	0.00	0	0.00	0	0.00	0	0.00	2	16.67	0	0.00	2	6.67
Others: Because of covid pandemic/ engaged in farming	0	0.00	1	25.00	0	0.00	1	33.33	1	8.33	0	0.00	3	10.00
Total	**7**	**100**	**4**	**100**	**2**	**100**	**3**	**100**	**12**	**100**	**2**	**100**	**30**	**100**

3.4.3.7 Attitude towards the Project

Approval on the Project – In general, a high majority (94.6%) of the respondents indicated approval of the Project against the 1.3 percent opposed (**Table 3-154**). About four percent were not sure whether they approve of the Project.

Table 3-154. Approval of the Project

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	94	95.90	56	93.30	34	94.400	42	100.00	92	93.90	50	90.90	368	94.60
No	1	1.00	1	1.70	0	0.00	0	0.00	2	2.00	1	1.80	5	1.30
Not sure	3	3.10	3	5.00	2	5.60	0	0.00	4	4.10	4	7.30	16	4.10
Total	98	100	60	100	36	100	42	100	98	100	55	100	389	100

Source: Socio-economic Survey; Note: No answer = 1 (Tagoloan -1)

The top three reasons of the respondents approving the Project were the expected convenience due to fast travel, road improvement, reduction of traffic congestion (31.7%); progress of the community (28.4%); and less traffic congestion (9.8%). About 3.4 percent mentioned the connection of farm-to-market roads and reduced susceptibility to accidents. The rest of the responses mentioned economic benefits such as work, employment, good roads for investors, and additional income.

Those opposing responded that the Project might affect their living and income source and cutting of trees. Those taking the "not sure stand" stated the Project might affect their house, displace people, and destroy the environment. These issues were underscored during the public consultations.

Approval upon abatement of negative impacts – A large majority (83%) approved the Project if the adverse effects are mitigated, 4.2 percent still gave a negative response, and 13 percent unsure (**Table 3-156**). The top five reasons for the "Yes", "No" and "Not Sure" responses to Project approval if adverse impacts are mitigated are enumerated below. The summary of the responses is shown in **Table 3-157**.

a) Affirmative response
   - Address the issues/concerns; good process
   - Depends on the contractor
   - Development and big help to the community and people; easy to transport

b) Negative response
   - Develop community; depends on situation; can be control
   - Environment will be affected
   - Others: this is a govt project; no comment

c) Not sure response
   - Don't know; can't decide; not certain; it depends; no comment
   - Farmers' source of water and houses will be affected
   - Others: provided no serious difficulties

Table 3-155. Reasons for approving the establishment of the Project

Affirmative reasons	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Easy travel, access easy and wide/ beautiful roads for vehicles; improved roads with overpass	27	30.70	13	31.70	5	15.60	16	41.00	27	32.90	16	34.80	104	31.70
For progress/improvement; big help; for a change; for the good of the people; for the next generation	24	27.30	14	34.10	10	31.30	11	28.20	21	25.60	13	28.30	93	28.40
Lessen traffic	10	11.40	4	9.80	5	15.60	4	10.30	6	7.30	3	6.50	32	9.80
Agree	11	12.50	5	12.20	3	9.40	2	5.10	6	7.30	1	2.20	28	8.50
It's a government project	3	3.40	2	4.90	5	15.60	3	7.70	11	13.40	2	4.30	26	7.90
Connect farm-to-market roads	1	1.10	1	2.40	0	0.00	2	5.10	4	4.90	3	6.50	11	3.40
Lessen/no accident; no longer prone to accident	4	4.50	0	0.00	0	0.00	0	0.00	4	4.90	3	6.50	11	3.40
Work/employment	4	4.50	1	2.40	3	9.40	0	0.00	0	0.00	0	4.30	10	3.00
Good roads for investors	3	3.40	0	0.00	1	3.10	1	2.60	2	2.40	0	0.00	7	2.10
Additional income	1	1.10	1	2.40	0	0.00	0	0.00	1	1.20	2	4.30	5	1.50
Others: just enough and important	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	2.20	1	0.30
Total	88	100	41	100	32	100	39	100	82	100	46	100	328	100
Negative reasons	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Might affect our living/-affect income source	0	0.00	1	100.00	0	0.00	0	0.00	1	50.00	1	100.00	3	75.00
Trees cut down	0	0.00	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00	1	25.00
Total	0	0.00	1	100	0	0.00	0	0.00	2	100	1	100	4	100
Reason for Not Sure response	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Affect houses	2	66.70	1	33.30	0	0.00	0	0.00	0	0.00	2	66.70	5	45.50
Displace people	0	0.00	0	0.00	1	100.00	0	0.00	1	100.00	1	33.30	3	27.30
It depends on the project	1	33.30	1	33.30	0	0.00	0	0.00	0	0.00	0	0.00	2	18.20
Destroy the environment	0	0.00	1	33.30	0	0.00	0	0.00	0	0.00	0	0.00	1	9.10
Total	3	100	3	100	1	100	0	0.00	1	100	3	100	11	100

Source: Socio-economic Survey

Table 3-156. Approval of the Project if the adverse impacts are mitigated

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	75	77.30	54	93.10	31	83.80	35	92.10	80	85.10	38	71.70	313	83.00
No	2	2.10	3	5.20	2	5.40	1	2.60	4	4.30	4	7.50	16	4.20
Not sure	20	20.60	1	1.70	4	10.80	2	5.30	10	10.6	11	20.80	48	12.70
Total	97	100	58	100	37	100	38	100	94	100	53	100	377	100

Source: Socio-economic Survey; NOTE: No answer = 13 (Cagayan de Oro City – 1, Sumilao – 4, Malaybalay – 2, Manolo Fortich – 4, Impasug-ong – 2)

Table 3-157. Reason for the approval/disapproval upon mitigation of adverse impacts

Affirmative reason	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Address the issues/concerns; good process	8	13.1	8	25	10	40	9	32.1	12	20.3	12	34.3	59	24.6
Depends on the contractor	24	39.3	1	3.1	5	20	1	3.6	8	13.6	2	5.7	41	17.1
Development and big help to the community and people; easy to transport	7	11.5	6	18.8	3	12	6	21.4	9	15.3	4	11.4	35	14.6
Safer roads; less accident; safety ensured	7	11.5	4	12.5	2	8	6	21.4	5	8.5	8	22.9	32	13.3
Can't go against the government	2	3.3	6	18.8	2	8	2	7.1	9	15.3	0	0.00	21	8.8
Less traffic	4	6.6	3	9.4	0	0.00	1	3.6	5	8.5	2	5.7	15	6.3
As long as lands and plants affected are paid; settle obligation	2	3.3	1	3.1	0	0.00	0	0.00	5	8.5	2	5.7	10	4.2
Okay if not damaging	3	4.9	0	0.00	1	4	1	3.6	3	5.1			8	3.3
Others: no comment; balance positive and negative; no more muddy roads; way to assist the elderly cross the street	2	3.28	1	3.13	0	0.00	1	3.57	1	1.69	2	5.71	8	3.33
Help each other; unite	2	3.3	1	3.1	2	8	0	0.00	2	3.4	0	0.00	7	2.9
Road accessible to farmers	0	0.00	1	3.1	0	0.00	0	0.00	0	0.00	3	8.6	4	1.7
Total	**61**	**100**	**32**	**100**	**25**	**100**	**28**	**100**	**59**	**100**	**35**	**100**	**240**	**100**
Negative reason	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Develop community; depends on situation; can be control	0	0.00	0	0.00	1	100	0	0.00	1	33.3	1	33.3	3	30
Environment will be affected	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	66.7	2	20
Others: this is a govt project; no comment	0	0.00	0	0.00	0	0.00	1	100	1	33.3	0	0.00	2	20
Negative reason	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	

	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Vulnerable to flooding	0	0.00	0	0.00	0	0.00	0	0.00	1	33.3	0	0.00	1	10
People will be affected	0	0.00	1	100	0	0.00	0	0.00	0	0.00	0	0.00	1	10
There's a positive and negative effect	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	10
Total	**1**	**100**	**1**	**100**	**1**	**100**	**1**	**100**	**3**	**100**	**3**	**100**	**10**	**100**
Reason for Not Sure response	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Don't know; can't decide; not certain; it depends; no comment	12	85.7	0	0.00	3	100	2	100	3	37.5	4	40	24	64.9
Farmers' source of water and houses will be affected	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	50	5	13.5
Others: provided no serious difficulties	0	0.00	0	0.00	0	0.00	0	0.00	2	25	1	10	3	8.1
Neutral; no choice	2	14.3	0	0.00	0	0.00	0	0.00	3	37.5	0	0.00	5	13.5
Total	**14**	**100**	**0**	**0.00**	**3**	**100**	**2**	**100**	**8**	**100**	**10**	**100**	**37**	**100**

Source: Socio-economic Survey

Consultation to the community – A high majority (94.3%) of the respondents indicated the importance of community consultation about the Project with Sumilao and Cagayan de Oro each with 95% affirmation (**Table 3-158**).

Table 3-158. Opinion on consulting the community about the Project

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	N	%	N	%	N	%	N
Yes	93	94.90	58	98.30	33	89.20	38	95.00	90	93.80	50	92.60	362	94.30
No	2	2.00	1	1.70	1	2.70	1	2.50	4	4.20	4	7.40	13	3.40
Not sure	3	3.10	0	0.00	3	8.10	1	2.50	2	2.10	0	0.00	9	2.30
Total	98	100	59	100	37	100	40	100	96	100	54	100	384	100

Source: Socio-economic Survey; Note: No answer = 6 (Malaybalay – 1, Manolo Fortich – 2, Sumilao – 2, Impasug-ong – 1)

The top three reasons behind the need for community consultation were a) augmenting the awareness level (57.1%), b) proper dissemination of information (15%), and c) proper decision making/consent (10.7%). The main reasons of the respondents who answered that community consultation was unnecessary were a) positive effects of the Project (69.23%), b) IEC fatigue, i.e., meetings have been previously conducted (23.1%) and c) no one can go against the Project (7.7%). Respondents with unsure stances gave the following reasons: a) awareness (37.5%), b) Project will depend on the government (37.5%), and c) minimal effect on the poor (25%).

Participation in meetings and consultations – A high majority (83.5%) of the respondents were willing to attend meetings and consultations about the Project with Sumilao having the highest affirmation at 95.2 percent followed by Manolo Fortich and Cagayan de Oro City with 77.68 and 78.6 percent respectively (**Table 3-160**).

The reasons for wanting to attend meetings and concentrated shown in **Table 3-161** were mostly on awareness and knowledge about the Project updates and additional information (29.7%) and knowledge about the process and activities/programs and guidelines (21.5%).

Table 3-159. Reasons for consulting the community about the Project

Affirmative reasons	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Raise awareness; inform the people on project purposes for them to be aware of the good /bad effects	55	62.50	27	58.70	12	40.00	24	70.60	45	56.30	23	47.90	186	57.10
Proper information	8	9.10	7	15.20	10	33.30	2	5.90	14	17.50	8	16.70	49	15.00
Proper decision making; consent by barangay	8	9.10	4	8.70	5	16.70	5	14.70	5	6.30	8	16.70	35	10.70
Gather peoples' perceptions	11	12.50	3	6.50	2	6.70	3	8.80	6	7.50	6	12.50	31	9.50
Explain and coordinate	3	3.40	2	4.30	0	0.00	0	0.00	6	7.50	0	0.00	11	3.40
Follow legal process	0	0.00	2	4.30	1	3.30	0	0.00	2	2.50	0	0.00	5	1.50
Agree to have wide roads	0	0.00	1	2.20	0	0.00	0	0.00	1	1.30	2	4.20	4	1.20
Importance of drainage	2	2.30	0	0.00	0	0.00	0	0.00	1	1.30	0	0.00	3	0.90
Follow rituals of the natives	1	1.10	0	0.00	0	0.00	0	0.00	0	0.00	1	2.10	2	0.60
Total	**88**	**100**	**46**	**100**	**30**	**100**	**34**	**100**	**80**	**100**	**48**	**100**	**326**	**100**
Negative reasons	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Positive effects of the Project	2	100	0	0.00	1	100.00	1	100	3	75.00	2	50.00	9	69.23
They won't listen/meetings have been conducted before	0	0.00	1	100	0	0.00	0	0.00	1	25.00	1	25.00	3	23.10
Others: No one can go against the government	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	25.00	1	7.70
Total	**2**	**100**	**1**	**100**	**1**	**100**	**1**	**100**	**4**	**100**	**4**	**100**	**13**	**100**
Reason for Not Sure response	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Awareness/for us to know/they will take charge	1	33.30	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	3	37.50
It depends on the gov't	1	33.30	0	0.00	1	50.00	0	0.00	1	50.00	0	0.00	3	37.50
The poor will not be much affected and people will know	1	33.30	0	0.00	0	0.00	1	100.00	0	0.00	0	0.00	2	25.00
Total	**3**	**100**	**0**	**0.00**	**2**	**100**	**1**	**100**	**2**	**100**	**0**	**0.00**	**8**	**100**

Source: Socio-economic Survey

Table 3-160. Participation in meetings and consultations about the Project

Response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Yes	77	78.60	52	86.70	32	86.50	40	95.20	76	77.60	48	88.90	325	83.50
No	6	6.10	3	5.00	2	5.40	0	0.00	5	5.10	1	1.90	17	4.40
Not sure	15	15.30	5	8.30	3	8.10	2	4.80	17	17.30	5	9.30	47	12.10
Total	**98**	**100**	**60**	**100**	**37**	**100**	**42**	**100**	**98**	**100**	**54**	**100**	**389**	**100**

Source: Socio-economic Survey; Note: No answer = 1 (Impasug-ong – 1)

Table 3-161. Reason for participation in meetings and consultations

Affirmative reason	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Knowledge/awareness about the Project	26	36.11	11	29.73	9	34.62	11	33.33	18	27.27	8	17.78	83	29.75
Knowledge about the process and activities/programs, processes, guidelines	14	19.44	11	29.73	5	19.23	12	36.36	8	12.12	10	22.22	60	21.51
Might conflict with schedules; busy with business/work; depends on time; if not far; if there is invitation	12	16.67	2	5.41	3	11.54	1	3.03	12	18.18	2	4.44	32	11.47
Provided if available; with time; short period; always attending; willing	5	6.94	2	5.41	4	15.38	4	12.12	5	7.58	8	17.78	28	10.04
Just attend; no problem	5	6.94	5	13.51	2	7.69	2	6.06	8	12.12	6	13.33	28	10.04
Understand the benefits or good effects and improvements of the project/ to gain knowledge what is to be done regarding the project; not to be ignorant	8	11.11	3	8.11	2	7.69	2	6.06	6	9.09	6	13.33	27	9.68
Know if house and lot will be affected	0	0	0	0	1	3.85	0	0	0	0	3	6.67	4	1.43
Others- attend if given money and fare/ to voice out questions not complaints	0	0	1	2.7	0	0	0	0	3	4.55	0	0	4	1.43
Need to get involved and listen; to help; to share the info	2	2.78	2	5.41			1	3.03	6	9.09	2	4.44	13	4.66
Total	**72**	**100**	**37**	**100**	**26**	**100**	**33**	**100**	**66**	**100**	**45**	**100**	**279**	**100**
Negative reason	**CDO**		**Malaybalay**		**Tagoloan**		**Sumilao**		**Manolo Fortich**		**Impasug-ong**		**Total**	

	N	%	N	%	N	%	N	%	N	%	N	%	N	%
busy; no time; working	1	33.3	3	100	1	50	0	0.00	2	50	0	0.00	7	53.8
this is a govt project	0	0.00	0	0.00	0	0.00	0	0.00	1	25	1	100	2	15.4
if given the schedule	2	66.7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	15.4
afraid of covid pandemic	0	0.00	0	0.00	1	50	0	0.00	1	25	0	0.00	2	15.4
Total	**3**	**100**	**3**	**100**	**2**	**100**	**0**	**0.00**	**4**	**100**	**1**	**100**	**13**	**100**

Reason for Not Sure response	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
It depends if available; not conflict with schedule; if no work; depends on the situation and time	11	73.33	3	60	2	66.67	2	100	8	50	1	20	27	58.7
Busy; preoccupied with business	1	6.67	2	40	1	33.33	0	0.00	5	31.25	3	60	12	26.09
having high blood pressure; dialysis of husband	0	0.00	0	0.00	0	0.00	0	0.00	3	18.75	0	0.00	3	6.52
There is pandemic	2	13.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	4.35
Others: have children to take care	1	6.67	0	0.00	0	0.00	0	0.00	0	0.00	1	20	2	4.35
Total	**15**	**100**	**5**	**100**	**3**	**100**	**2**	**100**	**16**	**100**	**5**	**100**	**46**	**100**

Source: Socio-economic Survey

3.4.4 Key Informant Interviews

The Key Informant Interviews (KII) conducted from May 28 to June 4, 2021 were participated by 93 locals from the six host cities and municipalities. The distribution of the KII respondents is shown in **Table 3-162**.

Table 3-162. Number of key informant respondents host LGU

Municipality	Sample Size
Tagoloan	13
Cagayan de Oro	13
Manolo Fortich	24
Sumilao	13
Impasug-ong	15
Malaybalay	15
Total	**93**

3.4.4.1 Demographic information of the Key Informants

Sex **–** The overall KII participants on the average comprised of 55.91 percent female and 44.09 percent male (**Table 3-163**). Male respondents dominated the KII in the municipalities of Tagolona and Sumilao.

Table 3-163. Sex of key Informants

Sex	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Male	5	38.46	7	46.67	8	61.54	7	53.85	9	37.50	5	33.33	41	44.09
Female	8	61.54	8	53.33	5	38.46	6	46.15	15	62.50	10	66.67	52	55.91
Total	**13**	**100**	**15**	**100**	**13**	**100**	**13**	**100**	**24**	**100**	**15**	**100**	**93**	**100**

Source: Key Informant Interview

Age distribution **–** The ages of the key informants ranged from 20 to 60 years old and above where majority (53.76%) were from 40 to 59 years old (orange cells in **Table 3-164**).

Table 3-164. Age of key informants

Age	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
16 – 19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
20 – 29	0	0.00	0	0.00	3	23.08	1	7.69	0	0.00	2	13.33	6	6.45
30 – 39	5	38.46	5	33.33	2	15.38	2	15.38	2	8.33	4	26.67	20	21.51
40 – 49	1	7.69	3	20.00	1	7.69	7	53.85	10	41.67	3	20.00	25	26.88
50 – 59	5	38.46	5	33.33	3	23.08	1	7.69	7	29.17	4	26.67	25	26.88
60 & above	2	15.38	2	13.33	4	30.77	2	15.38	5	20.83	2	13.33	17	18.28
Total	13	100	15	100	13	100	13	100	24	100	15	100	93	100

Source: Key Informant Interview

Civil status – The total average distribution of the key informant civil status was 72.04 percent married and 18.27 percent single (**Table 3-165**). In addition, more than the majority of the key informants across the host LGUs were married.

Table 3-165. Civil status of key informants

Civil status	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Single	3	23.08	2	13.33	4	30.77	1	7.69	2	8.33	5	33.33	17	18.28
Married	8	61.54	11	73.33	9	69.23	11	84.62	19	79.17	9	60.00	67	72.04
Widow	2	15.38	2	13.33	0	0.00	1	7.69	3	12.50	1	6.67	9	9.68
Total	13	100	15	100	13	100	13	100	24	100	15	100	93	100

Source: Key Informant Interview

Educational attainment – About a third of the key informants were college graduates (38.70%) followed by respondents who had secondary level education (17.20%). The educational attainment profile of the key informants is summarized in **Table 3-166.**

Table 3-166. Educational attainment of key informants

Educational attainment	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Elementary Level	0	0.00	1	6.67	3	23.08	0	0.00	1	4.17	0	0.00	5	5.38
Elementary Graduate	1	7.69	1	6.67	0	0.00	0	0.00	0	0.00	4	26.67	6	6.45
High School Level	4	30.77	2	13.33	2	15.38	2	15.38	4	16.67	2	13.33	16	17.20
High School Graduate	1	7.69	2	13.33	2	15.38	3	23.08	3	12.50	2	13.33	13	13.98
College Level	2	15.38	2	13.33	1	7.69	0	0.00	6	25.00	3	20.00	14	15.05
College Graduate	5	38.46	7	46.67	4	30.77	6	46.15	10	41.67	4	26.67	36	38.71
Vocational	0	0.00	0	0.00	1	7.69	2	15.38	0	0.00	0	0.00	3	3.23
Total	13	100	15	100	13	100	13	100	24	100	15	100	93	100

Source: Key Informant Interview

Occupation – About a fourth (25.8%) of the key informants were barangay officials followed by 14 percent in business and teachers (12.9%). Other occupations of the key informants were farmers, drivers, pastor/priest, government employees and midwives. About two percent of the key informants were housewives and IPs. The occupation distribution of the key informants is shown in **Table 3-167**.

Table 3-167. Occupation of the key informants

Occupation	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Housewife	0	0.00	0	0.00	1	7.70	0	0.00	1	4.00	0	0.00	2	2.20
Barangay Officials	3	23.10	2	14.30	3	23.10	2	25.00	6	24.00	8	40.00	24	25.80
Barangay employee	0	0.00	2	14.30	2	15.40	0	0.00	3	12.00	0	0.00	7	7.50
Barangay Health Worker	1	7.70	3	21.40	0	0.00	1	12.50	1	4.00	2	10.00	8	8.60
Teacher	2	15.40	3	21.40	2	15.40	1	12.50	1	4.00	3	15.00	12	12.90
Farmer	1	7.70	3	21.40	0	0.00	2	25.00	1	4.00	1	5.00	8	8.60
Business	3	23.10	1	7.10	2	15.40	0	0.00	5	20.00	2	10.00	13	14.00
Driver	2	15.40	0	0.00	2	15.40	1	12.50	1	4.00	1	5.00	7	7.50%
Pastor/ priest	1	7.70	0	0.00	0	0.00	1	12.50	1	4.00	0	0.00	3	3.20
Government	0	0.00	0	0.00	1	7.70	0	0.00	2	8.00	3	15.00	6	6.50

Occupation	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
employee														
IPMR	0	0.00	0	0.00	0	0.00	0	0.00	2	8.00	0	0.00	2	2.20
Midwife	0	0.00	0	0.00	0	0.00	0	0.00	1	4.00	0	0.00	1	1.10
Total	13	100	14	100	13	100	8	100	25	100	20	100	93	100

Source: Key Informant Interview

Key Informant sector – The sectors representing the key informants were host LGUs (30.1%), business sector (14%), education (12.9%), health (9.7%), and farmer and transportation (7.5%). Other sectors included religious, IPs, agriculture, CENRO, MPDO, PWD, and Women's group. **Table 3-168** shows the sector distribution of the key informants.

Table 3-168. Sector represented by key informants

Sector	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Agriculture	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	5.00	1	1.10
Business	3	23.10	1	7.10	2	15.40	0	0.00	5	20.00	2	10.00	13	14.00
CENRO	0	0.00	0	0.00	0	0.00	0	0.00	1	4.00	0	0.00	1	1.10
Education	2	15.40	3	21.40	2	15.40	1	12.50	1	4.00	3	15.00	12	12.90
Farmer	1	7.70	3	21.40	0	0.00	2	25.00	0	.00	1	5.00	7	7.50
Health	1	7.70	3	21.40	0	0.00	1	12.50	2	8.00	2	10.00	9	9.70
IPs	0	0.00	1	7.10	0	0.00	0	0.00	3	12.00	0	0.00	4	4.30
LGU	3	23.10	2	14.30	5	38.50	2	25.00	7	28.00	9	45.00	28	30.10
Mayor's Office	0	0.00	0	0.00	0	0.00	0	0.00	1	4.00	0	0.00	1	1.10
MPDO-MPDC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	5.00	1	1.10
PWD and Parents	0	0.00	1	7.10	0	0.00	0	0.00	0	0.00	0	0.00	1	1.10
Religion	1	7.70	0	0.00	1	7.70	1	12.50	2	8.00	0	0.00	5	5.40
Transportation	2	15.40	0	0.00	2	15.40	1	12.50	1	4.00	1	5.00	7	7.50
Women's	0	0.00	0	0.00	1	7.70	0	0.00	2	8.00	0	0.00	3	3.20
Total	13	100	14	100	13	100	8	100	25	100	20	100	93	100

Source: Key Informant Interview; Note: CENRO – City Environment and Natural Office, IPs – Indigenous People, LGU – Local Government Unit, MPDO-MPDC – Municipal Planning and Development Coordinator/Officer, PWD – People with Disabilities

Awareness of local traffic ordinances and safety – More than three-fourths (78.49%) of the participants were unaware of the local traffic ordinances and safety in their areas (**Table 3-169**).

Table 3-169. Awareness of traffic safety ordinances

Response	Frequency	Percent
Yes	20	21.51
No	73	78.49
Total	93	100

Source: Key Informant Interview

Among key informants who were aware, 55 and 18.18 percent said there were local and municipal ordinances respectively (**Table 3-170**). In addition, 18.18 percent said these ordinances pertained to wearing of safety gears, while 9.09 percent said it was slowing down near school premises. Other specific local ordinances related to installing road humps to slow traffic, signage for construction sites, no parking along the highway, banning trucks in the city roads, speed limits and ban on noisy mufflers.

Table 3-170. Local ordinances identified by the key informants pertaining to traffic safety

Local Ordinances	NR	% of total

Yes, there are ordinances	11	55.0
Wearing of safety gears	2	18.18
Municipal Ordinances	2	18.18
City – slow down school premise	1	9.09
Implementing /humps in the barangay/construction signage	1	9.09
No parking along the highway truck ban within the city	1	9.09
Peace and order	1	9.09
Speed limit / noisy muffler	1	9.09
Total	**20**	**100.0**

Source: Key Informant Interview; NOTE: NR – number of responses

Common problems in the community **-** The common community problems according to the key informants were 1) issues on ancestral land, 2) road/transportation issues, 3) financial problems, 4) lack of social services, 5) peace and security, 6) social issues, 7) COVID-19 pandemic, 8) and informal settler concerns. Issues of IP ancestral lands was the top problems in the communities (**Table 3-171**).

Table 3-171. Common problems observed in the community (Multiple Responses)

Common problems in the community	NR	% of total
IP/ancestral domain issues		
Ancestral domain issues	14	11.29
Ancestral domain, road to hinterland IP community	2	1.61
The ancestral domain is settled but the poor are still suffering	1	0.81
There is land grabbing of IP lands	1	0.81
Poverty among the IPs, ancestral land is not secured	1	0.81
Land conflict for land sold without proper documents	1	0.81
Road/transportation issues		
Road is slippery when it rains, damaged and muddy roads	7	5.65
Traffic, accident prone area, no lane for bicycles	3	2.42
Motorists that are abusive, noisy motorcycles	3	2.42
Traffic congestion, it is not clear where the jeepney stop is	2	1.61
Agriculture, farm to market road, farm inputs (seedlings and fertilizers), sustain their start-up business	1	0.81
Accessibility of buildings, highways, sidewalk	1	0.81
Dust due to construction of roads	1	0.81
Hit and run accidents	1	0.81
Underage children driving without license	1	0.81
Accident prone areas, lack of water supply, COVID-19 cases increasing	1	0.81
Road accidents	1	0.81
Parking space due to crowded area	1	0.81
Need for road construction going to the interior	1	0.81
The road is small even though it is 4 lanes, parking on the shoulder can still cause traffic	1	0.81
The road will not be paved due to military reservation	1	0.81
Difficult to travel due to few numbers of transportation vehicles and fare is very expensive	1	0.81
Miscommunication, wrong information about the road under construction	1	0.81
Financial problems/ issues		
Lack of livelihood projects and issues for farmers in selling their products	4	3.23
Financial issues, family problems	3	2.42
Difficult to bring products to the market and the price is very cheap; very cheap price of corn	2	1.61
Financial issues, unemployed	2	1.61
Financial problem of the organization	1	0.81
Child labor, distance of houses from school / economic status / lack of funding for incoming college students	1	0.81
Food security problem	1	0.81
Social services issues		

Common problems in the community	NR	% of total
Lack of water supply, slow water pressure	5	4.03
Garbage segregation, poverty, crime	2	1.61
Water system, road and drainage system	1	0.81
Dirty canal which causes flooding	1	0.81
Slow internet connection	1	0.81
4Ps selection is biased for those relatives/close people with the officials	1	0.81
Peace and security issues		
Out of school youth loitering, alcoholism among the youth	9	7.26
Crime, theft	4	3.23
Drug abuse or addiction	3	2.42
Peace and order due to high insurgency rates and NPA threats	3	2.42
Peace and security, gang rivalry	3	2.42
Gossiping, lack of discipline	2	1.61
Social issues		
Teenage pregnancy, right now we are educating our youth to decrease the highest problem in our society	7	5.65
Children have different attitudes from the youth before	1	0.81
Children sleep late due to online games / PC games	1	0.81
Illegal gambling such as cockfighting	1	0.81
Delayed pension for the senior citizen	1	0.81
COVID-19 issues		
COVID-19 – fear and anxiety	9	7.26
Not following the health protocols for COVID-19	3	2.42
There are people who do not want to be vaccinated for COVID-19 vaccine	1	0.81
Mental health problems due to stress	1	0.81
Informal settlers		
Proliferation of informal settlers	2	1.61
Migrants coming in and planting potatoes which had an effect on our laborers	1	0.81
Total	125	100

Source: Key Informant Interview; NOTE: NR – number of responses

Skills of the residents **-** The top three skills mentioned by the key informants shown in **Table 3-172** with an aggregated response of 57.15 percent were driving, cooking, and farming.

Table 3-172. Skills of the community members

Skills	NR	% of total
Driving	21	57.15
Cooking	19	19.39
Farming	16	16.33
Fishing	5	5.1
Food processing, pot making, cooking, facemask making	5	5.1
Handicraft making	5	5.1
Carpentry, labor, mason, electrical, welding, plumbing	5	5.1
Carpentry	4	4.08
Mason, labor	3	3.06
Electrical	2	2.04
Computer literate	2	2.04
Dress making	2	2.04
Creativity in designing, online business	1	1.02
Business	1	1.02
Carpentry, welding, mechanic	1	1.02
Knife making, bag making, mat weaving	1	1.02
Laborer, carpentry, mason	1	1.02
Packaging in Del Monte	1	1.02
Plumber, mason	1	1.02

Skills	NR	% of total
Singing	1	1.02
Welding, plumber, carpenter, mason	1	1.02
Total	98	100

Source: Key Informant Interview; NOTE: NR – number of responses

3.4.4.2 Suggested alternative livelihood

For men and women – The top five alternative livelihood suggested by the key informants for both men and women included handicraft making, farming, business, livestock raising and Technical Education and Skills Development Authority (TESDA) courses as well as Advance Learning System (ALS) courses (orange cells in **Table 3-173**). Other alternative livelihood suggested were establishing a cooperative, construction work, cooking, financial support for farmers, food processing training, food courier/online food selling, rice selling, dressmaking, fish selling, gardening, micro-credit, financial literacy, online selling, and working on tourist attractions.

For men only – The top five alternative livelihood suggested by key informants for men only were farming and training/financial help, carpentry and equipment, skills training on various skills, agricultural projects, and driving (orange cells in **Table 3-174**). Other suggestions were capital for livestock raising, construction work, fishing, handicraft making, and business on hardware supplies, buy and sell business, electrical training, factory worker, financial assistance for small business, food processing, vegetable growing, online business, and TESDA trainings.

Table 3-173. Suggested alternative livelihood for men and women

Alternative Livelihood	NR	% of Total
Handicraft training (rag making, basket weaving, wallets made out of recyclable materials)	14	14.43
Farming	10	11.34
Business, mini market or mini mart, used clothing (ukay-ukay) or repair shop	7	7.22
Livestock raising with provision of feeds	7	7.22
TESDA courses (welding, driving, carpentry)	6	6.19
Advance Learning System (ALS) -skills training, food processing	5	5.15
Financial support, post-harvest facilities, skill training for farmers, farm tractor credit	5	5.15
Cooperative	4	4.12
Construction work	4	4.12
Cooking	4	4.12
Food processing training	4	4.12
Food courier/ food vending/ consignment/online food selling	3	3.09
Gardening	3	3.09
Rice selling	2	2.06
Dress making	2	2.06
Enhanced farming skills, enhanced business skills	2	2.06
Fish selling	2	2.06
Bamboo products, corn-innovate products	1	1.03
Computer literacy and education and trainings	1	1.03
Stove pot making	1	1.03
Employment	1	1.03
Improvement training	1	1.03
Micro-credit	1	1.03
Financial literacy	1	1.03
Motor parts cooperative	1	1.03
Online selling	1	1.03
Seminar on capability building, how to market the products	1	1.03
Small business	1	1.03
Working on tourist attractions	1	1.03
Total	97	100

Source: Key Informant Interview; NOTE: NR – number of responses

Table 3-174. Alternative livelihood for men and women

Alternative Livelihood	NR	% of Total
Farming, training on farming, financial assistance	8	15.09
Carpentry and carpentry equipment	7	13.21
Skills training on black smiting, mechanic, carpentry, welding	7	13.21
Agricultural projects/activities	5	9.43
Driving	4	7.55
Capital for backyard livestock raising	3	5.66
Construction work	3	5.66
Fishing	2	3.77
Handicraft making - wallet making	2	3.77
Business involving hardware	1	1.89
Buy and sell business	1	1.89
Electrical training	1	1.89
Factory worker	1	1.89
Financial assistance for small business	1	1.89
Food processing	1	1.89
Home-grown vegetable	1	1.89
Livelihood	1	1.89
Online business	1	1.89
Plantation employment	1	1.89
TESDA training	1	1.89
Employment	1	1.89
Total	53	100

Source: Key Informant Interview; NOTE: NR – number of responses

For women only – The top five alternative livelihood suggested by key informants for women only were food processing training, TESDA training on various courses/skills, training on cosmetology, cooking viands, and gardening (orange cells in **Table 3-175**). Other suggestions were handicraft making, financial support for small business, online business training, mental health seminars/webinars, baking and pastry training, bamboo cultivation, buy and sell, farming, flower plantation, rice selling, livestock raising and selling used clothing.

Table 3-175. Alternative livelihood for women only

Alternative Livelihood	NR	% of Total
Food processing - cheese making, coffee processing	14	19.18
TESDA training on dress making, face mask, eco-bags, curtains, rag making, soap making, mat weaving	14	19.18
Trainings on cosmetology, massage and spa, housekeeping	9	12.33
Cooking viands	6	8.22
Gardening of vegetables and other plants	5	6.85
Handicraft making - mat weaving, slipper making, bamboo stick making, scrub making	5	6.85
Financial support for small business	4	5.48
On-line business trainings	4	5.48
Mental health seminars/webinars, responsible parenting seminars, women empowerment seminars	3	4.11
Baking and pastry training	2	2.74
Bamboo shoot cultivation and harvesting	1	1.37
Buy and sell	1	1.37
Farming	1	1.37
Flower plantation	1	1.37
Rice selling	1	1.37
Livestock raising	1	1.37
Selling used clothing (ukay-ukay)	1	1.37
Total	**73**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

For youth (boys and girls) - The top five alternative livelihood suggested by key informants for the youth were sports activities, livelihood programs/trainings, computer literacy trainings, TESDA trainings, and anti-drug campaigns (orange cells in **Table 3-176**). Other suggestions include community service, provision of school supplies, part time job, handicraft making, mental health and spirituality seminars/webinars, multi-purpose projects, values formation seminars, business trainings, teenage pregnancy seminars, faith-based projects, farming, livelihood trainings, and others.

Table 3-176. Suggested projects for youth (boys and girls)

Alternative Livelihood	NR	% of total
Sports – volleyball, cycling, basketball	18	17.82
Livelihood programs, trainings	14	13.86
Computer literacy, digital literacy, vlog making, responsible use of social media	7	6.93
TESDA for out of school youth, technical skills	5	4.95
Anti-drug campaigns, drug awareness seminars	4	3.96
Community service – tree planning, barangay beautification projects	4	3.96
School supplies giving books, life skills training	4	3.96
Part time job	3	2.97
Handicraft making - basket making, rag making,	3	2.97
Mental health, spirituality seminars	3	2.97
Multi-purpose projects	3	2.97
Social responsibilities awareness, values formation	3	2.97
Business, business training, small business	3	2.97
Teenage pregnancy seminars	2	1.98
Faith based projects – Bible study, choir	2	1.98
Farming	2	1.98
Livestock and poultry raising	2	1.98
Livelihood for out of school youth, skills training	2	1.98
Dressmaking training	2	1.98
Scholarship, funding vocational courses	2	1.98
Gardening, bonsai planting	2	1.98
Advocacy to eradicate gadgets	1	0.99
Bonsai planting	1	0.99
Capability building	1	0.99
Clean up drive	1	0.99
Digital library	1	0.99
Environmental awareness webinars/ seminars	1	0.99
Financial management training	1	0.99
Giving gadgets project	1	0.99
Landscaping	1	0.99
Online selling training	1	0.99
Peace and order seminars	1	0.99
Total	**101**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

Suggested programs and projects for youth - The top five programs and projects suggested by key informants for the youth particularly the boys were sports activities, TESDA skills training, seminars and counselling on HIV, sex education and teenage pregnancy, farming training, and community service (orange cells in **Table 3-177**). For the girls, the topmost five suggestions are training on various handicrafts, cooking, food processing, gardening, and baking and pastry trainings.

Table 3-177. Suggested projects for youth – boys and girls

Suggested programs/projects for youth – boys	NR	% of total
Sports activities – basketball, sports clinic	16	40
TESDA Skills training – carpentry, welding, massage, haircut, barber, electronics, dressmaking	7	17.5
Seminars and counseling on HIV and health literacy, sex education, drug addiction, teenage pregnancy	6	15
Farming training on organic farming	3	7.5
Community service such as tree planting	2	5
Construction work	1	2.5
Government support and financial aid then monitoring for the livelihood	1	2.5
Out school youth program like skills training	1	2.5
Part time job for out of school youth	1	2.5
Training on rescue	1	2.5
Values formation seminars/ trainings	1	2.5
Total	40	100
Suggested programs/projects for the youth – girls	**NR**	**% of total**
Training on basket making, dress making, doormat making, crotchety, bread making	8	19.05
Cooking	5	11.9
Food processing	3	7.14
Gardening	3	7.14
Baking and pastry	3	7.14
Seminar on non-traditional work such as welding and plumbing	3	7.14
Livelihood program	2	4.76
Sports – volleyball, badminton	2	4.76
Art designing	1	2.38
Buy and sell	1	2.38
Cosmetology	1	2.38
Dance contest	1	2.38
Education, team building activities, pageants	1	2.38
Faith-based activities	1	2.38
Mental health seminars	1	2.38
Training on organizing events	1	2.38
Suggested programs/projects for the youth – girls	**NR**	**% of total**
Pasalubong center	1	2.38
Handicraft product from recycled materials	1	2.38
Proper waste management	1	2.38
Selling vegetables	1	2.38
Training on vlogging	1	2.38
Total	**42**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

3.4.4.3 Attitude towards the Project

Acceptability of the Project **-** With regards to Project acceptability, 89.24% of the key informants were favorable of the Project with the rest (5.38%) unfavorable and uncertain. **Table 3-178** shows that the top five reasons for favoring the Project were 1) accessibility of transportation (38.55%), 2) farm-to-market roads for products (26.51%), 3) improvement of economic status (13.25%), 4) good road (7.23%), and 5) the children enjoying the benefits (3.61%).

Table 3-178. Reasons for favorable attitude towards the Project

Reasons for favorable attitude	NR	% of total
Accessibility of transportation, ease of traffic/ less traffic, convenience in travelling	32	38.55
Accessibility from farm to market, less expenses for the farmers in transporting products	22	26.51
If this project means to improve our economic status/growth increase employment opportunities, or produce more positive impacts	11	13.25
Good wide road, road is not muddy, high standard highway	6	7.23
Our children will enjoy the benefits	3	3.61
Business near the road will be enhanced	3	3.61
Reduces road accidents	2	2.41
Improve tourism since MF is a gateway	2	2.41
Increases the value of land	1	1.2
Increases the number of cars that can access the roads	1	1.2
Total	**83**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

Unfavorable attitude towards the Project - On the other hand, **Table 3-179** shows that the reasons why the Project was unfavorable to some key informants were traffic accidents (40.0%), air pollution (20.0%), environment impacts (20.0%), inconvenience during construction (20.0%), and non-or insufficient compensation of affected lands (20.0%).

Table 3-179. Reasons for unfavorable attitude towards the project

Reasons for unfavorable views	NR	% of total
Accidents may happen because of high speed	2	40.00
Air pollution	1	20.00
Might destroy the environment since more forest will be destroyed	1	20.00
Landowners' compensation/payment if not properly negotiated will become a problem	1	20.00
Total	**5**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

Uncertain attitudes towards the Project **-** The reasons for uncertain key informants shown in **Table 3-180** were a) affected lands may affect their livelihood (40.0%), b) lack of Project knowledge (20.0%), c) need for more discussion about the Project (20.0%), and d) road accidents and increase the waste generated (20.0%).

Table 3-180. Reasons for uncertain attitude towards the project

Reasons for uncertainty	NR	% of total
Don't want their land and house to be affected; Farmlands might be affected which would impact on their livelihood	2	40.00
No knowledge about the project at present, there is a need to gather more information from the community if they are in favor or not;	1	20.00
There is still a lot of things to be discussed about the project	1	20.00
There might be more road accidents. Increased waste due to the people throwing garbage in the highway	1	20.00
Total	**5**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

3.4.5 Assessment of key impacts and mitigating measures

Summary of the mitigating measures

The potential impacts of the Project on the people and its corresponding mitigation measures are summarized in Table 3-181.

Table 3-181. Summary of potential impact and mitigation measures

Potential Impact	Proposed mitigation measures
- Displacement of settler/s - Displacement / disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on Public Access	- Authority document over RROW - Conduct census of properties and land affected by the staging areas and RROW - Conduct consultations with the stakeholders and formulate mutually agreed schemes - Prepare and implement a Resettlement Action Plan (RAP)
- In-migration - Proliferation of Informal Settlers or "followers"	- Prepare and implement an Informal Settler Monitoring Plan - Monitor arrival of informal dwellers within the Project area - Prioritize local hiring
- Impacts on IPs/Cultures/Lifestyle	- Proper conduct of the FPIC process - Proper orientation of migrant workers on culture oriented on the culture and ways of living in the city/municipality
- Impacts on physical cultural resources	- Conduct survey of physical cultural resources, if necesary
- Threat to public health and safety	- Prepare and proper implement the following: ・Formulate Occupational Health and Safety Protocols during construction and operation phases ・Establish Grievance Redress Mechanism - Conduct sensitization campaigns both for workers and local communities about illicit behavior and crime - Coordination with local law enforcement
- Enhancement for the Local Benefits of the Project - Generation of Local Employment	- Conduct skills training at the host LGUs - Prepare a local employment plan - Prioritize hiring of qualified residents from the host barangays - Enhance the business opportunities during its constructions through the purchasing of supplies from local sources - Provision of livelihood opportunities if possible - Prompt payment of taxes and other legal fees
- Threat to delivery of basic services and resource competition	- Implement the Informal Settler Monitoring Plan - Coordination of DPWH/contractor with the host LGUs regarding needs of the migrants and residents of the community
- Traffic contribution along impact roads	- Traffic Management Plan that details that will manage the traffic flow must be prepared and properly implemented during the construction phase. - Schedule transport of heavy equipment during period when there are fewer vehicles on the road - Posting of appropriate traffic signage and warnings should also be established. - Predetermined routes of construction materials - Strict implementation of Construction Plan specifications for each Project component

3.4.5.1 Displacement of settlers

Number of households and household size

Cagayan de Oro City, Misamis Oriental

The 2020 household population of Cagayan de Oro City is presented in **Table 3-182**. The city has a population of 728,402. The household population is 723,671 and the number of households is 190,225 with an average size of 3.8.

Meanwhile, Barangay Carmen has the most populated barangay with 77,756 followed by Balulang with 42,205. Kauswagan comes in 3rd with 40,239 followed by Lapasan with 39,234, Bulua with 35,397 and Camaman-an with 35,238. On the other hand, Barangay 39 was the least populated with only 17 individuals. Other least populated barangays were Barangays 16, 6, and 5.

Table 3-182. Household population of Cagayan de Oro City, 2020

Barangay	Population	No of HH
Agusan	19,039	5,010
Baikingon	2,879	758
Bulua	35,397	9,315
Balubal	7,013	1,846
Balulang	42,205	11,107
Barangay 10 (Pob.)	557	147
Barangay 11 (Pob.)	162	43
Barangay 12 (Pob.)	257	68
Barangay 13 (Pob.)	965	254
Barangay 14 (Pob.)	351	92
Barangay 15 (Pob.)	1,847	486
Barangay 16 (Pob.)	25	7
Barangay 17 (Pob.)	2,058	542
Barangay 18 (Pob.)	1,269	334
Barangay 19 (Pob.)	227	60
Barangay 2 (Pob.)	50	13
Barangay 21 (Pob.)	363	96
Barangay 22 (Pob.)	3,324	875
Barangay 23 (Pob.)	936	246
Barangay 24 (Pob.)	607	160
Barangay 26 (Pob.)	1,215	320
Barangay 27 (Pob.)	1,601	421
Barangay 28 (Pob.)	493	130
Barangay 3 (Pob.)	93	24
Barangay 30 (Pob.)	678	178
Barangay 32 (Pob.)	792	208
Barangay 33 (Pob.)	84	22
Barangay 34 (Pob.)	529	139
Barangay 38 (Pob.)	48	13
Barangay 39 (Pob.)	17	4
Barangay 4 (Pob.)	68	18
Barangay 40 (Pob.)	339	89
Barangay 6 (Pob.)	33	9
Barangay 8 (Pob.)	90	24
Barangay 9 (Pob.)	130	34
Barangay 5 (Pob.)	34	9
Bayabas	13,991	3,682
Bayanga	3,402	895
Besigan	1,700	447
Bonbon	10,976	2,888
Bugo	31,229	8,218
Camaman-an	35,238	9,273
Canito-an	34,250	9,013
Carmen	77,756	20,462
Consolacion	9,396	2,473
Cugman	23,468	6,176
Dansolihon	6,206	1,633
F. S. Catanico	2,364	622
Gusa	28,974	7,625
Indahag	17,831	4,692

Barangay	Population	No of HH
Iponan	27,521	7,242
Kauswagan	40,239	10,589
Lapasan	39,234	10,325
Lumbia	31,504	8,291
Macabalan	19,562	5,148
Macasandig	23,235	6,114
Mambuaya	5,963	1,569
Nazareth	6,971	1,834
Pagalungan	2,410	634
Pagatpat	13,007	3,423
Patag	17,941	4,721
Pigsag-an	1,428	376
Puerto	13,174	3,467
Puntod	18,775	4,941
San Simon	1,642	432
Tablon	24,578	6,468
Taglimao	1,391	366
Tagpangi	2,823	743
Tignapoloan	5,621	1,479
Tuburan	1,388	365
Tumpagon	2,305	607
Barangay 1 (Pob.)	168	44
Barangay 7 (Pob.)	544	143
Barangay 20 (Pob.)	80	21
Barangay 25 (Pob.)	661	174
Barangay 29 (Pob.)	476	125
Barangay 31 (Pob.)	575	151
Barangay 35 (Pob.)	2,002	527
Barangay 36 (Pob.)	447	118
Barangay 37 (Pob.)	181	48
Total	**728,402**	**190,225**

Source: Philippine Statistics Authority, 2020

Malaybalay City, Bukidnon

The 2020 census population in Malaybalay City was 190,712 with 4,3834 number of households and a household population of 189,048 (**Table 3-183**). Average number of households is 4.3. Barangay Casiang has the largest population with 29,406 while Barangay 5 (Pob.) is the least with 71.

Table 3-183. Household population of Malaybalay, 2020

Barangay	Population	No of HH
Aglayan	8,215	1910
Bangcud	5,771	1342
Busdi	2,644	615
Cabangahan	3,162	735
Caburacanan	1,130	263
Canayan	6,553	1524
Capitan Angel	1,545	359
Casisang	29,406	6839
Dalwangan	7,785	1810
Imbayao	1,817	423
Indalaza	1,979	460
Kalasungay	9,961	2317
Kabalabag	1,199	279
Kulaman	1,291	300
Laguitas	3,899	907
Patpat (Lapu-lapu)	4,366	1015

Barangay	Population	No of HH
Linabo	7,448	1732
Apo Macote	5,024	1168
Miglamin	2,596	604
Magsaysay	3,176	739
Maligaya	2,413	561
Managok	7,567	1760
Manalog	1,035	241
Mapayag	1,045	243
Mapulo	1,675	390
Barangay 1 (Pob.)	6,442	1498
Barangay 2 (Pob.)	587	137
Barangay 3 (Pob.)	438	102
Barangay 4 (Pob.)	344	80
Barangay 5 (Pob.)	71	17
Barangay 6 (Pob.)	474	110
Barangay 7 (Pob.)	1,891	440
Barangay 8 (Pob.)	579	135
Barangay 9 (Pob.)	9,187	2137
Barangay 10 (Pob.)	3,447	802
Barangay 11 (Pob.)	3,034	706
Saint Peter	2,817	655
San Jose	9,213	2143
San Martin	3,326	773
Santo Niño	1,845	429
Silae	2,681	623
Simaya	4,713	1096
Sinanglanan	3,644	847
Sumpong	9,243	2150
Violeta	2,269	528
Zamboanguita	1,765	410
Total	**190,712**	**43,839**

Philippine Statistics Authority, 2020

Barangay Sta. Cruz is the most populous having 20 percent of the 2020 population of Tagoloan (**Table 3-184**). The second most populated is Barangay Poblacion with 10,326 followed by the Barangay Baluarte with 10,860. The barangay with the least population was the upland barangay of Rosario with 1,130 inhabitants. The total population is 80,319, the household population is 80,051 while the household number is 19,799. The average number per household is 4.0.

Table 3-184. Household population of Tagoloan, 2020

Barangay	Population	No of HH
Baluarte	10,860	2,715
Casinglot	10,207	2,552
Gracia	2,935	734
Mohon	4,349	1,087
Natumolan	10,878	2,720
Poblacion	10,326	2,582
Rosario	1,130	283
Santa Ana	9,010	2,253
Santa Cruz	16,022	4,006
Sugbongcogon	4,602	1,151
Total	**80,319**	**19,799**

Philippine Statistics Authority, 2020

Sumilao, Bukidnon

The municipality of Sumilao composed of 10 barangays has a population of 29,531 with a household population of 29,455 and a household size of 6,849. The 2020 population of the DIB Puntian, Kisolon, Kulasi, Poblacion, Roque and Vista Villa is shown in **Table 3-185**.

Barangay Kisolon, the central business district and the seat of government offices, is the most populated barangay with a population of 12,306 (**Table 3-185**) followed by Barangay Poblacion with a population of 4,927. Barangay Occasion on the other hand had the lowest population of only 617. It has 4.3 average population per household.

Table 3-185. Population and household population of Sumilao (2015)

Barangay	Population	No of HH
Kisolon	12,306	2,862
Culasi	617	143
Licoan	976	227
Lupiagan	978	227
Ocasion	735	171
Puntian	1,642	382
San Roque	1,380	321
San Vicente	3,301	768
Poblacion	4,927	1,146
Vista Villa	2,669	621
Total	**29,531**	6,849

Source: Philippine Statistics Authority, 2020

Manolo Fortich, Bukidnon

Manolo Fortich has a total population of 113,200. The household population is 113,043 while the number of households is 26,196. Manolo Fortich has an average household size of 4.3. The first three with the largest populations among the 11 urban and urbanizing barangays comprising 1/3 of the municipal population are Barangays Damilag (16,303), Alae (11,913) and Agusan Canyon, (9,234). The first two are the locations of Del Monte Philippines Incorporated (DMPI) pineapple plantation while the latter is an urban expansion area. The population increase in Barangay Alae was attributed to the presence of REBISCO, a large biscuit manufacturing company.

Table 3-186. Population of Manolo Fortich

Barangay	Total pop.	No. of HH
Agusan Canyon	9,234	2,147
Alae	11,913	2,770
Dahilayan	1,812	421
Dalirig	5,444	1,266
Damilag	16,303	3,791
Diclum	4,507	1,048
Guilang-guilang	1,459	339
Kalugmanan	4,158	967
Lindaban	2,535	590
Lingion	6,861	1,596
Lunocan	7,879	1,832
Maluko	4,447	1,034
Mambatangan	5,332	1,240
Mampayag	1,498	348
Minsuro	756	176
Mantibugao	3,725	866
Tankulan (Pob.)	8,954	2,082
San Miguel	5,515	1,283
Sankanan	3,776	878

Barangay	Total pop.	No. of HH
Santiago	1,569	365
Santo Niño	4,170	970
Ticala	1,353	315
Total	**113,200**	**26,196**

Source: Philippine Statistics Authority, 2020

Impasug-ong, Bukidnon

The total population of the municipality is 53,863. The urban barangay which is the Poblacion has the higest population of 12,693 followed by the urbanizing barangays of Impalutao (7,081), Kalabugao (5,482), Kibenton (4,977), and La Fortuna (4,812) (**Table 3-187**). The household population of Impasug-ong is 53,272 with 11,843 number of households

Table 3-187. Household population of Impasug-ong (2015)

Barangay	Total pop.	No. of HH
Bontongon	889	207
Bulonay	1,815	422
Capitan Bayong	3,751	872
Cawayan	2,315	538
Dumalaguing	2,991	696
Guihean	2,559	595
Hagpa	2,995	697
Impalutao	7,081	1,647
Kalabugao	5,482	1,275
Kibenton	4,977	1,157
La Fortuna	4,812	1,119
Poblacion	12,693	2,952
Sayawan	1,503	350
Total	**53,863**	**11,843**

3.4.5.1.1 Population density and growth

Northern Mindanao

The results of the 2020 Census of Population and Housing showed that the total population of Northern Mindanao reached 5,022,768 accounting for 4.61 percent of the country's population.

The region's population in 2020 was higher by 333,466 persons than its 2015 population of 4.69 million; 725,445 higher than its population of 4.30 million in 2010; and 1,517,060 higher than its population of 3.51 million in 2000. **Table 3-188** shows the population of Northern Mindanao based on various censuses. Its population increased by 1.46 percent annually from 2015 to 2020. This population growth rate (PGR) was slower than the PGR for the period 2010 to 2015 and even much slower than the PGR for the period 2000 to 2010.

Table 3-188. Total population of Northern Mindanao

Census Year	Total Population	Growth rate
1980	2,226,169	
1990	2,811,646	2.23
2000	3,505,708	2.06
2010	4,297,323	1.68
2015	4,689,302	1.46
2020	5,022,768	1.57

Source: Philippine Statistics Authority, 2020

Region X is composed of two highly urbanized cities (HUCs), seven component cities, 84 municipalities, and 2,022 barangays. By province, Bukidnon had the largest population (1,541,308) followed by Misamis Oriental (956,900), Lanao del Norte (722,902), and Misamis Occidental (617,333). Camiguin had the smallest

population with only 92,808 persons. The two highly urbanized cities of Region X, Cagayan de Oro City and Iligan City, posted a population of 728,402 and 363,115, respectively.

Bukidnon was the fastest growing province in the region with an annual population growth rate (PGR) of 1.81 percent from 2015 to 2020 followed by Misamis Oriental (1.57%).

Table 3-189. Total population of Northern Mindanao by selected areas

Province/HUC	Total population			
	2000	2010	2015	2020
Bukidnon	1, 060, 4115	1, 299, 192	1, 415, 226	1, 541, 308
Misamis Oriental	664, 338	813, 856	888, 509	956, 900
Cagayan de Oro city	461, 877	602, 088	675, 950	728, 402

Note: HUC – highly urbanized city; Source: Philippine Statistics Authority, 2020

Among the cities (excluding the City of Cagayan de Oro and the City of Iligan) and municipalities in the region, the City of Malaybalay in Bukidnon had the largest population. Other cities/municipalities that reached the 100 thousand population was Manolo Fortich, Quezon, and Maramag which are all in the province of Bukidnon.

Cagayan de Oro City

The city posted a total population of 728,402 persons as of May 1, 2020 (**Table 3-190**). This represents an increase of 52,452 persons over the total population of 675,950 in 2015. The 2020 figures translated to an annual population growth of 1.58 percent from 2015 to 2020. Last 2015, the growth rate is 1.58% from 2010 to 2015. Mambuaya has the highest annual population growth rate of 12.34%, Barangay 3 has the least population growth rate of -20.16% (**Table 3-191**).

Table 3-190. Historical growth of population in CDO

Census Year	Population	Growth rate
2000	461,877	
2010	602,088	2.69
2015	675,950	2.23
2020	728,402	1.58

Source: Philippine Statistics Authority, 2020

Table 3-191. Annual population growth rate of CDO per barangay

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Agusan	19,039	16,261	3.38%
Baikingon	2,879	2,291	4.93%
Balubal	7,013	4,718	8.70%
Balulang	42,205	34,793	4.15%
Barangay 1	168	349	-14.26%
Barangay 10	557	786	-6.99%
Barangay 11	162	204	-4.74%
Barangay 12	257	257	0.00%
Barangay 13	965	1,156	-3.73%
Barangay 14	351	526	-8.16%
Barangay 15	1,847	2,049	-2.16%
Barangay 16	25	36	-7.39%
Barangay 17	2,058	2,280	-2.13%
Barangay 18	1,269	1,561	-4.27%
Barangay 19	227	352	-8.82%

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Barangay 2	50	71	-7.12%
Barangay 20	80	69	3.16%
Barangay 21	363	535	-7.84%
Barangay 22	3,324	2,192	9.16%
Barangay 23	936	928	0.18%
Barangay 24	607	795	-5.52%
Barangay 25	661	1,113	-10.39%
Barangay 26	1,215	2,621	-14.94%
Barangay 27	1,601	1,610	-0.12%
Barangay 28	493	536	-1.74%
Barangay 29	476	448	1.28%
Barangay 3	93	271	-20.16%
Barangay 30	678	822	-3.97%
Barangay 31	575	1,170	-13.89%
Barangay 32	792	1,166	-7.82%
Barangay 33	84	67	4.87%
Barangay 34	529	634	-3.74%
Barangay 35	2,002	2,239	-2.33%
Barangay 36	447	679	-8.42%
Barangay 37	181	141	5.40%
Barangay 38	48	67	-6.78%
Barangay 39	17	36	-14.61%
Barangay 4	68	80	-3.36%
Barangay 40	339	791	-16.33%
Barangay 5	34	78	-16.04%
Barangay 6	33	110	-22.39%
Barangay 7	544	511	1.33%
Barangay 8	90	129	-7.30%
Barangay 9	130	315	-17.00%
Bayabas	13,991	13,670	0.49%
Bayanga	3,402	3,289	0.71%
Besigan	1,700	1,673	0.34%
Bonbon	10,976	9,573	2.92%
Bugo	31,229	30,893	0.23%
Bulua	35,397	32,348	1.91%
Camaman-an	35,238	30,927	2.78%
Canito-an	34,250	27,815	4.48%
Carmen	77,756	70,492	2.09%
Consolacion	9,396	10,433	-2.18%
Cugman	23,468	22,383	1.00%
Dansolihon	6,206	5,550	2.38%
F. S. Catanico	2,364	2,502	-1.19%
Gusa	28,974	26,815	1.64%
Indahag	17,831	16,179	2.07%
Iponan	27,521	26,340	0.93%
Kauswagan	40,239	35,069	2.94%
Lapasan	39,234	43,611	-2.20%
Lumbia	31,504	22,429	7.41%
Macabalan	19,562	20,721	-1.20%
Macasandig	23,235	20,738	2.42%
Mambuaya	5,963	3,431	12.34%
Nazareth	6,971	10,395	-8.07%
Pagalungan	2,410	2,290	1.08%
Pagatpat	13,007	8,456	9.49%
Patag	17,941	17,742	0.24%
Pigsag-an	1,428	1,347	1.24%

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Puerto	13,174	14,318	-1.74%
Puntod	18,775	18,796	-0.02%
San Simon	1,642	1,391	3.55%
Tablon	24,578	23,004	1.40%
Taglimao	1,391	2,249	-9.62%
Tagpangi	2,823	2,649	1.35%
Tignapoloan	5,621	4,866	3.08%
Tuburan	1,388	1,290	1.55%
Tumpagon	2,305	2,433	-1.13%
Total	**728,402**	**675,950**	1.59%

The recent 2020 population shows that Cagayan de Oro has a population density of 1,765 person per sq. m. This shows a significant change of 7.8% from 2015 population (**Table 3-192**)

Table 3-192. Population density in Cagayan de Oro

Year	Total Pop.	Land Area (sq.m)	PD	% Change in PD
2010	602,088	412.8	1,459	12.3
2015	675,950		1,637	21.0
2020	728,402		1,765	7.8

Source: Philippine Statistics Authority, 2020

Malaybalay, Bukidnon

Table 3-193 shows that the population increased from 174,625 in 2015 to 190,712 in 2020. It shows an increase of 16,087 and an average growth rate of 1.87 from 2015. San Jose shows the highest annual growth rate of 6.42% while Barangay 5 has the least with -18.35%.

Table 3-193. Historical growth rate in Malaybalay city

Census Year	Population	Growth rate
2000	123,672	
2010	153,085	2.16
2015	174,625	2.54
2020	190,712	1.87

Source: Philippine Statistics Authority, 2020

Table 3-194. Annual population growth rate of Malaybalay per barangay

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Aglayan	8,215	7,594	1.67%
Apo Macote	5,024	4,903	0.51%
Bangcud	5,771	5,111	2.59%
Barangay 1	6,442	5,293	4.22%
Barangay 10	3,447	2,942	3.39%
Barangay 11	3,034	3,209	-1.17%
Barangay 2	587	969	-10.01%
Barangay 3	438	788	-11.63%
Barangay 4	344	456	-5.76%
Barangay 5	71	186	-18.35%
Barangay 6	474	741	-8.98%
Barangay 7	1,891	2,298	-4.02%
Barangay 8	579	675	-3.18%
Barangay 9	9,187	9,022	0.38%
Busdi	2,644	2,377	2.27%

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Cabangahan	3,162	3,015	1.01%
Caburacanan	1,130	1,150	-0.37%
Canayan	6,553	5,870	2.34%
Capitan Angel	1,545	1,160	6.22%
Casisang	29,406	25,696	2.88%
Dalwangan	7,785	7,004	2.25%
Imbayao	1,817	1,833	-0.18%
Indalaza	1,979	1,690	3.38%
Kabalabag	1,199	1,158	0.74%
Kalasungay	9,961	8,272	3.99%
Kulaman	1,291	1,341	-0.80%
Laguitas	3,899	3,233	4.02%
Linabo	7,448	6,933	1.52%
Magsaysay	3,176	3,001	1.20%
Maligaya	2,413	2,113	2.83%
Managok	7,567	7,200	1.05%
Manalog	1,035	969	1.40%
Mapayag	1,045	979	1.38%
Mapulo	1,675	1,260	6.18%
Miglamin	2,596	3,188	-4.23%
Patpat	4,366	3,833	2.78%
Saint Peter	2,817	2,324	4.13%
San Jose	9,213	6,856	6.42%
San Martin	3,326	3,088	1.58%
Santo Niño	1,845	1,675	2.06%
Silae	2,681	2,629	0.41%
Simaya	4,713	4,161	2.66%
Sinanglanan	3,644	3,262	2.36%
Sumpong	9,243	9,302	-0.13%
Violeta	2,269	2,199	0.66%
Zamboanguita	1,765	1,667	1.21%
Total	**190,712**	**174,625**	**1.87%**

The 2015 population density in Malaybalay is 9.2 persons per square meter (**Table 3-195**). It shows a signficant decrease from 24.6 last 2015.

Table 3-195. Population density by area in Malaybalay

Census Year	Total Pop	Land Area (sq.m)	PD	% Change in PD
2010	153,085	969.19	158	14.1
2015	174,625		180	24.6
2020	190,712		197	9.2

Source: Philippine Statistics Authority, 2020

Tagoloan, Misamis Oriental

Table 3-196 shows that the number of households in the municipality increased from 46,649 in 2000 to 80,319 in 2020. The household population rose to 80,319 with a 1.99% growth from 2015. In terms of the population growth per barangay, Natumolan has the highest growth rate of 5.42% while Sugbongcogon has the least with 0.14% (**Table 3-201**).

Table 3-196. Historical growth rate in Tagoloan

Census Year	Population	Growth rate
2000	46,649	
2010	63,850	3.19

2015	73,150	2.62
2020	80,319	1.99

Source: Philippine Statistics Authority, 2020

Table 3-197. Annual population growth rate of Tagoloan per barangay

Barangay	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Baluarte	10,860	9,612	2.60%
Casinglot	10,207	9,711	1.05%
Gracia	2,935	2,574	2.80%
Mohon	4,349	4,037	1.58%
Natumolan	10,878	8,466	5.42%
Poblacion	10,326	10,235	0.19%
Rosario	1,130	1,045	1.66%
Santa Ana	9,010	8,140	2.16%
Santa Cruz	16,022	14,758	1.74%
Sugbongcogon	4,602	4,572	0.14%
Total	**80,319**	**73,150**	**1.99%**

The gross population density posted by the municipality in 2020 including the uncontested area was 682 persons per square kmeter. This shows a 9.8% change from the previous population density last 2015 of 621 person/sq.m.

Table 3-198. Population density of Tagoloan (2015)

Year	Total Pop	Land Area (sq.m)	PD	% Change in PD
2010	63,850	117.73	542	14.6
2015	73,150		621	25.8
2020	80,319		682	9.8

Source: Philippine Statistics Authority, 2020

Sumilao, Bukidnon

The population of the municipality in 2000 was 17,958 with a growth rate of 3.63 percent (**Table 3-199**). The population increased to 29,531 in 2020 despite a lower a growth rate of 1.41 percent. The increase in population could partly be attributed to in-migration of agro-industrial workers brought by multi-national companies and big investors in the municipality. Barangay Lupiagan has the highest annual groath rate of 4.07%, Culasi has the least with -0.60%.

Table 3-199. Historical growth rate of Sumilao (2000 to 2020)

Census Year	Population	Growth rate
2000	17,958	
2010	25,668	3.63
2015	27,660	1.43
2020	29,531	1.39

Source: Philippine Statistics Authority 2020

Table 3-200. Annual population growth rate of Sumilao per barangay

Barangays	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Culasi	617	635	-0.60%
Kisolon	12,306	11,532	1.38%
Licoan	976	858	2.75%
Lupiagan	978	809	4.07%
Ocasion	735	619	3.68%

Barangays	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Poblacion	4,927	4,705	0.98%
Puntian	1,642	1,566	1.00%
San Roque	1,380	1,264	1.87%
San Vicente	3,301	3,139	1.06%
Vista Villa	2,669	2,533	1.11%
Total	**29,531**	**27,660**	**1.39%**

The municipality has a population density of 150 persons per square kilometer (**Table 3-201**). This shows a 6.8% increase from the 2015 population density of 140 person per sq. km.

Table 3-201. Population density of Sumilao

Year	Total Pop	Land Area (sq.km)	PD	% Change in PD
2010	25,668	196.95	130	7.8
2015	27,660		140	15.0
2020	29,531		150	6.8

Source: Philippine Statistics Authority 2020

Manolo Fortich, Bukidnon

The household population of Manolo Fortich increased from 100,210 in 2015 to 113,200 in 2020. This shows a growth rate of 2.60% from 2015 (**Table 3-202**). With the barangays in Manolo Fortich, Minsuro has the least population growth rate of -5.34% while Damilag has the greatest with 7.21% (**Table 3-203**).

Table 3-202. Historical growth rate in Manolo Fortich

Census Year	Population	Growth rate
2000	74,252	
2010	91,026	2.06
2015	100,210	1.85
2020	113,200	2.60

Source: Philippine Statistics Authority 2020

Table 3-203. Annual population growth rate of Manolo Fortich per barangay

Barangays	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Agusan Canyon	9,234	9,985	-1.63%
Alae	11,913	9,135	5.75%
Dahilayan	1,812	1,743	0.82%
Dalirig	5,444	4,844	2.49%
Damilag	16,303	11,713	7.21%
Diclum	4,507	4,033	2.37%
Guilang-guilang	1,459	1,247	3.36%
Kalugmanan	4,158	3,684	2.58%
Lindaban	2,535	2,325	1.84%
Lingion	6,861	6,336	1.69%
Lunocan	7,879	7,346	1.49%
Maluko	4,447	4,125	1.59%
Mambatangan	5,332	4,349	4.38%
Mampayag	1,498	1,334	2.47%
Mantibugao	3,725	3,185	3.35%
Minsuro	756	981	-5.34%
San Miguel	5,515	4,867	2.67%

Barangays	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Sankanan	3,776	3,737	0.22%
Santiago	1,569	1,554	0.20%
Santo Niño	4,170	3,704	2.53%
Tankulan	8,954	8,711	0.58%
Ticala	1,353	1,272	1.31%
Total	**113,200**	**100,210**	**2.60%**

Based on the 2020 population of 113,200, Manolo fortich has a population density of 274 sq.km per person. Based on the previous population density last 2015 242 sq.km/person there iscan increase of 13% (**Table 3-204**).

Table 3-204. Population density of Manolo Fortich

Year	Total Pop	Land Area (sq.km)	PD	% Change in PD
2010	91,026	413.6	220	10.1
2015	100,210		242	24.4
2020	113,200		274	13.0

Source: Philippine Statistics Authority 2020

Impasug-ong, Bukidnon

The number of households in the municipality increased from 31,173 in 2000 to 53,863 in 2020 (**Table 3-207**). Based on the 2020 census, the current population in Impasug-ong shows a growth rate of 2.14% from 2015. In terms of annual population growth rate, Bulonay has the highest with 3.73% while Hagpa has the least (0.98%) (**Table 3-206**)

Table 3-205. Historical growth rate in Impasug-ong

Census Year	Population	Growth rate
2000	31,173	1.80
2010	43,587	2.52
2015	47,859	2.14
2020	53,863	

Source: Philippine Statistics Authority 2020

Table 3-206. Annual population growth rate of Impasug-ong per barangay

Barangays	Population (2020)	Population (2015)	Annual PGR (2015-2020)
Bontongon	889	800	2.25%
Bulonay	1,815	1,525	3.73%
Capitan Bayong	3,751	3,122	3.94%
Cawayan	2,315	2,080	2.28%
Dumalaguing	2,991	2,800	1.40%
Guihean	2,559	2,128	3.96%
Hagpa	2,995	2,859	0.98%
Impalutao	7,081	6,183	2.90%
Kalabugao	5,482	5,084	1.60%
Kibenton	4,977	4,242	3.42%
La Fortuna	4,812	4,360	2.10%
Poblacion	12,693	11,279	2.52%
Sayawan	1,503	1,397	1.55%
Impasugong Total	**53,863**	**47,859**	**2.52%**

The municipality is sparsely populated having a population density of 51 persons per sq. km. (**Table 3-207**). This shows 12.5% increase from 46 persons per sq. m. last 2015

Table 3-207. Population density of Manolo Fortich

Year	Total Pop	Land Area (sq.km)	PD	% Change in PD
2010	43,587	1051.17	41	9.8
2015	47,859		46	23.6
2020	53,863		51	12.5

Source: Philippine Statistics Authority 2020

3.4.5.1.2 Sex and age profile

Cagayan de Oro City

Table 3-208 shows the distribution of ages of the male and female population in CDO. About 30.81% of the city's population belonged to the age group 0-14 years old. Productive population (ages 15-64 years old) comprised 65.86 percent with a small portion (3.33%) above 65 years old.

Over the last three years, the female population was constantly increasing with a very slight increase of female over male with a sex ratio of 99:100 (**Table 3-208**).

Table 3-208. Population by age group and sex in CDO (2015)

Age group	Male	Female	Total	Age group	Male	Female	Total
Under 1	7207	6,616	13823	45-49	17123	16,992	34115
01-Apr	28952	27,008	55960	50-54	14479	15,139	29618
05-Sep	34442	31,832	66274	55-59	11793	12,751	24544
Oct-14	32110	30,533	62643	60-64	9161	9,902	19063
15-19	34120	34,765	68885	65-69	5514	6,093	11607
20-24	35411	36,291	71702	70-74	2692	3,545	6237
25-29	32690	31,529	64219	75-79	1723	2,579	4302
30-34	27120	25,571	52691	80 years and over	1297	2,371	3668
35-39	23882	22,900	46782	**Total**	**339952**	**335,998**	**675950**
40-44	20236	19,581	39817				

Source: CDO Ecological Profile 2019

Malaybalay, Bukidnon

The city has a relatively young populace with about 70% of its population below 30 years old. There appeared to be more males (52%) than the female (48%) population. **Table 3-209** shows the population distribution by age group and sex.

Table 3-209. Population by age group and sex in Malaybalay (2015)

Age group	Male	Female	Total	Age group	Male	Female	Total
Under 1	2049	2006	4055	45-49	4248	3957	8205
01-Apr	8761	8148	16909	50-54	3787	3461	7248
05-Sep	10043	9253	19269	55-59	3012	2793	5805
Oct-14	9924	9006	18930	60-64	2164	2238	4402
15-19	9810	9280	19090	65-69	1341	1345	2686
20-24	8832	8014	16846	70-74	772	852	1624
25-29	7896	6810	14706	75-79	503	666	1169
30-34	6400	5663	12063	80 years and over	380	665	1045
35-39	5807	5206	11013	**Total**	**90754**	**83871**	**174625**

40-44	5025	4508	9533	Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

About 33 percent of its 2015 population were under 15 years of age or 24,377 (**Table 3-210**). Children below five years old comprised 11.81 percent of the household population in the entire municipality. Children aged 5 to 9 years accounted for 11.24 percent of the population, and those aged 10 to 14 years, another 10.28 percent.

In terms of the distribution by age and sex, there were more males than females in age groups 0 to 54 years in 2015, with the male comprising 51.56 percent of these age groups. In the older age group 55 years old and over, there were more females than males. The females in these age groups made up 51.67 percent.

In 2015, children under 15 years old had a sex ratio of 106 males for every 100 females, while for those aged 15 to 64 years; the ratio was 106 males per 100 females. The sex ratio for the age group 65 years old and over was 81 males per 100 females, portraying the higher mortality of females than males in this age group.

Table 3-210. Population by age group and sex in Tagoloan (2015)

Age group	Male	Female	Total	Age group	Male	Female	Total
Under 1	902	754	1,656	45 - 49	1,727	1,715	3,442
1 - 4	3,601	3,379	6,980	50 - 54	1,495	1,465	2,960
5 - 9	4,188	4,032	8,220	55 - 59	1,284	1,231	2,515
10 - 14	3,851	3,670	7,521	60 - 64	920	939	1,859
15 - 19	3,769	3,644	7,413	65 - 69	586	575	1,161
20 - 24	3,776	3,523	7,299	70 - 74	252	320	572
25 - 29	3,419	3,062	6,481	75 - 79	167	247	414
30 - 34	2,891	2,606	5,497	80 years and over	115	242	357
35 - 39	2,452	2,296	4,748	**Total**	**37,497**	**35,653**	**73,150**
40 - 44	2,102	1,953	4,055	Source: Philippine Statistics Authority, 2015			

Sumilao, Bukidnon

The 2007 household population in Sumilao was comprised of 11,250 males and 10,470 females resulting in a sex ratio of 108 males for every 100 females. The municipality has a fairly young household population with ages 14 and below accounting for 40.04 percent of its 2007 population**. Table 3-211** shows the age group and sex distribution in Sumilao.

Table 3-211. Household population by age group and sex in Sumilao (2007)

Age group	Male	Female	Total	Age group	Male	Female	Total
Under 1	366	346	712	50 - 54	398	367	765
1 - 4	1,319	1,228	2,547	55 - 59	279	220	499
5 - 9	1,505	1,424	2,929	60 - 64	139	149	288
10 - 14	1,342	1,326	2,668	65 - 69	117	117	234
15 - 19	1,217	1,081	2,298	70 - 74	72	94	166
20 - 24	1,062	891	1,953	75 - 79	32	45	77
25 - 29	906	856	1,762	80 and over	40	55	95
30 - 34	767	650	1,417	**0 - 17**	**5,277**	**5,065**	**10,292**
35 - 39	678	606	1,284	**18 and over**	**6,023**	**5,405**	**11,428**
40 - 44	549	516	1,065	**Total**	**11,250**	**10,470**	**21,720**
45 - 49	512	449	961	Source: Sumilao CLUP 2011-2020			

Manolo Fortich, Bukidnon

According to the 2015 PSA census, the 5 to 9 years old age group had the highest population in the municipality (**Table 3-212**). Conversely, the age group with the lowest population is 80 and over with only 514 individuals.

Combining age groups of those aged 14 and below make up 33.54% of the municipal population. Those aged 15 to 64, considered the economically active population and actual or potential members of the work force, constitute 62.71 percent. The old dependent population consisting of the senior citizens (aged 65 and over) comprised 3.75 percent.

The age dependency ratios showed that there are 53 youth dependents for every 100 of the working age population in Manolo Fortich; 6 aged/senior citizens for every 100 of the working population; and overall, 59 dependents (young and old-age) for every 100 of the working population.

Table 3-212. Population by age group and sex in Manolo Fortich (2010)

Age group	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
Under 1	1,811	4.27	1,722	4.27	3,886	4.27
1-4	3,896	9.19	3,826	9.49	8,494	9.33
5-9	4,732	11.17	4,540	11.26	10,199	11.20
10-14	4,307	10.16	4,035	10.01	9,222	10.13
15-19	4,468	10.54	4,213	10.45	9,549	10.49
20-24	4,328	10.21	4,189	10.39	9,369	10.29
25-29	3,700	8.73	3,409	8.45	7,820	8.59
30-34	3,001	7.08	2,714	6.73	6,287	6.91
35-39	2,353	5.55	2,191	5.43	4,998	5.49
40-44	2,163	5.10	1,986	4.92	4,564	5.01
45-49	2,016	4.76	1,910	4.74	4,319	4.74
50-54	1,901	4.49	1,900	4.71	4,181	4.59
55-59	1,538	3.63	1,436	3.56	3,271	3.59
60-64	913	2.15	827	2.05	1,914	2.10
65-69	510	1.20	552	1.37	1,168	1.28
70-74	363	0.86	454	1.13	899	0.99
75-79	213	0.50	232	0.58	490	0.54
80 and over	168	0.40	192	0.48	396	0.44
Total	**42,381**	**100**	**40328**	**100**	**91,026**	**100**

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

The child and youth age group (0 to 14 years old) comprised about 51% of the municipal population while the old age (60 years old and above) only 4.5% (**Table 3-213**). Males also dominate the population with a sex ratio of 110:100.

Table 3-213. Population by age group and sex in Impasug-ong (2015)

Age group	Male	Female	Total	Age group	Male	Female	Total
0-4	3,338	3,238	6,576	40-44	1,334	1,070	2,404
5-9	3,168	2,967	6,135	45-49	1,073	1,003	2,076
10-14	3,004	2,901	5,905	50-54	923	801	1,724
15-19	2,798	2,505	5,303	55-59	653	579	1,232
20-24	2,249	1,960	4,209	60-64	440	389	829
25-29	1,964	1,590	3,554	65 and over	639	678	1,317
30-34	1,724	1,450	3,174	**Total**	**24,852**	**22,412**	**47,264**
35-39	1,545	1,281	2,826				

Source: Impasug-ong CLUP 2019-2028

3.4.5.1.3 Literacy rate and profile of educational attainment

Cagayan de Oro City

Table 3-214 shows that the city has a high level of literacy rate. About 95 percent of its population 10 years old and above are literate. The literacy rate in 2015 was higher among females (99.5 percent) than among males (99.4 percent). The same trend was observed in 2010.

Table 3-214. Literacy rate in Cagayan de Oro city (2010 and 2015)

Census year	Literacy rate %		
	Male	Female	Total
2010	99.0	99.2	99.1
2015	99.4	99.5	99.5

Source: CDO Ecological Profile 2019

Malaybalay, Bukidnon

The 2011 Malaybalay Integrated Survey System (MISS) showed that 97.63% of the city's 118,315 inhabitants 10 years old and older are literate with a higher literacy rate among males (**Table 3-215**).

Table 3-215. Literacy rate in Malaybalay (2011)

Barangay	Population of 10 years old and above	No. of literates	No. of illiterates	% Illiterates	
				Barangay	City
Barangay 1	3,696	3,670	26	0.70%	0.02%
Barangay 2	748	746	2	0.27%	0.00%
Barangay 3	381	380	1	0.26%	0.00%
Barangay 4	324	322	2	0.62%	0.00%
Barangay 5	153	152	1	0.65%	0.00%
Barangay 6	469	468	1	0.21%	0.00%
Barangay 7	1,676	1,667	9	0.54%	0.01%
Barangay 8	578	574	4	0.69%	0.00%
Barangay 9	5,661	5,601	60	1.06%	0.05%
Barangay 10	2,171	2,127	44	2.03%	0.04%
Barangay 11	2,401	2,380	21	0.87%	0.02%
Aglayan	5,478	5,406	72	1.31%	0.06%
Apo Macote	3,590	3,432	158	4.40%	0.13%
Bangcud	4,341	4,209	132	3.04%	0.11%
Busdi	1,587	1,434	153	9.64%	0.12%
Cabangahan	2,168	2,138	30	1.38%	0.02%
Caburacanan	801	746	55	6.87%	0.04%
Can-ayan	4,265	4,103	162	3.80%	0.13%
Capitan Angel	913	873	40	4.38%	0.03%
Casisang	16,220	16,098	122	0.75%	0.10%
Dalwangan	4,389	4,262	127	2.89%	0.10%
Imbayao	1,160	1,120	40	3.45%	0.03%
Indalasa	1,272	1,185	87	6.84%	0.07%
Kalasungay	5,885	5,851	34	0.58%	0.03%
Kibalabag	780	743	37	4.74%	0.03%
Kulaman	866	819	47	5.43%	0.04%
Laguitas	2,250	2,205	45	2.00%	0.04%
Linabo	5,641	5,449	192	3.40%	0.16%
Magsaysay	2,149	2,106	43	2.00%	0.03%
Maligaya	1,705	1,635	70	4.11%	0.06%

Barangay	Population of 10 years old and above	No. of literates	No. of illiterates	% Illiterates	
				Barangay	City
Managok	5,731	5,596	135	2.36%	0.11%
Manalog	635	552	83	13.07%	0.07%
Mapayag	961	926	35	3.64%	0.03%
Mapulo	920	910	10	1.09%	0.01%
Miglamin	2,347	2,217	130	5.54%	0.10%
Patpat	2,002	1,942	60	3.00%	0.05%
San Jose	4,324	4,236	88	2.04%	0.07%
San Martin	2,518	2,458	60	2.38%	0.05%
Sila-e	1,889	1,778	111	5.88%	0.09%
Simaya	3,123	3,090	33	1.06%	0.03%
Sinanglanan	2,659	2,586	73	2.75%	0.06%
St. Peter	1,819	1,712	107	5.88%	0.09%
Sto. Niño	1,261	1,242	19	1.51%	0.02%
Sumpong	6,620	6,548	72	1.09%	0.06%
Violeta	1,971	1,952	19	0.96%	0.02%
Zamboanguita	1,322	1,282	40	3.03%	0.03%
Total	**123,820**	**120,928**	**2,892**	**2.34%**	**2.34%**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

The Tagoloan literacy record showed that almost 99 percent of its household population 10 years old and over are literate (**Table 3-216**). Of the remaining one percent that were illiterate, 354 were male and 223 females.

Table 3-216. Household population by literacy of Tagoloan (2015)

Age group	Total Population			Literate			Illiterate		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
10-14	7,520	3,850	3,670	7,424	3,792	3,632	96	58	38
15-19	7,371	3,746	3,625	7,311	3,703	3,608	60	43	17
20-24	7,249	3,743	3,506	7,191	3,701	3,490	58	42	16
25-29	6,453	3,398	3,055	6,406	3,363	3,043	47	35	12
30-34	5,481	2,880	2,601	5,448	2,852	2,596	33	28	5
35-39	4,736	2,440	2,296	4,689	2,408	2,281	47	32	15
40-44	4,050	2,100	1,950	4,024	2,085	1,939	26	15	11
45-49	3,441	1,726	1,715	3,406	1,707	1,699	35	19	16
50-54	2,958	1,494	1,464	2,926	1,476	1,450	32	18	14
55-59	2,515	1,284	1,231	2,494	1,272	1,222	21	12	9
60-64	1,856	918	938	1,829	906	923	27	12	15
65 and over	2,503	1,120	1,383	2,408	1,080	1,328	95	40	55
Total	**56,133**	**28,699**	**27,434**	**55,556**	**28,345**	**27,211**	**577**	**354**	**223**

Source: Philippine Statistics Authority, 2015, Tagoloan CLUP 2017-2027

Among the 64,514 population five years and older, 42.74 percent have reached high school followed by 31.46% who attended elementary education, 1.13% (post-secondary), 11.02% (college undergraduate), 7.58 percent (baccalaureate/college graduate and post baccalaureate) (**Table 3-217**). The remaining 6.07 percent have neither not completed any grade, reached pre-school, nor special education. More males have gone to pre-, elementary education and high school education.

It is important to note however that more males have not completed any grade school education. It has been observed that more females have reached higher levels of education from post-secondary school up to college education.

Table 3-217. Population by highest grade/year completed in Tagoloan (2015)

Highest grade/year completed	Population (5 years old and over)	Male	Female
No grade completed	1,876	1,003	873
Preschool	2,018	1,050	968
Special education	20	9	11
Elementary	20,294	11,158	9,136
1st - 4th grade	10,952	6,129	4,823
5th - 6th grade	3,509	1,967	1,542
Graduate	5,833	3,062	2,771
High school	27,576	13,960	13,616
Undergraduate	11,372	5,690	5,682
Graduate	16,204	8,270	7,934
Postsecondary	727	297	430
Undergraduate	39	19	20
Graduate	688	278	410
College undergraduate	7,111	3,366	3,745
Baccalaureate/college graduate	4,852	2,130	2,722
Post baccalaureate	38	20	18
Not stated	2	1	1
Total	**64,514**	**32,994**	**31,520**

Source: Philippine Statistics Authority, 2015 Census of Population

Sumilao, Bukidnon

The literacy rate in Sumilao is 97.21% where 18,037 of the population 10 years old and over are literate (2010 PSA). On educational attainment for the household population of 5 years old and over, 50.45 percent have attended or completed elementary level, 28.59 percent attended high school, 0.83 percent post-secondary and only 3.31 percent earned an academic degree. 6.48 percent had not attended any grade level.

Manolo Fortich, Bukidnon

Table 3-218 shows there are only three illiterates per 100 literate population for 10 years old and over in the municipality indicating that 97% of the population are literate. The male literacy is slightly greater than the females (49.50% and 47.25% respectively) against the total percentage of persons 10 years old and above.

Table 3-218. Illiteracy rate in Manolo Fortich

Barangay	No. of persons 10 years old and above			Illiterate persons 10 years old and above*					
				Magnitude			Proportion**		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Agusan Canyon	7,850	3,989	3,861	68	30	39	1	1	1
Alae	4,838	2,472	2,366	66	32	34	1	1	1
Dahilayan	970	508	462	140	73	67	16	16	15
Dalirig	2,918	1,528	1,389	151	83	68	6	6	5
Damilag	10,261	5,115	5,146	154	76	78	2	2	2
Dicklum	2,923	1,467	1,455	135	59	76	5	4	5
Guilang-guilang	793	420	373	96	48	47	13	13	13
Kalugmanan	2,171	1,140	1,032	84	45	39	4	4	4
Lingion	3,341	1,748	1,593	69	36	33	2	2	2
Lindaban	1,498	778	721	26	14	12	2	2	2
Lunocan	4,591	2,384	2,208	165	96	69	4	4	3
Maluko	2,632	1,366	1,266	88	37	51	4	3	4
Mambatangan	3,029	1,627	1,403	98	53	45	4	4	3
Mampayag	1,012	504	508	117	54	63	13	12	12

Barangay	No. of persons 10 years old and above			Illiterate persons 10 years old and above*					
				Magnitude			Proportion**		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Mantibugao	1,839	937	902	37	24	13	2	3	1
Minsuro	572	323	249	21	12	9	4	4	4
Sankanan	2,355	1,214	1,141	44	30	14	2	3	1
San Miguel	3,563	1,827	1,736	32	21	11	1	1	1
Santiago	1,044	565	479	29	11	18	3	2	4
Santo Niño	2,814	1,478	1,335	92	44	48	4	3	4
Tankulan (Pob.)	6,127	3,088	3,039	120	63	57	2	2	2
Ticala	996	517	479	57	26	31	6	6	6
Total	**68,137**	**34,995**	**33,141**	**1,889**	**967**	**922**	**3**	**3**	**3**

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

Table 3-219 shows that the literacy rate in Impasug-ong of ages 10 years and above is 94.37 percent comprising 32,608 individuals where about 53% are males and 47 % are females.

Table 3-219. Literary population in Impasug-ong (2015)

Age group	Total Population			Literate			Illiterate		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
10-14	5,905	3,004	2,901	5,501	2,763	2,738	404	242	162
15-19	5,303	2,798	2,505	5,150	2,691	2,459	153	107	46
20-24	4,209	2,249	1,960	4,059	2,169	1,890	150	-	150
25-29	3,554	1,964	1,590	3,422	1,872	1,550	132	92	40
30-34	3,174	1,724	1,450	3,078	1,669	1,409	96	55	41
35-39	2,826	1,545	1,281	2,670	1,466	1,204	156	79	77
40-44	2,404	1,334	1,070	2,278	1,271	1,007	126	-	126
45-49	2,076	1,073	1,003	1,931	993	938	145	-	145
50-54	1,724	923	801	1,608	864	744	116	-	116
55-59	1,232	653	579	1,140	602	538	92	-	92
60-64	829	440	389	704	361	343	125	-	125
65 & over	1,317	639	678	1,067	530	537	250	110	140
Total	**34,553**	**18,346**	**16,207**	**32,608**	**17,251**	**15,357**	**1,945**	**685**	**1,260**

Source: Impasug-ong CLUP 2019-2028

3.4.5.1.4 Census of population/property that will be displaced/disturbed

The implementation of RA 7279 (Urban Development and Housing Act) and RA 7160 (Local Government Code) transferred more responsibilities to local government units pertaining to its land use, housing and infrastructure development in their respective localities. As such, the LGUs became the principal implementing bodies with regard to shelter needs to effectively and efficiently respond to the challenge of providing shelter to its homeless and underprivileged constituents.

Cagayan de Oro City

As of 2010, the housing backlog of the city was 39,304 consisting of 4,406 that were doubled-up, 24,813 households located hazardous areas and fire victims, 1,176 affected by infrastructure projects, 5,457 for demolition/eviction, 3,452 with pending threats for demolition, 3,209 for sale to occupants, conflict of ownership (7,955).

Table 3-220. Housing situation in Cagayan de Oro City (2007 and 2010)

Parameter	Year 2007		Year 2010	
	No.	% Change	No.	% change
Households (HH)	116,224	24.27	137,465	

Household Population	553,966	20.47	598,803	
Housing Unit (HU)				
Occupied HU	113,321	24.71	133,366	
Vacant HU				
Ratio of HH to Occupied HU			103:100	

Source: National Statistics Office (NSO)

The ideal standard household to housing unit ratio as of 2000 was 1:1. Ten years later, records showed that there are 133,366 occupied housing units in the city for the 137,465 households resulting to a ratio of 103 households for every 100 occupied housing units. This indicated the existence of doubled-up housing and a shortage of housing units. A total of 4,099 more housing units are needed to achieve the ideal ratio of a housing unit for each household. However, housing units that are made of light materials like cogon, nipa, anahaw, which will not last for five years and makeshift houses make up for the backlog.

Table 3-221. Housing backlog in Cagayan de Oro city (2010)

Backlog	No. of units	Total (%)
Doubled-Up Households	4,406	40.30
Unacceptable Housing Units	5,621	51.40
Makeshift/Salvage/Improvised Housing Units	907	8.3
Total	**10,937**	**100**

Source: National Statistics Office (NSO)

The Tropical Storm Sendong which struck in December 2011 changed the housing scenario in the city. Some places that have long been identified by the DENR as danger areas and not suitable for housing have suddenly been cleared when 4,301 houses were totally washed-out and 14,883 partially damaged. Barangay Macasandig was the hard-hit area with 1,630 structures totally washed-out followed by Balulang with 611 and Barangay 13 with 423 structures.

The declaration of President Benigno Aquino of some areas as "No Build Zone" rendered the once heavily inhabited areas as open and uninhabitable (**Table 3-222**). The former occupants of these areas numbering 2,740 families either temporarily took refuge on the various evacuation centers or stayed with their relatives.

Table 3-222. No build zones in Cagayan de Oro

Barangay	Purok
Macasandig	Sitio Calacala
	Biasong
	Tambo
Consolacion	Isla Baksan
	Isla Bugnaw
Barangay 13	Isla Delta
Barangay 15	Isla De Oro

Source: Cagayan de Oro City CLUP 2013-2022

The 2007 NSO survey showed of the 59 percent of the 116,224 households owned and/or amortized the lot they occupy, 16 percent are renters, 18 percent are occupying the land for free but with owners' consent, and 3 percent occupy the land without the consent of the owners. A survey conducted by the LGU in 2011 also showed 23,893 informal settler families.

Malaybalay City, Bukidnon

The city had a 2000 population of 123,672 with 19,228 households translating to an average household size of 6.43. By 2010, its population has increased to 153,085 resulting to a household population of 32,029 which means a growth rate of 5.24% for the past ten years (**Table 3-223**).

Table 3-223. Occupied housing units and growth rates in Malaybalay City (2000 and 2010)

Census year	Total population	Population growth rate	Total # of HH	HH growth rate	Occupied HU	Occupied HU growth Rate
2000	123,672	**2.16%**	19,228	**5.24%**	23,033	**3.22%**
2010	153,085		32,029		31,611	

Note: HH – household, HU – Housing unit; Source: Malaybalay CLUP 2016-2025

The unequal figures of household population and occupied housing units implied that there are households with double occupancy (one dwelling unit shared by two or more households, aka doubled-up). There were 418 doubled-up households in 2010 using data in **Table 3-223**.

To address the increasing housing needs of the city, private sectors invested in developing subdivision projects to cater most of the average income families. The government, on the other hand, provided decent and affordable housing to qualified beneficiaries based on RA 7279 (Urban Development Housing Act).

Table 3-224 lists the existing subdivision projects within the city as of 2010 consisting of 54 subdivision projects, 28 from the private owner/developer and 26 are government initiated in the form of resettlement, sites, and services, upgrading and employees housing. Three of these sites and services projects are located in rural barangays.

The 2013 MISS records showed 1,535 makeshift houses within Malaybalay City, 290 of it are located in the urban barangay, 321 are in the urbanizing barangays, and the rest in the rural areas. In addition, there were also 12,419 residential structures made of light materials where 2,453 structures are in the urban area, 2,526 in the urbanizing, and 7,440 in the rural areas.

Table 3-224. Housing projects in Malaybalay

No.	Subdivision	Location	Area (ha)	No. of lots/units
Private Housing				
1	Fe	Barangay 1	13.8992	104
2	Bade	Barangay 1	2.7959	88
3	Cudal	Barangay 2	0.4379	23
4	Pabillaran	Barangay 9	10.4418	95
5	Mamawag	Barangay 11	3.4413	46
6	Fortich	Barangay 11	3.5176	28
7	Flores	Sumpong	1.2523	23
8	De la Cerna	Sumpong	1.8880	4
9	Bliss	Casisang	5.3580	50
10	Ocaya	Casisang	4.2500	193
11	Grema I (1994)	Casisang	3.4067	204
12	Villa Azura I (1994)	Casisang	5.0287	306
13	Ma. Lilia Ramos Seelin (1994)	Sumpong	0.9763	25
14	Grema II (1995)	Casisang	3.5796	209
15	Villa Azura II (1996)	Casisang	4.0800	317
16	Carmenville (2003)	Casisang	6.1167	497
17	Manela Inc. (2003)	Barangay 7	2.7744	132
18	P & T Village (2003)	Kalasungay	10.1159	258
19	Green Valley (2005)	Laguitas	11.9437	355
20	Salang Homes (2006)	Natid-asan, Casisang	8.6875	496
21	Asian Village (2006)	San Jose	2.0066	104
22	Suna Village (2006)	Sumpong	2.488	124
23	Sunrise Village (2007)	Can-ayan	3.5791	327
24	CAHAFI Homes (2007)	Casisang	13.6300	859
25	Goldstar Subdivision (2009)	Casisang	2.0000	206

No.	Subdivision	Location	Area (ha)	No. of lots/units
26	Midland Valley Homes (2009)	Kalasungay	4.0000	227
27	Big Apple Homes (2009)	Casisang	3.5161	50
28	Greenfields Subdivision (2010)	Caisang	3.9859	182
29	Villa Monique Subdivision (2010)	Laguitas	3.3112	186
		Subtotal	**142.5084**	**5,718**
Public/government housing				
1	Bukidnon Housing and Site and Service I (1996)	Casisang	6.4049	197 H & L 66 lot only
2	Bukidnon Housing II (1997)	Casisang	2.4056	99
3	Bukidnon Housing IV (2004)	Casisang	3.4963	146
4	Bukidnon Homes (1999)	Casisang	6.4133	176 socialized, 87 economic
5	Panorama Heights (1998)	Kalasungay	1.5961 2.6298 2.304	68 socialized, 48 executives, 49 expansions
6	PGB Subdivision (2000)	Casisang	3.2803	79
7	Bukidnon Resettlement I (1995)	Kubayan, Casisang	5.097	226
8	Bukidnon Resettlement II (1999)	Depot, Casisang	5.387	263
9	Capitol Village I (2001)	Capitol Site	3.1749	134 H & L, 5 lot only
10	Capitol Village II (2001)	Capitol Site	2.125	119
11	Casisang Pagla-um I (2003)	Landing, Casisang	8.7551	339 resettlement, 143 site/services
12	Casisang Pagla-um II (1996)	Landing, Casisang	4.5764	187 lots, 32 Buk Homes
13	Bukidnon Resettlement III	Kimambong, Casisang	1.4775	74
14	Grandstand Village	Sumpong	1.6762	108
15	Kalasungay Village	BFI Area, Kalasungay	4.806	166
16	Bukidnon Housing V	Casisang	5.178	131 socialized
17	Bliss (1999)	Avinca, Casisang	5.345	160
18	GK-Natid-asan (2004)	Casisang	3.0363	169
19	Malaybalay Housing Project I (2005)	Casisang	3.521	147
20	Linabo Site and Services	Linabo	5	236
21	Laguitas Site and Services (2006)	Laguitas	1	63
22	Patpat Site and Services (2006)	Patpat	4	175
23	Natid-asan Resettlement (2006)	Sitio Lemon, Casisang	0.9945	48
24	Melendez Subdivision	Barangay 1	2.073	67
25	Malaybalay Housing Project II	Casisang	3	112
		Subtotal	**98.7532**	**4,119**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

The municipality has 16,661 occupied housing unit's majority of which were single houses with 12,953 occupancies (**Table 3-225**).

Table 3-225. Occupied housing units in Tagoloan (2015)

Type of building	Occupied HU	No. of HH*	HH population*	Average HH size	Ratio of HH to occupied HU	Ratio of HH population to occupied HU
Single house	12,953	13,207	58,667	4.44	1.02	4.53
Duplex	2,044	2,103	8,261	3.93	1.03	4.04
Multi-unit residential	1,634	1,659	5,931	3.58	1.02	3.63
Commercial/industrial/ agricultural	21	21	88	4.19	1.00	4.19
Institutional living quarter	2	2	12	6	1.00	6.00
Others	7	7	19	2.71	1.00	2.71
Not Reported	-	-	-	-	-	-
Total	**16,661**	**16,999**	**72,978**	**4.29**	**1.02**	**4.38**

Note: HH – household, HU – housing unit; Source: National Statistics Office, 2015 Census of Population and Housing

There was a housing backlog of 1,782 units in 2015 derived from the sum of the 412 units of housing backlog in **Table 3-226** and the 1,370 informal settlers in **Table 3-224**. The housing backlog was composed of 82.04 percent doubled-up, 1.21 percent unacceptable housing units, 15.78 percent makeshift /salvage/ improvised hut, and 0.97 percent other types.

Table 3-226. Housing backlogs in Tagoloan

Backlog	2007		2015	
	Number	Percent	Number	Percent
Doubled – Up Households	86	34.40	338	82.04
Unacceptable Housing Units	72	28.80	5	1.21
Makeshift / Salvage/ Improvised HU	58	23.20	65	15.78
Others	34	13.60	4	0.97
Total	**250**	**100**	**412**	**100**

Source: Tagoloan CLUP 2017-2027

Sumilao, Bukidnon

The building permits issued from 2007 to 2011 for residential, agricultural, institutional, and commercial structures enumerated below showed annual increases in the construction of buildings in the municipality. Some of the residential building constructions were replacement for old and dilapidated houses. The entry of the Monterey Hog Farm at San Vicente also contributed to the construction of agro-industrial and institutional buildings.

a) 2007 - 108 permits for 76 residential buildings, 25 agricultural, and five for commercial purposes.
b) 2008 - 151 permits for 139 residential, nine commercial, and three agro-industrial buildings.
c) 2009 - 165 permits for 155 residential, five for institutional, one for commercial, and five agro-industrial.
d) 2010 - 190 permits issued for 122 residential, 11 commercial, and six agro-industrial.
e) 2011 – 183 permits issued for 156 residential buildings and 20 agricultural purposes.

Table 3-227 shows that of the 4,179 occupied housing units in 2007, 33.07 percent (1,379 units) have bamboo or sawali walls. followed by 1,212 units with half-concrete and half-wood walls, 889 units with wooden walls, and 633 with concrete walls. Nine units (0.22 percent) of the dwelling units have makeshift or improvised materials.

About 95 percent of the dwelling units in the municipality used G.I. or aluminum sheets for roofing materials. The rest used bamboo roofs and mostly found in the farms.

Table 3-227. Types of houses by construction material in Sumilao

Types of houses	Number
Bamboo/Sawali	1,379
Half-Concrete and Half-wood walls	1,212
Wooden Walls	889
Concrete	633
Makeshift/Improvised Materials	9
Total	**4179**

Source: Sumilao CLUP 2011-2020

The improvement of residential buildings from light materials to concrete and semi-concrete could be attributed to the increased income of most families in the municipality. Most of these are landowners who have leased their agricultural lands to multi-national companies and plantation workers who have labored hard for the welfare of the families. These types of buildings are not only found in the urban barangays but also in the rural areas.

In 2007, the municipality of Sumilao with assistance from the Provincial Government of Bukidnon established the Sumilao Paglaum Village for 55 informal settlers living within the road right-of-way. The LGU had also purchased a one-hectare land at San Vicente and acquired another two areas in Kisolon for socialized housing projects.

Manolo Fortich, Bukidnon

The NSO Census recorded an increase in households in the municipality by 39% in 2010 (19,367) from 13,950 in 2000. The concentration of the households is in Barangay Damilag comprising about 13 percent of the total households in the municipality. Barangay Agusan Canyon ranked second with 1,970 households and followed by Barangay Alae with 1,710. Household size was pegged at an average of five members.

Of the 17,795 households recorded in 2010, 761 were living in makeshift houses. Barangay Lunocan has the highest number of makeshift houses (153) followed by Barangays Agusan Canyon (118) and Mambatangan (85) houses (**Table 3-228**).

Table 3-228. Households living in makeshift housing by barangay in Manolo Fortich (2010)

Barangay	Actual number of HH	Magnitude	Proportion**
Agusan Canyon	2,101	118	6.65
Alae	1,449	64	4.89
Dalirig	746	41	5.5
Dahilayan	278	18	6.47
Damilag	2,502	62	2.48
Diclum	743	12	1.61
Guilang-guilang	176	21	11.93
Kalugmanan	599	6	1
Lingion	893	79	8.85
Lindaban	389	25	6.43
Lunocan	1,218	153	12.56
Maluko	662	12	1.81
Mampayag	282	3	1.06
Mambatangan	818	85	10.39
Minsuro	162	6	3.7
Mantibugao	511	32	6.26
Sankanan	619	74	11.95
Santiago	231	2	0.87
Santo Niño	723	77	10.65
San Miguel	619	34	4.33
Ticala	257	5	1.95
Tankulan (Pob.)	1,651	64	4
Total	**17,795**	**761**	**5%**

Source: Manolo Fortich CLUP 2013-2022

About 63% or 10,868 of the household were owners or owner-like of house and lot and about 39% of the households have no permanent houses (**Table 3-229**).

Table 3-229. Tenure status of houses in Manolo Fortich

Tenure status	Number	Percent
Owner, owner-like possession of house and lot	10868	62.9
Rent house/room including lot	765	4.43
Own house/rent lot	335	1.94
Own house, rent-free lot with consent of owner	2441	14.13

Tenure status	Number	Percent
Own house, rent-free lot without consent of owner	472	2.73
Rent-free house and lot with consent of owner	2055	11.89
Rent-free house and lot without consent of owner	149	0.86
Other tenure status	145	0.84
Total	**17230**	**98.88**

Source: Manolo Fortich CLUP 2013-2022

The type of building for the houses in the municipality reflects its typical rural area. About 48.6 percent of the houses had roofs made of strong materials while 23 percent had roofs made of light materials (**Table 3-230**). A small percentage (2.91%) of the houses had roofs made of mixed but dominantly salvaged materials.

Table 3-230. Roof materials of houses in Manolo Fortich

Construction materials of roof	Frequency	Percent
Strong materials (concrete, brick, stone, wood, galvanized iron)	8397	48.6
Light materials (bamboo, sawali, cogon, nipa)	3972	22.99
Salvaged/makeshift materials	276	1.6
Mixed but predominantly strong materials	2460	14.24
Mixed but predominantly light materials	1639	9.49
Mixed but predominantly salvaged materials	503	2.91
Total	**17247**	**99.83**

Source: Manolo Fortich CLUP 2013-2022

There are about 7,519 houses (43.52%) with walls made of strong materials and 29.14 percent made of light materials (**Table 3-231**). This indicated the economic status of the households in the municipality where poverty incidence is still high.

Table 3-231. House wall materials in Manolo Fortich

Material	Number	Proportion
Strong materials (concrete, brick, stone, wood, galvanized iron)	7519	43.52
Light materials (bamboo, sawali, cogon, nipa)	5035	29.14
Salvaged/makeshift materials	216	1.25
Mixed but predominantly strong materials	2313	13.39
Mixed but predominantly light materials	1700	9.84
Mixed but predominantly salvaged materials	448	2.59
TOTAL	**17795**	**100**

Source: Manolo Fortich CLUP 2013-2022

The number of houses built in Manolo Fortich increased in the last ten years due to population increase. The CBMS records showed that the number of housing units in 2010 was 17,795 compared to NSO data 13, 950 in 2000. Approximately six percent of these were identified as makeshift houses.

In 2011, the Paglaum Village Housing Project, a joint program of the PLGU of Bukidnon and Manolo Fortich was implemented to address the housing needs of 50 families with makeshift houses along the RROW. Out of the 186 sitios scattered in 22 barangays, 18 sitios had 943 makeshift houses where 70 percent are located along the RROW and 30% along riverbanks with slopes susceptible to landslides and floods.

Impasug-ong, Bukidnon

The Sinabualan Village in Purok 6, Poblacion was constructed in the year 1996 and occupied since then by mostly public-school teachers and government employees. On the other hand, the Impasug-ong Village Sites and services (IVSS) in Purok 3 Poblacion was occupied in 2006 (**Table 3-232**).

Table 3-232. Housing projects and subdivisions in Impasug-ong

Housing project	Location	Area covered	Number of units
Sinabualan Subdivision	Purok 6, Poblacion	1.0115	61
Impasug-ong Village Sites & Services (IVSS)	Purok 3, Poblacion	2.5353	114
AITC Housing Project	AITC Site (Purok 7)	2.0000	111
Source: Impasug-ong CLUP 2019-2028	**Total**	**4.5353**	**286**

Most of the families used wood, galvanized iron, and cement or considered semi-concrete residences in building their houses accounting for 63.22 percent of the 9,734 households in 2015 (**Table 3-233**). There were also houses made of light materials, like wood, bamboo, sawali, cogon and nipa followed by those made of cement, bricks, stone and asbestos. In 2000, there were 110 housing units made of improvised and salvage materials also known as barong-barong or makeshift tenement which increased to 156 in 2007 and decreased to 29 in 2015.

Table 3-233. Type of housing construction materials in Impasug-ong (2015)

Construction materials of the outer walls	No. of occupied housing units	Construction materials of the roof					
		Galvanized iron/ aluminum	Tile/ concrete/ clay tile	Half galvanized iron and half concrete	Bamboo/ cogon/ nipa/ anahaw	Makeshift/ salvaged/ improvised materials	Trapal
Concrete/ brick/ stone	2,140	2,130	5	3	1		1
Wood	2,823	2,732	5	2	66	4	14
Half concrete/ brick/stone and half wood	1,319	1,294	4	17	3		1
Galvanized iron/ aluminum	31	31					
Bamboo/sawali/cogon/ nipa	3,221	2,720		7	231	51	212
Asbestos	7	7					
Makeshift/salvaged/ improvised materials	14	10			2		2
Trapal	13	7			1	3	2
No walls	2	2					
Not Reported	164	164					
Others							
Total	**9,734**	**9,097**	**14**	**29**	**304**	**58**	**232**

Source: Impasug-ong CLUP 2019-2028

Almost all of the residents in the municipality are living in their own houses and lots. Some of them may be living with their parents making them with owner-like possession and living in rent-free lots and own the house with the consent of the owner. Another is houses and lots that are free of rent with the consent of the owner (**Table 3-234**).

Table 3-234. Tenure status of housing in Impasug-ong

Tenure status	No. of HH	Type of building				
		Single House	Duplex	Multi-unit residential	Commercial/industrial /agricultural	Not Reported
Own or owner like possession of house and lot	6,925	6,651	200	50	17	7
Rent house/room including lot	412	342	29	40	1	-
Own house rent lot	31	29	2		-	-
Own house rent-free lot with consent of owner	1,483	1,413	48	12	-	7
Own house rent-free lot without	83	75	6	2	-	-

Tenure status	No. of HH	Type of building				
		Single House	Duplex	Multi-unit residential	Commercial/industrial /agricultural	Not Reported
consent of owner						
Rent-free house and lot with consent of owner	910	813	61	29	4	3
Rent-free house and lot without consent of owner	14	13	1	-	-	-
Not Applicable	-	-	-	-	-	-
Not Reported	-	-	-	-	-	-
Total	**9,858**	**9,339**	**347**	**133**	**22**	**17**

Note: HH – household; Source: Impasug-ong CLUP 2019-2028

3.4.5.1.5 Impact assessment on the displacement of settlers

1. PRE-CONSTRUCTION PHASE

Land valuation **-** the CMH project may affect land values for opportunists/businesspersons to flock to the area and lure landowners to dispose and sell their lands and because of economic difficulties, may fall to those with no concern with the welfare of the local residents.

The participants during the public scoping and IEC community consultation raised the issue of how the affected land will be assessed and the payment scheme. This is particularly an issue for owners with no legal documents for their land. The issue of the land rented by the Del Monte corporation was also a concern raised in addition to lands under ancestral domain titles. The IPs in the area were concerned on how the land will be evaluated and assessed.

2. CONSTRUCTION

Relocation of displaced settlers **- i**nformation gathered from the various City/Municipal Planning and Development Offices showed possible displacement of settlers by the Project. The majority of the participants during the public scoping raised concerns on displacement during the detailed engineering design and if there will be a relocation plan for those affected. This concern also came out from the survey and key informant interviews.

Right-of-Way and compensation for land and land improvements **-** Private landowners might disapprove of the Project if their land will be affected. If this is the case, the value of their land must be assessed accordingly with proper compensation. Those owning small land parcels (small lot owner farmers) may no longer have any land to work on for a living. Similarly, those residing near the proposed alignment whose lands will be affected but not benefiting from the Project have to be considered for priority hiring.

The participants during the public scoping stated that the RROW should be settled before the start of Project construction. The participants also asked about the situation with their lands being rented by the Del Monte Another issue to consider is the compensation scheme for those without legal documents for the land they occupy. The IPs also stated their concern for compensation since their land is part of the ancestral domain. These concerns were also raised by the survey respondents and key informants. In addition, the key informants also asked about possible loss of income and livelihood aside from compensation and potential relocation.

Conflict in right of way was a major issue during the pre-construction phase regarding land valuation, compensation for lands affected by the Project, and actual payment.

3.4.5.2 In-migration (proliferation of informal settlers)

Cagayan de Oro City

Informal settlers in the city are located in high-risk areas like rivers and creeks such as at the banks of the Cagayan de Oro River and the riverside of Barangay FS Catanico. The Local Shelter Plan 2012 of the city estimated 46,062 informal settler families occupying both private and public lands. An estimated 34,898 households need to be relocated including located in high-risk areas near rivers, creeks, and landslide prone areas.

Malaybalay City, Bukidnon

The total number of informal settlers in Malaybalay is 667 households composed within its urban area identified by the city LGU in 2014 and also at the road-right-of ways, riverbank buffer zones, and private/government lands comprising about four percent of the total municipal household population. It is expected that more will migrate from rural and from other neighboring cities to urban areas as a result of spill-out of development. Using the average number of persons in households in Malaybalay (4.3 persons per household), the city has an estimated 667 households. **Table 3-236** shows the summary of the informal settlers in Malaybalay City.

Tagoloan, Misamis Oriental

The CBMS 2017 census recorded at least 1,370 households or 9.42 percent of the total municipal households who were informal settlers (**Table 3-235**). The largest number of informal settlers is found in Barangay Sta. Cruz with 367 households followed by Barangay Poblacion with 211, Barangay Mohon with 193, Barangay Sugbongcogon with 184, Barangay Gracia with 116, Barangay Natumolan with 104, Barangay Baluarte with 96, and Barangay Sta. Ana with 73. There were fewer informal settlers in Barangay Casinglot with 20 and Barangay Rosario with six households. Some of these informal settlers build their houses in hazard-prone areas.

Table 3-235. Informal settlers in Tagoloan

Barangay	No. of HH	Informal settlers	
		HH	Percent
Baluarte	2,041	96	4.7
Casinglot	2,263	20	0.88
Gracia	596	116	19.46
Mohon	827	193	23.34
Natumolan	1,721	104	6.04
Poblacion	1,723	211	12.25
Rosario	239	6	2.51
Santa Ana	1,633	73	4.47
Santa Cruz	2,941	367	12.48
Sugbongcogon	552	184	33.33
Total	**14,536**	**1,370**	**9.42**

Note: HH – household; Source: Tagoloan CLUP 2017-2027

Table 3-236. Informal settlers in Malaybalay

No.	Location	Danger Areas*		Court Order		Parks & Playgrounds		Gov't Facilities		Private Properties		For tenurial upgrading		Total		Number of Informal settlers HH
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
	Urban															
1	Barangay 3	8	0.42											8	0.28	2
2	Barangay 4	20	1.04	32	14.95									52	1.81	12
3	Barangay 6	49	2.54											49	1.71	11
4	Barangay 7	116	6.02											116	4.05	27
5	Barangay 9	116	6.02											116	4.05	27
6	Barangay 10			62	28.97			2	0.43					64	2.23	15
7	Barangay 11	14	0.73	69	32.24									83	2.90	19
8	Casisang	17	0.88											17	0.59	4
9	Sumpong	129	6.70					390	82.98					519	18.11	121
	Sub-Total	**469**	**24.35**	**163**	**76.17**	**0**	**0**	**392**	**83.40**	**0**	**0**	**0**	**0**	**1,024**	**35.73**	**238**
	Urbanizing															
1	Aglayan	144	7.48					33	7.02	37	14.45			214	7.47	50
2	Bangcud	42	2.18											42	1.47	10
3	Managok	46	2.39											46	1.61	11
4	San Jose	33	1.71											33	1.15	8
	Sub-Total	**265**	**13.76**	**0**		**0**	**0**	**33**	**7.02**	**37**	**14.45**	**0**	**0**	**335**	**11.69**	**78**
	Rural															
1	Apo Macote	40	2.08											40	1.40	9
2	Busdi	65	3.37											65	2.27	15
3	Cabangahan	93	4.83											93	3.24	22
4	Caburacanan	12	0.62	51	23.83			23	4.89					86	3.00	20
5	Can-ayan	5	0.26											5	0.17	1
7	Dalwangan	27	1.40											27	0.94	6
8	Imbayao	15	0.78											15	0.52	3
9	Indalasa	6	0.31											6	0.21	1
10	Kalasungay	48	2.49							42	16.41			90	3.14	21
12	Kulaman	29	1.51											29	1.01	7
13	Laguitas	57	2.96											57	1.99	13

No.	Location	Danger Areas*		Court Order		Parks & Playgrounds		Gov't Facilities		Private Properties		For tenurial upgrading		Total		Number of Informal settlers HH
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
14	Linabo	11	0.57							82	32.03			93	3.24	22
16	Maligaya	30	1.56					1	0.21					31	1.08	7
18	Mapayag	7	0.36											7	0.24	2
19	Mapulo	3	0.16											3	0.10	1
20	Miglamin	42	2.18											42	1.47	10
21	Patpat		0.00					3	0.64	1	0.39			4	0.14	1
22	San Martin	127	6.59					18	3.83	94	36.72			239	8.34	56
23	Sila-e	54	2.80											54	1.88	13
24	Simaya	172	8.93											172	6.00	40
25	Sinanglanan	155	8.05											155	5.41	36
26	St. Peter	17	0.88											17	0.59	4
27	Sto. Nino	48	2.49											48	1.67	11
28	Violeta	61	3.17											61	2.13	14
29	Zamboanguita	68	3.53											68	2.37	16
	Sub-Total	**1,192**	**61.89**	**51**	**23.83**			**45**	**9.57**	**219**	**85.55**			**1,507**	**52.58**	**350**
	Total	**1,926**	**67.20%**	**214**	**7.47**	**0**	**0**	**470**	**16.40**	**256**	**8.93**			**2,866**		**667**

Note: Danger areas include RROW, riverbanks canal/drainage, coastline, garbage or landfill, and sidewalks/under the bridge; Source: Malaybalay CLUP 2016-20

Sumilao, Bukidnon

Informal settlers in the municipality could not be avoided as these families tend to construct their houses in areas where their livelihood source is located. Most of these families have no other lands, especially those at Barangays Kisolon and San Vicente whose dwelling units were within the road right-of-way. For San Vicente, particularly at Sitio Damay (Zone 7), these houses were not only along the national highway but also within landslide prone areas.

In 2008, the Provincial Government of Bukidnon and Municipal Government of Sumilao established a housing village for the 55 informal settlers living within the National Highway Road right-of-way at Kisolon. However, there are still houses within the road rights-of-way in certain areas in Barangays Kisolon and San Vicente.

Manolo Fortich, Bukidnon

Barangay Damilag (urban barangay) had the highest number of informal settlers (**Table 3-237**). The barangay is very near the Del Monte Plantation where job opportunities for laborers are offered. Some of these laborers, mostly migrants from other parts of Visayas and Mindanao, build makeshift houses in vacant lots without the consent of the owners. Barangays Alae ranked second with the highest number of informal settlers due to a large biscuit company (REBISCO) followed by Barangay Dalirig.

Table 3-237. Informal settlers in Manolo Fortich (2010)

Barangay	Total no. of HHs	Population	Informal settlers against total HHs (%)
Urban			
Alae	1,449	62	0.3484
Damilag	2,502	127	0.7137
Tankulan (Pob.)	1,651	33	0.1854
Sub-total	**5,602**	**222**	**1.2475**
Urbanizing			
Agusan Canyon	2,101	24	0.1349
Diclum	743	25	0.1405
Dalirig	746	40	0.2248
Lunocan	1,218	34	0.1911
Mantibugao	511	39	0.2192
Maluko	662	15	0.0843
Mambatangan	818	48	0.2697
San Miguel	619	19	0.1068
Sub-total	**7,418**	**244**	**1.3712**
Rural			
Dahilayan	278	60	0.3372
Guilangguilang	176	2	0.0112
Kalugmanan	599	53	0.2978
Lingion	893	32	0.1798
Lindaban	389	20	0.1124
Mampayag	282	68	0.3821
Minsuro	162	6	0.0337
Sankanan	619	52	0.2922
Santiago	231	6	0.0337
Santo Niño	723	42	0.236
Ticala	257	7	0.0393
Sub-total	**4,609**	**348**	**1.9556**
Total	**17,795**	**814**	**4.5743**

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

Three of the 13 barangays in the municipality are located along the National Highway. Another three barangays are located at the foot of Mt. Kitanglad and seven located across Tagoloan River. Due to this, majority of the barangays are located in forestall areas where the settlement is minimal. Some can be found in Barangays Impalutao, Bontongon, Bulonay, Dumalaguing, Guihean, Sayawan, Hagpa and Kalabuago.

The 2007 local survey showed the existence of homeless residents considered as informal settlers living along road buffers, privately and government owned lands, along creek and riverbanks, and along the road rights of way.

A total of 643 informal settlers were recorded in the 2015 CBMS survey (**Table 3-238**). Barangay Kalabugao had the highest number of about 544 persons followed by Barangays Impalutao with 44, Kibenton 30, Cawayan 29, Kalabugao 28, Dumalaguing 24, Hagpa 23, Guihean 14, La Fortuna 14, Poblacion 13, Bulonay 12, Sayawan 7 and Bontongon 1.

Table 3-238. Informal settlers in Impasug-ong (2015)

Barangay	No. of formal HH		No. of informal settlers HH		Proportion to total no. of HHs
	2011	2015	2011	2015	
Bontongon	162	131	0	1	0.76
Bulonay	276	279	5	3	1.08
Capitan Bayong	530	549	28	7	1.27
Cawayan	412	401	9	2	0.50
Dumalaguing	546	557	11	10	1.80
Guihean	356	381	6	12	3.15
Hagpa	537	621	0	10	1.61
Impalutao	1,145	1,107	28	24	2.17
Kalabugao	1,099	1,215	14	544	44.77
Kibenton	857	482	12	1	0.21
La Fortuna	801	822	9	3	0.37
Poblacion	2,176	2,260	0	10	0.44
Sayawan	265	267	0	16	5.99
Total	**9,162**	**9,072**	**122**	**643**	**7.09**

Source: Impasug-ong CLUP 2019-2028

Table 3-239 shows that 75 hectares of land is potential available for the housing projects of the municipality to cater the need for housing units.

Table 3-239. Inventory of potential lands for housing in Impasug-ong

Owner	Land area (ha)	Location	Suitability/conditions
AITC – LGU	10	Poblacion	Vacant – Residential area
Mr. Fidencio Neri	2	Capitan Bayong	Vacant – Agro-Industrial
CADT	15	Kalabugao	Vacant – Settlement Area
CADT	15	Hagpa	Vacant – Settlement Area
Private Property	10	Bulonay	Vacant – Settlement Area
Mrs. Lagremosa	5	Poblacion	Under Negotiation
Privately Owned	3	Capitan Bayong	Vacant – Settlement Area
Privately Owned	10	Poblacion (Jabines, Padilla)	Vacant – Agro Industrial
CARP	2	Impalutao	Vacant – Settlement Site
Mr. Guingona	2	Sitio Kubayan	Vacant – Settlement Area
Mr. Gaburno	1	Cawayan	Purchased by LGU
Total	**75**	Source: Impasug-ong CLUP 2019-2028	

Impact assessment

In-Migration: labor demand and entry of migrant workers - Contractors during the construction phase might bring in migrant workers increasing the influx of migrants in the area. This may pose a conflict with the issue on local hiring particularly that skilled workers in the barangay/municipality expect to be part of the workforce.

Due to the nature of the project, there might be a need for migrant workers with crucial skills and expertise. The entry of migrant workers will also lead to population increase and create housing demand and possible widening in the differential access to non-farm income and employment opportunities.

The concern for local hiring was raised during the IEC consultation, public scoping, survey and key informant interviews. The participants expect that they will be able to work in the construction project depending on their capabilities and skills. In addition, when the survey respondents were asked if they were given an opportunity to work for the project, majority would take the opportunity and allow their family members to work. However, there were concerns such as age, health matters, and having no skill.

Proliferation of informal settlers or "followers" - Factors such as population growth, lack of affordable housing, weak governance, economic vulnerability, low-paid work, marginalization, and displacement caused by natural disasters and climate change have driven the emergence of informal settlements. Accompanying Project implementation would be an increase in the informal settlers attracted to various economic activities related to construction projects. The presence of migrant workers may also mean the presence of their families in the construction housing provided by the contractor. Some of the migrants might also be those peddling or catering to the needs of the migrant workers in the area such as traders, suppliers, and other service providers (including sex workers). Aside from the proliferation of informal settlers, migration also poses a risk to social cohesion, culture and traditions, and to some extent, to the safety and security of the residents. It can lead to social tension associated with xenophobia and discrimination and to violence in neighborhoods, workplaces or schools.

Increased pressure on accommodations and rents - Accounting for more than 70% of land in most cities, housing determines the city/municipality's form and densities, provides employment, and contributes to growth (UN HABITAT, 2016). One of the biggest challenges cities faces is providing adequate and affordable housing to migrants, which is often in limited supply. A lack of affordable housing has led to people living in slums or squatting. People that live in slums due to poverty and in poor conditions can lead to poor health due to overcrowding and a lack of potable water and proper sanitation. Depending on the project workers' income and form of accommodation provided by the company, there may be increased demand for accommodation, which may lead to price hikes and crowding out of residents.

3.4.5.3 Cultural/Lifestyle change

The succeeding tables in this section present the indigenous peoples as predominantly exemplified in Malaybalay comprising the Manobo, Bukidnon, Talaandig, Higaonon, Tigwahanon, Matigsalug, Umayamnon and other Lumads. Manolo Fortich also mentions the Binukid as a local dialect spoken by 9% of its population signifying the presence of IPs. The Bukidnon and Dumagat also flourish in Impasug-ong.

Malaybalay City

From the city's total population of 162,011 (MISS 2013), the ethnic population of 60,591 comprises more than a third (37.4%) of the total population. The highest number of ethnic populations in the city is Bukidnon which is about 28% of the total ethnic population. Higaonon ranks second embracing 39% of the ethnic population. As shown below, underscored are the ethnic groups within Bukidnon such as the Manobo, Bukidnon, Talaandig, Higaonon, Tigwahanon, Matigsalug, and Umayamnon. Ethnic groups from another locality are included in the "other Lumad" category.

Table 3-240. Population by ethnic origin in Malaybalay

Barangay	Manobo	Bukidnon	Talaandig	Higaonon	Tigwahanon	Matigsalug	Umayamnon	Others	Total
Urban									
Poblacion 1	39	606	119	459	4	5	18	22	1,272
Poblacion 2	12	100	10	68	0	0	0	1	191
Poblacion 3	0	106	25	6	0	0	0	0	137
Poblacion 4	0	76	2	72	0	0	0	0	150
Poblacion 5	0	55	1	8	0	6	0	0	70
Poblacion 6	8	353	10	28	0	0	0	2	401
Poblacion 7	1	133	41	26	0	1	0	1	203
Poblacion 8	10	254	8	38	3	0	1	0	314
Poblacion 9	139	1512	292	814	32	22	64	75	2,950
Poblacion 10	54	398	48	279	16	0	6	16	817
Poblacion 11	9	1185	98	95	13	5	2	6	1,413
Casisang	122	2769	245	798	93	23	24	54	4,128
Sumpong	64	1466	148	2090	10	7	17	5	3,807
Subtotal	**458**	**9,013**	**1,047**	**4,781**	**171**	**69**	**132**	**182**	**15,853**
Urbanizing									
Aglayan	26	961	233	667	11	1	30	4	1,933
Bangcud	174	598	445	869	75	7	37	1	2,206
Managok	73	589	61	207	60	14	301	2	1,307
San Jose	47	532	178	1,127	15	**0**	**9**	5	1,913
Subtotal	**320**	**2,680**	**2,870**	**2,870**	**161**	**22**	**377**	**12**	**7,359**
Rural									
Busdi	1	16	7	1,407	10	0	7	0	1448
Cabangahan	16	720	77	47	1	0	2	3	866
Caburacanan	0	0	0	962	0	0	0	0	962
Can-ayan	39	26	39	4,250	13	0	49	6	4,422
Capt. Angel	0	694	402	23	0	0	0	2	1,121
Dalwangan	31	3,091	207	197	0	1	3	77	3,607
Imbayao	15	447	187	26	0	3	15	0	693
Indalasa	17	106	11	159	0	4	308	0	605
Kalasungay	52	5,447	124	90	3	0	1	6	5,723
Kibalabag	4	1	13	1,039	1	0	2	0	1,060
Kulaman	1	8	0	1,011	2	0	0	0	1,022
Laguitas	15	510	66	707	11	0	25	0	1,334

Barangay	Manobo	Bukidnon	Talaandig	Higaonon	Tigwahanon	Matigsalug	Umayamnon	Others	Total
Linabo	44	1,530	105	794	29	1	18	8	2,529
Macote	26	109	40	134	29	3	192	8	541
Magsaysay	6	922	113	203	7	0	1	14	1,266
Maligaya	16	183	22	227	6	2	2	12	470
Manalog	2	0	0	879	3	0	0	0	884
Mapayag	3	665	14	201	0	0	0	0	883
Mapulo	5	20	3	430	0	4	11	1	474
Miglamin	22	33	19	276	0		298	2	650
Patpat	12	1,566	13	373	1	9	2	8	1,984
San Martin	82	94	78	867	14	0	9	0	1,144
Sila-e	24	11	16	833	1	9	101	0	995
Simaya	29	187	203	97	7	9	6	10	548
Sinanglanan	59	226	109	121	0	3	23	11	552
St. Peter	5	52	264	258	8	0	10	19	616
Sto. Niño	17	114	35	10	1	0	38	3	218
Violeta	7	154	95	100	15	11	12	1	395
Zamboanguita	7	2	23	318	0	0	16	1	367
Subtotal	**557**	**16,934**	**2,285**	**16,039**	**162**	**59**	1,151	**192**	**37,379**
Total	**1,335**	**28,627**	**4,249**	**23,690**	**494**	**150**	1,660	**386**	**60,591**
Lumad population (%)	**2.20%**	**47.25%**	**7.01%**	**39.10%**	**0.82%**	**0.25%**	**2.74%**	**0.64%**	

Source: Malaybalay CLUP 2016-2025

Manolo Fortich

Akin to other areas, the early settlers of Manolo Fortich are a combination of migrants from Visayas and the neighboring areas of Mindanao on top of the existing natives of the place. Several dialects Cebuano/Binisaya, Tagalog, Ilongo, and Binukid are spoken. **Table 3-241** shows the population distribution according to Mother Tongue (Ethnic Origin) by sex in 2010. According to ethnicity, majority of the people in Bukidnon are Cebuano accounting for approximately 41% of the total population. The Bukidnon lumads/IPs (Bukidnon, Higaonon, Manobo, Talaandig, etc.) account for about 24% of the total population of the province. The Maranao form about 8% of the total population followed by the Hiligaynon/Ilonggo and Boholano groups with 12.7% and 7.37%, respectively, of the province's total population.

In Manolo Fortich, 26, 000 are Bukidnon, 10,000 are Higaonon, and 4,000 are Talaandig who are indigenous to the area.

Table 3-241 Population in Manolo Fortich, 2020

IP Group	IP Population
Bukidnon	26, 000
Higaonon	10, 000
Talaandig	4,000
Total	40, 000

Source: Municipal IP Coordinator

Table 3-242 Population by mother tongue and sex in Manolo Fortich (2010)

Mother tongue	Male	Female	Total	% of Total
Cebuano	35,024	33,529	63,049	69.26%
Boholano	4,948	4,664	9,612	10.56%
Tagalog	2,712	1,830	4,542	4.99%
Bikol	1,467	1,375	1,223	1.34%
Ilonggo	821	543	1364	1.50%
Bontok	752	525	1,277	1.40%
Ilocano	1,165	473	1,638	1.80%
Other Local Dialect (Binukid, etc.)	4,654	4,431	8,084	8.88%
Other Foreign Languages	47	44	91	0.10%
Not Stated	291	255	146	0.16%
Total	**49,578**	**46,431**	**91,026**	100.00%

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

Based on 2011 CBMS Survey of Impasug-ong, 67.4% are Higaonon and 32.6% are of the tribes from outside Bukidnon (**Table 3-243**). Among the residents of Barangay Capitan Bayong, 63.9% of the residents are Higaonon and 36.1% other tribes while in Barangay Cawayan, 52.6% are from other tribes and only 47.4% are Higaonon. In addition, Impalutao has 68.7% Higaonon and 76.1% of the residents of Kibenton are Higaonon and 71.1% of the dwellers are in La Fortuna.

Bukidnon mother tongue shows dominance comprising 75% of the total population in Impasug-ong.

Table 3-243 Population of Indigenous People in Impasug-ong

Barangay	2007 Population	IP Population	Total (%)	2011 Population	IP Population	Poverty Incidence	No. of HH
Bontongon	837	835	99.76	876	874	82.1	162
Bulonay	1,377	905	5.72	1,515	996	80.4	276
Capitan Bayong	2,172	1,387	63.86	2,560	1,635	47.3	530

Cawayan	1,446	686	47.44	1,918	910	61.2	412
Dumalaguing	2,626	2,592	98.71	2,756	2,720	32.5	543
Guihean	1,590	1,138	71.57	1,880	1,346	57.9	356
Hagpa	2,849	1,251	43.91	1,658	1,167	68.2	537
Impalutao	4,239	2,911	68.67	1,484	3,766	66.3	1,145
Kalabugao	4,974	2,831	56.92	5,412	3,080	64.1	1,099
Kibenton	3,311	2,521	76.14	4,072	3,100	83.3	857
La Fortuna	3,129	2,224	71.08	3,835	2,726	48.1	801
Poblacion	6,502	4,709	72.42	10,061	7,287	61.4	2,180
Sayawan	1,230	471	38.29	1,272	487	69.8	265
Total	**36,282**	**24,461**	**7.42**	**44,299**	**9,866**	**63.28**	**9,162**

Source: Impasug-ong CLUP 2019-2028

Table 3-244. Population by mother tongue and sex in Impasug-ong

Ethnicity	Male		Female		Total	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Bago	10	0.06	14	0.04	4	0.03
Ibanag	5	0.03	9	0.03	4	0.03
Kankanay	5	0.03	6	0.02	1	0
Mangyan	2	0	3	0.01	1	0
Ibaloi	42	0.24	65	0.2	23	0.15
Cuyonen	8	0.05	13	0.04	5	0.03
Subanen	23	0.13	38	0.11	15	0.09
B'laan	27	0.16	41	0.12	14	0.09
Mandaya	13	0.08	34	0.1	21	0.13
Manobo	21	0.12	43	0.13	22	0.14
Teduray	8	0.05	17	0.05	9	0.05
Bukidnon	12,591	72.76	24,461	73.87	11870	75.01
Ati	5	0.029	11	0.03	6	0.038
Itom	10	0.06	20	0.06	10	0.06
Badjao	6	0.034	8	0.02	2	0.012
Tau'tbato	2	0	3	0.01	1	0
Dumagat	4,127	23.85	7,624	23.02	3,497	22.12
T'boli	25	0.14	47	0.14	22	0.14
Other	375	2.17	658	2	283	1.79
Total	**17,305**	**52.26**	**33,115**	**100**	**15,810**	**47.74**

Source: Impasug-ong CLUP 2019-2028

3.4.5.3.1 Existing culture and lifestyle

Malaybalay is home to several indigenous peoples possessing distinct customs and traditionsThere are seven IP groups in the Province of Bukidnon, namely: the Manobo, Higaonon, Bukidnon, Matigsalug, Talaandig, Tigwahanon and Umayamnon tribes. Significant findings of the study show that in the area of religion, they still believe in the existence of spirits that affect their daily activities, albeit exposed to different religious denominations. All the seven tribes continue to engage in rituals which they call "pamuhat" in many activities of their life. The use of herbal medicines to cure certain illnesses remain a tradition despite the presence of the health centers.

<u>Bukidnon</u>

The Bukidnon tribe speak the Binukid dialect. Farming is their main means of livelihood. Among the products they produce are corn, palay vegetables and abaca fiber. The Bukidnons are known for their interest in arts and handicrafts. They have dances for every occasion like planting rice, harvesting or marriage. They also make colorful costume jewelry and accessories made of ornamental materials.

Higaonon
The Higaonon tribe houses are mostly made of wood, are located in the middle of a pineapple plantation. The The main economic activity is slash and burn cultivation of upland rice and corn. The hunting of bats, snakes, field rats, monkey and different kinds of birds is prevalent. Fishing is also one of the major activities. The tribesmen derive their means of living from working in the field as laborers of the pineapple plantation owned by a multinational company.

Manobo
The Manobo's possess an ownership system such as communal ownership. Land, called pasak, is the basis of their survival. Land embodies everything vital to support their life and culture. Thus, the Manobo concept of territoriality or land and resource- ownership is not restricted to land itself but it includes those that are physically attached to it.

Manobo's subsistence pattern is semi-nomadic mainly on shifting agriculture with hunting and gathering as supplementary activities. They have diversified to other economic practices such as entrepreneurship and the provision of physical labor and other services. In general, though, agriculture remains the primary source of employment, followed by forestry, inland fishing, and mining.

Matigsalug
Matigsalug are the original inhabitants of the Salug River (now called the Davao River). Typical dwellings are made of wood with only one room. The life of an animist revolves around a spirit world. They maintain that spirits live in water, land, trees, and rocks. Tragedies like illnesses, drought and death are caused by angry spirits. Events like planting crops and revenge-taking (called "pangayaw") are preceded by rituals. Life is preoccupied with appeasing the spirits by offering sacrifices.

Tigwahanon
The term Tigwahanon may have been derived from "guwa" (scattered) or from the Tigwa River. They were originally living in the nearby mountains of San Fernando, Bukidnon. The Tigwa river served as the main source of their livelihood. They have no problem as to food as they can always go hunting and gather plants that can be eaten. They are now farm laborers.

Umayamnon
These Indigenous peoples dwell along the watershed of Umayam River in the Mountains of Pantaron. The Umayamnon tribe means of livelihood is farming. Others work as laborers in nearby rice fields. Umayamnon are excellent makers of bead jewelry like necklaces called ginakit and inboy, beautiful, beaded men's bag called suning and unisex beaded bracelets called binuklad. They are proud and reserved people.

Talaandig
The members of the group are found in barangays and municipalities surrounding the mountain of Kitanglad, the historic domain of the Talaandig people. The Talaandigs are semi-settled agriculturalist in the uplands. The traditional crops of the Talaandig include corn, rice, rootcrops, abaka and banana. These crops are usually produced at consumption levels. Supplements to this subsistence level economy are raising chickens, pigs and other livestock. Pigs and chickens are usually utilized for religious purposes while large animals such as horses and carabaos are used for payment of debt and other financial obligations. The Talaandig technology includes blacksmithing, weaving, embroidery, hunting and food gathering.

3.4.5.3.2 Impacts on the culture and lifestyle

Cultural/lifestyle change on Indigenous Peoples
Government projects like establishment of highway projects that might encroach CADC/CADT will have an affect the security of land tenure that eventually would lead to displacements of the IP inhabitants. Certificate of Non-Overlap has been issued in Misamis Oriental and major parts of the Project in Bukidnon while FPIC is needed for the Barangays in Ticala, Manolo fortich, Culasi, Poblacion, Puntian, Vista Villa and San Roque in

Sumilao of which were identified within the unified claim of IMPUMATRICS (**Appendix 42**). If and when the final design would cover part of IPs ancestral domain, and displacements will occur, this would alter the life style of the people due to the probable loss of their traditional resources. This may affect their lands where they obtain their livelihood and food nutrients, herbal medicines, which they use for curing illness, the loss of the sacred grooves and ritual places and, likewise, desecration of the burial of their ancestors.

This could also lead to changes of their traditional culture and values system, as well as their indigenous knowledge system because such knowledge will be replaced by outsiders' knowledge and finally abandoning their cultural lore. The elders and adult members of the community fear that the youth might be influenced by the pressures of modern ways and that they cannot uphold or continue to live out their culture and traditions. Thus, the disappearance of culture and tradition is a feared possibility. The dreams and aspirations of the IPs are government support to help them uplift their social and economic status

3.4.5.3.3 Impacts on physical cultural resources

Cagayan de Oro City, Misamis Oriental

The City Museum of Cagayan de Oro, formerly known as the Water Tank Tower, is one of the historical places in city that contains old photographs and paintings, artifacts, antiques and an interesting old Ostrich egg, which is believed to be centuries old. The establishment is the oldest public structure in the city, which was built in 1922 and renovated into a museum in 2008.

Museo de Oro exhibits artifacts dug from Huluga Caves and repertoire of Bukidnon and the Maranao cultures; and the La Castilla, a museum dedicated to the conservation and preservation of the historical and cultural heritage found in the personal memorabilia of the founders of the Liceo de Cagayan University.

The most known worship venue in the city, St. Augustine Metropolitan Cathedral, located at the right of the City Museum of Cagayan de Oro. It has a gothic style architecture, adorned with stained glass and beautiful paintings of the four evangelists. The establishment has gone through several changes since it was built in 1624. It was only in 1946 when the cathedral and the convent was rebuilt through Archbishop James Hayes, SJ.

Just beside the St. Augustine Metropolitan Cathedral is the Gaston Park. It was once the main plaza of Cagayan de Misamis during the Spanish colonial period which served as a training ground for local patriots in the course of the Philippine-American War.

Another establishment in the city is Vicente de Lara Park, formerly known as MacArthur Park, where Press Freedom Monument and the Heritage Monument of Misamis Oriental designed by national artist Eduardo Castrillo.

Malaybalay City, Bukidnon

The several cultural/heritage in Malaybalay City are enumerated below:

- **Roxas Monument**

Source: Government of Malaybalay

The memorial site to the late president Manuel Roxas is a tribute to his heroism during the Japanese Regime when his patriotism and refusal to cooperate with the invaders brought him to imprisonment right in the site of the monument.

- **Torre ni David**

Source: Hans Brandeis

An eccentric house gives the visitor a mix awe, fear and curiosity, having been constructed with faces in the posts and in the ground and other sculptures. Although not maintained as before, there are remaining vestiges of the glory that was.

- **Old Acacia Trees**

Source: Bethel Baptist Hospital, Malaybalay City, Fortich St

Although claims of the age of these trees are not substantiated, the trees are interesting for their steady presence in the city and for their fast-dwindling numbers as many of them fall to the unexplained cuttings. The city was once full of them in the national road. One of the remaining is on the road across the plaza and

another, in the Bethel Baptist Hospital Compound which in itself is a place for the 40's style complex of building, a vestige of the missionary days of American doctors who started the hospital nearby.

- **Ereccion de Pueblo**

Source: Government of Malaybalay

This newly inaugurated monument depicts the negotiation and agreement between the Spanish colonizers and the native leaders, which took place in Malaybalay on June 15, 1877 in what may be the site traditionally described as the banks of the nearby Sakub spring. The source of this depiction is the Spanish document which is a record of the meeting on that date.

- **OTOP Products** of Malaybalay

Source: Discover Bukidnon

This is made from *"Hinabol"* a native material woven by "Bukidnon-Higaonon" tribe. It is made from abaca fiber and converted to different forms like bags, home decors, ribbons and other uses. Malaybalay Choice Handicrafts, Kamumay, Nida's Handicrafts, Valdez Handicrafts and Zeta Trading offer original and converted Bukidnon products from hinabol.

- Mt. Kitanglad Range National Park (MKRNP)

Source: DENR

The Mount Kitanglad Range Natural Park (MKRNP)- a total land area of 47,270 hectares, is located in northern Mindanao in the province of Bukidnon in Region 10. Mount Kitanglad is one of five peaks in the Kitanglad Mountain Range at 2,899 meters above sea level. MKRNP was declared a Protected Area through Republic Act No. 8978 in 2000. It was also declared as ASEAN Heritage Park in 2009 (DENR 2015).

MKRNP occupies portions of 8 municipalities in Bukidnon and provides various ecosystem services (e.g., water for domestic, agricultural, industrial, and commercial use, source for power generation) to over 100,000 households, and also to nearby provinces and cities like Cagayan de Oro City.

The eight municipalities and cities include Talakag, Baungon, Libona, Manolo Fortich, Impasugong, Lantapan and Malaybalay. The study area for the Central Mindanao High Standard Highway Project traverses the city of Malaybalay and the municipalities of Manolo Fortich, and Impasug-ong. Specifically, Malaybalay is located in the west of Mt. Kitanglad Range National Park (MKRNP). Four barangays of the city namely Dalwangan, Capitan Anghel, Imbayao, and Mapayag are within the buffer zone of the Mount Kitanglad Range Natural Park. The Protected Area Management Board (PAMB) has specified regulations as to the use of resources in the buffer zone. Thus, the city government ensures that communities of these barangays will follow the rules set by the PAMB (Malaybalay CLUP 2016-2025).

In Manolo Fortich, the Mt. Kitanglad Range National Park is located on the south. Two barangays in Manolo Fortich are located along Mt. Kitanglad Range National Park which are Barnagay Dahilayan and Barangay Guilang-guilang (Manolo Fortich CLUP 2013-2022). In Impasug-ong, the highest crest of the municipality is found at Mt. Kitanglad Range National Park located at the southern tip. Mt Saldab is located at the central part within Dumalaguing, Mt. Kimangkil at the northern part within barangay Hagpa, Mt. Kibuwa found at the south-eastern part within barangay Impalutao and Mt. Pangalak-akan, found within the vicinity of the municipal ranch (Impasug-ong CLUP 2019-2028

- **Camp Kasisang**

Source: Government of Malaybalay

A fifty-hectare camp in the heart of Bukidnon plateau, where Brigadier-General Roxas and 6,000 prisoners of war were imprisoned from August to December 1942.Camp Kasisang had been a training ground for the Philippine Constabulary.

Table 3-245 Distance of cultural areas to the Project

Name	Location	Distance (km)	Year Registered	Laws/ Regulations	Supervisory Authority
City Museum of Cagayan de Oro	Brgy. 1, Cagayan de Oro	13.49	2008	Cagayan de Oro Heritage Council	Cagayan de Oro LGU
Museo de Oro	Brgy. 40, Cagayan de Oro	12.94	1967		Liceo de Cagayan University
St. Agustine Metropolitan Cathedral	Brgy. 1, Cagayan de Oro	13.49	1624		Archdiocese of Cagayan de Oro
Gaston Park	Brgy.1, Cagayan de Oro	13.96	1624	National Historical Institute Marker	Cagayan de Oro LGU
Vicente de Lara Park	Brgy. 27, Cagayan de Oro	12.54			Misamis Oriental LGU
Old Acacia Trees	Sumpong, Malaybalay	1.79			
Ereccion de	Brgy. 8, Malaylabay	2.71	2010		Malaybalay LGU

Name	Location	Distance (km)	Year Registered	Laws/ Regulations	Supervisory Authority
Pueblo					
One Town, One Product	Casisang, Malaybalay	4.86			Malaybalay LGU
Roxas Monument	Aglayan, Malaybalay	12.03			Malaybalay LGU
Torre ni David	Cabangahan, Malaybalay	15.56	1962		Valmoria Family
Mt. Kitanglad Range National Park	Dalwangan, Capitan Anghel, Imbayao, and Mapayag, Malaybalay	35-37	2000	Declared as national park by PD No 677 dated December 14, 1990	Protected Area Management Board (PAMB)
	Barnagay Dahilayan and Barangay Guilang-guilang, Manolo Fortich			Declared as Protected Area under Presidential Proclamation 896 dated October 24, 1996	Malaybalay LGU
	Dumalaguing, Hagpa, Impalutao, Impasug-ong			Republic Act 8978 also known as the "Mt. Kitanglad Range Protected Area Act of 2000 on November 9, 2000	Manolo Fortich LGU
				ASEAN Heritage Park in 2009	Impasug-ong LGU
Camp Kasisang	Malaybalay	4.6-7	1948	Level II – Historical Marker	Philippines Historical Committee (PHC)

Focus group discussion has been conducted last April 27-28, 2021, with the IP leaders in order to determine the presence of sacred areas near the Project, their water sources and sources of livelihood. Based on the FGDs, interview with the barangay Indigenous People Mandatory Representatives, and visit to the allowed sacred areas and water sources, no sacred areas (**Table 3-246** and **Figure 3-114**) and water sources (**Table 3-247** and **Figure 3-115**) will be traversed by the alignment. Major sources of livelihood of the IPs are mostly farming and animal husbandry. Some of them are engaged in bead making, abaca weaving and managing resorts**. Annex 12** shows the photos of the sacred areas, water sources and minutes of the meetings.

Table 3-246. List of sacred areas near the Project

No.	Sacred Places	Coordinates		Distance*	Barangay	Municipality
		Longitude	Latitude			
1	Imbado Area	124.807	8.475181	0.55	Mambatangan	Manolo Fortich
2	Mambatangan Creek	124.8136	8.474182	0.55	Mambatangan	
3	Alae Creek	124.816	8.419892	1.6	Alae	
4	Pulog Hill	124.8479	8.417073	2.89	San Miguel	
5	Dicklum Creek	124.8449	8.380175	2.11	San Miguel	
6	Kapuso Creek	124.8598	8.352884	0.8	Tankulan	
7	Tungtungan	124.8436	8.323071	2.84	Sankanan	
8	Maninit creek	124.8594	8.336163	1.06	Sankanan	
9	Kihare creek	124.8607	8.337809	1.06	Sankanan	
10	Banda spring	124.8497	8.29173	5.91	Lindaban	
11	Balete tree	124.869	8.369526	2.97	Tankulan	
12	Mangima river	124.8745	8.364116	2.26	Dalirig	
13	Pagbayuhan stone	124.8804	8.358106	1.63	Dalirig	
14	Sisimon Stone	124.8852	8.346419	0.41	Ticala	
15	Ritual site near Kumaykay	124.8704	8.293948	5.61	Sankanan	
16	Inlapay River	124.8915	8.335826	0.03	Ticala	
17	Basag Falls	124.9111	8.333315	0.17	Vista Villa	Sumilao
18	Basag Cave	124.9111	8.333315	0.17	Vista Villa	
19	Basag river	124.9111	8.333457	0.13	Vista Villa	
20	Inigsinulan	124.9081	8.30672	2.8	Puntian	

No.	Sacred Places	Coordinates		Distance*	Barangay	Municipality
		Longitude	Latitude			
21	Taryaki	124.9359	8.330376	0.77	San Roque	
22	Mt. Kitanglad	124.9253	8.180058	2.23	San Vicente	
23	Danao cave	124.9551	8.215562	2.43	San Roque	
24	Ilihan Cave	124.983	8.330207	2.56	Kisolon	
25	Alalum Falls	124.9804	8.324124	1.57	Kisolon	
26	Pigaralan creek	124.94722	8.305	1.37	Bontongohan	
27	Humuhulyaw creek	124.9333	8.186281	11.49	La Fortuna	Impasug-ong
28	Inkalumad	125.0296	8.290216	4.12	Capitan Bayong	
29	Lirupan	125.0193	8.275075	2.03	Capitan Bayong	
30	Ipoon creek	125.0322	8.226544	1.04	Dalwangan	
31	Mt. Dapitan	124.91	8.06303	20.34	Victory	Lantapan
32	Kulasian Creek	125.12	8.0125	16.4	Cabangahan	Malaybalay
33	Segaba and kabakahan creek	125.0922	8.178351	1.44	Kalasungay	
34	Diguman ritual area	125.1048	8.181569	2.2		
35	Lumayaga and bag-as creek	125.1205	8.169827	1.11	Brgy 10	

NOTE: *distance to the Project, in km

Table 3-247. List of water sources of the IPs near the Project

No.	Water Sources	Coordinates		distance	Barangay	Municipality
		Longitude	Latitude			
1	Cawayanon deep well	124.8321	8.201889	0.86	San Miguel	Manolo Fortich
2	Miranda deep well	124.8213	8.382441	1.77	Damilag	
3	Balanban spring	124.8136	8.31087	5.52	Agusan Canyon	
4	Banda spring	124.8497	8.29173	6.08	Sankanan	
5	Unahon spring	124.8799	8.275198	6.71	Kalugmanan	
6	Basag falls	124.9106	8.275198	0.2	Villa Vista	Sumilao
7	Basag creek	124.9111	8.333457	0.13	Villa Vista	
8	Palaopao spring	124.9628	8.326492	1.79	San Roque	
9	Molokbolok spring	124.9322	8.181093	10.36	Lupiagan	
10	Pigaralan creek	124.94722	8.305	1.37	Bontongohan	
11	Sagumata spring	124.9404	8.186669	9.48	La Fortuna	Impasug-ong
12	Inlerop spring	124.952	8.204738	8.48		
13	Lalawan spring	124.9724	8.194459	6.18	Capitan Angel	
14	Sawaga river	125.0286	8.181093	3.18	Dalwangan	Malaybalay
15	Kulasian Creek	125.12	8.0125	16.4	Cabangahan	
16	Kulasihan Madaluson spring	125.0077	8.100242	10.22	Imbayao	
17	Yumayaban spring	125.0949	8.326492	2.82	Kalasungay	
18	Ibalabag spring	125.1273	8.213165	6.42	Sumpong	
19	Lumayaga and bag-as creek	125.1227	8.344789	1.5	Sumpong	

NOTE: *distance to the Project, in km

Distribution map of sensitive receptors such as education facilities, medical facilities, places of worship, and other public facilities is show in **Table 3-248** and **Figure 3-117**. All facilities are distributed more than 200 meters away from the center of the proposed CMH alignment.

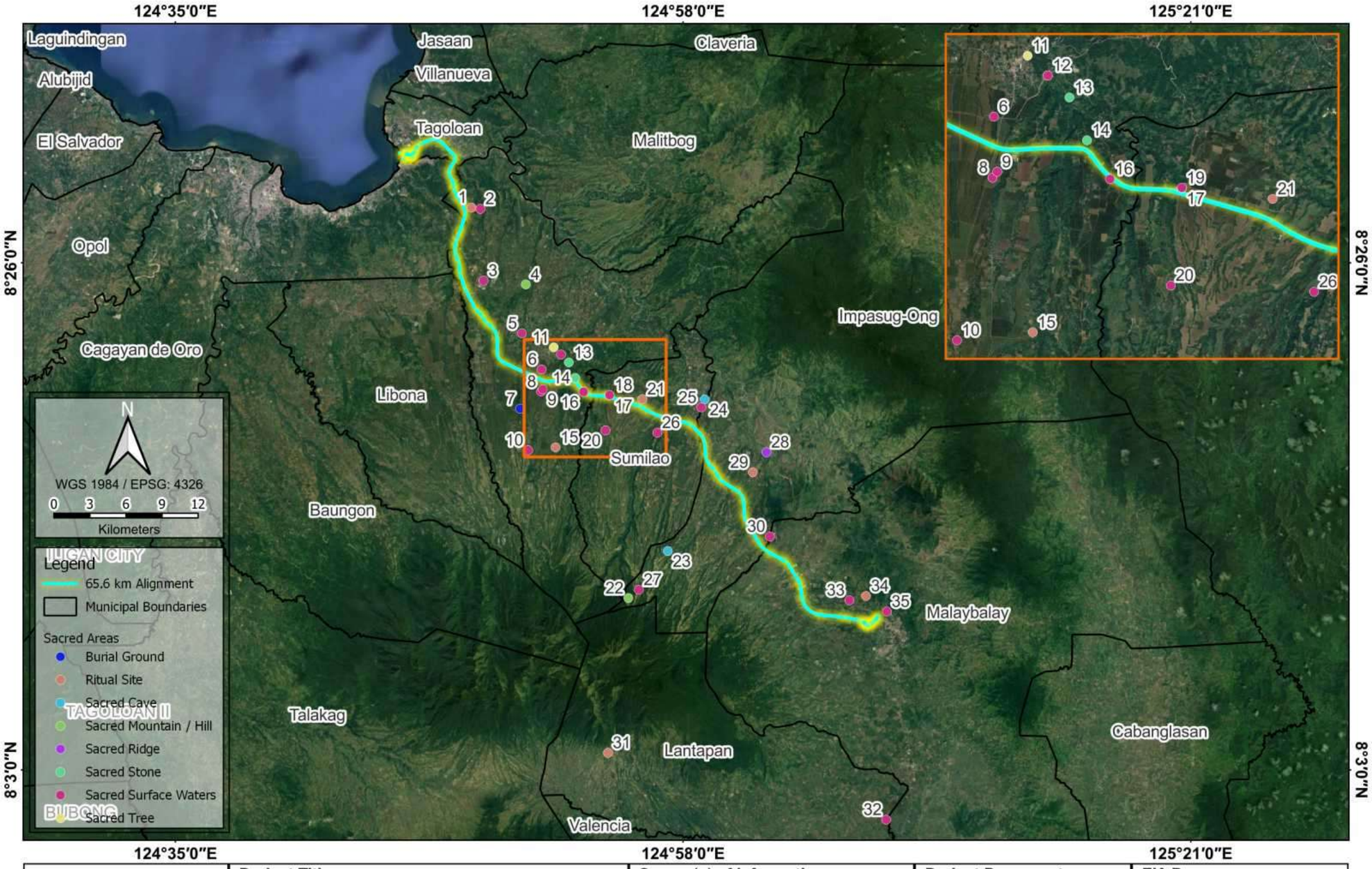
Table 3-248 List of Sensitive Receptors near the Project

No.	Name	Receptor	Distance (m)*	Amenity
1	Prois International Christian School System	Educational Facilities	2,006	school
2	St. Ignatius Technical College	Educational Facilities	1,921	school
3	E-tracc Station	Transportation	859	fuel
4	New Hope Christian School	Educational Facilities	985	school
5	Natumolan Elementary School	Educational Facilities	1,223	school
6	Healtop Eight Pharmacy	Medical Facilities	476	pharmacy
7	Bugo Barangay Hall	Public Facilities	448	townhall
8	PHLPost	Public Facilities	472	post_office
9	R&J Pharmacy	Medical Facilities	665	pharmacy
10	Bright Rock School	Educational Facilities	615	school
11		Public Facilities	785	shelter
12	Philippine Southfield School	Educational Facilities	936	school
13	Suntingon Elementary School	Educational Facilities	1,199	school
14	Bugo National High School	Educational Facilities	1,376	school
15	King of Zion School	Educational Facilities	1,958	school
16	COPCO Police Station 6	Police	1,553	police
17	Rose Pharmacy	Medical Facilities	1,513	pharmacy
18	Mercury Drug	Medical Facilities	1,498	pharmacy
19	Melecia Drug	Medical Facilities	1,479	pharmacy
20	Roan Pharmacy	Medical Facilities	1,486	pharmacy
21	Rika Drugstore	Medical Facilities	1,405	pharmacy
22	Rohon Pharmacy	Medical Facilities	1,391	pharmacy
23	China Bank	bank	1,372	bank
24	Southern Drugstore	Medical Facilities	1,366	pharmacy
25	Pen Bank	bank	1,307	bank
26	BPI	bank	1,262	bank
27	Christian Samaritan School	Educational Facilities	1,233	school
28	Mindanano Consolidated Cooperative Bank	bank	1,193	bank
29	JRS Express	Public Facilities	1,188	post_office
30	First Community Cooperative	bank	1,202	bank
31	BDO	bank	1,176	bank
32	PHINMA-Cagayan de Oro College	Educational Facilities	1,144	college
33	Malitbog Church	Place of Worship	9,643	place_of_worship
34	Aglipay Church	Place of Worship	9,675	place_of_worship
35	Malitbog Police Station	Police	10,012	police
36	Iglesia ni Cristo	Place of Worship	10,300	place_of_worship
37	Patac Primary School	Educational Facilities	19,542	school
38		Public Facilities	4,395	shelter
39	Sto. Nino Parish de Alae	Place of Worship	1,573	place_of_worship
40	San Miguel BHS	Medical Facilities	1,348	clinic
41	Our Mother of Perpetual Help Church	Place of Worship	927	place_of_worship
42	DPWH 3rd District Engineering Office	Public Facilities	2,178	public_building
43	Provincial Industrial Zone	Public Facilities	2,294	public_building
44	PharmaSave	Medical Facilities	2,470	pharmacy
45	Rural Bank of Manolo Fortich	bank	2,436	bank
46	Manolo Fortich Police Station	Police	2,460	police
47	D' Asian Hills Bank	bank	2,549	bank
48	Manolo Fortich Municipal Police Station	Police	2,790	police
49	DPWH Rank & File Cooperative Station	Public Facilities	3,311	community_centre
50	Dalirig Barangay Hall	Public Facilities	3,987	townhall

No.	Name	Receptor	Distance (m)*	Amenity
51	San Lorenzo Ruiz Church	Place of Worship	1,797	place_of_worship
52	San Isidro Old BHS	Medical Facilities	7,513	clinic
53	San Isidro BHS	Medical Facilities	9,080	clinic
54	St. Agustine Church	Place of Worship	7,234	place_of_worship
55	Brgy. Puntian, Sumilao BHS	Medical Facilities	5,897	clinic
56	Kalanganan Elementary School	Educational Facilities	18,736	school
57	DPWH Field Office	Public Facilities	7,056	public_building
58	Sumilao Cooperative Community Center	Public Facilities	4,322	community_centre
59	NFA	Public Facilities	3,130	public_building
60	Petron	Transportation	2,985	fuel
61	Sumilao Bus Terminal	Transportation	2,715	bus_station
62	Phoenix	Transportation	2,640	fuel
63	Shell	Transportation	2,434	fuel
64	Christ The King	Place of Worship	2,124	place_of_worship
65	Pilar High School	Educational Facilities	2,116	school
66	Petron	Transportation	2,068	fuel
67	Sumilao RHU	Medical Facilities	1,622	clinic
68	Impasug-ong Police Station	Police	2,027	police
69	Impasug-ong Central Elementary School	Educational Facilities	2,162	school
70		Transportation	5,854	ferry_terminal
71		Transportation	5,853	ferry_terminal
72	Himlayanan	Public Facilities	4,279	shelter
73	Impalutao Barangay Hall	Public Facilities	1,688	townhall
74	Northern Mindanao Integrated Research Center	Public Facilities	396	public_building
75	Bureau of Soils & Water Management	Public Facilities	377	public_building
76	Bureau of Animal Industry	Public Facilities	416	public_building
77	Bureau of Soils & Water Management	Public Facilities	412	public_building
78	National Artificial Breeding Center	Public Facilities	285	public_building
79	Rojon	Medical Facilities	775	pharmacy
80	Sumpong Chapel	Place of Worship	888	place_of_worship
81	Rodel Pharmacy	Medical Facilities	902	pharmacy
82	Bethel Baptist Christian Academy	Educational Facilities	1,109	school
83	One Network Bank	bank	1,425	bank
84	BDO Network Bank	bank	1,425	bank
85	LBC	Public Facilities	1,448	post_office
86	BukSU University Library	Educational Facilities	1,547	library

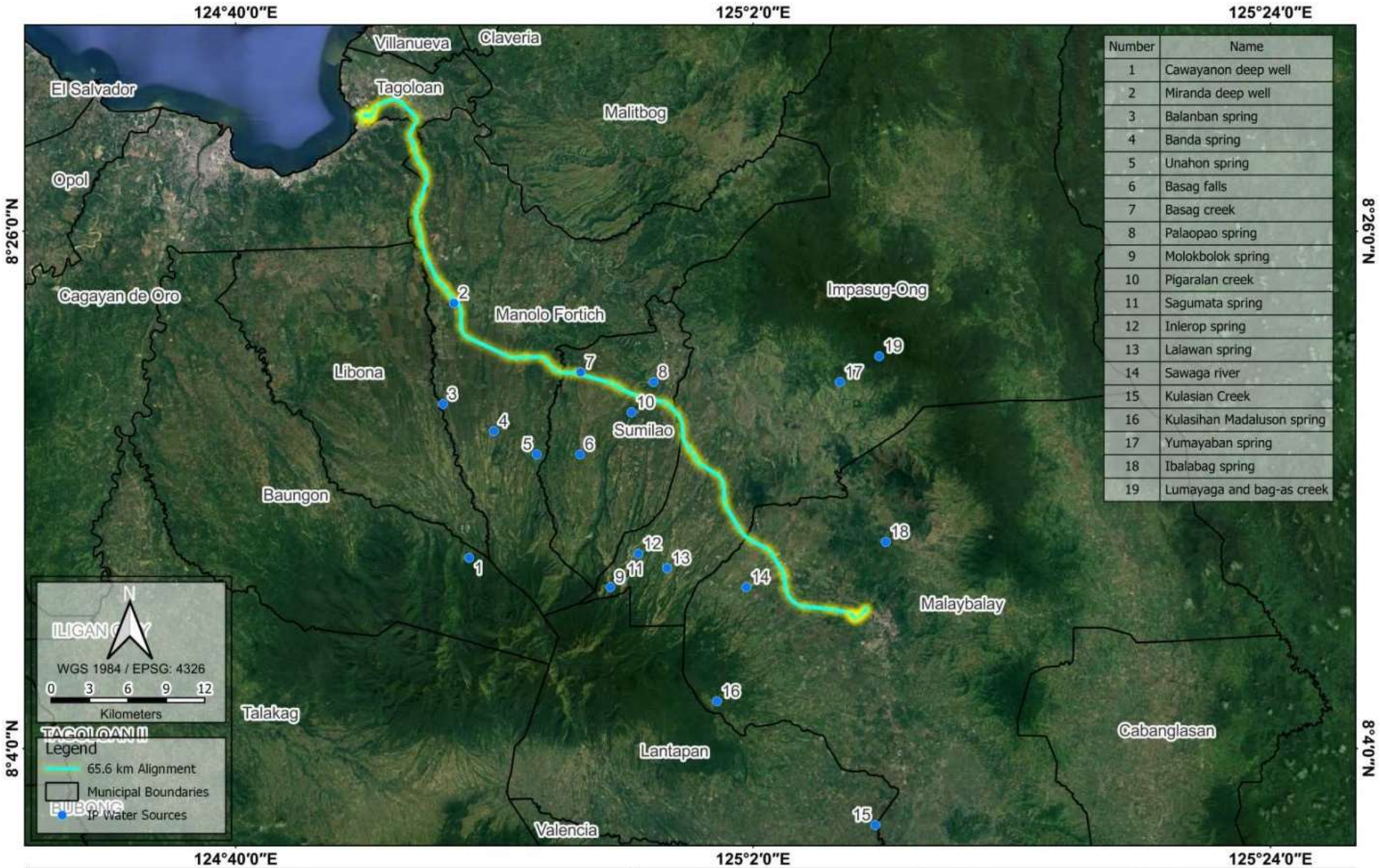
NOTE: *Distance from the center of CMH to facility (m)

Figure 3-114. Sacred areas of the IPs near the alignment



Sacred Areas Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Satellite (Basemap) PSA 2016 (Administrative Boundaries)		

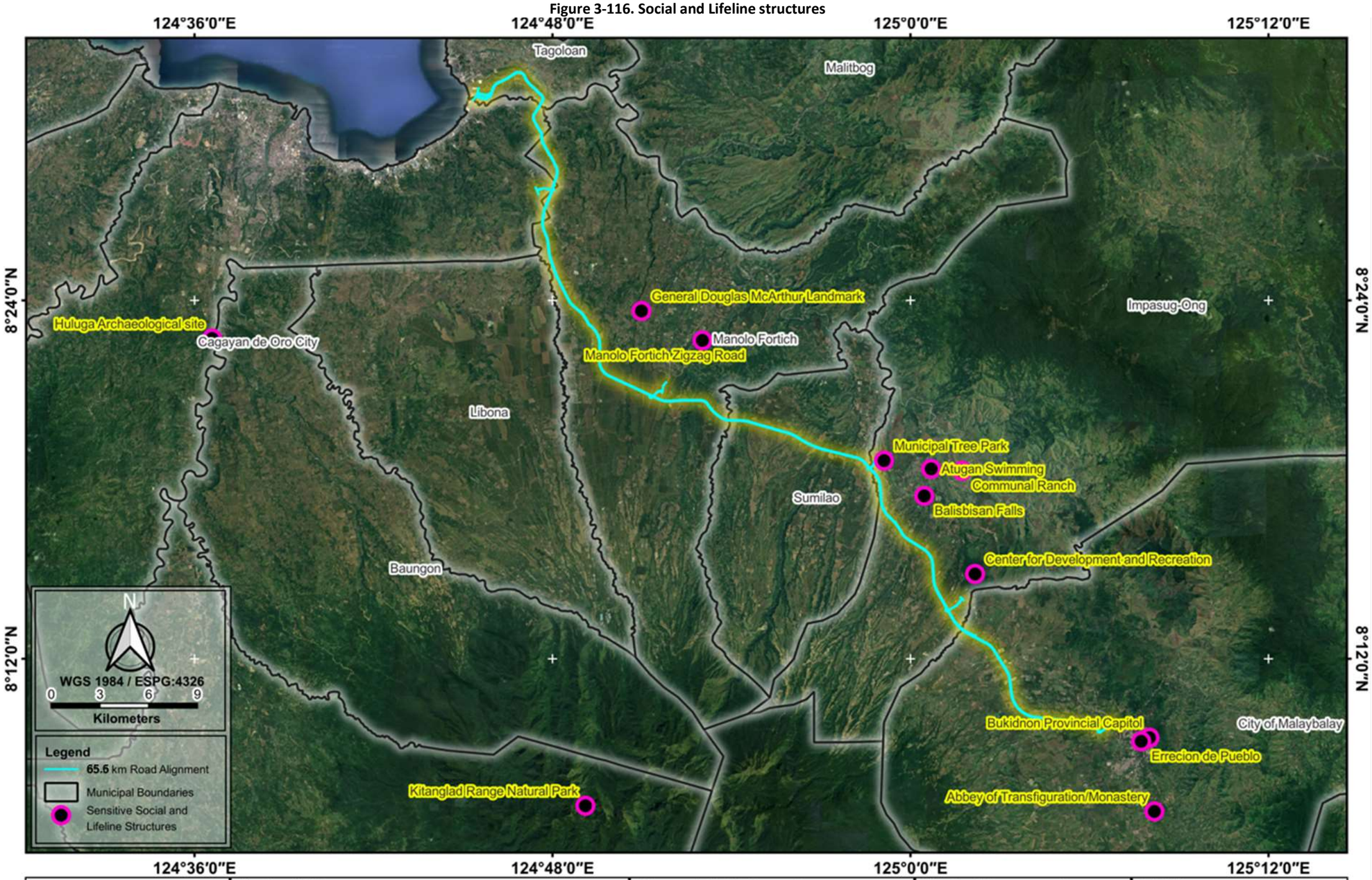
Figure 3-115. Water sources of the IPs



Number	Name
1	Cawayanon deep well
2	Miranda deep well
3	Balanban spring
4	Banda spring
5	Unahon spring
6	Basag falls
7	Basag creek
8	Palaopao spring
9	Molokbolok spring
10	Pigaralan creek
11	Sagumata spring
12	Inlerop spring
13	Lalawan spring
14	Sawaga river
15	Kulasian Creek
16	Kulasihan Madaluson spring
17	Yumayaban spring
18	Ibalabag spring
19	Lumayaga and bag-as creek

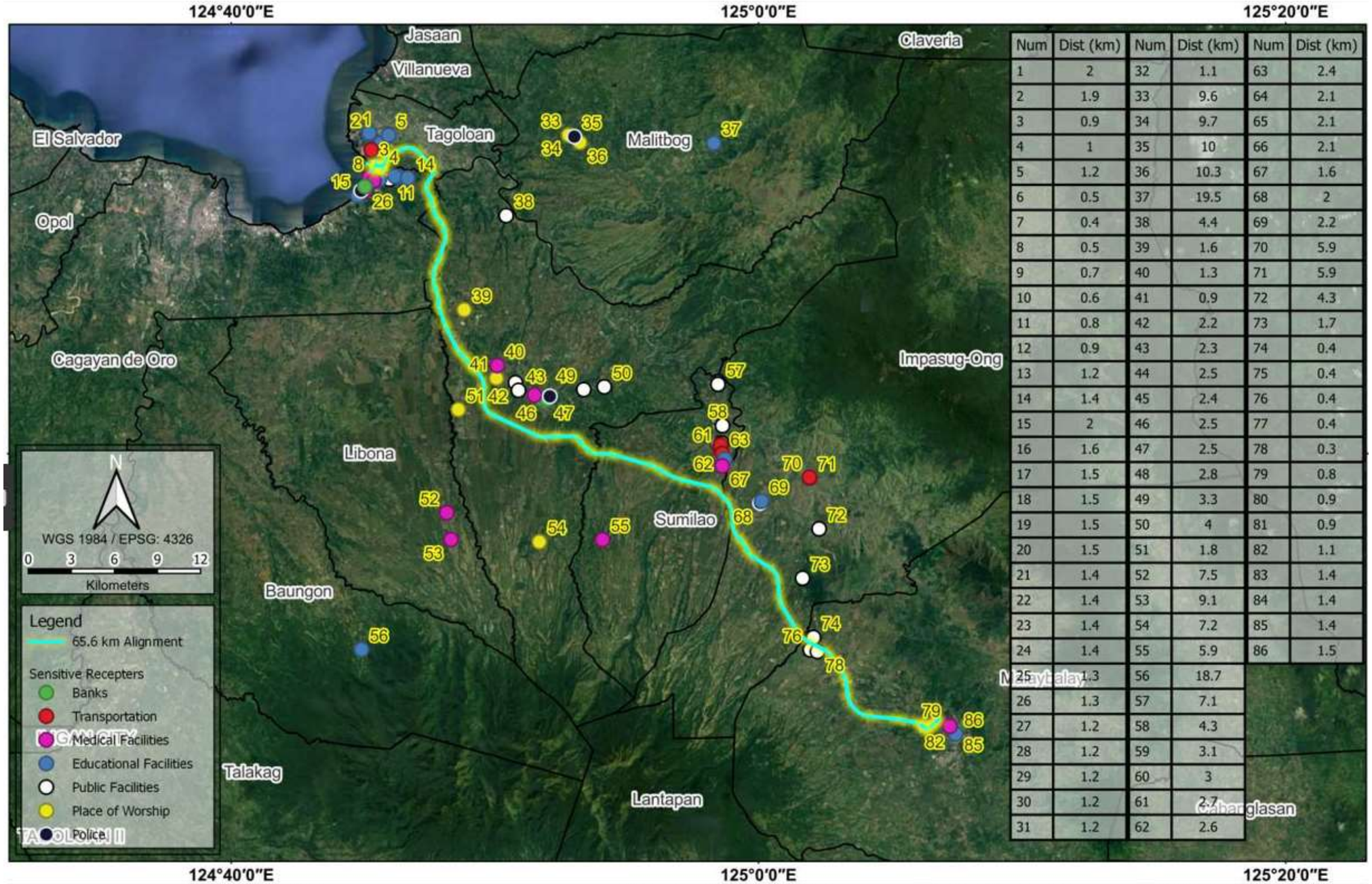
IP Water Sources	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Satellite (Basemap) PSA 2016 (Administrative Boundaries)		

Figure 3-116. Social and Lifeline structures



	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
Social and Lifeline Structures	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries)	JICA	AMEC ASIA INC.

Figure 3-117. Sensitive Receptors



Num	Dist (km)	Num	Dist (km)	Num	Dist (km)
1	2	32	1.1	63	2.4
2	1.9	33	9.6	64	2.1
3	0.9	34	9.7	65	2.1
4	1	35	10	66	2.1
5	1.2	36	10.3	67	1.6
6	0.5	37	19.5	68	2
7	0.4	38	4.4	69	2.2
8	0.5	39	1.6	70	5.9
9	0.7	40	1.3	71	5.9
10	0.6	41	0.9	72	4.3
11	0.8	42	2.2	73	1.7
12	0.9	43	2.3	74	0.4
13	1.2	44	2.5	75	0.4
14	1.4	45	2.4	76	0.4
15	2	46	2.5	77	0.4
16	1.6	47	2.5	78	0.3
17	1.5	48	2.8	79	0.8
18	1.5	49	3.3	80	0.9
19	1.5	50	4	81	0.9
20	1.5	51	1.8	82	1.1
21	1.4	52	7.5	83	1.4
22	1.4	53	9.1	84	1.4
23	1.4	54	7.2	85	1.4
24	1.4	55	5.9	86	1.5
25	1.3	56	18.7		
26	1.3	57	7.1		
27	1.2	58	4.3		
28	1.2	59	3.1		
29	1.2	60	3		
30	1.2	61	2.7		
31	1.2	62	2.6		

Sensitive Recepters Map	Project Title	Source(s) of Information	Project Proponent	EIA Preparer
	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Sensitive Recepters: Open Street Map		

3.4.5.4 Threat to delivery of basic services/resource competition

3.4.5.4.1 Water supply

Cagayan de Oro city, Misamis Oriental

The Cagayan de Oro Water District (COWD), registered in 1973, was the first water district to be established in the country. Its service area covered 64 of the 80 barangays of the Cagayan de Oro City, which include Barangays 1-40 of the Poblacion and 24 non-población barangays. COWD reservoirs, with the following respective location and capacity are shown **Table 3-249**.

Table 3-249 Water service area connection in Cagayan de Oro City (2018)

Location	No. of service connection			Total
	Residential	Commercial	Government	
West Service Area	51,042	2,045	149	53,262
East Service Area	39,356	4,611	391	44,406
Others	74	0	0	74
Total	**79,342**	**5,884**	**540**	**97,668**

Source: Cagayan de Oro City CLUP 2013-2022

Table 3-250 Water reservoir in Cagayan de Oro City (2018)

Description	Location	Capacity (cu.m.)
Concrete	Camaman-an	5,300
Concrete	Carmen	5,300
Steel Tank	Aluba Subd., Macasandig	76
Concrete	Bulua	2,900
Concrete	Tablon	2,100
Concrete	Puerto Heights, Puerto	4,000
Concrete	Youngsville	95
Steel Tank	Paglaum, Camaman-an	60
Steel Tank	Richmond, Camaman-an	189
Steel Tank	Malanang, Opol	385

Source: Cagayan de Oro City CLUP 2013-2022

Majority of connection comprises residential and commercial. The average water consumption in the entire City is about 1,438,068 cubic meters which is consumed by the government. People living in areas not presently covered by COWD rely on point sources such as shallow well, dug well and spring or a combination of these sources for their water needs. Some areas are served by communal faucet system. Other areas rely on ground water sources or rainwater and surface water.

Table 3-251 Water supply in CDO (2018)

Source of water	No. of HH	Percentage of HHs served
Level I	497	0.35
Level II	7,215	5.14
Level III	132,730	94.35
Others	226	0.16
Total	**140,668**	**100**

Source: Cagayan de Oro City CLUP 2013-2022

Malaybalay City, Bukidnon

Malaybalay has available water supply coming from surface waters from the mountain ranges of Mt. Kitanglad, and Mt. Tago. Majority of water sources were surface waters, however, there are also several functional deep wells that draw water from the underground aquifer. Water supply is delivered by a local water district serving 22 Barangays, 11 of which are from the Poblacion while Barangay Bangcud and Linabo are only partially served by the district. The remaining 24 barangays have their own water systems operated

by the Barangay Government. All levels of water supply are available to all barangays (Level 1, 2, 3). However, it can be noted that all barangay owned water systems are not equipped with chlorinators or equivalent disinfecting equipment.

Table 3-252. Water district connections by type in Malaybalay

Barangay	Commercial	Residential	Institutional	Total
Barangays 01 to 11	1,127	3,571	1	4,812
Aglayan	163	570	5	738
Bangcud	4	60	1	65
Cabangahan	6	274	3	283
Can-ayan		96	3	99
Casisang	271	3,914	22	4,207
Dalwangan	13	317	4	334
Kalasungay	62	911	8	981
Laguitas	25	298	4	327
Linabo	1	183	1	185
San Jose	48	667	7	722
Sumpong	263	1,337	11	1,611
Total	**2,187**	**11,105**	**192**	**13,484**

Source: Malaybalay CLUP 2016-2025

The local water district relies on 90.21% of its water supply from surface waters. Majority of its water supply comprise 65% of water distributed to its concessionaires produced by the treatment plan owned and run by the local government unit. The Malaybalay City Water Supply System's plant is situated in Sitio Kimambong. The plant has a capacity of producing 120-170 liters per second. The remaining 35% is produced from the combined pumping stations and water processing facilities of the district.

Table 3-253 Inventory of water system facilities in Malaybalay

Water source	Facility	Source capacity	Plant capacity	Ave. actual production
Kibalabag Creek	MCGWSS Plant	250	170	120
Sawaga River	Sumpong Plant	70	40	34
Bag-as, Lumayagan Creeks	Kalasungay Plant	42	30	18
Deep well	BLISS pump station	4	4	4
	Cabangahan pump station	3	3	3
	Dalwangan (BOS) pump station	3	3	3
	Azura pump station	4	4	4
	Total	**376**	**254**	**186**

Source: Malaybalay CLUP 2016-2025; all values in liter per second

The Malaybalay City Water District has expanded its service area to six barangays beginning in the year 2005 identified as Barangay San Jose, Laguitas, Aglayan, Linabo, Cabangahan and Dalwangan. The number of concessionaires rose to13,292 in 2014, in 2010 it was only 10,827 connections. This is equivalent to 23% growth over the last 5 years. The growth can be attributed to the expansion projects implemented jointly by the Local Government of Malaybalay City and of the district. Services have been expanded to include the highway barangays such as Bangcud and Patpat. Barangay Can-ayan has also been recently served.

At present the district has an existing two surface water treatment facility and four pumping stations; all combined has a capability of delivering water discharge of 84 lps. The MCGWSS has a capacity of discharging 170 lps processed water. As mentioned above, total available supply is 186 lps.

Tagoloan, Misamis Oriental

The Municipality of Tagoloan has three water providers namely Tagoloan Waterworks, Cagayan de Oro Water District, and Pilipinas Water Resources, Inc. (private) serving only in eight out of 10 Barangays. It serves Level II & III Water System mostly in the residential areas for their domestic water usage.

Industrial and some commercial establishments avail themselves of water connection from the industrial water of Philippine Veterans Investment Development Corporation (PHIVIDEC) Water System run by electricity (deep well), while others have constructed their own water system (deep well-type). While others are served by the present water provider.

Most residents get their drinking water from the water buying stations in Tagoloan while residents from far barangays avail water by digging shallow well and handpumps provided by the local and barangay government. Recently the Local Government Unit of Tagoloan had started constructing water system (deep well-type using electric motor) in barangay that have no access to the present water providers.

Water providers, namely: Tagoloan Waterworks serve 1,619 household, Pilipinas Water Resources, Inc. serve 1,540 household of level III and 6,185 household served by a communal faucet. Cagayan de Oro Water District and PHIVIDEC water system has no data.

Table 3-254 Water demand in Tagoloan

Year	Population served	ADD
2015 (Censal Year)	73,150	10,823
2018	80,518	11,913
2019	83,135	12,301
2020	85,837	12,701
2021	88,627	13,112

Source: Tagoloan CLUP 2017-2027; ADD - Average Daily Demand in cu.m. per day

Sumilao, Bukidnon

With the abundant source of potable ground water in the municipality, all barangays have their own water systems. However, there is still insufficiency in water supply. This could be attributed to small-sized pipelines and poor management of water system. Limited funds and the long distance of water source to the barangay proper have compelled the local governments to purchase small-sized pipes.

The Municipal Government owned water supply system covers part of Barangay Kisolon and San Vicente. This system was constructed in the early part of 1960s. With the fast increase of population, the system could no longer adequately supply the water needs of the two communities. 75% of households in these communities have less than 12 hours water service. The Barangay Kisolon had also installed water pipes for Purok 6 households which are not covered by the system.

Poblacion water system is managed by the Barangay Water Task Force. Molocboloc Spring supplies the water needs of Poblacion, Sumilao. However, the twelve kilometer water pipeline which started with a 4”Ø was reduced to 2”Ø, hence, restricting the volume of the water supply. At present, water distribution is done through rotation basis. Water service interruption is also experienced when transmission pipeline laid on slope is cut off due to landslide.

The same situation of fewer water supplies is observed in other barangays wherein pipelines started with 2”Ø but reduced to 1½”Ø. Lateral lines are also not installed for lack of funds, thus, depriving other households with water supply. Most of the barangay operated water systems are classified as Level 2. Most of the springs which supply the water systems dry up during long dry months. Most affected sources are those with less vegetation.

Table 3-255 Inventory of water distribution system in Sumilao (2009)

Barangay	HH served		
	Level I	Level II	HH served
Poblacion	37	544	316
Kisolon	60	670	1, 115
Kulasi	15	88	-
Licoan	12	184	-
Lupiagan	23	86	-
Occasion	20	104	-
Puntian	40	231	-
San roque	20	169	-
San Vicente	49	302	-
Vista Villa	14	124	-
Total	**290**	**2502**	**1869**

*N*ote: HH – household; Source: Sumilao CLUP 2011-2020

Manolo Fortich, Bukidnon

Most of the source of water resources in Manolo Fortich are ground water. These are located in Barangay Agusan Canyon, where Del Monte Philippines, Inc. is using deep wells to supply the water requirements of its employees. The list of water resources in Manolo Fortich is presented in **Table 3-256**.

From 8,806 households in 2009, it significantly increased to 15,872 households which are 89.19% of the total number of households with access to safe water. Barangays like Ticala, Kalugmanan and Sankanan has the lowest percentage of households with access to safe water – 45.14%, 57.43% and 58.60%, respectively.

The waterworks system run by the Manolo Fortich Water District (MFWD) supplies the potable water requirements of the 10 barangays, however not all households have availed the level III water system. The 10 barangays are Agusan Canyon, Alae, Damilag, Diclum, Lingi-on, Mambatangan, Mantibugao, San Miguel, Sto. Niño and Tankulan. The municipality has seven water reservoirs that would supply enough water for the whole municipality. Although it has plenty of potential sources of potable water system, it lacks financial resources to construct water system from source to each household.

Table 3-256 Water sources in Manolo Fortich

Sources of water supply	Location	Capacity*
Dicklum Spring Source 3	Dicklum	245.28
Dicklum Spring Source 1	Dicklum	272.64
Dicklum Spring Source 2	Dicklum	299.76
ManupihonLingi-on Spring Source	Lingi-on	136.32
Kisabong Spring Source	Agusan Canyon	872.16
Balamban-1	Agusan Canyon	436.08
Bayabason Spring Source 1	Damilag	817.68
Bayabason Spring Source 2	Damilag	981.072
Tagbalola Spring Source	Mantibugao	625.44
Mangima Spring Source	Tankulan	218.016
Balamban	Agusan Canyon	136.32

Source: Manolo Fortich CLUP 2013-2022; *cu.m. per day

The above water sources are the existing sources developed and used by the Manolo Fortich Water District. However, the present supply of water is not enough for the growing population of the municipality considering the increase of housing subdivisions in barangay Alae. There is a need for the development of more water sources to cope up the present demand of water in residential, industrial and agro-industrial areas. Barangay Ticala, Kalugmanan and Sankanan have the lowest percentage of households with access to safe water – 45.14%, 57.43% and 58.60%, respectively (**Table 3-257**).

The presence of illegal activities within the watershed area has introduced threats to the municipality like forest denudation and degradation and the drying of water source which reduced water charge in the area.

Preventing these activities will reduce the risk of flooding, as well as provide enough water for the watersheds. In the next plans for providing potable water in some areas, new water lines will be strategic and old water lines will be redesigned to avoid contamination of water lines due to the modern threats.

Table 3-257. Households with and without access to safe water in Manolo Fortich

Barangay	No. of HH		
	With access	Without access	Total
Agusan Canyon	2,075	26	2,101
Alae	1,435	14	1,449
Dahilayan	243	35	278
Dalirig	547	199	746
Damilag	2,471	31	2,502
Dicklum	699	44	743
Guilangguilang	173	3	176
Kalugmanan	344	255	599
Lindaban	786	107	893
Lingion	308	81	389
Lunocan	1,168	50	1,218
Maluko	543	119	662
Mambatangan	802	16	818
Mampayag	218	64	282
Mantibugao	506	5	511
Minsuro	143	19	162
San Miguel	515	104	619
Sankanan	460	325	785
Santiago	206	25	231
Sto. Niño	605	118	723
Tankulan	1,509	142	1,651
Ticala	116	141	257
Total	**15,872**	**1,923**	**17,795**

Note: HH – household; Source: Manolo Fortich CLUP 2013-2022

Table 3-258 List of reservoirs in Manolo Fortich

Project	Capacity*	Location	Owner
Calanawan ground reservoir	120	Barangay Poblacion	MFWD
Kihare ground reservoir	120	Barangay Poblacion	MFWD
Lingion reservoir	80	Barangay Poblacion	MFWD
Cristanvilla elevated tank	75	Barangay Dicklum	MFWD
Miranda elevated tank	75	Barangay Dicklum	MFWD
PCH-1 elevated tank	75	Barangay Dicklum	MFWD
PCH-2 steel elevated tank	75	Barangay San Miguel	MFWD
Total	**620**		

Source: Manolo Fortich CLUP 2013-2022; Note: MFWD - Manolo Fortich water district; * cubic meters

Impasug-ong, Bukidnon

Almost all barangays except for Bontongon have Level II type of water system. In terms of number and percentage Poblacion is the highest followed by Impalutao with 1044 and 470 households, respectively which is equivalent to 59 %. Potable water distribution in all barangays and sitios is 85%.

Almost all barangays have the Level II and III water system but there are still residents using the Level I water system, specifically those who live far from the built-up areas. Based on the 2015 CBMS the potable water system in the barangay including sitios, 49% of the household availed the Level III, 39% availed the Level II and 12% still in the Level I water system.

Table 3-259 Inventory of water systems in Impasug-ong (2015)

Barangay	# of HH	Type				Percent of total HH
		Level 1	Level II	Level III	Total	
Bontongon	131	37	68	26	131	1.44%
Bulonay	279	67	149	63	279	3.08%
Capitan Bayong	549	85	143	321	549	6.05%
Cawayan	401	53	156	192	401	4.42%
Dumalaguing	557	30	330	197	557	6.14%
Guihean	381	24	253	104	381	4.20%
Hagpa	621	213	347	61	621	6.85%
Impalutao	1,107	125	438	544	1107	12.20%
Kalabugao	1,215	83	436	696	1215	13.39%
Kibenton	482	22	177	283	482	5.31%
La Fortuna	822	138	373	311	822	9.06%
Poblacion	2,260	160	567	1,533	2260	24.91%
Sayawan	267	28	126	113	267	2.94%
Total	**9,072**	**1,065**	**3,563**	**4,444**	**9,072**	**100.00%**

Source: Impasug-ong CLUP 2019-2028

The biggest average water consumption is the commercial consumers which accounts to 330.7 cubic meter with a total of 10 number of connections located in Barangay La Fortuna followed by Poblacion with 196.92 cubic meter with 13 number of connections (**Table 3-260**). On the other hand, the domestic consumers have 1,533 connections accounting to 24.34 cubic meters average water consumption found in Poblacion. Barangay La Fortuna and Capitan Bayong have an average water consumption of 15 cubic meters. All the rest have an average water consumption of 10 cubic meters.

Table 3-260. Average monthly water consumption by type of consumers in Impasug-ong

Barangay served	Domestic		Commercial		Industrial		Others	
	NOC	AWC	NOC	AWC	NOC	AWC	NOC	AWC
Poblacion	1,533	24.34	13	196.92	0	0	0	0
La Fortuna	311	15.48	10	330.7	0	0	0	0
Capitan Bayong	321	15	1	143	0	0	0	0
Cawayan	192	15	0	0	0	0	0	0
Kibenton	283	10	0	0	0	0	0	0
Impalutao	544	10	0	0	0	0	0	0
Bontongon	26	10	0	0	0	0	0	0
Guihean	104	10	0	0	0	0	0	0
Sayawan	113	10	0	0	0	0	0	0
Dumalaguing	197	10	0	0	0	0	0	0
Kalabugao	696	10	0	0	0	0	0	0
Hagpa	61	10	0	0	0	0	0	0
Bulonay	63	10	0	0	0	0	0	0

Source: Impasug-ong CLUP 2019-2028; NOC – number of connections; AWC – average water consumption

The municipality of Impasug-ong have four water sources namely: Iglirop in Sitio Intavas, La Fortuna; Batingolo, Impalutao; Kagunaw Intake box at Sitio Bontongon, Barangay Hagpa and ground reservoir located at Purok 7, Poblacion (**Table 3-261**). The Iglirop source has a capacity of 30 liters per second, 150 gal/minute in Batingolo and three liters per second in Kagunaw Intake Box. At present, almost all barangays including Sitios have already availed potable water system.

Table 3-261 Sources of water in Impasug-ong

Source	Location	Capacity	HH served	Type of water supply		Funding source
				Pump	Gravity	
Iglirop	Sitio Intavas, Barangay La Fortuna (Operational)	30 li/sec.	1,092		✓	MBUSSP

Source	Location	Capacity	HH served	Type of water supply		Funding source
				Pump	Gravity	
Ground reservoir	Purok 7, Barangay Poblacion (Operational)		792	✓		DMPI
Batingolo	Upper Tulugan, Barangay Impalutao (Operational)	150 gal/min.	173		✓	MRDP & LGU
Kagunaw Intake Box	Sitio Bontongon, Barangay Hagpa (to be constructed)	3li/sec.			✓	Salintubig

Source: Impasug-ong CLUP 2019-2028

3.4.5.4.2 Power supply

Cagayan de Oro City

Cagayan de Oro's power supply is provided by several sources, such as: A) 724 MW hydroelectric power sourced from the powerful Agus and Pulangi rivers provided by TRANSCO'S Mindanao Grid and distributed by CEPALCO, B) CEPALCO's 1 MW grid connected, Photovoltaic Solar Power Plant. The conjunctive operations of the Solar Power Plant and Bubunawan Power Company's (BPC) 7 MW Run-of-River Hydro is the first operational PV-Hydro tandem project in the world. C). 210 MW coal-fired power plant of Germany's STEAG State Power, Inc. at the Phividec Industrial Estate, D). MINERGY's 18.90 MW land-based power generating plant Power distribution is facilitated by the Cagayan Electric Power and Light Company (CEPALCO), and MORESCO. The table below shows the electricity consumed by barangay.

Table 3-262. Electric service in Cagayan de Oro (2018)

Electric Cooperative	Barangay covered		Consumer		Consumption
			Type	Number	(Kwh)
CEPALCO	40 – Poblacion 26 – Non-Poblacion Agusan Balubal Balulang Bayabas Bonbon Bugo Bulua Camaman-an Canitoan Carmen Consolacion	Gusa Indahag Iponan Kauswagan Lapasan *Lumbia Macabalan Macasandig Nazareth Patag Puerto	Street Light Residential Commercial Industrial Bulk Power	150 107,269 14,935 258 8	9,397,995 230,424,250 224,306,175 178,719,189 139,396,780
	Cugman F.S. Catanico	Puntod Tablon			
Sub-Total				**122,620**	**782,244,389**
MORESCO-1	15 – Non-Poblacion Baikingon Bayanga Besigan *Canitoan Dansolihon Mambuaya Pagalungan	Pagatpat Pigsag-an San Simon Taglimao Tagpangi Tuburan Tumpagon Tignapoloan	Street Light Residential Commercial Water System Public Building & Facilities Industrial	1,308 15,445 235 4 185 1	839,334.93 16,788,995.33 2,636,087.81 45,499 678,468.71 374.92
Source: Cagayan de Oro City CLUP 2013-2022			**Sub-Total**	**17,182**	**20,988,760.7**
			Total	**135,392**	**798,789,447.7**

Malaybalay City, Bukidnon

Bukidnon Electric Cooperative (BUSECO) supplies the energy needs of the city. Due to the increase in the number of consumers, BUSECO has increased its house connections to 25,364 in Malaybalay classified into

the following: residential – 22,566, commercial – 1,981, streetlights – 36 accounts, Industrial – 130 that includes high voltage and primary metered and public building – 651.

Table 3-263 Power consumption in Malaybalay

Year	No. of consumers	Consumption (kWh)
2011	26,221	1,682,267.91
2012	28,685	1,818,947.36
2013	31,107	1,959,335.06
2014	33,471	2,102,224.55
2015	35,769	2,246,724.23
2016	37,997	2,392,167.05
2017	40,152	2,538,048.88
2018	42,235	2,683,985.71
2019	44,245	2,829,683.28
2020	53,280	3,548,250.48

Source: Malaybalay CLUP 2016-2025

Residential consumers are the largest in terms of connections and the biggest in terms of consumption. 65,962 consumers were listed in 2011 and out of these, 59,580 or about 90% are residential connections. Also shown in the table below, about 37% or 3,134,153 Kwh of the total 8,440,979 Kwh consumption is residential in nature.

Table 3-264. Power consumption in Malaybalay City (2011)

Consumer	No. of consumers	Average consumption (kWh sales)
Residential	59,580	3,134,153
Low voltage		
Commercial	4,103	1,929,366
Public building	1,649	543,818
Industrial	365	772,879
Street light	236	86,692
Higher voltage	29	1,974,071
Total	**65,962**	**8,440,979**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

CEPALCO supplies power to industries, commercial establishments and residential houses in Tagoloan. In 2017, CEPALCO serves a total of 10,182 households, 914 commercial and 30 industrial establishments while 7,940 (43.81%) households are still not served due to its far distance from the distribution lines, and some households cannot afford to have electrical connection, and some households living in the same house.

There are two power substations found in the municipality; these are the NAPOCOR power substations, which is located in upper Natumolan, and CEPALCO substation, which is located in lower Natumolan found along the old national road.

Table 3-265 shows that out of the 4,541 total number of households, only 2,806 have electric connection. It is only 61.79% of the total number of households in the entire municipality. Barangay Kisolon has 27.48% of the total number of households served with electricity. It is followed by the urbanizing barangays of Poblacion and San Vicente with 10.35% and 8.94% respectively. The table further shows that the average consumption per month of some barangays accept the barangays of Kulasi and Lupiagan are high. This is due to the presence of poultry and piggery farms.

Table 3-265 Power consumption in Tagoloan (2015 to 2017)

Consumer	2015		2016		2017	
	NOC	AC	NOC	AC	NOC	AC
Residential	5,710	656,650	9,711	1,233,397	10,182	1,598,574
Commercial	554	277,000	869	459,701	914	512,754
Industrial	81	1,905,863	29	550,491	30	616,230
Institutional	12	7,482.41	13	8,500.50	14	11,331.16
Public Buildings	13	44,860.50	14	50,737.58	14	57,818.16
Streetlights (Public)	13	20,805.58	13	16,923.58	14	16,143.08
Others (Specify)	-	-	-	-	-	-
Total	**6,383**	**2,038,997.57**	**10,649**	**641,161.66**	**11,168**	**721,293.40**

NOTES: NOC - No. of connections; AC – average consumption (kWh/month)

3.4.5.4.3 Communications

Cagayan de Oro City

There are several types of communications systems and service providers within the city, namely: Telecommunication Services, TV Stations, Broadcast Stations, Broadband Networks and Internet Service Provider. Internet has experienced significant growth as the number of service providers have increased.

The city has grown increasingly dense and is characterized by sprawl. This development has led to traffic congestion following the surge in number of private vehicles, as well as limited accessibility to basic services.

Malaybalay City, Bukidnon

There is only one telephone company in the city that serves the urban center which is the Philippine Communications (PhilCom). Cellular phones are widely used in the urban center of the city that compensates the presence of lone telephone company. At least 24 cell towers/cites are located in different places within the city, Globe Telecommunication, Smart Telecommunication, Inc., Sun Cellular and PLDT.

There are six radio stations (2 AM Bands, 4FM) and one cable television network. National daily newspapers circulating the city are the Philippine Daily Inquirer, Philippine Star, and Manila Bulletin, while there are also two local newspapers: Mindanao Gold Star Daily and Bukidnon Newswatch in circulation.
The major mail distribution center of the city is still the Philippine Postal Office, though other private companies like 2GO, LBC Air Cargo, JRS Express, Air 21, Western Union and DHL are now providing messengerial services and other.

The urban center is coping up with the latest technological advancement of telecommunication, but the rural areas are still using the traditional letter sending through vehicle drivers and broadcasting over the public radio stations for their messages. To communicate (especially emergency cases) with the barangay officials in the rural areas, the city government has issued two-way radios to the barangays. These radios also serve as the official channel to relay messages through the Patrol 117.

Table 3-266 Communication services in Malaybalay City

Carrier	Volume per day
FEDEX	3 packages
AIR 21	2 transactions
JRS	50 packages
LBC	50 packages
Cebuana Kuarta Padala	5 transactions
M. Lhuillier	10 transactions
Western Union	5 transactions
Total	**125 transactions**

Source: Malaybalay CLUP 2016-2025

There are five radio stations (2 AM & 3 FM bands) and one cable television network. National daily newspaper circulating the city are the Philippine Daily Inquirer, Philippines Star and Manila Bulletin, while there are also two local newspapers; Mindanao Gold Star Daily and Bukidnon News watch in circulation.

With regards to courier services, there are seven companies that serve the city with a total of 125 transactions a day (**Table 3-266**). Some of these companies also serve as pawnshops. There are seven postal facilities within the city, 82 Mail boxes found in a designated area, one bupost, one manual, one money order machine, one mail distribution center, one stamping machine, one GSIS e-card, two Postal Stations and six mail transport services (**Table 3-267**). Mail transport service is served through the use of motorcycle, bicycle, vans and other means. These postal facility services might increase next year due to increase of population.

Table 3-267. Postal Facilities in Malaybalay city

Postal facility	Number
BUPOST	1
Mail distribution center	1
Mail boxes	82
Money order machine	1 manual for check
Stamping machine (meter)	1 postal metered machine & 1 GSIS-e-card
Postal stations/circuits	2 BSU & Aglayan
Mail transport service	6 motorcycles

Source: Malaybalay city CLUP 2016-2025

Tagoloan, Misamis Oriental

Tagoloan had one telephone company, the Philippine Long-Distance Telecommunication (PLDT) located at barangay Sta. Cruz. PhilPost operates the municipal postal service located at the Municipal Grand Stand building at Poblacion, Tagoloan, with one postmaster and one postman.

In addition, the use of the cellular mobile telecommunication system (CMTS) has become the most common means of communication. This is mainly because of its accessibility and affordability in the area through the presence of six (6) cell sites of the providers like Sun Cellular, Smart and Globe that paved access lines to cell phone holders making communication accessible to all sectors. The municipality has no problems regarding distant communication. Internet Connections are also available with DSL, Smart Bro and Globe Broadband providing 4G data communication but its limited only to urban areas since some rural areas have no signal from these internet providers, as well these areas have no cable for internet connections.

Sumilao, Bukidnon

The most common communication facility in the municipality is the mobile cellular phone. There are four towers installed in the barangays of Kisolon and Poblacion as shown in **Table** 3-268. These stations are owned by Globe, Smart, and Sun Cellular. People in the municipality availed the services though these mobile phone companies. The mobile phones also serve as the tool in building linkages among the ten barangays of Sumilao.

Table 3-268. List of existing cell sites in Sumilao (2010)

Company	Barangay	Number	Date started
Globe	Kisolon	1	November 14, 2003
	Poblacion	1	June 14, 2003
Smart	Kisolon	1	May 15, 2004
Sun Cellular	Poblacion	1	August 18, 2010

Source: Sumilao CLUP 2011-2020

At present, there is one telephone line installed in barangay Kisolon which is owned by SOTELCO. It has several subscribers. Through this, international and domestic calls could be transmitted in this public calling office.

Internet connection is also offered by SOTELCO through DSL connection. Globe, Smart and Sun Cellular through plug and play internet broadband connection also serve as gateway of the municipality to the world wide web. In terms of postal service facility in the municipality, there is one post office based at the municipal hall with only one personnel manning the office. With the presence of other mode of communication, few letters are sent through the post office.

Table 3-269. Volume of postal transactions in Sumilao

Type of service		2007		2008		2009	
		Received	Dispatched	Received	Dispatched	Received	Dispatched
a.	Letter	9,362	1,880	10,500	2,300	9,756	1,180
b.	Packages	3	2	4	4	5	3

Source: Sumilao CLUP 2011-2020

It could be observed that there are more letters received by the post office compared to those that are dispatched. For the packages, most are either sent or received through LBC in Malaybalay City and Cagayan de Oro City. Packages sent to Malaybalay City are delivered to Kisolon by LBC personnel without additional charge. Newspaper of local and national circulations are also delivered in Kisolon. But the most common mode of getting information is through radios and televisions. Dream satellite and Cignal cables are also available that enable subscribers to select TV station programs.

Manolo Fortich, Bukidnon

Smart, Globe and Suncellular Telecommunication are constructing their cellular towers in the six urbanizing barangays in the municipality. SOTELCO is providing landlines while DEARBC is also providing cable services in the urbanizing barangays**.**

Majority of the telecommunication towers are located in the residential areas. There is one tower that is located in a landslide prone area. This tower is vulnerable to geo-hazard such as earthquakes, if this happens, telecommunication services shall be interrupted and would affect the economic activities in the municipality. The emergence of modern information technology and communication interplay in the attainment of the vision of the LGU towards a premiere industrialization.

Table 3-270. Telecommunication companies in Manolo Fortich

Barangay	Smart cell sites tower	Globe cell sites towers	Sun Cellular Cell sites towers	SOTELCO landlines	DEARBC cable network
Agusan Canyon	1	1		1	1
Alae	1	1	1		
Damilag	1	1	1	1	1
Mambatangan	1	1			
San Miguel	1	1			
Tankulan	1	1	1	1	1
Total	**6**	**6**	**3**	**3**	**3**

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

Communication system within the Sayre Highway Grid, those barangays near the Sayre Highway namely Poblacion, Capitan Bayong, La Fortuna, Kibenton, Impalutao, and Cawayan use cellular phone technology. The telecommunication companies of Globe and Smart have established towers within the municipality to serve this grid. The Digitel Mobile Philippines, Inc. (Sun cell) had also installed a relay tower in Barangay Guihean but there is still no network connection for Sun Cell in the municipality. Some parts of the municipality have

no network connection in all types of telecommunications. They have to be contented with the old system of communication. The municipalities type and location of communication facilities is shown in **Table 3-271.**

In the other areas of the municipality, communication has been through personal contacts, and postal services. In 2008, Postal Communication Service was able to receive 9,783 and dispatch 3,598 letters and packages. In 2018, it is estimated that the Post Office received 50 letters/packages a day. This Office is manned by lone personnel based at the municipal hall. Sometimes letters for far flung barangays are sent through their barangay officials.

Postal Services is present in the premises of the Municipality. Several cellphone companies are also installing their cell site tower to provide the community easy access to communication. These were located in Poblacion, Capitan Bayong, Impalutao and Guihean.

Table 3-271. Communication facilities in Impasug-ong

Facility	Year constructed	Barangay	Ownership
Postal services		Poblacion	Public
Cell sites network			
Globe	2004	Poblacion	Private
Smart	2004	Poblacion	Private
Globe	2005	Capitan Bayong	Private
Globe	2006	Impalutao	Private
Digitel Mobile Philippines, Inc.	2007	Guihean	Private
Digitel Mobile Philippines, Inc.	2010	Poblacion	Private
Domineer Pointe, Inc.	2015	Impalutao	Private
Public calling stations	N/A		
Broadcast and television network (radio, television, cable)	N/A		

Source: Impasug-ong CLUP 2019-2028

The Municipal post office receives a minimum of 50 letters and packages a day and distributes the same immediately. This would sum to 12,000 letters and packages in the whole year.

There are several telecommunication companies who installed cell site towers in the different barangays in the municipality. ABS-CBN and GMA TV Networks also installed tower in Mt. Kitanglad. This is of great help to the community in terms of easy access of communication and information technology.

Table 3-272. Communication companies in Impasug-ong

Cell sites	Location	Date started
Globe	Poblacion	2004
Smart	Poblacion	2004
Globe	Capitan Bayong	2005
Globe	Impalutao	2006
Digitel Mobile Philippines, Inc.	Guihean	2007
Digitel Mobile Philippines, Inc.	Poblacion	2010
Domineer Pointe, Inc.	Impalutao	2015
TOWERS:		
Smart	Guihean	2000
Globe	Guihean	2002
ABS-CBN	Mt. Kitanglad, La Fortuna	1993
GMA	Mt. Kitanglad, La Fortuna	2000
RCPI/Bayan Tel/DOTC	Guihean	1997
DMPI	Mt. Kitanglad	2015

Source: Impasug-ong CLUP 2019-2028

The Post Office of the municipality is still functional, but no one wanted to send letters anymore because it is easier to contact through cellular phones. But official documents are sent through mails such as Bank Notices, Credit Cards, and Court Notices. Packages are also catered by the Post Office specially packages from other countries since it is cheaper than other couriers. Aside from it, there are also internet connections within the municipality.

The Philippine Post Office receives an average of 50 letters/packages a day with a total of 1,000 letters/packages a month and 12,000 a year.

The municipality has no printing statiojn for newspapers, tabloids and magazines but we have access to printouts of tabloids, newspaper and magazines.

3.4.5.4.4 Protective services

Cagayan de Oro City

Peace and order

The peace and order situation of the City of Cagayan is generally stable. The Cagayan de Oro City Police Office (COCPO) has a total strength of 748 uniformed personnel, of which 45 are Police Commissioned Officers and 703 are Police Non-commission Officers, serving a total civilian population of 634,873 (2012 population). It has an approximate police-to population ratio of 1:935 which is within the minimum standard police to population ratio of 1:1000. As of now, there are only 405 policemen assigned in the field to 10 different police stations in the city namely: Divisoria, Cogon, Agora, Carmen, Macabalan, Puerto, Bulua, Lumbia, Macasandig and Cugman. In spite of this, COCPO ably performs its police duties and effectively respond to crime incidence by employing pre-emptive measures through intensified conduct of saturation drives and finding other solution strategies. Such measures greatly deterred criminals and other lawless elements to freely conduct their nefarious activities. In fact, crime rate in the city has decreased from 0.78 in 2010 to 0.61 in 2011.

Also, the presence of BPATS (Tanods, Barangay Police) in each barangay contributes in maintaining peace and order in their respective barangay with a total strength of 1,364 in the entire city. They are the force multipliers of COCPO and the first responder when crime occurs in the barangay sufficient enough to respond immediately to the protective service needs of the residents.

The city's crime volume on index and non-index crimes in 2017 grew by about 90.6% versus the 2016 total crime volume (**Table 3-273**). Despite the rise in crime volume, however, the overall crime solution efficiency grew by 41.1%, which could be attributed to the high number of crimes solved in 2017.

Table 3-273. Cagayan de Oro crime statistics (2016-2017)

Parameter	2016	2017	% Increase 2016-2017
Total crime volume (Index and Non-Index)	1,878	3,579	90.6%
Crimes solved	717	1,710	138.5%
Crime solving efficiency	38.2%	53.9%	41.1%

Source: City Mayor's Annual Report, 2018

Crime prone barangays are Puerto, Carmen, Macabalan, Macasandig, Cugman, Bugo, Bulua, Nazareth, Puntod, Tablon, Lapasan and Lumbia. Area of Responsibility (AOR) of Police Station 1 and Police Station 2 recorded sporadic and numerous crime incidents and were concentrated in populated barangays. Most were perpetrated in Barangays 5 and 8 of Police Station 1 Area of Responsibility and Barangays 31 and 33 of Police Station 2.

In 2017, among the index crimes reported for the year, theft posted the highest total at 51.0% of the annual total index crimes and also the highest among crimes against property. Meanwhile, deaths resulting from

traffic incidents account for 130.0% homicide rates versus the combined cases of murder & homicide. Overall crime solution efficiency for all crimes reported for 2017 by Cagayan de Oro City Police Office (COCPO) was computed at 53.9% (**Table 3-274**).

Table 3-274. Crime statistics in Cagayan de Oro (2017)

Nature of crime	Total	Crimes cleared		Crimes solved	
		Total cleared	Clearance efficiency	Total solved	Solution efficiency
Index crimes	2,587	1,193	46.1%	1,053	40.7%
Against persons	701	480	68.5%	402	57.3%
Murder	35	25	71.4%	17	48.6%
Homicide	15	14	93.3%	9	60.0%
Physical injury	555	372	67.0%	339	61.1%
Rape	96	69	71.9%	37	38.5%
Against property	1,886	713	37.8%	651	34.5%
Robbery	442	118	26.7%	106	24.0%
Theft	1,326	553	41.7%	506	38.2%
Carnapping motor vehicle	11	7	63.6%	7	63.6%
Carnapping motor cycle	106	35	33.0%	32	30.2%
Cattle rustling	1	-	0.0%	-	0.0%
Non-index crimes	992	712	71.8%	657	66.2%
Traffic incidents	2,172	1,335	61.5%	1,025	47.2%
Homicide	65	59	90.8%	54	83.1%
Physical injury	751	471	62.7%	376	50.1%
Damage to property	1,356	805	59.4%	595	43.9%
Special laws	1,773	1,566	88.3%	1,318	74.3%
Total	**7,524**	**4,806**	**63.9%**	**4,053**	**53.9%**

Source: City Mayor's Annual Report, 2018

Fire protection and prevention

The Central Fire Station (CFS) in the city is located in a very congested area which hampers their activities delaying response in time of emergency call for assistance and thus the spread of fire is not easily contained. It has 11 sub-fire stations located in the following barangays: Bugo, Puerto, Tablon, Lapasan, Macabalan, Kauswagan, Bulua, Carmen, Balulang, Macasandig, and Nazareth.

The CFS has only 106 personnel though the ideal fireman to population ratio is 1:2,000 this means there is insufficient number of firefighters. The firefighting facilities are also inadequate; only 3 units rescue trucks exclusively assigned at the Central Fire Station and 12 units pumpers to different fire sub-station (1 pumper in every fire sub-station).

Fire incidents in Cagayan de Oro has reduced by 25% from 56 fire incidents in 2009 to 42 fire incidents in 2010 and in 2011. This achievement is being complemented by the continuous support from the active private/business sectors in the city so with the assistance from trained Barangay Fire Volunteer Brigade.

Reformatory institutions

For the jail management, the BJMP is strategically located at Barangay Lumbia. The City Jails are for both male and female dormitories. It detains almost half of the total population of inmate's region wide. Both the male and female dormitories are now facing congestion problem. Presently, CDOCJ-MD occupies a lot area of 18,632 sq. m. with a floor area of 5,159.05 sq. m. and has only a cell area of 1,226.58 sq. m. with the ideal capacity of 934 inmates from the ideal capacity. However, at present it caters 1,148 inmates or it exceeds about 214 inmates from the ideal capacity or 22.9% congested.

The standard ratio of personnel to inmates is 1:7 or one custodial personnel as to 7 inmates. However, at present this jail has only 74 personnel manning 1,148 inmates or the present ratio is 1:15.5 which means there should be at least 80 additional personnel to meet the required standards set by the United Nations to uplift the living condition of inmates while they are incarcerated.

On the other hand, the female dorm comprises a lot area of 2,184 sq. m. with a floor area of 907.08 sq. m. and has only a cell area of 314.72 sq. m. to cater the ideal capacity of 92 inmates. As of this date, the jail houses 109 inmates which means it exceeds about 17 inmates from its ideal capacity or 18.48% congested.

Malaybalay City, Bukidnon

Peace and order

The Malaybalay Police Station has 76 police force serving 126, 210 population (2005) which translates to a ratio of 1 policeman for every 1, 792 persons. This means it is not an ideal ratio which means the city needs 606 more policemen. There are 9 police community precincts located in Sumpong, Dalwangan, Casisang, Aglayan, Managok, Bangcud, Zamboangita, Can-ayan and Barangay 9 (Public Market). The police force to population ratio is highest in Casisang with 1 policeman for every 13,874 individuals. Lowest ratio is in Sumpong with 1:151. A low ratio indicates that there are more policemen available to serve the population of a given area.

Malaybalay City hosts two military and police camps. One is the Camp Ramon M. Onahon, located at Barangay 7. It is the provincial headquarters of the Philippine National Police. The other one is Camp Osito Bahian, located at Impalambong, Barangay 10. It is the home of the 403rd Infantry Brigade. The Barangay Public Safety Officer (BPSO) also assists in the peace-keeping efforts at the barangay level.

Out of 46 barangays under the area of responsibility (AOR), Barangay Casisang has the highest number of crimes occurrence which recorded 225 crime incidents followed by Barangay 9 with 115 crime incidents, Barangay Sumpong with 104 crime incidents, Barangay 4 with 56 crime incidents and Barangay 5 with 48 crime incidents.

In 2014, a total of 1,660 crime incidents were reported. About 55.42% or 920 cases are index crimes while 740 cases or 44.58% were classified as non-index crime (**Table 3-275**). Among the index crimes, Physical Injuries had the highest frequency with 326 cases followed by Theft with 289 cases, Robbery with 159 cases, Carnapping with 73 cases, Murder with 27 cases, Rape with 22 cases, Homicide with 19 cases and Cattle Rustling with 5 cases. Of the 1660 crime volume, 750 cases were considered solved reflecting a crime solution efficiency (CSE) of 45.57% as compared to last year of which 1011 crime volume with 20.37% crime solution efficiency (CSE).

Table 3-275. Crime statistics in Malaybalay (2014)

Type	No. of cases	Percentage
Index crime	920	55.42%
Non-index crime	740	44.58%
Total	**1,660**	**100%**

Source: Malaybalay CLUP 2016-2025

Women and children protection desk concerns

A total of 456 cases were filed for women and children protection concerns. 287 of these cases involved violence against women and 172 for child abuse and exploitation.

Table 3-276. Cases of violence against women in Malaybalay

Case	Number	Case	Number
Violation of RA 9262	241	Acts of lasciviousness	5

Rape	7	Grave coercion	1
Physical injuries	10	Slander/oral defamation	1
Threats	2	Abandonment	4
Concubinage	2	Sexual harassment	2
Attempted rape	9	Trespassing	1
Malicious mischief	1	**Total**	**287**
Unjust vexation	1	Source: Malaybalay CLUP 2016-2025	

Table 3-277. Cases of child abuse and exploitation in Malaybalay

Case	Number	Case	Number
Rape	20	Grave oral defamation	2
Attempted rape	7	Abandonment	1
Physical injury (Viol of RA 7610)	36	Swindling	1
Violation of RA 7610	88	Frustrated homicide	1
Violation of RA 9262	2	Acts of lasciviousness	5
Abduction	5	Attempted homicide	2
Theft	2	**Total**	**172**

Source: Malaybalay CLUP 2016-2025

In 2014, the Traffic Management Center station recorded 801 traffic accidents in Malaybalay which resulted in the death of 27 victims. 455 of the accidents involve vehicles collision, 151 involve vehicles versus pedestrian, 28 hit and run, 74 single accidents, 16 hit an animal, and 43 hit by fixed objects.

Moreover, 672 of the traffic accidents are caused by reckless driving, 25 caused by driving 'possible of alcoholic breath", 15 slippery roads, 12 mechanical defects, 4 tire explosions, and 12 due to roads under construction. Sayre Highway, Fortich St. along city proper and Poblacion Barangays are considered major traffic accident prone areas.

Tagoloan, Misamis Oriental

Peace and order

The Philippine National Police (PNP) station is adjacent to the municipal building. Generally, the peace and order situation in Tagoloan is normal. The peace and order situation and the overall condition are very favorable for development and investment.

Ideally, 500 constituents shall be serviced by one PNP personnel. At present, the actual total number of policemen in Tagoloan is 39, falling short of the standard which must be 74 based on the actual population of 73,150 on the minimum standard police to population ratio of 1:1000. The PNP station needs an additional 35 PNP personnel to conform to the standard. This personnel shortage could not be attributed to the Local Government Unit of Tagoloan since this is inherent to the PNP Organization. The number of PNP personnel assigned to the locality depends on the availability of police uniformed personnel at the provincial level. The limitation is temporarily addressed with the mobilization of the barangay tanods in every barangay and other support groups from civic organizations for the maintenance of peace in and order in the municipality. Despite the shortage of personnel, response time of PNP personnel is satisfactory.

The crime rate in Tagoloan is low with a total of 90 crimes committed in 2017. Most of the crimes committed are violation of special laws, non-index crimes, and for index crimes this involves physical injury and theft. It can be observed that the crime rate decreased from 2013 to 2017 by 16% (**Table 3-278**). The crime rate is 419 per 100, 000 population.

Table 3-278. Crime statistics in Tagoloan (2013-2017)

Type of crime	2013	2014	2015	2016	2017
Index Crimes					
Crimes Against Person					
a. Murder	5	10	1	15	1
b. Homicide	3	2	3	3	1
c. Physical Injury	19	20	26	60	15
d. Rape	7	9	8	6	0
Crimes Against Property					
a. Robbery	47	51	24	31	6
b. Theft	177	257	15O	104	14
c. Carnapping	25	23	7	5	2
d. Cattle Rustling	1	3		3	0
Non-index Crimes					
Reckless Imprudence Resulting to	-	-	-	-	
*Homicide			6	9	0
*Physical Injury			59	59	6
*Damage to property			35	33	5
Violation of Special Laws	124	127	110	107	20
Other non-index crimes	189	312	28	114	20
Total	**597**	**814**	**307**	**549**	**90**

Source: Tagoloan CLUP 2017-2027

As shown in **Table 3-279**, Barangay Poblacion has the most numbered cases of CICL for the past three years having a total of 20 cases from 2015 to 2017 followed by Sta. Cruz with 18 cases and Sugbongcogon with 9 CICL cases. Of the 10 barangays of Tagoloan, Mohon and Rosario have no cases of CICL at all for the past 3 years.

Table 3-279. Crime incidence for minors in Tagoloan

Barangay	2015	2016	2017
Poblacion	6	7	7
Baluarte		6	1
Casinglot	1		7
Natumolan		5	3
Gracia	2	3	2
Sugbongcogon	0	0	9
Sta. Cruz	2	6	10
Mohon	-	-	-
Sta. Ana	-	3	-
Rosario	-	-	-

Source: Tagoloan CLUP 2017-2027

Fire Incidence for the Past Five Years

For the past five years, Barangay Gracia has the highest incidents of fire at 10 or 17.86% of the 56 fire incidents recorded. Followed by Barangay Poblacion and Barangay Casinglot, respectively. Based on records, the major causes of fire are the grass fires or rubbish fires, unattended live embers and unattended cooking. Grass Fires and rubbish fires are usually attributed to the hot weather and dry season wherein dry grasses are easily burned and spread.

Table 3-280. Fire incidence records in Tagoloan (2013 to 2017)

Barangay	Type of occupancy	Origin/Cause	Frequency of occurrence				
			2013	2014	2015	2016	2017
Baluarte	Industrial	Unattended live embers	0	1	0	0	0
	Residential	Unattended live embers,	1	0	0	0	1

Barangay	Type of occupancy	Origin/Cause	Frequency of occurrence				
			2013	2014	2015	2016	2017
		electrical short circuit					
Casinglot	Residential	Intentional (arson case), electrical (2)	0	0	0	3	0
	Educational	Electrical short circuit	1	0	0	0	0
	Storage	Rubbish fire	0	0	0	1	0
	Others (grass fire, rubbish fire)	Grass fire, unattended rubbish fire (2)	0	0	0	1	2
Gracia	Industrial	Unattended live embers, flux of welding	1	0	0	1	0
	Others (garbage; electrical transformer)	Unattended cooking, matchstick, grass fire (5)	0	0	2	6	0
Natumolan	Industrial	-	1	0	0	0	0
	Residential	Unattended live embers	0	0	1	0	0
	Others (grass fire)	Grass fire	0	0	0	1	0
Mohon	Industrial	Live embers, unattended rubbish fire	0	0	0	1	1
	Residential	Electrical short circuit	1	0	0	0	0
	Others (rubbish fire 2)	Rubbish fire	0	0	0	1	1
Poblacion	Industrial	-	1	0	0	0	0
	Mercantile	Electrical short circuit,	1	0	0	1	0
	Residential	Kerosene lamp, electrical short circuit, unplugged cellphone, unattended live embers	3	1	0	0	0
	Vehicular	Electrical short circuit	0	0	0	0	1
	Others (grass fire)	Grass fire	0	0	0	1	0
Sugbongcogon	Industrial	Unattended live embers, metal sparks	1	0	0	0	1
	Residential	Unattended live embers	0	0	1	0	0
	Business	Flux of welding machine	0	0	0	1	0
	Others (container van, rubbish)	Exposed to extreme heat weather condition; rubbish fire	0	0	1	1	0
Rosario	-	-	0	0	0	0	0
Sta. Ana	Residential	Unattended live embers, electrical short circuit	0	0	1	0	1
	Others (grass fire, rubbish fire)	Grass fire (3), rubbish fire (2)	0	0	0	4	1
Sta. Cruz	Industrial	LPG tank leakage	1	0	0	0	0
	Residential	Kerosene lamp, unattended live embers, arson	1	0	0	0	2
	Others (grass fire)	Grass fire (1)	0	0	0	1	0
		Total	**13**	**2**	**6**	**24**	**11**

Source: Tagoloan CLUP 2017-2027

Traffic accidents

Statistics shows that the growth in population is the growth of vehicles. as well that gives the increase rate in traffic accidents in this municipality. A wide impounding area intended for vehicles involved in traffic accidents in a must to have in a class A Municipality as it deemed necessary for the full implementation of Traffic Laws for violators.

Tagoloan protective facilities

In terms of police station lot requirements, the present lot area of police station had only 400 square meters comparing the lot requirements for PNP base on standard of a class "A" police station there's a need of 2,500 square meters. So, there is a need of additional lot area of 2,100 square meter.

The Bureau of Fire Protection (BFP) which is mandated to prevent and suppress fires avoiding loss of life and damage to properties. There are twelve firemen personnel assigned in Bureau of Fire Protection situated along the PHIVIDEC area located at Barangay Sta. Cruz and they are complemented with one fire trucks. Based on standard on a ratio of 1:2000 fireman to population and facility of fire truck to population ratio of 1:28,000, compared to the actual, there is a need of additional manpower requirement of 25 firemen and an additional two fire truck based for calendar year 2015.

Table 3-281. Protective services by facilities and equipment in Tagoloan

Type of service	Barangay	Area (sq.m.)	Physical condition of facilities	No. of personnel	Ration	Vehicles	
						No.	Types
Police							
Headquarters	Poblacion	400	Fair (Newly Constructed PNP Building)	39	1:1,600	3	Toyota Hilux, Mahindra Patrol Car and Toyota single cab patrol
						2	Rauser motorcycle and Boxer Patrol Motorcycle
Sub-station	None	N/A	N/A	N/A	N/A	N/A	N/A
Outpost	Poblacion	20	Poor/dilapidated	2	1:1000	1	Mahindra Patrol Car
	Crossing Vicmar	20	Poor/dilapidated	2	1:1000	1	Mahindra Patrol Car
Traffic							
Fire Protection							
Headquarters	Sta Cruz	2,000	Needs repairs (part of roof is leaking, and part of ceiling is destroyed, and tiles of office area needs replacement)	12	1:5000	1	Isuzu Morita Fire Truck (Unserviceable & subject to major repair)
Municipal Jail	Poblacion	153	Some structures need repair	6	1:2	1	MITSUBISHI L300 (Prisoners Van) by September 2018
Coast Guard Station	Sugbongcogon	500	Fair	13	1:4000	2	Rubber boat and Aluminum boat

Source: Tagoloan CLUP 2017-2027: Ratio - Personnel to population ratio

Number of Protective Human power by Type

The protective services and facilities for ensuring public safety and order include the newly constructed type A PNP building and detention cells, Coast Guard station, Fire Station units including firefighting hydrants and Municipal Jail Office. Police protection service is situated just beside the Municipal Office Building along the national highway in Barangay Poblacion with three issued PNP vehicles. In addition, two police outposts are located in Barangay Poblacion and Sugbongcogon. 39 uniformed personnel serving as protectors against all forms of crime, there are Coast Guard station located in Brgy. Sugbongcogon with 13 personnel, in addition to that of the Bureau of Fire Protection situated along the PHIVEDIC area not strategically located from other Government Offices with only one fire truck and a personnel complement of 12 then the Municipal detention cell manned by 6 personnel.

Sumilao, Bukidnon

The present peace and order status of Sumilao is generally peaceful. There are 23 officers assigned in the Sumilao Police Station.

The Sumilao Police Station holds its office in the eastern part of the municipal hall which faces the national highway. Due to its limited space, the women cell was converted into a radio room. Since the municipal hall is not protected with concrete fence, which will serve as perimeter barrier, the station is vulnerable to enemy attack.
To assist the PNP force, the LGU hired traffic aides to assist the flow of traffic at Barangay Kisolon especially during school days when children cross the national highway. There are also 160 Barangay Tanods in the municipality who help in the maintenance of peace and order.

The Police Station has one vehicle in good running condition and the other one needs repair. It has also communication facilities with a radio operator hired by the local government. What the office needs is a women's cell and a generator set in case of power interruption.

The LGU has provided funds for the maintenance and operating expenses of the office. However, this fund is not enough especially for the fuel and repair of vehicle which affect the mobility of the PNP force. Financial support for personnel undergoing training/school and enhancement seminars is also limited. Rice allowance is provided to the PNP by Sumilao.

As shown in **Table 3-282**, Sumilao experienced a high total index crime in 2009 compared to the previous years. The most common crime against person in 2009 is physical injury with 23 cases, murder with 4 incidence and robbery with 2. The non-index crime in 2009 had also slightly increased by four incidences compared to the previous years. The total crime volume for the year 2009 is 77 while 2008 is 56.

Table 3-282. Crime statistics in Sumilao (2006-2009)

Type of crime	2006	2007	2008	2009
Index Crimes				
Murder	1	2	1	4
Homicide	1	1		
Physical injuries	2	15	9	23
Rape	3	3	2	
Total crime against person	7		12	27
Robbery		1	1	2
Bank robbery				
Hijacking/highway robbery				1
Theft	5	4	6	14
Total crime against property	4		6	17
Total Index Crimes	**12**	**26**	**37**	**41**
Average monthly crime rate	2.4	5.5	17.04	18.5
Non-Index Crimes				
Illegal drugs	3	2		2
Illegal gambling	4	8		1
Loose firearms	2	2		1
Kidnapping				
Carnapping		1		2
Illegal fishing				
Illegal logging				
Cattle rustling				1
Estafa				1
Others	27	3	7	12
Other forms of deceits				
Malicious mischief				3
Total non-index crimes	**36**	**16**	**19**	**23**
Total crime volume	**46**	**42**	**56**	**77**

Type of crime	2006	2007	2008	2009
Average monthly crime rate	**9.6**	**8.6**	**2.5**	**3.0**

Source: Sumilao CLUP 2011-2020

The Bureau of Fire Protection Office in the municipality is manned by seven non-commissioned officers. It has one fire truck and a driver hired by the Local Government Unit. The Bureau of Fire has its own office and quarters. The Local Government Unit provides rice allowance to the Bureau of Fire Protection officers. **Table 3-283** shows the fire incidence that occurred for the last 5 years in the municipality. For the last 3 years since 2009, only two fire incidents were recorded and responded. Regular inspections on residential and commercial buildings are conducted by the personnel of the Bureau of Fire Protection.

Table 3-283. Fire incidence in Sumilao

Barangay	Frequency of Occurrence				
	2005	2006	2007	2008	2009
Kisolon	0	0	1	1	0
Total	0	0	1	1	0

Source: Sumilao CLUP 2011-2020

Manolo Fortich, Bukidnon

Peace and order

Crime volume in September 2012-August 2013 was reduced by 42; from 233 in the previous year down to 191. Crime volume is a distinct classification used to get key data on recurring crime. Crimes are sorted into index and non-index categories. Index crimes are those of serious nature that occur with sufficient frequency and regularity. Crimes against person such as murder, homicide, physical injury and rape, and crimes against property such as robbery, theft, car napping/carjacking and cattle rustling make up index crimes. Physical Injury (54) is the most commonly reported crime, followed by robbery 37 comes next and Theft (36) are the top most committed crime in the municipality (**Table 3-284**).

Meanwhile, total volume of non-index crime in 2012 decreased from 68 to 62. Non index crimes, on the other hand, are violations of special laws such as illegal logging or local ordinances (**Table 3-285**).
Table 3-285Crime solution efficiency for the last two years of 20122013 was improved from 48.6% to 53.2%, respectively. Higher crime incidence occurs both in poor rural areas and in urban barangays but relatively high in urban places. **Table 3-286** projected a total number of police manpower using the standard 1:1000 policeman-population ratio for the entire planning period.

The establishment of 24-hour Command Center manned by the Respond Quickly Rescue Team since 2002 and Bantay Zona, both Special Projects of the present administration have also contributed to the peace and order in the area. The Bureau of Fire of Protection-Regional Office 10 has a sub-office in the municipality manned with 7 firemen and equipped with one (1) fire truck, 1 re-filler fire truck and other firefighting facilities. However, the absence of Municipal Disaster Risk Reduction Center may cause us not to fully deliver the protective services to our constituents. particularly those who are vulnerable to disasters.

Table 3-284. Crime volume in Manolo Fortich (2011-2012)

Year	Crime against person				Crime against property				IC	NIC	CV	CSE
	MU	HO	PI	RA	RO	TH	CN	CR				
2011	2	0	8	1	4	3	1	1	20	8	28	35.70%
2011	3	0	6	0	3	4	0	1	17	4	21	33.30%
2011	1	0	8	0		1	0	1	11	7	18	44.40%
2011	1	1	8	0	5	3	0	1	18	12	30	46.60%
2012	0	0	3	1	4	4	0	1	13	8	21	42.80%

Year	Crime against person				Crime against property				IC	NIC	CV	CSE
	MU	HO	PI	RA	RO	TH	CN	CR				
2012	1	1	4	0		6	0	2	14	6	20	50.00%
2012	2	0	7	0	3	2	0	2	16	4	20	45.00%
2012	0	0	2	1	3	7	0	1	14	4	18	55.50%
2012	1	0	5	0	3	1	1	0	11	4	15	66.60%
2012	0	0	1	0	4	1	1	0	7	5	12	33.30%
2012	2	1	0	0	5	2	2	0	12	3	15	66.60%
2012	3	0	2	0	3	2	1	0	11	3	14	64.20%
TOTAL	16	3	54	3	37	36	6	10	165	68	233	48.60%

Source: Manolo Fortich CLUP 2013-2022; NOTES: MU – murder; HO – homicide; PI – physical injuries; RA – rape; RO – robbery; TH – theft; CN – carnapping; CR – cattle rustling; IC- index crime; NIC – non-index crime; CV – crime volume; CSE – crime solution efficiency

Table 3-285. Non-index crime in Manolo Fortich (2013)

Classification	Sept 2011 – Aug 2012	Sept 2012 – Aug 2013	Classification	Sept 2011 – Aug 2012	Sept 2012 – Aug 2013
Grave Threat	4	6	Resistance and Disobedience	6	4
Viol of RA 9262	10	8	Trespass to Dwelling	5	3
Viol of RA 7610	14	11	Viol of RA 9165 (Drugs)	3	4
Malicious Mischief	6	4	Viol of PD 705 (Illegal Logging)	1	5
Oral Defamation	6	5	Acts of Lasciviousness	4	2
Arson		1	Parricide	0	0
Alarm and Scandal	5	4	TOTAL	68	62
Direct Assault	4	5	Source: Manolo Fortich CLUP 2013-2022		

In 2012, average crime rate of 18.2% or 18 number of crimes committed per 1000 population of the municipality has decreased by 3.3% in 2013 with 14.9% crime rate. PNP-Manolo Fortich considers low index crime rate as a measure of successful crime prevention.

Table 3-286. Number of policemen in Manolo Fortich (2010)

Barangay	Population	Barangay	Population
Urban & Urbanizing:	**65,628**	**Rural:**	**25,398**
Tankulan	7,907	Dahilayan	1,527
Agusan Canyon	9,850	Guilang-guilang	1,152
Alae	8,552	Kalugmanan	2,986
Damilag	11,385	Lindaban	2,017
Dalirig	3,541	Lingi-on	5,496
Diclum	3,731	Mampayag	1,312
Lunocan	6,341	Minsuro	870
Mambatangan	3,248	Sankanan	3,287
Mantibugao	2,678	Santiago	2,066
Maluko	3,871	Sto. Nino	3,445
San Miguel	4,524	Ticala	1,240
		Total	**91,026**

Source: Manolo Fortich CLUP 2013-2022

PNP Manolo Fortich thru its Women and Children's Desk Officer is working hand-in-hand with MSWDO concerning crimes committed by delinquent minors and abused women and children. The MSWDO is extending support services to youth offenders through counselling and productive activities that would train them to acquire socially accepted behavior. There were 34 incidences reported regarding victims of R.A 9262 or Anti-Violence Against Women and their Children Act and 19 or 56% of the total reported cases were filed in court.

Manolo Fortich has police manpower to population ratio of 1:2881 (standard1:100), fireman to population ratio of 1:13,400 (standard- 1:2,000), jail guard to inmates' ratio of 1:20 (standard- 1:7) (**Table 3-287**). In entirety, the municipality have not passed the minimum requirement of the national standard at all types of protective services.

Table 3-287. Protective services in Manolo Fortich

Protective service	Location	Existing personnel	Facilities/equipment			
			Fire fighting vehicle	Prisoner van	Rescue truck	Others
PNP						
Headquarters	Poblacion	33	0	0	0	Police cars
Sub- Station/Stations	Alae,Lunocan, Maluko		0	0	0	
Special Training Unit	Damilag					
Police Regional Mobile Group	Alae					
Bureau of Jail Management & Penology	Poblacion	5	0	0	0	
Provincial Detention and Rehabilitation Center	Poblacion	12	0	0	0	
Fire Protection						
Headquarters	Poblacion	7	1	0	0	
Civilian Volunteers	All Barangays	420				
Respond Quickly Rescue Team	All Barangays	10	0	0	1	Ambulance
Military Camps						
52nd Engineering Brigade	Poblacion		0	0	1	
14th Company Bukidnon Citizen Active Auxiliary Detachment- 9th Infantry Batallion (Maramag, Bukidnon)	Guilangguilang		0	0	0	

Source: Manolo Fortich CLUP 2013-2022

Fire incidences

Causes of fire incidences in 2012 is show in **Table 3-288** of which electrical short circuit has the highest cause of 5 incidences followed by spontaneous combustion and playing matches with 1 incidence each.

Table 3-288. Fire incidences in Manolo Fortich (2012)

Causes of fire	Frequency
Electrical short circuit	3
Spontaneous combustion	1
Child playing match	1
Total	**5**

Source: Manolo Fortich CLUP 2013-2022

Impasug-ong, Bukidnon

Table 3-289 shows the unsolved crimes from 2014 until 2018. Among these crimes, the most crimes committed are non–index crime, physical injury and theft. Non-Index Crime includes negligent manslaughter, non-aggravated assault, forgery and counterfeiting, fraud, embezzlement, stolen property, vandalism, weapons, prostitution & common law vice, sex offenses, narcotic laws, gambling, offenses against family & children, driving under the influence of liquor.

Table 3-289. Crime incidence in Impasug-ong (2014 to 2017)

Type of Crime	2014				2015			
	TO	CS	Offender		TO	CS	Offender	
			M	F			M	F
Index Crimes								
Crimes Against Person								
a. Murder	2	0			7	6	6	
b. Homicide	2	0			1	1	1	
c. Physical Injury	8	6	6		73	55	55	
d. Rape	2	2	2		11	11	11	
Crimes Against Property								
a. Robbery	8	0			26	4	4	
b. Theft	12	0			52	21	21	
Non-Index Crimes	11	9	9		136	124	124	
Type of Crime	**2016**				**2017**			
	TO	CS	Offender		TO	CS	Offender	
			M	F			M	F
Index Crimes								
Crimes Against Person								
a. Murder	5	2	2		3	2	2	
b. Homicide	2	2	2		0			
c. Physical Injury	42	28	28		79	78	78	
d. Rape	8	8	8		6	6	6	
Crimes Against Property								
a. Robbery	23	3	3		13	5	5	
b. Theft	39	17	17		50	8	8	
Non-Index Crimes	174	162	162		144	124	124	

Note: Criminal Suitability (CS) and Technical Offenses (TO):
Source: Impasug-ong CLUP 2019-2028;

Crime Incidence by Barangay for Children Below 18-years Old in Conflict with the Law for the Past Five Years

There is only one crime committed by a child below 18 years old in conflict with the law which was robbery. Robbery is defined as the action of taking property unlawfully from a person or place by force or threat of force and it only happened on year 2014.

Fire Incidence - As presented on the **Table 3-290**, there are two structural fires occurred in barangay Poblacion, one on year 2014 and one last 2016. There were also three fire incidences recorded last 2018 but it was not specified what were burned. There was also one structure burned in Kibenton and one in La Fortuna in 2015. In year 2016, there were two vehicular fire incidents that happened in barangay Dumalaguing. Also, one unspecified fire incident in barangay Impalutao in 2018 that had taken place. There was also 13 grass fire reported in year 2016 during the onset of Dry Spell. The said grass fire occurred in Poblacion, Capitan Bayong, Impalutao and Kibenton. In addition, one unspecified fire incident in year 2018 in barangay Kalabugao. All in all, there are 26 fire incidents reported but in 2017, there are no reported fire incidents.

Table 3-290. Fire incidence in Impasug-ong (2014 to 2018)

Barangay	2014	2015	2016	2017	2018
Poblacion	1-Structural		1-Structural		3
La Fortuna, Kibenton		2- Structural			
Dumalaguing,			2-Vehicular		1
Impalutao					1
Poblacion, Capitan Bayong, Impalutao, Kibenton			13-Grass Fire		1

Barangay	2014	2015	2016	2017	2018
Kalabugao					1
Total	**1**	**2**	**16**		**7**

Source: Impasug-ong CLUP 2019-2028

Number of Protective Manpower by Type - There is only one Police station established in the Municipality manned by 34 Police personnel located in a 2,000 square meter in Barangay Poblacion and in its excellent condition. The Personnel to Population ratio is 1:1,400 and there are 4 Patrol Cars/motorcycles owned by the said Police Station.

One Fire Station can be found in the Municipality manned by 7 Fire Personnel situated in a 120 square meter land beside the Municipal Gymnasium and is considered poor as to its physical condition since it is already dilapidated. There is only 1 fire truck provided for the said station.

Table 3-291. Protective services in Impasug-ong

Type of service	Barangay	Area (sq.m)	Physical condition of facility	No. of personnel	Personnel to population ratio	Vehicle	
						No.	Type
Police							
Headquarters	Poblacion	2,000	Excellent	37	1:1,400	4	Patrol Car/ Motorcycle
Sub-station							
Outpost							
Traffic							
Fire protection							
Headquarters	Poblacion	120	Poor	7	1:2,000	1	Hino, FT
Jail Management							
City/municipal jail							
Total				**44**		**5**	

Source: Impasug-ong CLUP 2019-2028

Number of Protective Manpower by Type - In the Municipal Police Station, there are 32 policemen and 5 policewomen assigned in the station and 3 Non-Uniformed Personnel (NUP) assigned. All the 13 barangays of the municipality have 20 volunteers as force multiplier for Peace and order also known as the BSPJO and a total of 40 Auxiliary Services.

Table 3-292. Impasug-ong Barangay Security Force and volunteers

Type of service	Number of security force/security	Facilities/ equipment	Condition of facilities/equipment
Peace and Order	260	-	-
Disaster	-	-	-
Auxiliary Services	40	-	-
Others	-	-	-

Source: Impasug-ong CLUP 2019-2028

3.4.5.4.5 Educational facilities

Cagayan de Oro City

Elementary and Secondary Education

Cagayan de Oro has 70 public elementary schools and 37 public secondary schools. Complementing the public schools are the 75 private elementary schools, 46 private secondary schools and 90 preschools. With the institutionalization of Kindergarten Education into the Basic Education System R.A. No. 10157 otherwise known as "An Act Institutionalizing the Kindergarten Education into the Basic Education System and

Appropriating Funds Therefor," all public elementary schools in the city are offering kindergarten classes to cater the 5-year-old school children. The different kindergarten programs include Kindergarten Regular Program (KRP), Kindergarten Volunteer Program (KVP) and Kindergarten Summer Program (KSP).

For the school year 2011-2012, there are 12,159 pupils enrolled in kindergarten, 79,368 pupils in elementary and 29,714 students in the public secondary schools. In the private schools, there are 5,992 kindergarten pupils, 12,600 elementary pupils and 11,521 secondary students. Public school enrolment manifested an increase of 3.72% for the elementary and 2.50% in the secondary compared to the previous school year 2010-2011. The private schools also registered an increase of 1.42% for elementary and 6.86% in the secondary. The booming economy of the city and the influx of subdivisions and other socialized housing projects is one major factor on the increase of enrolment in both public and private schools. More families have opted to establish their dwelling in the city with the hope of uplifting their source of income and providing quality education to their children. Cagayan de Oro also serves as the melting pot for Region X. Elementary teacher-pupil ratio is 1:43.83 and1:35.86 in the secondary.

Classroom-pupil ratio is 1:56.49 in the public elementary and 1:60.03 in the public secondary. This signifies that more classrooms are needed and with the institutionalization of kindergarten in basic education, this also means additional classrooms to be constructed with provisions for 5-year-old pupils. The increase of enrolment in every level, the Institutionalization of Kindergarten and the implementation of K to 12 Program collaboratively point to the need to purchase additional textbooks in all levels.

Although the enrolment is continuously increasing, participation rate is decreasing in both elementary and secondary level. This can be attributed to the economic/financial constraint. Some students are forced to work for a living and even others serve as the bread winner of the family.

To address the low participation rate and high dropout rate especially in the secondary, the Division of Cagayan de Oro City implemented the Dynamic Learning Program and the Open High School Program.

The Alternative Learning System of Cagayan de Oro City Division also provided alternative opportunities to our less privileged school children to acquire education. The ALS offered various programs from literacy to livelihood. This is to ensure maximum participation among all learners.

Higher Education - Private school flourished in the city giving parents and students more options in the choice of a school. As of SY 2011-2012 the City of Cagayan de Oro has 16 higher learning schools, 15 are private-owned. Thus, only 17% of college enrollees are in government-operated Mindanao Polytechnic State College (MPSC). In addition, the Bukidnon State University has operated a satellite school located at Misamis Oriental General Comprehensive High School (MOGCHS) which contribute about 1.8 percent of college enrollees in government school. It implies that around 81.2% of the enrolment goes to the private owned colleges/universities.

Malaybalay City, Bukidnon

There are 74 kindergarten schools within the city, 63 of which are public and 11 are private. The number of elementary schools is 78 and 14 of which are private and 64 are public. The secondary schools have also increased, the city now has nine secondary schools plus the five school annexes. There are also two integrated schools, these schools cater to both elementary and high school students (**Table 3-293**).

Table 3-293. Inventory of schools in Malaybalay City (2015)

Classification	Private	Public	SUC	Total
Kindergarten	11	63		**74**
Elementary	14	64		**78**
Secondary	9		1	**9**

Classification	Private	Public	SUC	Total
Main		10		**10**
Annexes		5		**5**
Integrated Schools		2		**2**
Total	**34**	**144**	**1**	**179**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

The Municipality of Tagoloan has a total of 81 learning institutions, both public and private. Basic education is being provided by 57 preparatory schools, 15 primary schools, and 6 high schools strategically located in the municipality. Tertiary education is offered by one college (Tagoloan Community College) and two technical/vocational school managed by the Technical Education and Skills Development Authority (TESDA) (**Table 3-294**). Public schools provide majority of the basic education services in the municipality while private schools served mostly Tagoloan secondary and tertiary education levels by the local government unit economic enterprise.

There are also preparatory schools in the municipality. There are 37 Early Childhood Care Development Centers/Day Care Centers (DCCs) located in the 10 barangays in the municipality with a corresponding 37 Child Development Workers who attends the 3-4 years old children, 13 Rural Improvement Club Centers (RICCs), and two run and managed privately.

Table 3-294. Inventory of schools in Tagoloan (2017)

Category	Public school	Private school	Total
Preparatory	50	7	57
Primary	10	5	15
Secondary	3	3	6
Tertiary	1		1
Vocational	1	1	2
Total	**65**	**16**	**81**

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

Early Childhood Care Development (ECCD) programs in Day Care Centers are strengthened with more than 10 Day Care Centers established in far flung barangays and/or sitios. Taking into account the vast number of public elementary schools scattered in 22 barangays, the Department of Education have clustered the District Level of Manolo Fortich into DepEd District I and DepEd District II. Four primary schools (Abyawan, Impakibel, Gauron & Bagalangit) were converted into elementary schools and more school buildings for elementary level were built and upgraded from semi-concrete to concrete buildings. It is observed that the two central schools namely, MFCES and Alae Central School for DepEd I and DepEd II have the most populated students per classroom; thus, students are already deprived of quality education.

There are four national high schools established in the municipality. Manolo Fortich National High School has the highest number of enrollees. The then extension high school of Manolo Fortich National High School at Barangay Dalirig is now converted as Dalirig National High School. More classroom buildings are needed in order to meet the minimum standard of 1:40 classroom: student ratio. A lower participation rate and higher drop-out rate is generally reported among secondary schools since half of the population for this school-age group are part of the working age population and most of them, for economic reasons, would prefer to work.

NBCC, an LGU-run community college is observed to have a periodic increase per school year of total enrollees, as shown in the table below. More courses were offered since it operationally started in 2005.Throughout its operation, NBCC have been known for molding quality graduates and have been duly

recognized by CHED and PRC for its outstanding performance particularly in the field of College of Education. The present administration is granting scholarship program to poor but deserving college students of NBCC.

The Department of Education has implemented Alternative Learning System in 12 Barangays, particularly in the barangays of Tankulan, Lingi-on, Kalugmanan, Sitio Kibolawan of Kalugmanan, Lindaban, Dalirig, Maluko, Alae, Damilag, Agusan Canyon, Mampayag and Manitbugao. Most of the classes are held in the public elementary schools while some classes are being conducted in the barangay halls. ALS is a ladderized, modular non-formal education program for dropouts in elementary and secondary schools, out-of-school youths, non-readers, working Filipinos and even senior citizens.

The former district office of Congressman Paras located at NORMINCO, Tankulan used to be the site for Technical /Vocational Education. There were identified out of school youths and non-working who were given various skills training through short-term courses such as welding, dressmaking, culinary, automotive mechanic, and among others.

Sumilao, Bukidnon

The Department of Education has established complete elementary schools in all barangays of Sumilao. It has 12 complete elementary schools, two public high schools and one private high school. A District Office is established at Kisolon which serves as a center for trainings and other school related activities within the municipality.

In the secondary level, Sumilao National High School at Poblacion and its Annex at Kisolon acquired ICT facilities from different sources which are internet connected serving not only students and teachers but to the community as well. Aside from the public schools in the municipality, there is one private school offering secondary education, the Pilar High School situated in Kisolon.

There is no existing tertiary school/college in the municipality but the people have easy access to higher education considering that the municipality is located between two big cities, Cagayan de Oro City in the North and Malaybalay and Valencia City in the South.
The enrolment of the elementary schools in Sumilao for SY 2007-2008 reached up to 4,344 with 92 teachers. The current teacher-pupil ratio is pegged at 1:47 or one teacher for every 47 pupils. Lupiagan has the highest ratio of 1: 58 and Ocasion has the lowest of 1:30, as shown in the table below.
As to classroom, the same table shows a total of 93 classrooms with an average of one (1) classroom per 47 pupils. This is generally within the standard requirements. However big schools with high enrolment have higher ratio.

For the secondary level, the two public high schools have a combined enrolment of 598 for SY 2007-2008, with 17 teachers and pegged at 1:35 teacher –student ratio. These two schools are in the orange coding which means a ratio of 1:35-39.99. This further means that teachers are fairly distributed. Pilar High School has 429 students with 1:39 ratio.

For student-classroom ratio, Sumilao National High School Main has a ratio of 1:42, Kisolon National High School –Annex at 1:51, while Pilar High School has registered a student-classroom ratio of 1:50 or 50 students in one classroom.

There are 97 school buildings in the elementary schools in this municipality as of 2007-2008. About 25 buildings need repair. Two schools need additional classroom buildings due to increase in enrolment. These are Kisolon Central Elementary School and San Vicente Elementary School.

In the secondary level, Sumilao National High School Main has 14 school buildings, six of these structures need major and minor repairs. Kisolon Annex has 10 school buildings and 2 of which needs repair. Pilar High

School on the other hand has just constructed a two-storey building to cater the classroom needs of their students.

Impasug-ong, Bukidnon

For school year 2017-2018, there are more enrollees in kindergarten and in Senior High School. In June 2017, some Kindergarten teachers are having 70 pupils in a class, especially in big schools.

However, thru the Division of Bukidnon additional teachers were employed and assigned to the district especially those schools in the far distant barangays. Additional IP teachers were assigned in IP schools like in Bundaan Elementary School, Dumalaguing ES, Magawa and Bulonay ES. Integrated schools like Impalutao Integrated School and Kibenton IS were given permanent Secondary School teachers.

In terms of classroom situation, some Kindergarten pupils are housed in makeshifts rooms and Senior High School students are scheduled for shifting classes for them to be accommodated. There are no enough classrooms for the Senior High School students and Integrated Schools. Majority of the elementary schools need additional classrooms.

There are enough chairs in majority of the elementary schools compared to the high schools since the Senior High School students are making use of the Junior High School buildings and classrooms. Majority of the schools have no playgrounds not even enough space for students to play. There is a need of additional comfort rooms, science laboratory rooms, computer laboratory and library.

3.4.5.4.6 Recreational facilities/sports facilities

Cagayan de Oro City

Cagayan de Oro City recreation, entertainment, and sports facilities and their respective locations is shown in **Table 3-295**. Cagayan de Oro has its city–Wide Sports Development Program and it has 11 major events financially subsidized by the city namely; basketball, volleyball, table tennis, sepak takraw, athletic, karatedo, badminton, arnis, chess, taekwondo, boxing and other sports related activities. Under this program, group of competent coaches and trainers called Advance Scientific System Efficiency Training (ASSET) was organized. They have to coach and train young players on sports discipline anchored in the vision and goals of the city sports development program.

This Sports Program had been serving aspirants athletes to excel and explore in different sports competition in national and international level. In fact, it offered not only great opportunity for young people to develop and enhance their skills in sports, but also financial assistance and incentives to those who contributed honors in the name of the city.
The Department of Education Culture and Sports Development Program had organized a school varsity type of athletes in every school. There are seven sports events conducted annually: District Meet, Division Meet, Regional Meet, Palarong Pambansa, COAA Meet, Milo Olympics which are locally funded under the SEF Funds and School Intramurals funded by the school and PTA. In three consecutive school years, the varsity players have been awarded as consistent over-all-champion in the Northern Mindanao Regional Athletic Meet.

Table 3-295 Recreation, entertainment, and sports in Cagayan de Oro (2018)

Faciliy	Location
Movie houses	Limketkai Complex, Barangay 31
Limketkai Cinema I, II, III, IV	Barangay 26
Gaisano Mall Cinema I, II, III, IV	Corrales- C.M. Recto Avenue
SM City Cinema1,2,3,4	1. Yacapin-V. Roa Streets
Centrio Mall, Ayala Cinema 1, 2, 3, 4	2. Barangay 26
Shopping Centers/Malls	3. Hayes-Osmeña Streets

Faciliy	Location
Centrio Mall, Ayala Gaisano Mall/City	4. J.R. Borja-Guillermo Streets
Ororama Supercenter	5. Bulua
Limketkai Center	Carmen
Robinson Super Center	J. R. Borja Street Barangay 31
Savemore	Limketkai Center
Shopwise	1. SM City, Upper Carmen
Puregold	2. Kauswagan Highway
Resorts	3. Agora, Lapasan
Acuña	4. Capistrano-Pacana Streets
Cabula River Resort	Limketkai Center
	Lapasan
	Tablon
	Sitio Cabula, Lumbia
Chali	Cugman
Coco Bay	Baloy
Country Village Hotel	Villarin Street, Carmen
De Oro Saga Resort	Bulua
El Dorado	Bonbon
Harbor Lights Hotel	Gusa
Gardens of Malasag Eco-Tourism Vill	Cugman
Maandig	Bonbon
Macro Hotel	Cugman
Pryce Plaza Hotel	Upper Carmen
Raagas	Bonbon
Ridgeview Chalets	Xavier Estates, Upper Carmen
Victoria	Bayabas
Stargate Dream Vacation	Upper Macasandig
Sonrisa Vista Resort	Bayabas
Sports Facilities	
Bowling Alleys	Upper Balulang
Xavier Estates Sports and Country Club	Gusa
Shuffle Square	
Gymnasium/Coliseum/Auditorium	
Alwana Sports Complex	Cugman
Bulua Gym	Bulua
Capitol University Gym	Corrales Extension
City Central School Gym	A. Velez-Yacapin Streets
Corpus Christi Gym	Macasandig
DMCC Gym	Kauswagan
MUST Gym	Lapasan
Gregorio Pelaez Sports Center	A. Velez Street
Guani Sports Center	Gumamela Street, Carmen
Liceo de Cagayan University Gym	Carmen
Lourdes College Auditorium	Capistrano Street
Lourdes College Gym	Macasandig
Oro Christian Grace School Gym	Macasandig
Pilgrim Christian College Gym	Capistrano-Akut Streets
Sports Zone (Temp. Closed)	Tomas Saco Street, Nazareth
Xavier University Gym	Corrales Avenue
Golf Course	
Camp Evangelista	Patag
Pueblo de Oro	Upper Carmen
Tennis Court	Capitol Compound

Faciliy	Location
Capitol Tennis Court	Gaerlan-Capistrano Streets, B1
Golden Friendship Tennis Court	A Velez Street
Gregorio Pelaez Sports Center	Kauswagan
Liceo de Cagayan University Tennis Court	Nazareth
Nazareth Tennis Court	Macabalan
Phil. Port Authority Tennis Court	
Pryce Plaza Hotel Tennis Court	Carmen Hill Kauswagan
RER Drive Subd. Tennis Court	Upper Balulang
Searsolin Tennis Court	Upper Balulang
Seventh Day Adventist Tennis Court	
Sports and Country Club Tennis Court	Xavier estates
Villa Ernesto Subd. Tennis Court	Gusa
Xavier University Tennis Court	Corrales Avenue
Fitness and SPA	
Ban Sabai Thai Spa	Corrales Street
Body Touch Massage & Spa Duke Spa	Robinson Mall, Limketkai Center
FAI THAI Massage	National Highway, kauswagan
Flora's Beauty Salon & Spa	Pabayo Street
La Cabana Spa	Pabayp Streets (Annex) JR Borja-
Nikki Salon & Spa	Pabayo Streets
Nuat Thai Foot & Body Massage	CM Recto Avenue
Nuat Thai Massage	Marco Hotel, Cugman
Raf-Raf Thai Traditional Massage	Pabayo-Cruztaal Streets
Sentara Nail & Body Spa	Agodo Road, Corner Limketkai
Spa de Marie Beauty Centrum	Florentino Street
Spa de Oro Salon	Tiano-Pacana Street
TA TSU JIN Spa & Body Massage	Limketkai Drive
Thai Boran Massage	Pabayo-Gomez Street
Touch n Heal Facial Body & Foot Massage	Capistrano-Pacana Street
3K Thai Traditional Massage	Abujuela-Burgos Streets Pres.
Vanity Works Salon Day & Spa	Quirino Streets
	Capistrano-Borja Streets
	Rosario Arcade

Source: Cagayan de Oro City Ecological Profile 2019

Malaybalay City, Bukidnon

The City of Malaybalay has several good places that attract tourists the whole year. Some of them are described below.

a. The Monastery of Transfiguration - As a spiritual destination, the monastery sprawls through several hundreds of hectares owned by the Benedictine monks who spend their life in farm work and prayer. Their produce, sold in a souvenir shop consist of the famous Monk's Blend coffee and peanut delicacies. The main church was designed and the last work by national artist Leandro Locsin. This site appeals to the tourist seeking peace quiet, communion with nature and appreciating the pure cool air.

b. Monastery of Carmelite Nuns- The monastery nuns provide an environment of natural attractions with its well-kept grounds as well as spiritual blessings of peace renewal.

c. Jesuit Retreat House - Primarily a retreat center, its well-kept grounds being on the banks of a creek offer the intrepid a climbing experience amidst a mini rainforest ambiance. Owned by the Jesuits, silence and nature harmony is an unforgettable experience.

d. Mt. Kitanglad Agriculture and Ecological Center (MKAEC) – The MKAEC is a Gawad Saka 2006 First Place Winner for showcasing an ecological and agricultural all organic, all-natural lifestyle. This is a site for bird watching, trekking, camping, fishing and eco-walk. Being situated at the foothill of Mt. Kitanglad, a rare flight of the Bukidnon eagle could be in your sights as you walk along misty eco-trails with a cool temperature to equal that of Trinidad valley in Mt. Province. The site of frequent conferences and seminars, the rustic ambiance is one to snare the ecology-oriented tourist at heart.

e. Lapanday Farm - The sweetest pineapples exported fresh are from this Filipino agri-corporation. Its plantations are located in different sites and the headquarters are found not more than a 10-minute drive from the City's commercial section. This is owned by the Lorenzo family, a name long associated with the pineapples and agriculture.

f. NOMIARC and Stock Farm - This area is the site of farm showcases where animals of good stocks (bred) and high value vegetables are seeded and tested for research by government technicians.

g. The Capistrano Mountains - Located in the Basakan area of the city attracts hardy climbers for its high white rock formation where rock climbing, rappelling and exploring of caves in the area will be a great and exciting activity aside from the refreshing view of green rice fields surrounding the mountain.

h. The Bukidnon Tree Park- owned by government unit, the tree park consists of hills and forest that appeal to hikers and bikers. The foremost area known to many tourists is the festival grounds to the Kaamulan Festival. It also has a Kaamulan Open Theater, the scene of many conferences and performances of local and national performing artist.

i. Nature Park and Swimming Pool- this natural attraction features scenic environs the site of a varied flora and fauna, providing varied environmental activities of which bird watching is one. A swimming pool and another for children welcome the daring to try clean, coolest water.

j. Hernandez Ranch- Owned privately by the Hernandez family, the site was developed with horseback riding trails, swimming pools and fishing grounds.

k. Mt. Kitanglad Range Natural Park - The name *"kitanglad"* was derived from a legend that there was once a great flood that submerged the native lands of Bukidnon and only the tip of the mountain, the size of a *"tanglad"* (lemon grass), remained visible (*"kita"* in Cebuano).

l. Mt. Kitanglad Range Natural Park became a full-pledge protected area in 2000 by virtue of Republic Act (RA) 8978 known as the Mt. Kitanglad Range Protected Area Act of 2000. It is considered one of the country's priorities protected areas and a prime spot for nature ventures like trekking and birdwatching. The range is one of the few remaining rainforests in the Philippines and host to most important diverse species of rare and endemic wildlife like the Philippine Eagle. MKRNP covers 47,270 hectares and is the sacred ancestral domain of the Bukidnon, Talaandig and Higaonon tribes. Five of its peaks have very high elevations: Mount Dulang-dulang, the highest at 2,938 meters (the second highest peak in the country following Mt. Apo in Davao City); Mount Kitanglad at 2,899 meters (officially declared the fourth highest peak in the Philippines); Mount Maagnaw at 2,742 meters; Mount Lumuluyaw at 2,612 meters; and Mount Tuminungan at 2,400 meters.

Association of South East Asian Nations (ASEAN) declared Mount Kitanglad Range Natural Park as Heritage Park last May 16, 2010 and joins 27 other heritage parks in the ASEAN region. It is also the third declared ASEAN Heritage Park in the Philippines, after Mt. Apo in Davao, and Mt. Iglit-Baco in Oriental Mindoro.

Accommodation and Food

The Pine Hills Hotel- The City's pearl of food, drinks and accommodations, this elegant setting offers quality food and rest for the travelers with discriminating taste and very particular about comfort.

Haus Malibu, Villa Alemania, Plaza View, 1st Avenue, Green Ridge Apartelle and Pelots Guest House – are six of the hotel/accommodation facilities in the city that offer lodging at reasonable prices and clean facilities.

Rey's Grill, Mindy's, Fiona's, Anton's, Amadeo's, The Garden, & Skyway - are only some of the eating places offering grilled seafood and meat. The tasty concoctions of marinades and sauces are enough to restore one's vitality.

The Bukidnon Brew Café, Mint Leaf Café, Ashley's Tearoom & Gifts, Le' Cafe, Isabella, Café Casanova, Sunflower, Pizzahan sa Plaza and Benedict - affording a refreshing stop from hectic sightseeing, variously located in the center of the city offering snacks and watering holes for the young and coffee aficionados.

Original Delicacies – Pinasitas of Cake Boom, the OO7 Choco Roll of Em's Fastfood and the famous krispylicious Chicken Neck of Centro Food and Folk Haus are original recipes and creations that are truly culinary delights the city is proud of.

Events to Watch or Join

The Kaamulan Festival- a yearly cultural celebration, this festival is unique for being an event that brings together both tribal and lowlanders together in a mutual appreciation of the ethnic custom and mores. Seven hill tribes (the Talaandig, Higaoonon, Umayamnon, Manobo, Tigwahanon, Matigsalug and Bukidnon) come together with ritual prayers, dances and songs in colorful attire to charm the tourist. It is now three decades that the festival has happened, with side shows of horse races, rodeo and other ethnic events.

Horse Racing and Show- the Malaybalay Horseman Association offer equestrian events to watch out for in the course of the year. They have participated as far north as Cebu and as far south as Davao where they garnered awards for their efforts. This group has also overseen the development of horse breeds and their presents specimens prove the success in this endeavor. The Club President is former judge and present Dean of the College of Law Bukidnon State University and a member of the City Tourism Board Vivencio P. Estrada.

Airsoft Club Events- recent placer in the just concluded national competition in Ozamiz City, this Outdoor association of Airsoft aficionados gives great fun even to onlookers, while playing in their very challenging and ruggedly designed game course.

Rodeo, Moto-Cross and Offroad Competition- the action for these is often tied up with the festival Kaamulan. The event is participated in by local and national level competitors.

Mountain Biking-there is a vigorous presence of mountain bikers who regularly get together and hold their events. These are office workers and career men whose idea of recreation and fitness is mountain biking. Their normal place of congregating is right in Fortich Street across the Bukidnon State University.

Easter Sunday- a dawn mass featuring about a hundred 'angels' consisting of children singing quite an event to see every year. It draws together a flood of people usually at the Provincial Capitol grounds having been entrenched in the Church calendar. However, in the 60's it evolved into a feast that brought children to rehearse and perform in the great discipline for the joy of the feast of resurrection and up to now, this has established itself as a regular event for the people of the city.

Malaybalay is positioning itself as an ecotourism and cultural destination. The resources around will definitely answer for that vision.

Sports and Recreation

Sports facilities in the city are mostly basketball courts of which there are 223 courts located all over the city. Most of these are already dilapidated and needs rehabilitation but some are new and housed inside covered courts. Next to basketball, billiards, volleyball and tennis are some of the sports activities the locals enjoyed.

For track and field games, the only venue available is the poorly maintained and dilapidated grandstand at Sumpong. Other outdoor games like football and baseball can be played at the capitol grounds. Recreational activities are usually held in 155 KTV's and 39 internet shops all over the community.

The Sangguniang Kabataan (SK) of the City of Malaybalay conducts various sports activities in the different barangays of the city, which are usually done during the first five months of the year. There were several sports equipment given to select Barangays in support to their sports activities during their celebration of "Fiestas" and "Araw".

Tagoloan, Misamis Oriental

Tagoloan is one of the coastal municipalities in Misamis Oriental and a potential area for eco-tourism. It is approximately 19 kilometers away from the City of Cagayan de Oro by means of public transportation. Presently, the approximately 6.10 kilometers stretch coastline may not be so appealing due to presence of seaside dwellers, underdeveloped offshore/foreshore potentials and occurrence of Industrial/Commercial wharfs. But, by taking a closer assessment, it would reveal more of significant number of attractions.

The A.L. Casiño Park and A.T. Cosin Park is considered as the main tourist attraction in the town. Amenities such as wide-area playing ground with recreational facilities, psychedelic globe-type fountain that catch the attention of pedestrians, especially during night-times, a giant statue of the mother earth and a refreshment canteen brings comfort and relaxation at its best.

The municipality has several outdoor and indoor sports facilities (**Table 3-296**). Majority of outdoor facilities, particularly basketball courts, are provided by the municipality. Except for the Tennis Court which the Parish Church owns, other sports and recreation facilities requiring large investments are provided by the private sector. Majority of these sports and recreation facilities are concentrated in its center of the barangays. But almost all the barangays in the municipality have covered courts which are used for various sports activities and at times serve as venues for assemblies and evacuation centers, cultural activities during fiestas, among others. Public and private schools also have sports facilities like track ovals and courts.

The ten barangays of Tagoloan have basketball courts, with some barangays having two or three basketball courts. There is a public plaza of 23,763 square meters at Poblacion and Sta. Ana, and covered court facilities with a total area of 6,450 square meter distributed to all barangays.

Table 3-296. Sports facilities, parks and playgrounds in Tagoloan

Barangay	Facilities/location	Area (sq. m.)
Baluarte	Covered court - Centro Basketball court – Nabulod, Centro, Sto. Nino Plaza/playground - Sto.niño	540
Casinglot	Covered court - Centro Basketball court – Centro, San Vicente	540
Gracia	Covered court - Centro Basketball court - Centro	540
Mohon	Covered court - Centro Basketball court	540
Natumolan	Covered court - El Mundo Basketball court – Centro, El Mundo	540
Poblacion	Covered court/public gym - Centro Public plaza Tennis court - Parish church Basketball court- Promiseland, Villamanga, & Pulot	1,590 19,387
Rosario	Covered court - Centro Public plaza	540
Sta. Ana	Covered court - Centro Public plaza - Centro Basketball court – Centro, Nasalaban, Bontong, Dike Public plaza - Dike	540 4,376
Sta.Cruz	Covered court- Centro	540
Sugbongcogon	Covered court- Centro	540

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

Being strategically located near the urban center of Cagayan de Oro City, Manolo Fortich has a lot to offer even to local tourists. Presently, the local tourism industry in Manolo Fortich continues to grow with eco-adventure and nature parks. Among the tourist attraction and are located in areas vulnerable to flood, landslide, strong winds, soil erosion and earthquake and two others are located in areas vulnerable to landslide, strong winds, soil erosion and earthquake.

Tourism has increased by 127.20 hectares from 30.50 in 2005 to 157.70 hectares in 2012. This was attributed to the newly opened recreational tourism sites at Barangay Kalugmanan, Dahilayan and Diclum. **Table 3-297** and **Table 3-298** presents the tourist sites and natural attractions in Manolo Fortich.

Table 3-297. Tourist sites in Manolo Fortich

Name	Location	Facilities
Dahilayan Adventure Park	Dahilayan	Adventure rides such as zip line, drop zone, flying lizard, challenging ropes course and wall climbing. Accredited accommodation and restaurant.
Forest Park	Dahilayan	Assortment of recreational activities, playground, picnic area, café, and accommodation.
Saddle Ridge camp	Dahilayan	Eco-adventure tour, camping area, restaurant and accommodation.
Dahilayan Gardens & Resort	Dahilayan	Fun recreational activities, camp sites, picturesque garden ideal for photoshoots, venue for special occasions and accommodation.
Kampo Juan	Dicklum	Challenging and one-of-a-kind adventure rides, innovative demo farms ideal for educational tours, venue for special occasions
Mangima Canyon Springs & Country Park	Dalirig	Swimming pools, venue for special occasions and gatherings, restaurant and accommodation.
DMPI Golf Course	Cawayanon, San Miguel	18-hole golf course and club house restaurant

Name	Location	Facilities
Del Monte Philippines, Inc. Pineapple Plantation	Located in 12 barangays	Renowned pineapple plantation in the country
Montegelo Farm	San Miguel	Swimming pools, venue for special occasions and gatherings, restaurant and accommodation.
Mountain Pines Farm	Dahilayan	
MENZI Farms and MENZI Orchard Residences	Menzi, Damilag	
Helms Farms	Kalugmanan	
Mac Arthur Landmark	Mapait, Dicklum	
Franciscan Friars of the Immaculate Seminary House and Chapel	Gabok, Lingion	
Bagalangit Ultimate Bivouac	Kalugmanan	Airsoft games, barracks, dining hall, obstacle courses, power van, cottages, archery, tipi huts
Mother of Perpetual Help Church	Cawayanon, San Miguel	

Source: Manolo Fortich CLUP 2013-2022

Table 3-298. Nature attractions in Manolo Fortich

Name	Barangay	Facilities	Description
Mt. Kitanglad Range Natural Park	Dahilayan and Kalugmanan	Rest cabin	The newest mountain destination of the toughest mountain running trail in the country which already hosted two International Rugged Mountain Race participated by local and foreign athletes.
Sumalsag Cave	Dalirig		A place of excitement for the cavers and spelunkers. Sumalsag Cave is the longest cave in Northern Bukidnon with approximately 1,859 meters of underground channel. If you're into an extraordinary adventure, be ready to slide, crawl, swim or even wriggle your body as you move about inside this magnificent Sumalsag Cave.
Mangima Canyon	Dalirig	Cottages	A haven of nature enthusiasts where one can view perfect scenic canyons
Abyawan Ridges	Abyawan, Dalirig		One can have a panoramic vista of the Tagoloan river and the scenic canyons as the river traverse the Dalirig, Lingi-on, Sto. Nino
Tagoloan River	Abyawan & Dalirig		One of the major watersheds of the municipality
Salt Spring	Guilangguilang		Rarely visited spring with natural salty taste of spring water

Source: Manolo Fortich CLUP 2013-2022

Sumilao, Bukidnon

Sumilao is endowed with vast natural and human-made resources which could be developed as tourist destinations. However, the Local Government Unit has no existing local tourism office, nor formulated any tourism development plan that could be used as guide in the development and promotion of the said sector. Although some interesting areas exist, no fees are collected for those who have ventured to visit these places.

The famous landmark of the municipality is the Alalum Falls which is located along the national highway at Barangay Kisolon. Its imposing beauty can easily be seen by motorists. The viewing area had been landscaped and stairs going down to the falls was constructed. Several passers-by stopped to view the grandeur of the falls. The municipality has also other falls that have not been developed.

The Palaopao Hill which stretches along the boundary of the municipalities of Sumilao and Manolo Fortich from the northeast to the southeast and stands 836 feet above sea level is home of several caves. The sides of the hill also contain several rock shelters, limestones overhangs and even contain wooden coffins and artefacts whose designs are traced back during the metal age. These places were used as burial ground in the early part of the nineteenth century. The caves are attracting several spelunkers with Sumalsag cave as the most popular. However, all of these are not protected and developed.

Mount Kitanglad is situated the southern part of the municipality. It is specifically located at barangays Lupiagan and Licoan. Mount Kitanglad ranges imposing majesty and splendor easily catch the attention of the travelers plying the route from Cagayan de Oro City to the southern part of Bukidnon Province. With its strategic location and height of more than 9,000 feet above sea level, anyone can see from the top of the wide splendor of Macajalar Bay and the panorama below and surrounding the mountain. It is also the sanctuary of the wild plants and animals especially the endangered species which is the fast-vanishing monkey-eating eagle. Communication facilities such as relay stations were also established on the top of the mountain and bunkers for their employees were constructed. These bunkers are also used as shelters for the several climbers who have reached the peak of the mountain. Kitanglad Volunteer Guards with honoraria from the Provincial and Municipal Governments have been hired to protect the flora and fauna which are found in the mountain.

The vast fertile land of Sumilao which is also suitable to agriculture is filled with wide plantation of pineapple and banana. These fields present awesome sight to several visitors.

The ½ hectare man-made lake of FARM Coop at Barangay Kisolon has been developed as a resort. The coop has constructed several sheds and bamboo rafts for visitors. This water impounding was purposely constructed as source of drip-irrigation for the banana plantation of DOLE, Philippines and FARM Cooperative Incorporated. It is also utilized as Tilapia production.

A one-hectare man-made lake in a cattle ranch of the Bando Farm at Poblacion, Sumilao has also become the home of wild white ducks. The ranch management had banned the use of air guns in this area to protect these wild ducks.

As for the support facilities, some of the potential tourist spots such as caves and waterfalls could only be reached by foot. Though hotels are not yet available in the locality, lodging houses are available for those who want to pass their night. Fast foods or eateries are also available.

Recreation

All barangays in the municipality have open spaces such as plaza. These plazas serve as an area where families could relax and have funs with their children or friends. Standard- sized basketball courts are constructed within the plaza where boys play their favorite basketball games. These concrete paved courts are also complemented with stage for social and cultural shows which are usually held during celebrations such as fiestas. With the construction of other infrastructure facilities such as barangay hall, health center and other buildings within the plaza, the open space have become limited. Areas for other sports activities such as volleyball are held in vacant lots outside the plaza. In Kisolon, a 2,000-seat gymnasium was constructed by the Municipal Government. Barangays Poblacion and Kisolon have also their own covered courts.
Video-K bars are also present in most barangays. Three barangays had banned the operation of video-k bars as these had caused troubles especially when customers got drank. Some households have their own units for family affairs. The presence of the telephone line in Kisolon had enabled some entrepreneurs to operate internet cafés and video games.

A cockpit arena is established in Kisolon where cockfighting aficionados could spend their weekends. The absence of resorts and swimming pools have forced the local residents to travel to other places. On the

general, there are few entertainment venues and activities in the localities where the residents could relax. The table below shows the sports and recreational facilities of the barangays of the municipality.

Table 3-299. Sports and recreational facilities in Sumilao

Type of facility	Barangay	No.
Sports Facilities		
Basketball Court (Outdoor)	Kisolon	4
	Kulasi	1
	Licoan	1
	Lupiagan	1
	Ocasion	1
	Poblacion	1
	Puntian	1
	San Roque	1
	San Vicente	3
	Vista Villa	2
Covered Court	Kisolon	1
	Poblacion	1
Volleyball Court	All barangays	10
Gymnasium	Kisolon	1
Billiard	Kisolon	3
	Licoan	1
	Lupiagan	1
	Occasion	1
	Poblacion	1
	San Vicente	1
	Vista Villa	1
Recreational Facilities		
Cockpit	Kisolon	1
	Vista Villa	1
Children Playground	All Barangays	10
Video-k Bars	Kisolon	15
	Kulasi	1
	San Roque	1
	Licoan	1
	Lupiagan	1
	Poblacion	5
	Puntian	1
	San Vicente	3

Source: Sumilao CLUP 2011-2020

Impasug-ong, Bukidnon

Impasug-ong has a municipal gymnasium utilized as venue for annual basketball tournaments sponsored by the municipal government. The actual recreational area of the urban barangay consisting of Poblacion, Impalutao and Kalabugao in 2015 is 12.4003 square meters while the current area is 12.7094 in 2016 and it increased to 13.3491 in 2017. Presently in this area are constructed in the Municipal Gymnasium, covered court, tennis court and the refurnished Plaza Rizal.

There are 29 basketball courts constructed in 13 barangays. There are also covered courts constructed in all barangays and ongoing construction in 5 sitios. For barangays Kibenton and La Fortuna, considered as

urbanizing barangays, the total actual recreational area in the year 2015 is 4.7311 square meters and it has a current aggregate area of 4.8494 in 2016 and 4.9698 in 2017 respectively.

A municipal plaza is located in the Poblacion with a newly constructed Dome. Rest rooms for male and female users are also constructed. The 13 barangays also have their own plazas where residents can stroll and socialize, as well as playgrounds where children can play and enjoy. A cockpit is found at Barangay Impalutao, Impasugong managed by private entity.

The Municipality is conducting an annual summer basketball and volleyball league participated by the 13 barangays. These were divided in five categories for both men and women namely the pasarell division, junior division, senior division, civic division, and women division.

There are at least one covered court in every barangay. These said covered courts are equipped with bleachers, basketball facilities and an outdoor stage. There is also a Gymnasium in the municipality and there is a Dome type covered court in the municipal plaza to cater sports and other activities.

Table 3-300. Sports facilities in Impasug-ong

Name	Location	Facilities/Equipment	Description
Municipal gymnasium	Poblacion	Lights & sounds, fiber glass basketball goal and electronic score board, comfort rooms, fitness equipment	Venue for sports and other activities
Covered court	Poblacion	Bleachers, basketball facilities	Venue for sports and other activities
Covered court	12 barangays	Bleachers, basketball facilities, outdoor stage	Venue for sports and other activities

Source: Impasug-ong CLUP 2019-2028

3.4.5.4.7 Food security

Cagayan de Oro City

Food security is defined by FAO as year-round availability, accessibility and affordability to safe and nutritious food. The Philippine Association of Nutrition (1997) estimates that the poorest sector of the Philippines, which comprises almost 40% of all households, spends about 60 % of its available income on food alone. In a study conducted by Holmer and Dresher (2005) in Cagayan de Oro, on the adult scale, only 29.3 % of the respondents were considered food secure, while 31.3 % were food insecure without hunger and a high 39.4 % were food insecure with hunger (**Table 3-301**).

Table 3-301. Food security of urban poor in Cagayan de Oro City (2006)

Categories	Frequency	Percentage
Food secure	88	29.33
Food secure without hunger	94	31.33
Food insecure with hunger	118	39.33
Total	**300**	**100.00**

Source: Holmer and Drescher (2005)

Malaybalay City, Bukidnon

In Malaybalay, of the city's total land area of 108, 259 hectares, only 2,797 hectares in 2001 and 2,996 hectares in 2012–or an increase of seven percent—were identified under the Network of Protected Areas for Agricultural and Agro-industrial Development (NPAAD) or agricultural protected areas for food production.

In contrast, 2,350 hectares in 2000 and 9,052 hectares in 2012 were actually used for agri-industrial plantations for pineapple, rubber, banana and sugarcane. In those 12 years, land conversion rate rose by 285 percent. This is one of the actions identified by the LGU for ensuring food security in the area.

Malaybalay is mainly an agricultural area, and its products include rice, corn, sugarcane, vegetables, legumes, root crops, high value crops and commercial crops. Commercial crops composed of rubber, coffee, banana and pineapple. Pineapple and banana plantations are now proliferating in the outskirts of the city proper. Their aggressive expansion even to prime agricultural areas could pose a danger to the local food security.

For corn production, the city was able to produce 5,872 MT of corn in 2010, with an average yield per hectare of 2.2MT. In 2015, production rose to 72,032 MT with an average yield per hectare of 4.19MT. Just like rice, the city has become more efficient in producing corn. The city's self-sufficiency level for corn for 2015 is quite high at 1,541.23%, this was only 240% in 2010.

Tagoloan, Misamis Oriental

Pursuant to Republic Act 8435, otherwise known as Agriculture and Fishery Modernization Act, the national government's main thrust is to ensure food security, among others. In line with this, in August 1999, the office of the Municipal Agriculture in Tagoloan submitted the plan and was adopted as per Resolution No. 26, s. 1999 known as the Strategic Agriculture and Fisheries Development Zone (SAFDZ) of the Municipality of Tagoloan, Misamis Oriental.

The major agricultural crops in Tagoloan are corn, cassava, upland rice, banana, papaya, vegetables, mango, and coconut. Of the 1,010.50 hectares planted to various agricultural crops, banana covers 361 hectares or 35.7 percent with an estimated annual production of 1,083 metric tons. Coconut covers 152 hectares with an estimated annual production of 608 metric tons, while vegetables cover 73 hectares with an estimated annual production of 233.6 metric tons. Corn covers 269 hectares with an estimated annual production of 1.34 metric tons. Cassava covers 50 hectares with an estimated production of 0.5 metric tons. Rice covers 31 hectares with an estimated annual production of 248 metric tons. Papaya covers 23.5 hectares with an estimated production of 1,880 metric tons. Mango covers 50.75 hectares with an estimated production of 203 metric tons.

Tagoloan's projected population by the year 2027 is 107,379. Cereals and its by-products are considered as basic food which is very important in the daily nutrition. An area of 300.25 hectares with a total of 1,594 metric ton per year on rice and corn production in two cropping's in a year. The production per year and Average Yield / Ha. / Cropping of 5 tons for corn and 4 tons for rice. By the year 2027, the estimated per capita consumption of the 107,379 population will be 13,315.00 metric ton per year. Also, by 2027 the municipality will need an additional area of 1,760 hectares to meet the demand for rice and corn. By combining the production area for corn and rice, then the municipality can still meet the demands for cereals.

Manolo Fortich, Bukidnon

In order to keep and preserve highly suitable agricultural lands for the long-term food security of the constituents of Manolo Fortich and in line with the food security program of the nation, certain agricultural lands are protected against irreversible conversion such as those for urban uses. These lands belong to the Network of Areas for Agricultural Development (NPAAD). It includes Crop Development Zone and Pasture/livestock development zone.

Manolo Fortich reports food sufficiency and the population from 2017 to 2019 in (**Table 3-302)**. For rice production, there is not enough supply for the population. However, corn production is sufficient for the population. However, Filipinos usually prefer rice to corn for their food.

Table 3-302. Food sufficiency in Manolo Fortich (2017 - 2019)

Crop	2017		2018		2019	
	Population	Food security (%)	Population	Food security (%)	Population	Food security (%)
Rice	104,992	**21.81**	107,154	**22.02**	109,362	**22.21**
Corn	104,992	**3,200.70**	107,154	**3,197.50**	109,362	**3,186.90**

Source: Manolo Fortich CLUP 2013-2022

Sumilao, Bukidnon

The supply and demand of prime food commodities such as supply of rice for human consumption for the municipality is deficit even with the annual projected increase in production of the particular commodity of 0.03 percent. The need to increase the area for irrigated rice cultivation is very evident to attain rice sufficiency to feed the whole population of the municipality.

Poultry meat is still deficit in the municipality since commercial poultry farms are for egg purposes only. Only about 0.5 percent of culled chickens coming from these commercial farms are marketed within the locality, the rest are transported to nearby provinces. Swine production for meat purposes are mostly raised on the backyard level. Pork production is high compared to the demand. For vegetables and fruits, production is still high compared to the demand. The municipality is a supplier of these products outside the local market because of its high production.

Impasug-ong, Bukidnon

The program of the Bureau of Fisheries and Aquatic Resources (BFAR) has helped the municipality answer the needs of fish proteins. Establishment of fishponds by the fish farmers and dispersal of tilapia fingerlings by BFAR have increased agricultural productivity, augmented income, promoted food security and improved the farmers' rural livelihood. The per capita consumption of fish and fish products (along with meat and poultry products) amounted to 54 kilograms per year. Most consumption is of marine fish. But in the municipality of Impasugong, freshwater fish which is tilapia is dominant. Other freshwater fish available through fisherfolk catch are catfish, kasili, pait, haluan, pantat, dalag, Alimango/alimasag, hipon, dalapakan, tambilolo Pigok, shells, tigod and etc. Consumer acceptance of tilapia and other freshwater fish has increased in the past years.

In addition, to increase food security in the municipality, the Department of Agrarian Reform has processed 2,088.2521 hectares of farmlands awarded to deserving beneficiaries and has an area of 158.8111 hectares pending to be covered. The Impalutao-Cawayan Agrarian Reform Community which has 937.2129 hectares is recognized by DAR.

Based on **Table 3-303**, the current production of rice and corn in the municipality exceeds to its consumption. This means that surplus is sold outside the municipality, and some are utilized as feed ingredients.

As to vegetable production, many farmers are investing in high value crop production. The Municipal Agricultures Office (MAO) encourages individual household to venture into "Food Always in the Household" by planting vegetables in their backyards which would also help eliminate malnutrition in the municipality.

As to milk production, MAO aims to utilize the Municipal Communal Ranch to raise hybrid cattle to be used as milking cows to produce fresh milk products. There are many poultry farms located in the municipality, but their egg produced are hatched and delivered to other municipalities which leads the MAO to come up with the strategy to encourage farmers to raise native chickens to produce eggs and meat as well.

Less farmers are into hog fattening due to African swine fever, but the MAO are doing its best to encourage farmers to venture back into hog fattening. The office also encourages people's organizations to participate and avail themselves of livelihood programs offered by National Agencies.

Currently, fruit in the municipality is sparsely produced due to lack of knowledge among farmers in growing fruit trees. This needs orientation among farmers in utilizing riverbanks and lot boundaries as part of the environmental protection program. Its produce will be an additional livelihood for the people and will also help in food security.

Table 3-303. Food production and consumption in Impasug-ong

Food item	Population		Consumers		PLA	AAP	Standard*	Production (M.T.)		Requirement (M.T.)/YR		Surplus/deficit	
	2019	2028	2019	2028				2019	2028	2019	2028	2019	2028
Cereals & cereal products	54,118	65,891	32,470.80	39,534.60	12,151.66		0.124	10,947.15	48,606.64	4,026.38	4,902.29	6,920.77	43,704.35
Rice	54,118	65,891	22,729.56	27,674.22	2,009.88	4.00	0.124	7,555.00	8,039.52	2,818.47	3,431.60	4,736.53	4,607.92
Corn	54,118	65,891	9,741.24	11,860.38	10,141.78	4.00	0.124	3,392.15	40,567.12	1,207.91	1,470.69	2,184.24	39,096.43
White	54,118	65,891	6,818.87	8,302.27	2,061.82	3.50	0.124	1,696.08	7,216.38	845.54	1,029.48	850.54	6,186.90
Yellow	54,118	65,891	2,922.37	3,558.11	8,079.96	4.50	0.124	8,544.73	36,359.80	362.37	441.21	8,182.36	35,918.60
Sugar & syrup	54,118	65,891	21,647.20	26,356.40	400.35	50.00	0.07	31,281.42	20,017.50	1,515.30	1,844.95	29,766.12	18,172.55
Starchy roots & tubers	54,118	65,891	21,647.20	26,356.40	965.00	1.64	0.06	1,520.00	1,582.60	1,298.83	1,581.38	221.17	1.22
Vegetables	54,118	65,891	54,118.00	65,891.00	1,400.00	1.52	0.03	11,638.38	11,638.38	1,623.54	1,976.73	10,014.84	9,661.65
Fruits	54,118	65,891	27,059.00	32,945.50	700.00	1.42	0.028	541.11	994.00	757.65	922.47	(216.54)	71.53
Dried Beans, nuts & seeds	54,118	65,891	5,411.80	6,589.10	859.81	4.55	0.004	0.75	3,912.14	21.65	26.36	(20.90)	3,885.78
Milk & milk products	54,118	65,891	13,529.50	16,472.75	1,676.00	0.50	0.016	200.00	838.00	216.47	263.56	(16.47)	574.44
Eggs	54,118	65,891	27,059.00	2,945.50	1,330.00	0.50	0.004	500.00	665.00	108.24	131.78	391.76	533.22
Fish, meat & poultry	54,118	65,891	27,059.00	49,418.25	665.00	5.00	0.054	113.55	3,325.00	1,461.19	2,668.59	(1,347.64)	656.41

Source: Impasug-ong CLUP 2019-2028; NOTES: *ha/person/year; PLA - Projected Land Area; AAP - Average Annual Production;

3.4.5.4.8 Impact assessment on the threat to delivery of basic services /resource competition

Delivery of basic services /resource competition

Construction and operation- Migration affects the demands on the infrastructure and services in the place of destination. Shifts in demand occur in housing, childcare, power generation, shops, roads, amusement parks, schools, public transport, police, telephones and employment, among others. Inadequacies in the city/municipality's infrastructure and services add to the pressure. The rapid population growth results in migrants having to cope with insufficient infrastructure and cities/municipalities having to manage the lack of planning to meet the needs of all people.

The demand for utilities, such as water, energy and telecommunications, can be put under severe pressure, with those at the lowest income levels suffering disproportionately from a lack of access. The situation gets worse when migrants reside in the same neighborhood as low-income residents already accessing the scarce resources.

Increased demand on water resources

Construction **-** One of the most severe challenges, especially in developing cities/municipalities, is the availability of clean water. The Sustainable Development Goals intend to achieve universal and equitable access to safe and affordable drinking water for all people by 2030. The influx of migrants places an increasing demand on water resources, followed by an associated increase in sewage generation which, in turn, creates demand for waste water treatment facilities. A lack of such facilities results in an increased risk of untreated waste contaminating water, rendering more sources of water unusable and depriving more people of an increasingly scarce resource.

Increased demand on power supply

Construction and operation- **-** Migration also affects energy consumption and CO2 emissions quantitatively. A comprehensive study in 2013 on the effects of internal migration on residential energy consumption and CO2 emissions in Hanoi, Vietnam illustrated that "urban-to-urban migration had no statistically significant effect on per-capita energy consumption and CO2 emissions. Population growth driven by rural-to-urban migration produces lower estimates of energy consumption than natural population growth." Cities are underestimating the impact of rural-to-urban migration such that energy consumption estimates are lower when the population has increased due to this migration than through urban-to-urban migration and natural population growth. These outcomes have imperative implications for the energy policy of cities/municipalities in the context of population growth and energy utilization (Komatsu, Kaneko & Dinh Ha, 2013).

Increased demand on communication technologies

Construction and operation- **-** Advances in communications technology have made it possible to access relevant information. These technologies not only make more and better information accessible to migrants and their families, but also connect relatives, friends and colleagues physically separated by migration. ICT has played a crucial role in reducing the physical divide between migrant family members separated by geographies. Such technology directly influences how people socialize and work in transnational pluralistic societies. However, the speed of transmission may be affected by the volume which is added by the migrants in the areas.

Peace and order/ safety and security

Construction **-** Some developed cities/municipalities regard migration as a security issue and use it as an excuse to instate stringent and restrictive policies. However, some cities/municipalities welcome migrant workers especially if they are integral to the development of the community.

Increased demand for education facilities

Construction **-** Some migrant workers might bring their families along with them, especially if the construction work is long term. Even though the proposed Project will not pose a direct on the accessibility of the students to their schools, soaring immigration directly affects the availability of places in primary schools, and

inevitably pushes schools towards increasing class sizes and adding classrooms. When an influx of children from migration occurs, cities/municipalities need to ramp up resources and capacity to deal with it. Lack of such resources poses big issues for their governments, undermining efforts to keep class sizes down and to provide school places for all children.

Increased use of recreational facilities/sports facilities

Construction **-** The significance of migrants' leisure stems from the role leisure plays in individuals' lives. At the same time, leisure pursuits of migrant bear consequences for the receiving society or the local community. Participation in leisure/recreational activities is important in recuperation from work and building self-esteem aside from building and maintaining a social group. Apart from maintaining individual and group identities, leisure plays a role in migrants' adaptation to the receiving society through opening up opportunities of contacts with the mainstream population and ethnic group members (Stodolska & YiKook 2003; Stodolska & Alexandris 2004; Kim 2012) and facilitates positive inter-ethnic interactions. However, this may also result to conflict in the availability and access to the recreational and sport facilities available in the community.

Increased risk of illicit behavior and crime

Construction **-** The influx of workers and service providers into communities may increase the rate of crimes and/or a perception of insecurity by the local community. Such illicit behavior or crimes can include theft, physical assaults, substance abuse, and prostitution. Local law enforcement may not be sufficiently equipped to deal with the temporary increase in local population.

Food security

Construction **–** Food security is a current reality in the country to include the areas where the highway will be located. Food security is defined by the Food and Agriculture Organization (FAO) "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." Its components include availability, access, utilization and stability (ifsc.aciar.gov.au/food-security-and-why-it-matters.html. Accessed 3 September 2021). This is a current reality in the country to include the areas where the highway will be located.

3.4.5.5 Threat to public health and safety

3.4.5.5.1 Medical facilities

Cagayan de Oro City

There are 53 Barangay Health Centers (BHC) of the city and 13 medical officers are responsible for implementing public health programs. Each medical officer supervises and rotates to at least 3 assigned BHCs or more. There are 37 nurses. Most of them are assigned to one BHC. But there are 8 nurses assigned to two or more BHC with small population coverage. There are 66 midwives. Most of them are assigned to one BHC. Some health centers with larger population have 2 or 3 midwives. There are 6 dentists, 21 sanitary inspectors and 10 medical technologists distributed to four districts of the city, serving several BHCs.

The BHC generally deliver the same package of health services like Maternal and Child Health, Disease- Free Zone Initiatives, Intensified Disease Prevention and Control, Healthy Lifestyle and Health Risk Management, Environmental Sanitation, and Health Advocacy and Promotion. All BHCs are OPB accredited. Though all BHCs are functioning as lying-in clinics and implementing TB sputum examinations through its designated microscopy center, they are still waiting for their Philhealth accreditation on MCP and TB-DOTS.

On the other hand, the City Health Office (CHO) serves as the main headquarter where it houses the medico-legal services, issuance of health permits, animal bite treatment center, social hygiene clinic, and administerial functions. The achievement of various health programs by the CHO depends on the support they receive from their Local Chief Executive (LCE).

The curative health delivery system is provided by the 14 hospitals, 3 of which are government and 11 private hospitals. One government hospital is operating as level 4, Northern Mindanao Medical Center (DOH retained hospital which caters to the constituents of the city and Region X) while the two other government hospitals are operating as level 2, namely JR Borja General Hospital and Camp Evangelista Station Hospital (military hospital which caters mostly to military personnel and their dependents). Of the private hospitals, Maria Reyna Hospital is operating as a level 4 category hospital while 5 of the private hospitals, namely: Madonna and Child Hospital, Polymedic Medical Plaza, Capitol University Medical City, Polymedic General Hospital and Cagayan de Oro Medical Center are operating as level 3 hospitals. Puerto Community Hospital and Sabal Hospital Inc. are level 2 private hospitals while Del Monte – Bugo operates as a level 1 private hospital.

In Cagayan de Oro, there are four districts attending the health care delivery system. In the West, there are four hospitals namely; JR. Borja General Hospital, Madonna and Child Hospital, Camp Evangelista Station Hospital and Polymedic Medical Plaza. In the East, there are also four hospitals namely Ma Reyna Hospital, Capitol University Medical City, Del Monte Hospital – Bugo, and Puerto Community Hospital. Lastly, there are six hospitals comprising the central district namely, Northern Mindanao Medical Center, Polymedic General Hospital, Sabal Hospital Inc., Cagayan de Oro Medical Center, CDO Maternity Children's Hospital and Puericulture Center. The fourth district is High Land District which doesn't have any hospital.

In 2011, all government and private hospitals in the various districts of Cagayan de Oro City were able to meet the minimum licensing requirements of the Department of Health and all are also accredited with PhilHealth.

From the 14 Hospitals of the four Districts excluding NMMC (DOH retained hospital) and Camp Evangelista Station Hospital (Military Hospital), there are a total number of 1,805 beds.

Table 3-304. Hospitals by category, bed capacity, and personnel in Cagayan de Oro City (2018)

Hospital	Category	# of beds	# of rooms	Physician	Nurse	Midwife	Dentist
CDO Polymedic Medical Plaza	Tertiary	150	128	392	221	0	0
CDO Polymedic Medical General hospital	Tertiary	105	24	3	97	0	2
Capitol University Medical City	Tertiary	181	148	36	254	14	5
Cagayan de Oro Maternity Children's Hospital & Puericulture	Level 1	70	26	26	24	6	0
Cagayan de Oro Medical Center	Tertiary	112	98	6	132	34	1
Camp Evangelista Station Hospital	Secondary	100	20	5	17	13	1
Doctor's Sabal Hospital	Primary	55	70	4	37	2	0
J.R. Borja General Hospital	Secondary	100	36	56	233	19	2
Northern Mindanao Medical Center	Tertiary	600	61	194	548	59	3
Madonna and Child Hospital	Tertiary	105	-	6	113	9	1
Maria Reyna Hospital	Tertiary	130	108	15	181	6	3
Puerto Community Hospital	Secondary	35	19	3	23	1	1
	Total	**1,708**	**738**	**360**	**1,880**	**163**	**19**

Malaybalay City, Bukidnon

The Malaybalay City Health Office serves as the main rural health unit facility of the city and is staffed with doctors, dentists, nurses, medical technologists, midwives, pharmacists, nutritionists, sanitary inspectors and non-technical personnel. The CHO has 140 employees, of whom only 52 or 37% are regular. It is located in Barangay 4 this city (**Table 3-305**). It provides all basic health services such as medical and dental check-ups, consultations, laboratory tests, nutrition services and other health related services for communicable and noncommunicable diseases. With these available services and various department of health programs implemented, the City Health Office facility has inadequate and limited space to cater all its daily clients.

The City Health Office usually caters to the needs of nearby urban barangays, while the other barangays are served by Barangay Health Centers (BHC). Of the 46 barangays of the city, only Poblacion Barangays 2, 4, 5, 6, 7 and 8 have no health centers because these barangays lack site where they could construct the health centers. The BHCs are manned by midwives, Barangay health workers, barangay nutrition scholars and trained hilots. Based on standard ratio of population per Barangay Health Station which is 1:5000, Malaybalay City has 1:3,886ratio. However, the deployment of Barangay Midwives is based on per barangay, regardless of its population.

A lying-in clinic in Barangay Mapulo serves residents of 8 Upper Pulangui Barangays.There are four existing private hospitals and one Bukidnon Provincial Medical Center (BPMC) in the city. All are situated within the población area. Out of the four private hospitals, three are secondary level and one is primary.

Table 3-305. Health demographic information of Malaybalay

Total Population (2015)	170,635
Number of Barangays	46
Number of BHS	52
No. of Households (2015)	41,343
Botika ng Barangay	28
Sentrong Sigla BHS	12
Nutrition Posts	98

Health workers	Number	Health workers	Number
Doctors	4	Dentist	2
Nurses	18	Midwives	47
Medical technologist	4	Sanitary Inspectors	3
Laboratory aides	4	Malaria worker	1
Non-Technical/Medical	93	Radiologic technologist	1
Pharmacist	1	Total CHO employees	183
Nutritionist	1	Active BHWs	467
Dental Aide	3	BNS	72
Physical Therapist	1	Trained Birth Attendants	61

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Table 3-306 shows the Tagoloan medical health facilities and personnel. Tagoloan has one Municipal Health Center, 10 Barangay Health Stations, one BEMONC Facility with one Newborn Screening Facility, one Public-Private Mix DOTS Unit, and one Laboratory.

The Municipal Health Office has 1 Municipal Health Officer, 1 Public Health Nurse, 2 Sanitary Inspectors, 1 Medical Technologist, 1 Dentist, 14 Midwives, 1 (DTTB) Doctors to the Barrio, 16 Nurses under Nurse Deployment Project 1 (FHA) Family Health Associates, 1 (PHA) Philippine Health Agenda, 1 (UHCI) and 5 Rural Health Midwifes Placement Program of Department of Health.

There are two hospitals in the municipality. St. Paul Hospital run by the local government unit of Tagoloan, with 28 beds capacity and 5 doctors, 34 Nurses, 2 Midwifes, and 2 MedTech. While the other is Tagoloan Polymedic General Hospital, a private hospital, with 50 beds capacity and 17 doctors, 28 Nurses, 1 Midwife, and 2 other personnel.

In providing health services to the locality, the ratio on health care personnel must be parallel to the localities' total population. The Municipality of Tagoloan has a total population of the following per year: 2015-74,755, 2016-76,759, and 2017-77,241. The increasing population of Tagoloan implies the need of the

following health personnel: Doctor-2, Nurse (to be assigned at Rural Health Unit)-4, Midwife (to be assigned at Rural Health Unit)-4, and Rural Sanitary Inspector-3.

Table 3-306. Health facilities and personnel in Tagoloan (2017)

Health facility	Barangay	Ownership	# of beds	Personnel						Physical condition
				D	N	M	SI	Other	Total	
Hospital										
Tagoloan Polymedic General Hospital	Sta. Cruz	Private	50	17	28	1	0	2	48	Operational
St. Paul Hospital	Poblacion	Public	28	5	34	2	0	2	43	Operational
Main/Municipal Health Center										
MHO	Poblacion	Public	5	1	1	4	2	2	10	Operational
BHS	Poblacion	Public	0	0	0	1	0	14	15	Operational
BHS	Sta. Cruz	Public	0	0	0	1	0	17	18	Operational
BHS	Natumolan	Public	0	0	0	1	0	18	19	Operational
BHS	Sta. Ana	Public	0	0	0	1	0	20	21	Operational
BHS	Baluarte	Public	0	0	0	1	0	15	16	Needs repair
BHS	Casinglot	Public	0	0	0	1	0	11	12	Operational
BHS	Mohon	Public	0	0	0	1	0	8	9	Operational
BHS	Sugbongcogon	Public	0	0	0	1	0	8	9	Operational
BHS	Gracia	Public	0	0	0	1	0	5	6	Operational
BHS	Rosario	Public	0	0	0	1	0	8	10	Need Repair

Source: Tagoloan CLUP 2017-2027; NOTES: D – doctor, N – nurse, M – midwife, SI – Sanitary inspector; MHO - Municipal Health Office; BHS - Barangay Health Station

Manolo Fortich, Bukidnon

There is one public hospital existing in the municipality (Bukidnon Provincial Hospital) located at Barangay San Miguel and private hospital situated within the premise of Del Monte Philippines Inc. in Camp Philipps, Agusan Canyon that is run by Tagoloan Polymedic Hospital. All barangays have Barangay Health Stations and the Municipal Health Center, a certified Sentrong Sigla with Birthing Facility that is Philhealth Accredited. It is situated within the vicinity of the New Municipal Government Center at Tankulan. The main health center is open 24 hours and manned by 2 doctors, 1 dentist, 1 medical technologist, 3 nurses, 7 nurses under contract thru DOH RN HEALS, 1 dental aide, 1 rural sanitary inspector (J.O.), 24 midwives and 235 active BHWs.

Sumilao, Bukidnon

A Municipal Health Center is established in Barangay Kisolon which serves as referral station for patients and clients coming from the different barangays of Sumilao. This center is manned by a Municipal Health Officer, a public health nurse, a medical technologist, a midwife and a sanitary inspector. An ambulance driver and a utility worker are also assigned in this office. **Table 3-307** shows the medical health facilities and personnel of the municipality in 2009.

Table 3-307. Health facilities and personnel in Sumilao (2009)

Barangay	Facility			Personnel					
	Type	# of beds	Condition	D	N	M	SI	Others	Total
Kisolon	MHO	0	Dilapidated		1	1	1	1	5
San Vicente	Barangay health station								
Puntian									
Culasi									
San Roque									
Ocasion									
Lupiagan									
Licoan									
Vista Villa									
Poblacion									

Barangay	Facility			Personnel					
	Type	# of beds	Condition	D	N	M	SI	Others	Total
Kisolon	Provincial health station	0	Well maintained		1	1	0	3	6
Kisolon	Emergency hospital	10			4	3	0	2	10

Source: Sumilao CLUP 2011-2020; NOTES: D – doctor, N – nurse, M – midwife, SI – Sanitary inspector

Other barangays have their own Health Stations which are manned by midwives and assisted by Barangay Health Workers. Since there are only six midwives in the municipality, four of them are assigned to serve two barangays. Barangay Kisolon has also its own Barangay Health Station but is only manned by a Barangay Health Worker.

There are 54 Barangay Health Workers, 10 trained hilots, 20 Barangay Nutrition Scholars and 29 Barangay Service Point Officers who assist in the delivery of health services in the municipality. Except for the trained hilots, these barangay volunteers received regular honoraria from the Provincial, Municipal and Barangay Governments.

The Provincial Government of Bukidnon had also established the Provincial Health Station which is located near the Municipal Health Center. It is manned by a doctor, a nurse, a midwife, a medical technologist, a clerk and an ambulance driver/utility worker. This PhilHealth Accredited Station caters to the beneficiaries of the Indigency Program of the Provincial Government.

In addition to these health facilities, there are also one private hospital and a clinic in Kisolon and another community clinic at San Vicente. The ten-bed hospital is manned by two doctors, 4 nurses, 3 midwives and 1 medical technologist. They have also a clerk and aides.

The Sumilao Cooperative Community Clinic at Barangay San Vicente caters to all patients of Sumilao with referrals from the municipal paid midwives. This clinic which is managed by San Miguel Corporation dispenses medicines and consultation free of charge. However, the medicines are limited and are more on first aid cases.

There are also eight Botika ng Barangay in the municipality with initial capital in the form of medicines from the Department of Health. These stores sell generic medicines which are cheap and affordable. Only barangays Kisolon and Vista Villa have not availed this assistance. However, there are three pharmacy stores in Kisolon.

For patients who need adequate medical care, they are referred to other hospitals at Malaybalay City and Cagayan de Oro City. The Local Government Unit has three units' ambulance for the transportation of these patients. The Provincial Health Station has also its own ambulance and so with the private hospital.

Impasug-ong, Bukidnon

All health facilities are owned by the LGU and are distributed as follows: one Rural Health Unit (RHU) located in Barangay Poblacion, and one Barangay Health Station (BHS) in the rest of the barangays totaling to 12 BHS (**Table 3-308**). There is no existing BHS located in Barangay Poblacion, all health services are provided by the RHU. There is no existing hospital facility in the municipality. For patients requiring hospitalization they would have to travel to Malaybalay City where the nearest hospitals are Bukidnon Provincial Medical Center in Malaybalay City is the referral hospital of the Rural Health Unit.

Currently the MHO has only one physician, one dentist, one nurse, one medical technologist, one sanitary inspector and 14 midwives. Based on the population of the municipality, it would require at least two doctors, two dentists, four nurses, three sanitary inspectors and 16 midwives to serve the community with 2 RHM in 3 Barangays namely Poblacion, Kalabugao and Impalutao. Since the rural health unit provide birthing services, more midwives are required for the functionality of the birthing facility.

All the 12 Barangay Health Stations in the Municipality provides Maternal and Child Health services, Child Care services, services for communicable and non-communicable diseases, Expanded Program on Immunization, family planning services, consultation, sputum smearing and environmental sanitation services. The Rural Health Unit, on the other hand, provides all the services given by the BHS with the addition of dental services, laboratory services and birthing services.

Table 3-308. Health facilities and personnel in Impasug-ong

Health facility	Barangay	Ownership	Personnel					
			D	N	M	SI	Others	Total
Main/district/city health center								
RHU	Poblacion	LGU	1	1	1	1	2 RHM	6
Barangay health station								
BHS	Bontongon	LGU	0	0	0	0	1 RHM	1
BHS	Bulonay	LGU	0	0	0	0	1 RHM	1
BHS	Capitan Bayong	LGU	0	0	0	0	1 RHM	1
BHS	Cawayan	LGU	0	0	0	0	1 RHM	1
BHS	Dumalaguing	LGU	0	0	0	0	1 RHM	1
BHS	Guihean	LGU	0	0	0	0	1 RHM	1
BHS	Hagpa	LGU	0	0	0	0	1 RHM	1
BHS	Impalutao	LGU	0	0	0	0	1 RHM	1
BHS	Kalabugao	LGU	0	0	0	0	1 RHM	1
BHS	Kibenton	LGU	0	0	0	0	1 RHM	1
BHS	La Fortuna	LGU	0	0	0	0	1 RHM	1
BHS	Sayawan	LGU	0	0	0	0	1 RHM	1

Source: Impasug-ong CLUP 2019-2028; NOTES: D - Doctor, N - nurse, M-Medical technologist, SI-Sanitary Inspector; RHU- Rural Health Unit; BHS – Barangay Health Station

3.4.5.5.2 Leading causes of morbidity and mortality and nutritional status of children

Cagayan de Oro City

Live births in the city in 2011 numbered 14,485 or a crude birth rate of 23.4%. This translated to 1207 babies born each month, 40 babies born per day, or almost 2 births per hour. There was a very slight decrease in the rate from previous year, which was 24.5%. There were 5,149 or 8.33% people die this year in the city. This indicates to 429 persons died per month or 14 persons died per day.

High Maternal Mortality. Cagayan de Oro City's maternal mortality was persistently and steadily increasing from 90/100,000LB in 2002 to 170/100,000LB in 2010. However, there is a drop to 110/100,000LB in 2011. This is due to active monitoring of traditional birth attendants and, at the same time, ensuring that all the health centers are functioning as lying-in clinics. The improvement in data recording and reporting lead to abrupt rise in maternal deaths starting 2006. This reflected a more realistic picture of the magnitude of maternal deaths. Several factors were probed for the high maternal mortality, such as; the low coverage of quality prenatal and postpartum care, home deliveries attended by TBAs, low coverage of iron supplementation, delays in referral of emergency cases and low contraceptive prevalence rate. In addition, the referral hospitals are located in the city, thus the increase in death. All these factors will be further illustrated in the next discussions below. Very striking in the review of maternal deaths is the fact that most deaths (uterine atony, uterine rupture and uterine inversion) are due to incompetence of the person that conducted the delivery. Most of these deliveries occurred at home assisted by TBA. There were also considerable numbers of teenage maternal deaths. In fact, in 2011, 30% of maternal deaths are teen-age mothers.

In 2011, most common causes of maternal deaths were eclampsia, preeclampsia, followed by uterine atony, and then amniotic fluid embolism on 3rd. Sepsis and congenital heart disease shared on 4th rank. All of these

were preventable causes of maternal deaths if only early and adequate interventions were in place. More so, strict adherence to safe motherhood policy, that includes regulating birthing homes and traditional birth attendants, should be imposed.

Data also showed that maternal deaths are occurring in densely populated areas while no deaths occurred in the rural or highland areas. This clearly implies that despite the availability and accessibility of health facilities where a pregnant mother could travel less than 15 minutes to the nearest health facility for care, most of them prefer to deliver at home assisted by TBA. Several factors can be hypothesized such as, social exclusion of people belonging to marginalized sectors, level of education of pregnant mothers, poor seeking behaviors of pregnant mothers, affordability of health services, unregulated functions of TBA and weak support and referral system.

Percentage of facility-based deliveries was gradually increasing above the NOH target for the past years. Notably, in 2011 facility-based deliveries rose to 84%. However, despite improvement in the rate of facility-based deliveries, it did not reduce the number of maternal deaths in the city. This is because most deaths either occur at home or happened due to delays in referral when emergency arises. Factors involved were already discussed above. To date, there are already BEmONC Teams trained, although their health centers need to be upgraded to become BEmONC areas.

High Infant Mortality. For six years, the trend of infant deaths was maintained steadily in significant numbers. Although the city achieved the MDG target for 2015, which is less than 19 per 1,000 live births, city's IMR doubled in 2011 from 2001 data (**Table 3-309**).

The consistent high number of infant deaths in the city is due to the following: late or delay referrals of non-CDO infants to end-referral centers in this city, neonatal deaths from home deliveries assisted by TBA, poor childcare at home, and poverty. The data may also show the need of strengthening its safe motherhood policy as more than two-thirds of infant deaths were neonates. Most of these neonates died either related to home delivery assisted by unskilled birth attendants or inadequate newborn care.

More infant deaths occurred in the urban areas compared to rural areas. The reasons of high maternal deaths in urban areas as mentioned above may hold true also for infant deaths. However, the low registry of infant deaths in rural areas is possible since some families prefer to bury them immediately rather register their infant deaths.

Sepsis and Respiratory Distress Syndrome/ Prematurity top the leading causes of infant death in 2011. This is followed by pneumonia. In the past, pneumonia has always been the number one cause of infant deaths. However, since there was an increase in prematurity, RDS and sepsis ranked number 1. Poor antenatal care is one of the factors that contribute to poor pregnancy outcome. Sepsis was mostly observed among children delivered at home. Pneumonia is the 3rd leading cause of infant death. It was showed also that incidence of pneumonia deaths was lowered. Factors affecting the outcome of pneumonia include nutrition, immunization coverage, micronutrient supplementation and early referral of complicated cases.

Table 3-309. Leading cases of infant death in Cagayan de Oro (2011)

Leading causes	Number	Rate
Sepsis	39	2.69
Respiratory Distress Syndrome	39	2.69
Pneumonia	32	2.21
Asphyxia	20	1.38
Congenital Heart Disease	19	1.31
Age	17	1.17
Meningitis	11	0.76
Multiple Congenital Anomalies	11	0.76
Aspiration	6	0.41

NOTE: per 1000 live birth, Source: Cagayan de Oro City CLUP 2013-2022

Double burden from communicable diseases and lifestyle-related diseases. Pneumonia remains on top as the leading cause of mortality from the top 10 diseases over the last 3 years as shown in **Table 3-310**. Chronic kidney disease, dengue and sepsis show an equal number of cases for the last 2018 period.

Table 3-310. Leading causes of mortality in Cagayan de Oro City (2016 - 2018)

Causes	Number of cases		
	2016	2017	2018
Pneumonia	545	739	126
CAD/MI	'-	-	115
Cancer	638	712	108
CVD/CVA	411	462	76
HCVD	464	372	63
DM	312	324	55
Vehicular accidents	202	246	40
Sepsis	-	-	15
Dengue	-	-	15
Chronic Kidney Dis.	-	-	15

Source: Cagayan de Oro City CLUP 2013-2022

Malaybalay City, Bukidnon

In 2015, there were 3,577 live births with a birth rate of 20.7%. Based on the survey, there were about 86.4% babies born attended by medical practitioners like doctors (45%); midwives (41%), and nurses (0.3%). Of the total deliveries, only about 444 or 12.4% deliveries were assisted by trained hilots and 41 or 1.1% attended by hilots not officially trained.

Leading Causes of Morbidity - The top five causes of morbidity include intestinal infections like cholera, amoebiasis, and the like. The second top cause is disease of esophagus, stomach and duodenum. This is the major cause of morbidity of patients under 1 year old. Third is influenza and pneumonia. Fourth is other diseases of the urinary tract system and fifth is chronic lower respiratory diseases.

Intestinal infectious diseases or gastroenteritis is the number one cause of morbidity of Malaybalay City. The pattern of the occurrence of the disease decreases as the age increases. Mainly it affects the ages below 19 years and most cases involve the male patients. Viruses, bacteria, parasites, or other pathogens can cause infections in the stomach and small and large intestines, which often lead to gastroenteritis.

The second top cause of morbidity is the diseases of esophagus, stomach and duodenum in Malaybalay City. Alarmingly 74% of the affected age is under 1 year old, however, it is decreasing as the age increases. Further, 87% of the affected sex is the male group.

The third top cause for morbidity is influenza and pneumonia. For influenza and pneumonia, it can be observed that individuals at greatest risk for being hospitalized were infants younger than 19 years and adults 60 years of age or older regardless of the sex. Further, pneumonia is the second top cause of morbidity in the Province of Bukidnon. A record of 14,029 cases has been reported by the Provincial Health Office on its 2012 annual report.

The top three leading causes of infant mortality were Pneumonia (3,146; 14.3%); Bacterial sepsis of newborn (2,731; 12.4%); and Respiratory distress of newborn (2,347; 10.7%). The listed top ten leading causes of infant mortality in 2013 were the same with what was recorded in 2012 which only differ in ranks.

Another cause of morbidity in Malaybalay city is the diseases of the urinary system. Infants under 1 are the most affected, thus the number of cases decreases as the age increases. It can also be observed that the females are the most susceptible to the disease.

Chronic lower respiratory diseases completed the top five causes of morbidity in Malaybalay City. It can be deduced that below 19 years old are the most affected age thus, declining as the age rises. Chronic Lower Respiratory Disease (CLRD) actually comprises three major diseases: chronic bronchitis, emphysema, and asthma, that are all characterized by shortness of breath caused by airway obstruction. The obstruction is irreversible in chronic bronchitis and emphysema, reversible in asthma.

Leading Causes of Mortality - In 2015, the top five leading causes of mortality are cardiac arrest, myocardial infarction, pneumonia unspecified, hypertensive heart disease and abdominal aortic aneurysm (**Table 3-311**). More males suffered from the top five causes of mortality, while there is more female who suffered from hypertension and status asthmaticus. There are also more males who suffered from motor vehicular and cerebrovascular accidents.

Table 3-311. Leading causes of mortality in Malaybalay (2011)

No.	Causes	Number of cases			
		Male	Female	Total	Rate
1	Cardiac arrest	41	30	71	4.20
2	Myocardial infarction	43	25	68	4.02
3	Pneumonia unspecified	41	21	62	3.66
4	Hypertensive heart disease	17	13	30	1.77
5	Abdominal aortic aneurysm	17	11	28	1.65
6	Non-Insuline dépendent diabetes mellitus	16	11	27	1.59
7	Hypertension	11	15	26	1.53
	Cerebrovascular disease unspecified	14	12	26	1.53
8	Motor vehicular accidents	22	3	25	1.47
9	Cerebrovascular accident	11	10	21	1.24
10	Status asthmaticus	8	11	19	1.12
	Total	**537**	**331**	**868**	**5.13**

NOTE: per 10,000 Population; Source: Malaybalay CLUP 2016-2025

Other Causes of Mortality - In 2015, there were 35 infant deaths recorded, 4 maternal deaths, 16 perinatal deaths, 7 neonatal, and 12 fetal deaths (**Table 3-312**). The top three cause of death among infants were prematurity with 25.7%, congenital heart disease and birth asphyxia with 11%. Maternal deaths are caused by uterine atony, ruptured ectopic pregnancy, severe pre-eclampsia, and post-partum dilated cardiomyopathy.

Causes of fetal deaths are fetal distress/ asphyxia, fetus affected by cord complications, and meconium aspiration syndrome. Perinatal deaths are caused by fetal distress/asphyxia, meconium aspiration syndrome, congenital heart disease, congestive heart failure, meconium stained, and cord complications.

Table 3-312. Other causes of mortality in Malaybalay

Causes	No. of cases	Rate
Under five children mortality	42	13.97
Infant mortality	35	9.78
Maternal death	3	1.11
Fetal deaths	12	3.35
Perinatal deaths	16	4.45
Neonatal deaths	7	1.95

Source: Malaybalay CLUP 2016-2025

Nutritional Status of Children -In 2015, there 3,577 live births with a birth rate of 20.7%. There were about 86.4% babies born attended by medical practitioners like doctors (45%); midwives (41%), and nurses (0.3%).

Of the total deliveries, only about 444 or 12.4% deliveries were assisted by trained hilots and 41 or 1.1% attended by hilots not officially trained.

Tagoloan, Misamis Oriental

Leading Causes of Morbidity - With respect to morbidity, from 2016-2017, acute upper respiratory tract Infection ranked as number one cause of illness in the municipality from a rate of 62.3% per 1,000 population for a total number of 5,448 cases present as compared to 70.5% of a total number of 4,660 for the year 2017. Other diseases are animal bite, hypertension, wound (all forms), urinary tract infection, diabetes mellitus, tuberculosis (all forms), diarrhea, pneumonia, dengue fever (**Table 3-313**).

Table 3-313. Leading causes of morbidity in Tagoloan (2015 – 2017)

No.	Causes of morbidity	2015	2016	2017
1	Acute upper respiratory tract infection	4,660	5,845	5,448
2	Animal bite	921	1,036	461
3	Hypertension	696	242	195
4	Wound (All Forms)	395	92	375
5	Urinary tract infection	250	769	392
6	Diabetes mellitus	239	76	7
7	Tuberculosis (All Forms)	233	214	240
8	Diarrhea	213	76	86
9	Pneumonia	109	24	20
10	Dengue fever	107	135	0
	Total	**7,823**	**8,509**	**7,224**

Source: Tagoloan CLUP 2017-2027 (Rate per 1,000 Population)

Leading causes of mortality- The state of health in the Municipality in 2015 appears to be fluctuating as reflected by the decrease in the total crude death rate, in which 2.53 in 2015, 2.66 in 2016 and 2.51 in 2017 per 1,000 populations (**Table 3-314**).

There was no maternal death reported from 2015-2017 since effective, quality and continuous care delivery of personnel and proper supervision of Rural Health Midwives and Integrated Volunteers, (BHW's & BNS) and knowledge gained from trainings were applied.

Table 3-314. Leading causes of mortality in Tagoloan (2015 - 2017)

No.	Causes	2015	2016	2017	Total
1	Chronic Hypertensive Vascular	40	43	55	138
2	Cancer All Forms	27	22	24	73
3	Pneumonia	22	28	17	67
4	Cardio Respiratory Arrest	21	29	41	91
5	Bronchial Asthma	18	11	6	35
6	Diabetes Mellitus	17	20	28	65
7	Myocardial Infarction	17	9	4	30
8	Injuries All Forms	9	22	18	49
9	Sepsis/Septicemia	7		3	10
10	Chronic Renal Failure	7	17		24
	Total	**185**	**201**	**196**	**582**

Source: Tagoloan CLUP 2017-2027 (Rate per 1,000 Population)

Nutritional status of children - Tagoloan registered an increasing malnutrition in the degree of underweight, severely underweight and overweight of children 0–71 months for the year 2015 to 2017. While children 0–15 years consolidated school nutritional status records a decreasing number of wasted, severely wasted increase in 2017, overweight and obese records annually increasing.

Table 3-315. Nutritional status of children in Tagoloan

Degree of malnutrition	2015		2016		2017	
	Number	Percent	Number	Percent	Number	Percent
Total children (0-71 months) weight for age status						
Underweight	307	3.20	237	2.5	452	5.10
Severely underweight	70	0.75	51	0.54	128	1.40
Overweight	81	0.86	55	0.58	130	1.50
Total children (0-15 Years)						
Wasted	1,159	10	970	9	746	6.7
Severely wasted	312	3	269	3	322	2.9
Overweight	192	2	204	2	243	2.1
Obese	37	0.30	40	0.36	69	0.6

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

Vital Health Statistics for the last three years (2010-2012) such as crude birth rate, crude death rate and infant mortality rate were at its highest rates in 2011 (**Table 3-316**). The topmost leading causes of morbidity are often upper respiratory tract infection, urinary tract infection and hypertension (**Table 3-317**). While the top three causes of mortality are commonly related to poor lifestyle and improper food intake such as hypertensive vascular disease, hypostatic pneumonia/ senility and all forms of cancer (**Table 3-318**). Vital Heath Programs for children generally showed good performance as far as annual accomplishment report is concerned due to the trained and functional 230 BHWs designated in 22 barangays.

Table 3-316. Vital health statistics in Manolo Fortich (2010 – 2012)

No.	Vital health statistics	2010		2011		2012	
		No.	Rate	No.	Rate	No.	Rate
1	Crude Birth Rate	2,481	29.01	3,381	38.39	2,317	25.83
2	Crude Death Rate	297	3.47	337	3.83	318	3.54
3	Infant Mortality Rate	3	1.21	9	2.66	4	1.72
4	Maternal Mortality Rate	2	0.81	1	0.3	1	0.43
5	Fetal Mortality Rate	4	1.61	8	2.37	10	4.31

Source: Manolo Fortich CLUP 2013-2022; Note: Rate per 1,000 population

Table 3-317. Leading causes of morbidity in Manolo Fortich (2010 - 2012)

No.	Causes of morbidity	2010		Causes of morbidity	2011		Causes of morbidity	2012	
		No.	Rate		No.	Rate		No.	Rate
1	URTI	1,247	145.83	URTI	1,468	167	URTI	3,733	416.29
2	Hypertension	678	79.29	UTI	975	111	Hypertension	1,192	132.92
3	Diarrhea	159	18.59	Hypertension	888	101	Peptic acidosis	335	37.35
4	Dengue	139	16.25	Peptic Acidosis	492	55.9	Diarrhea	309	34.45
5	UTI	84	9.82	Arthritis	447	50.8	Amoeba	95	10.59
6	Skin Disease	67	7.84	Diarrhea	366	47.5	UTI	86	9.59
7	Influenza	34	3.98	Skin Disease	357	40.5	Asthma	72	8.02
8	Pneumonia	26	3.04	Influenza	298	33.8	TB, Pulmonary	36	4.01
9	Bronchitis	25	2.92	Bronchitis	204	23.2	Pneumonia	21	2.34
10	Amoebiasis	10	1.17	Gastroenteritis	173	19.6	Chicken Pox	16	1.78

Source: Manolo Fortich CLUP 2013-2022; Note: URTI – upper respiratory tract infection, UTI – Urinary tract infection

Table 3-318. Leading causes of mortality in Manolo Fortich (2010 - 2012)

No.	Causes of morbidity	2010		2011		2012	
		No.	Rate	No.	Rate	No.	Rate
1	Hypertensive Vascular Disease	109	12.74	113	12.83	98	10.92
2	Hypostatic Pneumonia, Senility	48	5.61	75	8.52	62	6.91
3	Accidents (all forms)	33	3.86	48	5.45	48	5.35
4	Cancer (all forms)	33	3.86	26	2.95	23	2.56
5	Chronic Renal Failure	14	1.64	11	1.25	18	2
6	6. Diabetes Mellitus	13	1.52	11	1.25	14	1.56
7	Chronic Obstructive Pulmonary Disease	11	1.29	5	0.57	8	0.89
8	Alcoholic Liver Cirrhosis	7	0.82	9	1.02	6	0.66
9	Status Asthmaticus	6	0.70	5	0.57	9	1
10	Peptic Ulcer Disease	2	0.23	7	0.79	2	0.22

Source: Manolo Fortich CLUP 2013-2022(Rate per 1,000 Population)

Impasug-ong, Bukidnon

The general health situation of Impasugong based on the past five years (2012-2016) is fluctuating. For the crude birth rate, it has the sharpest increase on 2014 at 19.3%. For the general morbidity, indicators were also fluctuating with the sharpest increase on 2016 at 11.95% (**Table 3-319**). This may be attributed to an increase in health seeking behavior of the constituents or an improved access to health services. It is important to note that the indicators on morbidity are only based on the data from the Rural Health Unit (RHU), and as to consultation from private sectors or clinics outside the municipality, it cannot be consolidated by the RHU.

For the indicators under mortality, the general trend was also fluctuating except for the Infant Mortality Rate (IMR) where it has been decreasing. The fluctuating health indicators signify that the municipality should focus on programs to control or decrease the trends, especially on Maternal Mortality and Young Child Mortality Rate. The general health situation of the municipality is summarized on the table below.

Table 3-319. General health situation in Impasug-ong (2014 to 2018)

Health indicator	2014		2015		2016		2017		2018	
	No.	%	No.	%	No.	%	No.	%	No.	%
Fertility										
Crude birth rate (CBR)	959	19.3	1004	19.59	1,061	20.08	1,349	25.53	1,347	25.49
Morbidity										
General medical	2,125	4.29	2,725	5.3	6,313	11.95			8,425	16.92
Consultative rate	2,125	4.29	2,725	5.3	6,313	11.95			8,425	16.92
Mortality										
Crude death rate (CDR)	94	1.89	102	1.99	118	2.23			101	0.203
Infant mortality rate (IMR)	9	9.38	2	1.99	2	1.19	5		4	0.30
Young child mortality rate (YCMR)	12	0.13	10	0.19	3	2.83	5		4	
Maternal mortality rate (MMR)	8	8.34	1	0.99	1	0.94	0	0	0	0

Source: Impasug-ong CLUP 2019-2028

Leading causes of morbidity **-** The leading morbidity in the municipality of Impasugong for the past five years is predominantly communicable in nature. In 2012 and 2013, cough and colds were the leading cases of morbidity, while on the years 2015 and 2016 it was fever of undescribed origin (**Table 3-321**). This is consistent with many studies showing high communicable disease morbidities among low- and middle-

income communities. Factors affecting this include geographic consideration, demographic profile and socio-economic factors.

Leading causes of mortality - As summarized on **Table 3-322**, the leading cause of death was senility while on the succeeding years it was cardiac arrest of undescribed cause. However, looking into the rest of the 10 causes of mortality for the past five years it is evident that the municipality is facing the double burden of communicable and non-communicable disease as causes of mortality. It is important to note that in 2014 there was a high incidence of strangulation secondary to suicide indicating an increased in suicide rate. Also, in the past two years there is an emergence of poisoning and trauma as leading causes of death.

Nutritional status of children

Nutritional status of children - Impasugong have been consistently in the bottom five among the municipalities in the Province of Bukidnon. **Table 3-323** shows that there was an increased malnutrition rate from 5.15% in 2012 to 10.6% in 2016. Further dissection of the data reveals that GIDA barangays are the biggest contributor to the overall malnutrition rate. Other contributing factors are socio-economic profile of the families the children belong to.

Common illness at the respondent households – The common illnesses that commonly affected the household members from May 28 ito June 2021 were coughs (35.5%), colds (33.1%) and fever (13.9%). These illnesses were mostly weather- and lifestyle-related illnesses.

Table 3-320 shows the common illnesses experience by household members.

Table 3-320. Common illnesses experienced by respondent households

Illness	CDO		Malaybalay		Tagoloan		Sumilao		Manolo Fortich		Impasug-ong		Total	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Cough	28	37.84	17	41.46	15	33.33	14	32.56	25	35.21	19	32.76	118	35.54
Colds	28	37.84	11	26.83	15	33.33	12	27.91	26	36.62	18	31.03	110	33.13
Fever	7	9.46	9	21.95	4	8.89	10	23.26	7	9.86	9	15.52	46	13.86
Fever Relapse	1	1.35	0	0.00	0	0.00	0	0.00	8	11.27	6	10.34	15	4.52
Headache	2	2.70	0	0.00	3	6.67	2	4.65	0	0.00	1	1.72	8	2.41
Arthritis	1	1.35	0	0.00	3	6.67	2	4.65	0	0.00	0	0.00	6	1.81
Diabetes	3	4.05	1	2.44	0	0.00	0	0.00	0	0.00	2	3.45	6	1.81
High blood	0	0.00	1	2.44	2	4.44	1	2.33	0	0.00	1	1.72	5	1.51
Flatulence/Colic	0	0.00	0	0.00	1	2.22	0	0.00	2	2.82	0	0.00	3	0.90
Tooth ache	0	0.00	0	0.00	1	2.22	1	2.33	0	0.00	1	1.72	3	0.90
Allergies	0	0.00	0	0.00	0	0.00	0	0.00	1	1.41	1	1.72	2	0.60
Chicken fox	0	0.00	1	2.44	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Covid-19	0	0.00	0	0.00	0	0.00	0	0.00	1	1.41	0	0.00	1	0.30
Diarrhea	0	0.00	1	2.44	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Heart disease	0	0.00	0	0.00	0	0.00	1	2.33	0	0.00	0	0.00	1	0.30
Boils	1	1.35	0	0.00	0	0.00	0	0.00	1	1.41	0	0.00	2	0.60
Pneumonia	1	1.35	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Tonsilitis	1	1.35	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
Tuberculosis	1	1.35	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.30
UTI	0	0.00	0	0.00	1	2.22	0	0.00	0	0.00	0	0.00	1	0.30
Total	**74**	**100**	**41**	**100**	**45**	**100**	**43**	**100**	**71**	**100**	**58**	**100**	**332**	**100**

Source: Socio-Ecconomic Survey conducted from May 28 to June 4, 2021.

Table 3-321. Leading causes of morbidity in Impasug-ong (2012 - 2016)

No.	2012		2013		2014		2015		2016	
	Causes	Total	Causes	Total	Causes	Total	Causes	Total	Causes	Total
1	Cough and colds	1506	Cough and colds	1642	Headache	1128	Fever	802	Fever	802
2	URTI	583	URTI	621	Cough and colds	305	URTI	613	URTI	613
3	Fever	252	Pneumonia	295	URTI	223	Influenza	347	Influenza	347
4	Diarrhea	231	Essential Hypertension	179	Diarrhea	57	Pneumonia	175	Dermatitis	202
5	Pneumonia	158	Hypertension stage 1	164	Infected wound	47	Acute gastroenteritis	168	Pneumonia	173
6	Abdominal Pain	129	Tension Headache	162	UTI	26	Hypertension	141	Acute gastroenteritis	168
7	Infected wound	126	UTI	113	Pneumonia	25	UTI	85	Hypertension	141
8	Acute Gastroenteritis	114	Boil	112			Acute bloody diarrhea	30	UTI	85
9	UTI	103	Toothache	98			Otitis	27	Acute bloody diarrhea	30
10	Skin disease	100	Functional diarrhea	0					Otitis media	27
	Total	**3,302**	**Total**	**3,386**	**Total**	**1,811**	**Total**	**2,388**	**Total**	**2,588**

Note: URTI – Upper respiratory tract infection, UTI – urinary tract infection; Source: Impasug-ong CLUP 2019-2028

Table 3-322. Leading causes of mortality in Impasug-ong (2012 - 2016)

No.	2012					2013					2014					2015					2016				
	Causes	%	Total	M	F	Causes	%	Total	M	F	Causes	%	Total	M	F	Causes	%	Total	M	F	Causes	%	Total	M	F
1	Old Age	31	17	12	5	Senility	19%	8	2	6	Senility	37	23	15	8	CP arrest	34	18	7	11	Cardiac arrest	28	17	10	7
2	Severe pneumonia	16	9	3	6	Pneumonia	12%	5	0	5	CPA	21	13	8	5	Pneumonia	17	9	4	5	CVA	25	15	6	9
3	CPA	13	7	5	2	HT Stage 2	12%	5	3	2	Strangulation	10	6	4	2	Cardiac Arrest	13	7	5	2	Trauma	15	9	6	3
4	Cancer, all forms	11	6	5	1	CVA	12	5	4	1	Cardiac Arrest	6	4	3	1	CVA	11	6	4	2	Senility	7	4	1	3
5	ARF	9	5	3	2	HT Stage 1	10	4	2	2	ARF	6	4	3	1	Typhoid	9	5	5	0	Respiratory failure	7	4	2	2
6	Hypertension	5	3	2	1	MI	10	4	3	1	Cancer	5	3	1	2	SOB	6	3	2	1	CPA	5	3	2	1
7	Edema	5	3	1	2	CHF	7	3	1	2	Asthma	5	3	2	1	Poisoning	4	2	2	0	Breast cancer	5	3	0	3
8	CRF	4	2	1	1	Asthma	7	3	0	3	CHD	5	3	2	1	AP	2	1	1	0	Cholelithiasis	2	1	1	0
9	CVA	4	2	2	0	Head injury	7	3	2	1	Severe dehydration	3	2	1	1	Acute hepatitis	2	1	0	1	Liver cirrhosis	3	2	1	1
10	Hemoptysis	2	1	1	0	Cancer	5	2	0	2	Pneumonia	3	2	1	1	Gastroenteritis	2	1	0	1	Severe dehydration	3	2	1	1
	TOTAL	**100**	**55**	**35**	**20**		**100**	**42**	**17**	**25**		**100**	**63**	**40**	**23**		**100**	**53**	**30**	**23**		**100**	**60**	**30**	**30**

Source: Impasug-ong CLUP 2019-2028; ARF – acute respiratory failure; CRF - chronic respiratory failure; MI - Myocardial Infarction; HT – Hypertension; CHF - Congestive Heart Failure; CP – cardio-pulmonary arrest; CHD - congenital heart disease; SOB - shortness of breath; AP - acute pancreatitis;

Table 3-323. Nutritional status of children in Impasug-ong (2012 – 2016)

Degree of malnutrition	2012		2013		2014		2015		2016	
	No.	%	No.	%	No.	%	No.	%	No.	%
Underweight	306	4.37	337	5.16	183	2.28	845	5.84	603	8.2
Severely Underweight	55	0.78	64	0.98	59	0.73	142	1.71	177	2.41
Total	**361**	**5.15**	**401**	**6.54**	**620**	**7.7**	**363**	**7.55**	**780**	**10.6**
Overweight	18	0.26	26	0.4	6	0.07	67	0.81	123	1.67
Total no. of children (0-15 years old)	7,010	100	7,748	100	6,240	100	6,227	100	7,351	100

Source: Impasug-ong CLUP 2019-2028

3.4.5.5.3 Environmental health and sanitation profile

Cagayan de Oro City

Sanitation - Cagayan de Oro had some households without sanitary toilets. In 2019 there were 4, 279 or 3.04% of households with unsanitary toilets and 3, 729 or 2.87% without toilets. **Table 3-324** shows the data of status of toilet in 2019.

Table 3-324. Toilet facilities in Cagayan de Oro City (2019)

Type of toilet	HH Number	Percentage of HH
Household with sanitary toilets	132,660	94.08
Household with unsanitary toilets	4,279	3.04
Household without toilets	3,729	2.87

Note: HH – household; Source: Cagayan de Oro City CLUP 2013-2022

Inventory of cemeteries and memorial parks- Cagayan de Oro City Memorial Park is located at Bolonsori, Camaman-an, with an area of 19.6716 hectares or 196,716 sq.m. As reflected in **Table 3-325**, the number of burials in the said memorial park totaled to 51,979 in 2011. The present the city memorial park is congested, some plots are located in critical areas and flood prone areas along the bank of the creek. Records show an estimated average of five burials a day.

Complementing the city memorial park are four private memorial parks namely: Cagayan de Oro Golden Memorial Park, Divine Shepherd Memorial Park, Green Hills Memorial Park, and Golden Haven Memorial Park. These memorial parks have enough plots to accommodate more burials.

Table 3-325. Cemeteries and memorial parks in Cagayan de Oro City

Cemeteries and memorial parks	Barangay	Ownership	Area (ha)	Capacity	Remarks
Cagayan de Oro Golden Memorial Garden Phase I & II	Lumbia	Private	15	39,094	
Divine Shepherd Memorial Garden	Bulua	Private	7.4	7,865	
Green Hills Memorial Park	Bulua	Private		5,290	
Bolonsori - CDO Memorial Park	Camamanan	Public	19.6716	51,979	Congested flooded Located in critical areas
Bulua Cemetery	Bulua	Public	0.750	72	Congested
IFI Cemetery	Bulua	Private	14,970	74	
Iponan Cemetery	Iponan	Public	1.2248		Fully occupied
Canitoan Cemetery	Canitoan	Public	1.9	487	Congested
Gusa Cemetery	Gusa	Public	0.5912		Fully occupied
Golden Haven Memorial Park	Bulua	Private	10.0202	197/22,068	
Tablon Barangay Cemetery	Tablon	Public	3.000		Fully occupied
Baikingon Barangay Cemetery	Baikingon	Public	1.0		
Balubal Barangay Old Cemetery	Balubal	Public	1.0		
Bayanga Barangay Cemetery	Bayanga	Public	1.0		
Besigan Barangay Cemetery	Besigan	Public	-		
Canitoan Barangay Cemetery	Canitoan	Public	1.9	487	Congested
Dansolihon Barangay Cemetery	Dansolihon	Public	0.75		
Roman Catholic Church	Agusan	Private	0.2		Fully occupied
Bugo Memorial Home	Bugo	Public	2.4	91	
Taglimao Cemetery	Taglimao	Public	-	-	
Tignapoloan Cemetery	Tignapoloan	Public	2.5	-	
Tuburan Cemetery	Tuburan	Public	-	-	
Tumpagon Cemetery	Tumpagon	Public	1.0	-	

Souce: Cagayan de Oro City Ecological Profile 2019

Solid waste management - To address the increasing solid waste generation of the city, the City Council legislated an Ordinance No 6444-98 creating the City Public Services Office (CPSO). The office oversees street cleaning, park maintenance, garbage collection, dumpsite operation and maintenance. The Solid Waste and Management program has been turned over to City Local Environment and Natural resources Office (CLENRO).

A total of 267,714.31 kilograms per day are disposed at the sanitary landfill. Biodegradable waste material has the highest disposal quantity at 174,037.81 kilogram per day with public market and commercial sources have contributed significantly **Table 3-326**. Noticeably, the institutional sector disposed 45 percent of recyclable waste to sanitary landfill.

With the total waste generated, 53% of biodegradable and 72% of recyclable wastes were diverted from the total waste generation within the collection service area. For 2017, Cagayan De Oro City has 48 % waste diversion rate with 248,648.69 kilograms per day.

Table 3-326. Solid waste generation in Cagayan de Oro City (2017)

Sector	Biodegradable		Recyclable		Residual		Special waste	
	kg/day	%	kg/day	%	kg/day	%	kg/day	%
Residential	46,117.70	34	4,792.19	15	17,165.04	100	1,970.44	100
Commercial	21,453.85	50	2,895.28	15	16,182.51	100	2,134.64	100
Public Market	87,272.58	75	474.55	10	10,624.58	100	383.14	100
Institutional	17,420.50	45	6.009.68	45	7,728.30	100	437.88	100
Industrial	1,773.19	10	854.45	10	21,476.47	100	574.34478	100
Total	**174,0327.81**		**15,026.15**		**73,176.90**		**5,473.445**	

Source: Cagayan de Oro City CLUP 2013-2022

The 25-hectares City Sanitary Landfill was opened in 2017 in barangay Pagalungan, which is about 12 kilometers from the city proper, with the first-ever disposal of solid waste generated in the city made on 18 April 2017.

Efforts at the new landfill in 2017 included the establishment of 1-hectare operation cell with leachate pond and drainage system. In compliance with conditions set in the Environmental Compliance Certificate (ECC), three water quality monitoring were conducted with all results within the standards set by the government.

Meanwhile, the decommissioned 17hectare controlled dumpsite of the city government located in Upper Dagong, Barangay Carmen was the nominated project for funding under the 2018 General Appropriations Act (GAA) – Local Government Support Fund (LGSF) which allocated PHP 35 million for the city government. When completed, the proposed ecopark will feature facilities for a wider range of publics, from children to senior citizens. Located about 3 kilometers from the city proper, the ecopark will offer a breather for city residents and visitors alike to engage in leisure and wellness activities. In 2017, eight hectares of the decommissioned dumpsite was rehabilitated through the planting of various tree species.

Among the institutional efforts supportive of solid waste management included the endorsement by the City Ecological Solid Waste Management Board to the City Council of the proposed Integrated Solid Waste Management Ordinance for the latter's legislation of the proposal into law.
The Oro Kalimpyo Awards was also launched in 2017 in search of outstanding barangays on ecological solid waste management.

Revenues generated through enforcement of environmental laws resulted to the collection of PhP 13.946 million in 2017, while during the first quarter of 2018 about PHP 40.635 million has been generated.

Malaybalay City, Bukidnon

Sanitation - In 2011, 28,176 or ninety percent (90%) of the households have access to safe water. Household with sanitary toilet is 86% or 27,237 of the total 32,201 households of the city. Eight-eight percent (88%) of the total numbers of households have garbage disposal system and basic sanitation facilities. Food handlers with health certificate and the food establishments with sanitary permits have increased in number as compared in the previous years.

Inventory of cemetery- The city has a public cemetery with 21.30 hectares. The city is planning to add 1.91 hectares in Barangay Sumpong.

Solid waste management - Prior to the creation of the City Environment and Natural Resources Office (City ENRO), the City General Services Office (CGSO) served as the lead office in the management of solid waste in the City of Malaybalay. However, when the City ENRO was created and started its operation in 2009, it took charge of the entire solid waste management of the city, including the management of all equipment and facilities used in the garbage collection, transport and disposal; the operation and maintenance of the final disposal facility; and the supervision of all personnel who are involved in the management of the solid wastes, like the street sweepers, garbage collectors, compactor/dump truck drivers and dumpsite maintenance personnel.

In 2011, Solid Waste Management Ordinances of the city was fully enforced to the 14 barangays originally served by the garbage collection with the imposition of fines and penalties for those who violated the ordinances. The Clean and Green Program is actually a competition among the 46 barangays of the city, to determine the performance of the barangay in implementing programs and policies relating to ecological solid waste management, pollution control, and other environmental considerations. The outstanding barangay is given due recognition and cash prizes.

By 2015, from the original 14 barangays (11 urban barangays: Poblacion 1 to 11 and 3 urbanizing barangays: Sumpong, Casisang, Kalasungay), as the only beneficiaries of the garbage collection, the City ENRO expanded its collection services to the additional 22 barangays, making the total number of barangays served by waste collection into 35. These include barangays Dalwangan, Patpat, San Jose, Laguitas, Aglayan, Cabangahan, Bangcud, Linabo, Violeta, Managok and Maligaya. Solid Waste collected in the 14 barangays were both the biodegradable and the non-biodegradable, while only residual wastes were collected in the added barangays considering that these 14 barangays are within the urban area wherein the establishment of a composting facility is difficult compared to that of the rural barangays. To address the problem, the City Government provided composting facilities to cater the biodegradable of the 14 clustered barangays.

The total waste generation of the city is estimated to be at 151.98 tons/day but only 18.54 tons/day reaches the disposal site (**Table 3-327**). This means that only 12.20% of the total wastes generated per day reached the final disposal facility at present. In other words, 139.78 tons/day does not reach the final disposal facility. This could have been diverted through composting and recycling or some are retained at home. MISS data also revealed that there are residents in the city whose disposal systems are either through pit-holes, open-dumping, and open-burning which are actually prohibited in the city.

Table 3-327. Waste generation in Malaybalay City

Year	Population	Waste generation source unit	Volume of waste generation
2011	157,167	0.500	78,583.5
2012	160,625	0.500	80,312.5
2013	164,159	0.500	82,079.5
2014	167,770	0.500	83,885.0
2015	171,461	0.500	85,730.5
2016	175,233	0.500	87,616.5

Year	Population	Waste generation source unit	Volume of waste generation
2017	179,088	0.500	89,544.0
2018	183,028	0.500	91,514.0
2019	187,055	0.500	93,527.5
2020	191,170	0.500	95,585.0
2021	195,376	0.500	97,688.0

Source: Malaybalay CLUP 2016-2025

The city government still uses the controlled disposal facility at Barangay Can-ayan, which is around 5 kilometers from the urban center as its final disposal of the collected waste. Biodegradable wastes were processed as organic fertilizer through the Bioreactor Composting Facility and Vermi Composting Facility, the Bioreactor has a capacity of 1,000 kilograms per day. While the non-biodegradable wastes are disposed into the City Material Recovery Facility for further segregation and sorting, the residual wastes are finally dumped into the final disposal area. The collection of garbage fees is incorporated in the license permit payment as part of the miscellaneous fees collected from the establishment. Generally, the small establishments are collected Php80.00, while the large establishment including the restaurant are collected PhP400.00 per year.

Tagoloan, Misamis Oriental

Sanitation - Tagoloan is a fast-developing town due to the presence of several industries in the area. Influx of migrants is expected, thus the growing number of households and rapid growth of population each year. **Table 3-328** shows the type of toilet facilities in the occupied housing units in Tagoloan by barangay.

Table 3-328. Toilet facilities in Sumilao

Barangay	Type of toilet facility					
	Sanitary			Unsanitary		
	2015	2016	2017	2015	2016	2017
1. Sta. Cruz	2,092	2,416	2,416	464	24	24
2. Poblacion	2,004	2,510	2,500	292	30	40
3. Casinglot	1,685	1,907	1,905	149	161	163
4. Sta. Ana	1,299	2,047	2,047	479	77	77
5. Baluarte	1,208	1,832	1,820	392	187	199
6. Mohon	1,050	925	932	31	7	0
7. Natumolan	1,027	1,848	1,868	324	20	0
8. Sugbongcogon	751	817	817	35	0	0
9. Gracia	381	481	481	29	0	0
10. Rosario	192	203	221	25	18	0
Total	**11,689**	**14,986**	**15,007**	**2,220**	**524**	**503**

Source: Tagoloan CLUP 2017-2027

Inventory of cemeteries and memorial parks - The Catholic cemetery in Poblacion, Tagoloan Misamis Oriental has existed since time in memorial. Way back then, the area was isolated from the residential and commercial areas at the time it came to be.

Tagoloan has now grown from a sleeping town to an urbanizing community in an industrialized and highly commercialized area. The cemetery in between the main access road to Barangay Natumolan and the National Highway has become a question in its location but then again it has existed in the area longer than any other resident and commercial establishment.

Poblacion cemetery is located behind Paula's hotel in which congestion and flooding incidence occur during heavy rains. The Iglesia Filipiniana Independiente Cemetery in Sta Ana has also existed longer than the residents living in the area. The old Catholic Cemetery in Sta. Ana is no longer accepting new burials since there is no more available lots, the new location of the public cemetery at an elevated location in Sta. Ana is

now being utilized by all religious sectors. The adjoining properties have become an avenue for burial spilling and expansion of cemetery. The rest of the cemeteries are newly operated. **Table 3-329** presents the cemeteries and memorial parks in Tagoloan.

Table 3-329. Cemeteries and memorial parks in Tagoloan

Cemetery/memorial park	Barangay	Ownership	Area (ha)	Remarks
Iglesia Filipina Cemetery	Sta. Ana	Private	0.1480	Congested
Sta. Ana Catholic Cemetery (Old)	Sta. Ana	Private	0.1692	Congested
Tagoloan Roman Catholic Cemetery	Poblacion	Private	3.3000	Congested
Rosario Cemetery	Rosario	Public	1.0000	
Sta. Ana Catholic Cemetery (New)	Sta. Ana	Private	1.2500	
Royal Garden	Sta. Ana	Private	1.4998	
Sta. Ana Public Cemetery	Sta. Ana	Public	0.5000	

Source: Tagoloan CLUP 2017-2027

Solid waste management - The municipality's solid waste management program is being run by the Municipal Environment & Natural Resource Office (MENRO) with a designate Solid Waste Focal Person. It is municipal departments which handles the collection system, oversees the operation of the eco-waste center, enforce the provisions under R.A 9003, the SWM Ordinance in coordination with other offices, conducts information and education campaign in barangays as well as supervises progress of SWM implementation in the barangays. Municipal Environment and Natural Resources Office findings are reported during the MSWM Board meetings. Starting from a controlled dumpsite, the municipality has put it into closure and converted it into an eco-waste facility wherein it became a central Material Recovery Facility (MRF) of the municipality. It has a Residual Containment Area (RCA) while an ongoing processing for the establishment of Sanitary Landfill.

Industrial establishments have provided their own water treatment facilities while others using septic tank and concrete line canals before it drains to street canals and creeks and rivers. The size and capacity of wastewater treatment systems are determined by the estimated volume of sewage generated from residences, businesses, and industries connected to sewer systems as well as the anticipated inflows and infiltration, but the LGU has no wastewater treatment systems yet. The toilet facilities commonly used by the household in buildings and houses are water-sealed, sewer/Septic Tank, closed pit and others. The predominant method of wastewater disposal in municipality is discharged into a body of surface water. Suburban and rural areas rely more on subsurface disposal. The Industrial waste created, the DENR evaluate the degree of pollution problem created. In either case, wastewater must be purified or treated to some degree in order to protect both public health and water quality.

The degree to which wastewater must be treated varies, depending on local environmental conditions and governmental standards. Effluent standards, on the other hand, pertain directly to the quality of the treated wastewater discharged from a sewage treatment plant. The factors controlled under these standards usually include biochemical oxygen demand (BOD), suspended solids, acidity, and coliforms.

The waste of the municipality of Tagoloan totals to 9,029.21 kilograms per day (9.02 tons). The composition per source is shown in **Table 3-330**. Disposed waste composition came from different types of sectors such as residential, commercial, Institutional, market, Industry, and RHU and hospital. It is indicated that the highest volume of wastes collected coming from the biodegradable of 3,883.48 kgs/day or 43%, followed by Residual of 2,936.23 kgs/day or 32.52%, Recyclable of 1,734.12 kgs/day or 19.21%, and Special of 475.39 kgs/day or 5.27%. The waste collected and transported to the temporary residual containment area.

Table 3-330. Waste generation and composition in Tagoloan

Sector	Biodegrables (kg/day)	Recyclable (kg/day)	Residual (kg/day)	Special (kg/day)	Total wastes (kg/day)
Residential	2,122.18	1,245.38	1,944.02	222.28	5,533.86
Commercial	269.77	32.02	45.21	9.00	355.99
Institution	14.90	17.23	12.97	0.93	46.03
Market	1,369.97	193.59	857.91	28.43	2,449.91
Industry	104.97	243.07	70.82	214.33	633.18
RHU and hospital	1.69	2.83	5.30	0.42	10.24
Total	**3,883.48**	**1,734.12**	**2,936.23**	**475.39**	**9,029.21**
% composition	**43.00%**	**19.21%**	**32.52%**	**5.27%**	**100%**

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

Manolo Fortich has some households without sanitary toilets. There were 1,419 or 7.12% of households without toilets. **Table 3-331** shows the data of status of toilet in the municipality.

Table 3-331. Number of households without toilets in Manolo Fortich

Barangay	No. of HH	WT	Barangay	No. of HH	WT
Agusan Canyon	1,839	25	Minsuro	242	53
Alae	1,949	4	Mantibugao	570	41
Damilag	2,797	8	Mampayag	248	54
Dahilayan	371	71	Mambatangan	830	173
Dalirig	746	74	Santiago	263	16
Diclum	865	16	Sto. Niño	875	138
Guilang-Guilang	208	6	San Miguel	886	29
Kalugmanan	462	200	Sankanan	843	129
Lingion	1,193	81	Tankulan	1,792	24
Lindaban	459	128	Ticala	270	143
Lunocan	1,343	1	**Total**	**19, 903**	**1, 419**
Maluko	852	5			

Note: HH – household; Source: Manolo Fortich CLUP 2013-2022; WT - without toilet

Inventory of cemeteries and memorial parks - There are eight barangays who have not yet apportioned their respective cemetery areas, namely; Dicklum, Lingi-on, Kalugmanan, San Miguel, Sto. Nino, Ticala and Mambatangan. Pryce Garden is located in Barangay Mambatangan but it is limited only to those who can afford to pay. Some barangays such as Dicklum is near to Tankulan Cemetery or Kalugmanan is near to Sankanan but having their own public cemetery areas shall not only offer convenience to their constituents but could also prevent a fast overcrowding of burials in the said existing cemeteries.

Solid waste management - The Municipality has two garbage trucks with personnel who are responsible in collecting non-biodegradable waste from the households of the seven urbanizing barangays. Bio- degradable wastes are not collected by the garbage crew, it will remain in the households.

Waste characterization survey conducted in the last quarter of 2011 showed that there is about 0.50 kg per day of waste generated per capita and about 890,171 kg of residual waste that are final disposed to the CDF. **Table 3-332** shows the solid waste generation of the municipality per year 2010-2021. Manolo Fortich is operating and establishing a Controlled dumping Facility at barangay Alae. It has been used by the LGU in year 2002. It is about 6 hectares.

Table 3-332. Solid waste generation in Manolo Fortich (2010 - 2021)

Year	Population	Waste generation	Year	Population	Waste generation
2010	91,026	16,566,732	2016	102,872	18,722,704
2011	92,901	16,907,982	2017	104,992	19,108,544
2012	94,815	17,256,330	2018	107,154	19,502,028
2013	96,768	17,611,776	2019	109,362	19,903,884
2014	98,762	17,974,684	2020	111,615	20,313,930
2015	100,796	18,344,872	2021	113,914	20,732,348

Source: Manolo Fortich CLUP 2013-2022; NOTEs: kg/year; 0.5kg/daysx7days/week x 52weeks/year

The municipal government is currently operating a five hectare - Controlled Dumping Facility at Barangay Alae. Barangays are encouraging to implement their own Material Recovery Facilities (MRFs) but only about 60% are actively operating their respective MRFs. Major industries shall be enforced to operate their own landfill and thereby manage their own waste disposal site considering that the would-be conversion of LGU-owned CDF into Sanitary Landfill shall only be enough to household wastes to be generated.

Sumilao, Bukidnon

Inventory of cemeteries and memorial parks **-** All ten barangays of Sumilao have their own public cemeteries. These cemeteries occupy 13.1285 hectares or 0.063% of the Sumilao's land area. Population growth is very suggestive to increase area for cemeteries. With these, an additional 3.9217 hectares is proposed, accounting a total cemetery area of 17.0502 for the next ten years.

Solid waste and wastewater management - With the implementation of the Republic Act 9003 otherwise known as the Ecological Solid Waste Management Act, the Local Government Unit of Sumilao created a team to spearhead in the information dissemination and education campaign in all ten (10) barangays of the municipality regarding RA 9003. In spite of it, collection of garbage is concentrated only in the urban barangay of Kisolon, particularly in the barangay proper. Kisolon, where the seat of government is located, has the highest number of households and is the business center of the municipality, thus, large volume of garbage is generated from this locality. Solid wastes in other nine barangays are still manageable and are taken care of by the households.

Solid waste management in the urban area is handled by the Ecological Solid Waste Management Coordinator. Households and commercial establishments practice segregation of solid waste at source. The segregated garbage is hauled and temporarily disposed at barangay San Vicente which is approximately five kilometers away from the barangay proper of Kisolon. The existing dumping facility which is one hectare is a temporary site until such time that the local government unit has identified and acquired an area for Final Disposal Facility (FDF).

Collection of garbage is undertaken regularly. Garbage collectors spent eight hours a day from Monday to Friday using the three-cubic meter capacity garbage compactor and oftentimes, the mini-dump truck is used to haul solid waste from the source to the disposal facility. The road leading to the dumpsite is maintained with the use of a grader.

Garbage from the households is deposited in receptacles or sacks. The garbage collectors load the solid waste in the truck. Since most households take care of their own garbage, only four trips are needed for the garbage compactor to collect the garbage in a day.

Although segregation of solid waste is practiced in most households, some wastes dumped at the disposal site are still mixed with other materials. This is the reason why the local government employed a total of six waste segregators. They are stationed in the dumpsite to further segregate the hauled garbage and place

separately the recyclable materials in the Material Recovery Facility (MRF) which is constructed within the dumpsite.

Waste reduction is unconsciously done in every household in the municipality. Bottles, scrap iron, metals and tin cans are separated and sold to junk shops that are present in the locality. There are about ten or more transient / ambulant buyers coming from Cagayan de Oro City and Valencia City who buy recyclable and reusable materials.

In some public places like the market, municipal buildings, plaza, school buildings and waiting sheds, receptacles are strategically installed wherein transients deposit their solid waste. Their receptacles are either metal or plastic drums.

The compostable wastes are more than half or eighty percent of the total wastes (**Table 3-333**). It is composed of food, kitchen, yard and garden wastes and rotten vegetables from the flea market. The recyclable that includes plastics, metals, bottles, glasses, ceramics, boxes, cartons and empty sacks makes up for the twenty percent.

Biodegradable materials are separated from non-biodegradable materials. The non-biodegradable materials are stored in the MRF and later, sold to buyers. At present, there are no buyers for cellophanes and broken glasses/bottles. With this, the local government unit planned to purchase processing facilities such as shredding machines and plastic densifiers.

Table 3-333. Average waste generated in Sumilao (2009)

Type of waste	Volume*	Total (%)
Biodegradable	4.0	80
Non-Biodegradable	1.0	20
Total	**5.0**	**100**

Source: Sumilao CLUP 2011-2020; NOTE: *cu.m./day

Impasug-ong, Bukidnon

Sanitation - About 1,032 have unsanitary toilets and around 1,594 without toilets.
Solid waste generation - **Table 3-334** shows the waste composition and source of the municipality. Waste generated in all sources showed that biodegradable waste has the biggest volume followed by recyclable waste. Based on the data gathered by the LGU, the bulk of the types of waste generated from the total sampling, are biodegradable wastes which is equivalent to 79.46%. This implies that if properly managed, more than one half will be recovered as compost fertilizer which can be used for household backyard gardening. This will enable every household to produce food for consumption and for additional income. If properly implemented, this becomes a livelihood project for income generation. The remaining 20.54% of the total wastes sampling are non-biodegradable, it is in this waste that the council should identify specific strategies in order that proper segregation, recycling and recovery will be applied. Eventually, there will be reductions of waste volume dumped at the landfill.

Toxic/hazardous waste, which implies proper handling and management, are generated mostly by multinational corporations like DOLE Philippines and Inc. Del Monte Philippines, Inc. due to the use of chemical pesticides in their banana/pineapple plantations. These wastes need regular crop management. Nevertheless, the company's Environment and Safety Division are controlling such practices for public health and the general welfare of the community. This has been created a Multi-Tripartite Committee to monitor the environmental compliance of these companies.

Table 3-334. Waste composition and source in Impasug-ong

Source	Biodegradable	Recyclable	Special waste	Residual	Total	% of total
Household	35.08	5.58	0.03	15.23	56.55	22.48
High Income	1.28	1.17	-	0.83	3.28	1.3
Middle Income	17.4	2.08	0.03	8.33	27.84	11.07
Low Income	16.4	2.33	-	6.07	25.43	10.11
Commercial	7.65	4.24	-	-	11.69	4.65
Industrial	-	-	-	-	-	-
Institutional	151.5	23.5	-	-	175	69.57
Others	5.66	3.25	-	-	8.31	3.3
Total	**199.89**	**36.57**	**0.03**	**15.86**	**251.55**	**100**

Source: Impasug-ong CLUP 2019-2028; All values in kg/day

There is only one method of Solid Waste Disposal or treatment used in the municipality which is the Controlled Dump Site. The facility is located in Capitan Bayong, Impasugong with a total land area of two hectares and is managed by the Local Government Unit.

Wastewater generation by source and treatment/ disposal methods - The Municipality has several industries but most are using dry processing which require less water and thus emits almost no waste water. Some of these are the San Miguel Feed Mill, ABERDI and Impasugong Furniture Shop and Sawmill. The San Miguel Purefoods Hatchery is generating wastewater but they constructed a wastewater treatment facility for the purpose. The wastewater from the Public Market is treated in the treatment facility constructed by the LGUImpact assessment on the threat to public health and safety

Construction phase

Threat to public health and safety

Increased risk of communicable diseases and burden on local health services. Health is considerably linked to the conditions and environment in which people are born, live and work. Migration, social structures and economic policies are other social determinants of health. The presence of infectious diseases in migrants causes concern for cities/municipalities, which in some cases have opted to screen for them, leading to debates on the human rights of migrants. While the "healthy migrant effect" may be applicable in cases where migrants are generally healthier than the population, migrants with pre-existing health conditions can strain cities'/ municipalities' healthcare systems. Due to the current pandemic with COVID-19, more stringent healthcare protocols are required for migrants.

In addition, the influx of people may bring communicable diseases to the area, including sexually transmitted diseases (STDs), or the incoming workers may be exposed to diseases to which they have low resistance. This can result in an additional burden on local health resources. Workers with health concerns relating to substance abuse, mental issues or STDs may not wish to visit the project's medical facility and instead go anonymously to local medical providers, thereby placing further stress on local resources. Local health and rescue facilities may also be overwhelmed and/or ill-equipped to address the industrial accidents that can occur in a large construction site.

Weather-sensitive diseases and impact aggravation as a result of climate change as projected by PAGASA. One of the most vital sectors that is severely affected by climate change is the human health. Increases in temperatures and rain could trigger a number of adverse impacts; in particular, the outbreak and spread of water-based and vector-borne diseases leading to higher morbidity and mortality; increased incidence of pulmonary illnesses among young children and cardiovascular diseases among the elderly. In addition, there could also be increased health risk from poor air quality especially in urbanized areas.

Vector-borne diseases which include malaria, diarrhea, and infections associated with undernutrition – are most serious in children living in poverty. Due to fluctuations in the weather, the food supply will be affected which may cause the increase in malnutrition.

Floods, droughts and contaminated water raise disease risk. Higher temperatures are hastening rates of evaporation of surface waters and melting the glaciers that provide fresh water for many populations. Lack of fresh water compromises hygiene, thus increasing rates of diarrheal disease.

Extreme air temperatures and air pollution are hazardous to health. Heatwaves are a direct contributor to deaths from cardiovascular and respiratory diseases, particularly among elderly people. High temperatures can also raise the levels of ozone and other air pollutants that exacerbate cardiovascular and respiratory diseases, as well as pollen and other aeroallergens that trigger asthma (WHO, 2009).

Environmental Health and Sanitation. The link between drinking water and sanitation is critical because human waste is a major source of water contamination. Migration can greatly exacerbate the challenges of managing sewage in a city/municipality given the growth of the population, but the city/municipality cannot always meet the demand due to insufficient capacity. This aggravates health problems associated with spreading communicable diseases, which can further worsen with the lack of sanitation facilities.

3.4.5.6 Generation of local benefits from the project

3.4.5.6.1 Local economy

Cagayan de Oro City

The economy of Cagayan de Oro is largely based on industry, commerce, trade, service and tourism. The city's development has led to a rising demand for safe and affordable housing for its growing population. New investments in 2017 reported by the City Finance Department grew at 136.7% with total capitalization at PHP 3.906 billion, consisting of more than 4,000 businesses that are either registered with the Department of Trade and Industry (DTI) or Securities and Exchange Commission (SEC) and those without trade name. Meanwhile, despite growth of renewed business licensees in 2017, their Gross Sales posted negative growth at -8.2%.

Meanwhile, construction boom in the city surged to new heights in 2017 driven mainly by construction of hotels, condominium, housing units and commercial and hospital buildings. However, the single largest investment reported was the Bulk Water Project of Metro Pacific Investments at PHP 2.8 billion.

Based on the report on investments registered with and/or monitored by the Department of Trade and Industry (DTI) provincial office in 2017 posted an overall growth of 2.14% against the 2016 recorded investments. Major investments in 2017 was recorded at PHP 4.468 billion under the Infrastructure and Services Sector category and at PHP 2.267 billion under Real Property/Real Estate/Real Estate Development Sector, as categorized by DTI.

In 2017, the annual revenue receipts reported by the Treasurer's Office posted an increase of 15% over 2016 receipts. By source, local tax (e.g., Real Property Tax, Business Tax) and nontax (e.g., Permits, Licenses, etc.) receipts grew by 9% versus the 2016 receipts while receipts from external sources, which includes the Internal Revenue Allotment (IRA) of the city, posts a growth of 20% compared to the external receipts reported for 2016 (**Table 3-335**). Meanwhile, receipts from the city's economic enterprises decline by -24.7%, based on the City Accounting Office report for 2017.

Table 3-335. Annual revenue of Cagayan de Oro City (2016 - 2017)

Sources	2016	2017	% Change
Local sources	1,604,215	1,748,644	9%
Tax revenue	1,197,270	1,450,461	21%
Real property tax	280,558	542,425	93%

Sources	2016	2017	% Change
Business tax	843,046	820,253	(3%)
Other taxes	73,666	87,783	19%
Non-tax revenue	406,945	298,183	(27%)
Permits and licenses	88,867	107,520	21%
Service income	80,518	91,968	14%
Economic enterprise	236,735	97,605	(59%)
Other receipts	825	1,090	32%
External sources	1,605,022	1,926,483	20%
Internal revenue allotment	1,223,554	1,408,088	15%
Other shares from National Tax Collection	72,008	127,606	77%
Extraordinary receipts, grants, donations, aid	309,460	390,789	26%
Total	**3,209,237**	**3,675,127**	**15%**

Note: In thousand pesos; Source: City Mayor's Annual Report, 2018

In terms of the city's annual share out of the proceeds from national internal revenue taxes for 2017, the city received a total share of PHP 1.408 billion in IRA, which constitutes 46.6% of the city's total income in 2017. The 2017 IRA is 15.1% higher than the 2016 IRA.

Meanwhile, analysis of the report by the Bureau of Local Government Finance (BLGF) of the Department of Finance (DOF), as posted in its website, shows that the IRA dependency of the city for the period 2013 to 2016 grows at an average of 0.6% annually.

Malaybalay City, Bukidnon

Malaybalay City is mainly an agricultural area, and its products include rice, corn, sugarcane, vegetables, legumes, root crops and commercial crops such as rubber, coffee, banana and pineapple. During the past years, corn used to be the pre-dominant crop in the city, but corn areas gave way to sugarcane, agri-farms (poultry, hog), and residential areas. Sugarcane (306,600 metric tons) and rice (30,318 MT) came out now as the predominant crops in terms of production volume. These products are usually sold in the local market, or in nearby municipalities of the province. There are also farmers producing larger volume of corn and rice who sell their products in Cagayan de Oro.

Agri-based industries primarily poultry and piggery, now flourish in the Malaybalay. These farms are assisted by big corporations such as San Miguel, Purefoods, Monterey and Swift. Other agri-based industries in the city include Asian Hybrid Philippines (feeds processing), Rubber Tex (rubber shoes manufacturing), and Monastery Farms (peanuts and other preserved foods). Also notable are the 12 cattle ranches that produce an average of 470 heads yearly.

The employment per sector showed that 70% of employment is in the farming/ crop production sector followed by government agencies and commercial/private establishments. Agri industries and service sectors registered only about 1.63% and 5.99% respectively. The lowest is the manufacturing/processing sector at only 0.36 %

Given Malaybalay's scenic natural areas, so far only three spring resorts, five plazas/nature parks have been developed. Other beautiful sites such as natural growth forest, industrial tree plantation sites, mountains, falls, rivers and caves are still to be developed for eco-tourism which can be additional sources of employment/livelihood.

In 2014, the City Agriculture Office generated the total income of Php115, 450.00 coming from the different agriculture-based projects. The amount collected contributed the revenue generation activity of the city.
High dependency rate on the Internal Revenue Allotment (IRA) is one of the major fiscal problems that confront the Local Government Units, and Malaybalay is not an exemption. This observation is based on the actual income of Malaybalay for calendar year 2012 - 2015. The City Government realized an average income

of 847.3 million in the past four years, of which 750 million or 88% comes from IRA and the remaining 12% or 97.2 million are locally sourced.

In line with the efforts of the City Government to boost local income, the local taxes received from local taxpayers in 2015 was P116.5 million, it was only 83.3 million in 2012.The Internal Revenue Allotment (IRA) also soared at 888.9 million for calendar year 2015.As shown in the table below, the gross income of the city reached 1 billion pesos by end of 2015. It appears that the local taxes have grown bigger that IRA over the past 4 years. The average growth rate of local taxes, while IRA has 115 growths.

One of the sources of local income comes from Business Tax collection. For the year 2012, the amount collected was P27, 045,157.27 and by year 2015 it rose to 36,304,496.45 (refer to Table 32 below). In the span of four years the business taxes registered an average annual growth rate of 11%. This is the rate uses to project the income from business taxes from 2016 until 2020 (**Table 3-336**).

Table 3-336. Annual revenue of Malaybalay City (2012 - 2015)

Revenue source	2012	2013	2014	2015	% Change
Business taxes					
Tax on business	21,989,339.92	20,169,101.33	28,440,371	29,121,094	12%
Other taxes	-		5,205,385	7,183,403	38%
Other permit & licenses	5,055,817.35	6,519,255.92	-	-	-36%
Printing & publication	-		-	-	-
Sub-Total	**27,045,157.27**	**26,688,357.25**	**33,645,756.00**	**36,304,496.45**	**11%**
Fees and charges					
other taxes	2,911,606.14	4,151,424.85	-	-	-19%
Fees & charges	3,270,095.50	3,438,074.71	8,202,015	8,281,589	48%
Service/user charges	1,299,717.90	746,486.91	3,037,737	3,842,730	97%
Other receipts	2,220,966.27	3,418,973.65	242,043	872,286	74%
Share from lotto	1,631,631.32	1,737,215.56	980,634	1,877,367	18%
Interest income	-	-	4,485,540	4,833,241	8%
Miscellaneous sale	-	-	-	-	-
Sub-Total	**11,334,017.13**	**13,492,175.68**	**16,947,969.00**	**19,707,214.22**	**20%**
Economic enterprise					
Income from Cemetery	246,000.00	225,100.00	356,990	422,700.00	23%
Market Operations	9,179,561.90	9,720,121.46	9,554,599	9,425,683.26	1%
S/H Operations	758,785.39	782,246.63	760,799	740,186.47	-1%
Toll & Terminal Fees	2,624,470.00	2,740,915.00	2,678,956	-	-33%
Water Works	8,017,549.43	9,268,820.40	9,791,972	10,939,627.91	11%
Other Economic Enterprises	-	-	-	3,075,329.50	-
Sub-Total	**20,826,366.72**	**22,737,203.49**	**23,143,316.00**	**24,603,527.14**	**6%**
Real property tax collection					
Current Year	18,607,139.42	19,235,771.78	21,303,421	27,070,936.19	14%
Prior Year	3,719,631.88	4,668,310.74	3,802,078	6,558,019.92	26%
Penalties for CY & PY	1,789,774.90	1,818,414.80	1,885,823	2,277,343.04	9%
Sub-Total	24,116,546.20	25,722,497.32	26,991,322	35,906,299.15	15%
Local income	83,322,087.32	88,640,233.74	100,728,363	116,521,536.96	12%
IRA	644,147,712.00	689,529,984.00	777,687,180	888,964,728.00	11%
Total income	**727,469,799.32**	**778,170,217.74**	**878,415,543**	**1,005,486,264.96**	**11%**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Although the municipal economy is inclining towards urbanization, some barangays are quite rural with its economy still the agriculture sector. Commerce and trade are the highest generator of employment in the municipality. The strategic location of the town encourages some merchants and businessmen from other towns to sell their products. The Industrialization is an economic activity that is advantage for Tagoloan

The Tagoloan Public Market at Poblacion with an area of 5,000 square meters and the immediate commercial areas around it serve as the Central Business District (CBD). There are also strings of commercial establishments such as grocery/convenient stores, fast food chains, pawnshops, pharmacies, lending financial institutions, hardware stores, gasoline refilling stations, water refilling stations, and real estate renting hotel and restaurants. The municipality has its own slaughterhouse which is located at Barangay Sta. Cruz. The municipality's population is engaged in various cottage industries like, furniture making, sand and gravel and hollow blocks making and other concrete products.

Local revenue sources include the Php 229,927,613.97 actual income for the General Fund in 2017 which is 17% higher than the Php 196,503,323.77 generated revenues for 2016. The increase is attributable to the growing industrialization which entails high collection rate of local business tax. Similarly, a consistent growth rate is acclaimed on tertiary school operation under the local economic enterprise which largely contributed to local revenues (**Table 3-337**).

Table 3-337. Annual revenue of Tagoloan

Income by source	2017	Growth rate 2017	2016	2015	Growth rate 2016
Income - general fund					
Tax revenue	67,254,551.84	23%	54,574,286.05	47,453,984.60	15%
Non-tax revenue			17,177,422.38		
Service & bus. income	15,231,515.13	(11%)	0.00	18,695,392.16	8%
Gains	1,000,000.00	100%	206,736.00	0.00	
Other income	0.00	(100%)		1,473,276.12	(86%)
IRA	146,441,547.00	18%	124,544,879.00	113,012,470.00	10%
Total revenue (GF)	**229,927,613.97**	17%	**196,503,323.77**	**180,635,122.88**	8%
Less: expenditures					
1. Personnel services	82,930,742.42	(11%)	93,372,067.70	76,767,686.20	22%
2. MOOE	92,132,007.69	34%	68,436,547.48	84,716,794.78	(19%)
3. Non-cash expenses	7,223,364.11	(15%)	8,514,861.27	0.00	100%
4. Financial expenses	3,808,181.14	4%	2,010,325.36	0.00	100%
Total current operating	**186,094,295.36**	20%	**172,333,801.81**	**167,974,125.98**	(7%)
Surplus/deficit from Current operation	**43,833,318.69**	17%	**24,169,521.96**	**0.00**	
5. ADD/subsidy from	1,699,500.00	20%	0.00	0.00	
6. Subsidy to other Fund	7,336,755.60	111%	6,070,700.24	6,489,645.00	6%
Surplus/deficit	**38,196,063.01**		**18,098,821.72**	**12,660,996.90**	42%
Income-economic enterprise					
Market/slaughterhouse					
Market-Service and bus. income	3,115,724.12	21%	2,572,176.89	2,085,143.64	23%
Slaughterhouse income	600,899.00	7%	562,594.00	462,015.00	21%
Total revenue	**3,716,623.12**	19%	**3,134,770.89**	**2,547,158.64**	23%
Less: expenses		12%	1,094,287.79	1,045,608.92	5%
1. Personnel services	1,229,596.20	24%	1,569,289.48	2,962,453.70	(47%)
2. MOOE	1,948,808.70	25%	10,309.38	1,439.32	62%
3. Non-cash	12,879.73	100%	0.00	70.34	(100%)
4. Financial Expenses	345.81	19%	**2,673,886.65**	**4,009,572.28**	(33%)
Total expenses	**3,191,630.44**	14%	**460,884.24**	**(1,462,413.64)**	132%
Net Income	**524,992.68**				
Add: Subsidy from GF	0.00	(81%)	0.00	1,682,000.45	(100%)
Less: Subsidy to National	24,000.00	48%	124,000.00	24,000.00	72%
Surplus/Deficit	**500,992.68**		**336,884.24**	**195,586.81**	42%
Tagoloan Comm. College					
Actual Income	**58,408,935.33**	6%	**54,658,926.13**	**54,043,597.02**	1%

Income by source	2017	Growth rate 2017	2016	2015	Growth rate 2016
Less: Expenditures				0.00	
P.S.	17,256,134.62	9%	15,785,913.68	18,322,803.81	(13%)
MOOE	30,964,927.19	(13%)	35,692,399.85	18,373,402.85	94%
Financial Expenses	19,533.28	(25%)	254,962.19	1,859,642.66	(86%)
Non-cash	21,023,485.32	18%	1,094,194.53	8,186,543.68	(87%)
Total Expenses	**49,264,080.42**	(6%)	**52,827,470.25**	**46,742,393.00**	13%
Surplus	**9,144,854.91**	399%	**1,831,455.88**	**7,301,204.02**	(75%)
Less: subsidy	888,000.00	5%	884,000.00	7,344,790.00	(88%)
Net Income	**8,256,854.91**	771%	**947,455.88**	**(43,585.98)**	23%
St. Paul Hospital (first yr)					
Service & Business Income					
Less: Expenditures	**6,819,672.00**				
P.S.	8,738,525.43				
MOOE	5,173,322.17				
Non-cash expenses	244,580.00				
Total Expenses	**14,156,427.60**				
Net Income/deficit	**(7,336,755.60)**				
SEF					
Personnel Services	0.00	(100%)	2,142,410.34	2,716,371.07	(21%)
MOOE	4,178,808.62	23%	3,380,521.07	6,459.740.11	(47%)
Non-cash Expenses	102,297.70	(84%)	679,444.36	0.00	100%
Total expenses	**4,281,106.32**	(30%)	**6,202,375.77**	**9,176,111.18**	(32%)
Surplus	**3,760,539.08**	(105%)	**1,832,953.83**	**107,554.72**	604%

Source: Tagoloan CLUP, 2017-2027

Manolo Fortich, Bukidnon

Being an agricultural municipality, farmers and/or farm laborers particularly in corn plantation is the predominant type of employment. The topmost major crops in Manolo Fortich are corn, pineapple and cassava. Vast areas for pineapple plantation are owned mainly by DMPI and only small portions of areas in certain barangays are planted with pineapple by local farmers.

Major firms operating in Manolo Fortich are into production or processing of agricultural products such as pineapple, corn, cut flowers, coffee, rice and livestock. The major investment of REBISCO, a biscuit factory is also instrumental towards the thrust to generate employment in the municipality. Farming is the main income source of 50% of the households while those employed account for 38% only. Those engaged in business is 8% and about 4% depend on retirement or remittances.

As far as revenue generation is concerned, cost to collect revenues have declined from 29% down to 10.77%. Local revenue collection efforts are seen in the figure below wherein the municipality have decreasing IRA dependency rates (or its dependency from external sources) have dropped dramatically from 70.97% in 2010, 69% in 2011 and 65% in 2012. There is an increasing trend for local- sourced revenue per capita which significantly describes locally- sourced revenue per person.

Personal expenditure ratio has not exceeded the ceiling mandated by the Local Government Code of 1991. In a per capita basis, the municipal government have not met the desired/ exceptional ratings for total expenditure per capita, wherein Manolo Fortich only spent P1556.39 per person in 2010, P1,618.00 per person in 2011 and P1,409 per person in 2012. The proportion of actual debt service costs against total regular income was always in accordance to LG Code of 1991 since it has not exceeded the debt servicing limitation which is 20% of its total regular income.

Table 3-338 show the 4-year comparative income and expenses of the LGU. A consistent increase from 2009 to 2011 of 6% and 8%. However, in 2012, the IRA was reduced by about 3% over that of 2011. In 2011, the LGU has a total revenue of P176,275,318.94, wherein P121,327,560.00 or 69% came from the IRA. Only 31%

of the total revenue represents the locally sourced income. This means that the IRA dependency of the LGU is 69%.

In 2012, the LGU has a total local income of P57, 507,429.50 under the General Fund. While in 2011, the total local income is P54, 947,758.94. There is an increase of P2, 559,670.56 or 5% of local income from 2011 to 2012. On the other hand, expenditures for Personal Services and Maintenance and Other Operating Expenses are also increasing from 2009 to 2012. This was attributed to the increase of the salaries of the employees under the Salary Standardization Law and also increased in the cost of supplies and materials and services.

Table 3-338. Manolo Fortich revenues (2006 - 2012)

Income	2009	2010	2011	2012
Local Taxes	17,046,782.98	19,464,966.58	22,176,686.43	19,249,226.06
Permits and Licenses	2,856,973.07	2,764,988.37	2,887,749.83	4,261,533.51
Services Income	2,001,070.96	2,039,077.07	2,290,460.12	2,505,042.62
Business Income	19,782,916.01	25,195,448.64	25,352,263.46	28,431,312.01
Other Income	26,314,811.88	1,047,727.53	2,240,599.10	3,060,315
IRA	105,651,788.20	112,134,547.20	121,327,560.00	117,857,304.00
Total Income	173,654,343.10	162,646,755.39	176,275,318.94	175,364,733.50
Less: EXPENSES				
Personal Services	54,054,054.78	57,773,580.34	74,033,502.34	78,269,652.25
MOOE	62,188,847.14	66,675,735.75	71,886,075.38	55,313,024.57
Financial Expenses	5,300,422.26	4,879,257.84	3,541,356.04	2,756,717.33
Total Expenses	121,543,324.18	129,328,573.93	149,460,933.76	133,582,676.82
Net Operating Income	52,111,018.92	33,318,181.46	26,814,385.18	39,025,339.35
Add: Subsidies	0	0	0	0
Subsidies to Other LGUs/GOCC	13,487,833.01	12,096,257.80	18,254,779.47	9,169,755.31
Net Income before extraordinary Items	38,374,395.85	21,221,923.66	8,559,605.71	29,855.584.04
Net income	38,374,395.85	21,221,923.66	8,559,605.71	29,855,584.04

Source: Manolo Fortich CLUP 2013-2022

Sumilao, Bukidnon

Sumilao is strategically situated between two cities of Cagayan de Oro and Malaybalay. The growth of commerce and trade is slowly transformed into a society of business organization, although mostly micro. Sumilao is an agricultural and industrial developing municipality. More than 85% of its population is dependent on agriculture while the rest are on commercial activities.

Sumilao is basically an agriculture-based community where most of the populace are dependent on agriculture as its main economic activity and as source of main income. Ordinary farmers are planting rice, corn and vegetables both traditional and high value crops while the large corporations, the DOLE Philippines-Skyland Division and the De Monte Philippines, Inc. are engaged in planting commercial crops of sweet lakatan banana and pineapple. There is also an influx of agro-industrial establishment in the area, the piggery and breeder farms but required a minimal employment only. The municipality boost of its natural and man-made attractions which when developed can be a source of income for the populace. Small cottage industries like broom making made of guiyong, ceramics and pot made of clay and hollow blocks making are gaining headway in the area.

Impasug-ong, Bukidnon

The economy of Impasug-ong is intensified through the development of its natural resources. Hydro-electric power projects are present such as the Panoon Mini-Hydro Power Project managed by the Urbiztondo-

Pelonio Associates Company (UPAC). The National Greening Program of the Department of the Environment and Natural Resources (DENR) is also a significant component in the economic growth of Impasug-ong. 19 partner organizations were funded for the rehabilitation and protection of forests/watershed and for the development of marginal lands to production areas. This is to provide the upland and lowland households with low income to have an alternative livelihood, thus alleviating poverty.

There are also manufacturing, and processing plants established in the municipality. Skilled workers and laborers are hired locally by these companies. These companies include the Feed Mill at Barangay Impalutao; Veneer/Plywood at Poblacion; Oil Palm Mill at Poblacion; DOLE Organic Fertilizer Plant and Banana Plantations; and, the Pineapple Plantations of Del Monte Philippines, Incorporated.

Agriculture has become the economic backbone of the Municipality. Most of its farmers are into the production of corn, rice, coffee, abaca, rubber, oil palm, high value commercial crops and livestock serving as their sources of income.

The Municipality is also a tourist destination with its natural endowments. Although tourism in Impasugong is not yet full-blown to generate income, however, this is being developed by the LGU.

For 2017, there is a significant decrease in the non-office expenditures classified under Special Purpose Appropriations per COA Circular no. 2015-009, the implementation of Philippine Public Sector Accounting System (PPAS) of which appropriations in the budget shall reconcile with COA for uniformity of implementation.

The local government is highly dependent on Internal Revenue Allotment (IRA) Share by 90.28%. Below is a table showing an actual 6-year comparative income and expenses of the LGU. The table below shows that Internal Revenue Allotment is the major source of income of the LGU.

Table 3-339. Resources utilization of Impasug-ong (2014 - 2019)

Source	2014	2015	2016	2017	2018	2019
Revenue						
Local income					-	-
Local taxes	8,253,610.61	8,960,585.96	9,689,885.07	9,500,000.00	10,450,000.00	11,495,000.00
Permit fees and licenses	691,859.90	-	-	-	-	-
Service income	946,087.11	3,481,226.99	1,833,796.50	1,660,000.00	1,826,000.00	2,008,600.00
Business income	7,934,983.10	6,740,038.10	6,506,522.75	6,040,000.00	6,644,000.00	7,308,400.00
Other income	2,452,144.10	1,338,315.78	1,145,468.08	400,000.00	440,000.00	484,000.00
Total local income	20,278,684.82	20,520,166.83	19,175,672.40	17,600,000.00	19,360,000.00	21,296,000.00
IRA	166,491,105.00	190,203,433.00	209,527,081.00	238,801,634.00	262,681,797.40	288,949,977.14
Total revenues	**186,769,789.82**	**210,723,599.83**	**228,702,753.40**	**256,401,634.00**	**282,041,797.40**	**310,245,977.14**
Allocation						
PS	47,910,522.18	48,171,466.56	53,638,363.95	81,098,851.00	89,208,736.10	98,129,609.71
MOOE	12,209,874.59	15,703,190.36	15,287,065.26	104,098,686.00	114,508,554.60	125,959,410.06
CO	550,640.00	1,528,140.00	504,500.00	4,710,688.00	5,181,756.80	5,699,932.48
20%DF	8,164,656.10	9,613,333.50	7,993,163.69	47,760,327.00	52,536,359.70	57,789,995.67
5% LDRRMF	1,924,214.59	4,581,909.50	7,160,244.50	12,820,082.00	14,102,090.20	15,512,299.22
Aid to barangay		13,000.00		13,000.00	13,000.00	13,000.00
Non office	71,804,053.98	74,642,938.79	78,483,225.93			
Infrastructure	2,983,009.21	6,218,456.24	350,575.00	5,900,000.00	6,490,000.00	7,139,000.00
Total (a)	**145,546,970.65**	**160,472,434.9**	**163,417,138.3**	**256,401,634.00**	**282,040,497.40**	**310,243,247.1**

Source	2014	2015	2016	2017	2018	2019
		5	3			4

Source: Impasug-ong CLUP 2019-2028; (a) allocation

3.4.5.6.2 Employment rate/ profile

Cagayan de Oro City

The average labor force participation rate for both sexes comprised 69.8 percent (81.7 male and 57.7 female) as of 2010 for ages 15 years old and up; lower than that of 2007 which is 70.9 percent (based on NSO Regional Survey) (**Table 3-340**). The decreasing number of labor force indicates that there are more members of the household who are not in the labor force.

Table 3-340. Labor force population of Cagayan de Oro City (2010)

Age group	Both Sexes	Percent age	Male	Percent age	Female	Percent age
15-19	70,220	18.14	34,982	9.03	35,239	9.1
20-24	62,407	16.12	31,089	8.03	31,318	8.09
25-29	54,197	14	26,999	6.97	27,198	7.02
30-34	44,243	11.43	22,041	5.69	22,203	5.73
35-39	39,690	10.25	19,772	5.11	19,918	5.14
40-44	33,795	8.73	16,836	4.35	16,959	4.38
45-49	29,968	7.74	14,929	3.86	15,039	3.88
50-54	24,863	6.42	12,386	3.2	12,477	3.22
55-59	17,517	4.52	8,726	2.25	8,791	2.27
60-64	10,280	2.65	5,121	1.32	5,159	1.33
Total	**387,180**	**100**	**192,882**	**49.82**	**194,299**	**50.18**

Source: Cagayan de Oro City CLUP 2013-2022

Malaybalay City, Bukidnon

The employment rate of the city is quite high at 95%. As to nature of employment, based on the 2013 MISS results, about 33% of those employed have permanent status, 46% are seasonal or temporarily employed, and 22% are employed on demand basis (daily, weekly, or monthly). As to type of employment, 53% are wage and salary earners; 32% are self-employed and about 15% have their own farms (**Table 3-341**).

Table 3-341. Nature and type of employment in Malaybalay City

Total Population of labor force	99,984	
Population of 15-64 years old in the Labor Force	58,281	58.30% (to total 15-64 years old population)
Employed Population (15-64 years old)	55,442	95% (To total Employed Population)
Nature & type of employment	**Population**	**Percentage to employed population**
Nature of Employment		
Permanent	18,069	32.6%
Seasonal/Temporary	25,305	45.6%
Daily/Weekly	12,068	21.8%
Type of Employment		
Salary/Wage Earners	9,643	17.4%
Self-employed (small enterprises)	8,032	14.5%
Farmers	9,394	16.9%

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Household population in Tagoloan was estimated at 73,150 in 2015. Overall, 63.03 percent of the total population in 2015 were in their economically productive years (15 to 64 years old). The age-dependency ratio in 2015 was estimated at 58 per hundred working persons. This implies that 100 working individuals

would have to support 58 more persons aside from themselves. The dependency burden falls on the working group and the dependents comprising almost 37 percent of the total population.

Table 3-342. Household population composition by work force dependent in Tagoloan (2015)

Classification	Total	Male		Female		Ratio
		Number	Percent	Number	Percent	
Working-age (15-64)	46,110	23,729	51.46	22,381	48.54	106
Labor force (15 & over)	48,613	24,849	51.12	23,764	48.88	105
Dependent (0-14 and 65 & over)	26,868	13,654	50.82	13,214	49.18	103
Young dependent (0-14)	24,365	12,534	51.44	11,831	48.56	106
Old dependent (65 and over)	2,503	1,120	44.75	1,383	55.25	81

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

Table 3-343 shows that 48% of the total household population belonged to working-age population (15 to 64 years). Young dependents (0 to 14 years) and old dependents (65 years and over) posted a share of 52%. Manolo Fortich had an overall dependency ratio of 52 in 2010. This means that there were 52 dependents for every 100 working-age population.

From this total of 40,277, 68% are in the labor force. It is estimated that 91.22% are economically active and 8.78 % are unemployed, thus; disclosing a ratio of 9 unemployed persons for every 100 employed persons. Using the 2.06% annual growth rate of population, labor force population increased by 10.17%.

Table 3-343. Labor force population of Manolo Fortich

Year	Population (15 years old and above)			In the labor force						Not in the labor force		
				Employed			Unemployed					
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
2010	59,270	30,512	28,758	37,026	19,061	17,965	3,251	1,674	1,577	31,756	16,348	15,408
2011	60,491	31,141	29,350	37,789	19,454	18,335	3,318	1,708	1,610	32,410	16,685	15,725
2012	61,737	31,782	29,955	38,567	19,854	18,713	3,386	1,743	1,643	33,078	17,029	16,049
2013	64,307	33,105	31,202	40,173	20,681	19,492	3,527	1,816	1,711	32,461	16,711	15,750
2014	64,307	33,105	31,202	40,173	20,681	19,492	3,527	1,816	1,711	34,455	17,737	16,718
2015	65,631	33,787	31,844	41,000	21,107	19,893	3,600	1,853	1,747	35,165	18,103	17,062
2016	66,983	34,483	32,500	41,844	21,542	20,303	3,674	1,891	1,783	35,889	18,476	17,413
2017	68,364	35,194	33,170	42,707	21,985	20,721	3,750	1,930	1,819	36,628	18,856	17,772
2018	69,771	35,918	33,853	43,586	22,438	21,148	3,827	1,970	1,857	37,383	19,245	18,138

Source: Manolo Fortich CLUP 2013-2022

Sumilao, Bukidnon

Based on the 2009 Community-Based Monitoring (CBMS) survey, there are 13,453 people in the locality and 3,654 people belong to the productive age. About 98% percent of the total number of employable age is employed mostly in agriculture. However, most of them have inadequate income.

Impasug-ong, Bukidnon

The labor force population as presented in **Table 3-344**, shows that males ages 15 years old and above consist of 15,342 with 10,828 or 37.80% who are employed while 13,306 females of the same age group is 3,759 or 13.12% are employed.

Table 3-344. Labor force population of Impasug-ong (2015)

Sex	Population 15 years old and over	Employed	Percent	Unemployed	Percent
Male	15,342	10,828	37.80	4,514	15.76
Female	13,306	3,759	13.12	9,547	33.33

Sex	Population 15 years old and over	Employed	Percent	Unemployed	Percent
Total	**28,648**	**14,587**	**50.92**	**14,061**	**49.08**

Source: Impasug-ong CLUP 2019-2028

The productive population or the working age group which is within the 15-64 years old comprises 53.83% of the total count. With the total population as illustrated in the table below, the child and youth age group (0-14 years old) comprise about 18,616 equivalents to 68.11% while the older population (65 years old and above) comprises 4.82% of the population with a total of 46.20%. This composes the total age dependency ratio (**Table 3-345**).

Table 3-345. Work force dependent population in Impasug-ong (2015)

Classification	Total	Male		Female		Ratio
		Number	Percent	Number	Percent	
School going population (4-21)	**19,143**	**9,927**	**51.86**	**9,216**	**48.14**	**109**
Pre-school (5)	1,247	646	51.80	601	48.20	107
Primary (6-11)	7,288	3,742	51.34	3,546	48.66	106
High School (12-17)	6,801	3,515	51.68	3,286	48.32	107
Tertiary (18-21)	3,807	2,024	53.17	1,783	46.83	114
Working-age (15-64)	27,331	14,703	53.80	12,628	46.20	116
Labor Force (15 and over)	28,648	15,342	53.55	13,306	46.45	115
Dependent (0-14 and 65 & over)	**19,933**	**10,149**	**50.92**	**9,784**	**49.08**	**104**
Young Dependent (0-14)	18,616	9,510	51.09	9,106	48.91	104
Old Dependent (65 and over)	1,317	639	48.52	678	51.48	94

Source: Impasug-ong CLUP 2019-2028

3.4.5.6.3 Poverty incidence

Misamis Oriental and Bukidnon

In the Philippines in 2018, the monthly poverty threshold for a family of five is an average income of P10, 481 per month. This amount is enough to cover a single family's basic food and non-food needs. Poverty threshold refers to the minimum income a family or individual must earn in order to be considered “not poor”. Food threshold in 2018 means that a family of five needed no less than P 7,337, on average, to meet the family’s basic food needs for a month.

The 2018 Family Income and Expenditures Survey (FIES), the PSA is able to generate reliable estimates down to Highly Urbanized City. In Cagayan de Oro the poverty level is 6.2% among the total population. In terms of food threshold, 1.1% of the total population belong to such category. Misamis Oriental without Cagayan de Oro City has a subsistence of 2.3% of the total families and a poverty incidence of 11.4% among the population. This includes Tagoloan, Misamis Oriental. Bukidnon registered 5.6% subsistence incidence among families and 22.2% poverty incidence in Malaybalay, Sumilao, Manolo Fortich and Impasug-ong (**Table 3-346**)

Table 3-346. Subsistence and poverty incidence in Misamis Oriental and Bukidnon (2018)

Province/city	Subsistence incidence among families (%)		Poverty incidence among population (%)	
	2015	2018	2015	2018
Cagayan de Oro city		1.1	41.9	31.5
Misamis Oriental (without Cagayan de Oro city)	5.1	2.3	16.5	11.4
Bukidnon	27.0	5.6	47.6	22.3

Source: Philippine Statistics Authority, 2020

Poverty is chronic and endemic in Bukidnon. The incidence of poverty is high because Bukidnon is largely dependent on traditional forms of agriculture where incomes are substantially low. In fact, labor leaders in a 2002 dialogue with government officials estimated that the average farm laborer in Bukidnon was only paid

70 to 80 pesos a day—about US$1.4 at the 2002 average exchange rate of 51.6 pesos per dollar (Mordeno 2002). In addition, the seasonal nature of most of Bukidnon's farm work leaves much of the labor force without secure employment for a substantial part of the year.

Cagayan de Oro City, Misamis Oriental

Based on 2009 NSO Regional survey on family income and expenditures, the average regional family income for 2009 increased to P165, 000 from P142, 000 in 2006. The total number of families was recorded at 839,000 in 2009 and 789,000 in 2006. This 50,000-rising number of families from 2009 to 2006 indicates the increasing number of populations in this time span.

Based on 2003 Small Area Poverty Estimates of the National Statistical Coordination Board (NSCB), Cagayan de Oro City posted the least in poverty incidence in Northern Mindanao. The city had a poverty incidence of 15.50% which implies that 15.50 % of the City's population has an income below the poverty line for 2003. In 2018, PSA Family Income and Expenditures Survey (FIES) showed that Cagayan de Oro's poverty incidence decreased from 41.9% to 31.5%. The subsistence incidence among families in Cagayan de Oro is recorded at 1.1% in 2018.

Malaybalay City, Bukidnon

Based on the 2013 Malaybalay Integrated Survey System (MISS) results, with 35,055 households surveyed, there are 17,413 households or 50% which have income below food threshold and 22,019 households or 63% which have income below the poverty threshold.

Also shown in **Table 3-347** the magnitude of subsistence and poor families in the city using the 2011 MISS survey results and using the 2009 food and poverty thresholds of PhP 11,365 and PhP 16,297 respectively. Comparing the 2011 and 2013 figures, it appears that the magnitude of subsistence households has increased by 1,074. However, the percentage to total number of households decreased by 1% (from 51% to 50%). The magnitude of poor households has increased by 1,603, but its percentage to total remained the same at 63%. The Province of Bukidnon is considered among the top ten in the country with high incidence of poverty, and its 2012 poverty incidence is 41.5%, which is lower than the city (63%).

Table 3-347. Comparative magnitude of poverty in Malaybalay

Indicators	2011 MISS survey	2013 MISS survey
Provincial Food Threshold (2009, 2012)	11,365	14,062
Provincial Poverty Threshold (2009, 2012)	16,297	20,115
Surveyed Households	32,193	35,055
Magnitude of Subsistence Households	16,339	17,413
Percentage of Subsistence Households	51%	50%
Magnitude of Poor Households	20,416	22,019
Percentage of Poor Households	63%	63%
Magnitude of Poor Households above Subsistence	4,077	4,606
Percentage of Poor Households above Subsistence	13%	13%

NOTE: MISS - Malaybalay Integrated Survey System; Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Among the population in Tagoloan, 41.9% of all the households or 27,019 population live below the poverty line. The highest proportion of households who fall below the poverty line is noted in barangay Rosario (80.1%) which the source of income is farming and furthest barangay to the urban center, followed by Baluarte (51.3%) which some household income relies on fishing. The barangays with more than forty percent of its households falling below the poverty line are Sugbongcogon (40.3%), Sta. Cruz (41.7%), Casinglot (42.4%), Sta. Ana (42.6%), and Natumolan (45.8%) (**Table 3-348**).

Table 3-348. Households in Tagoloan with income below the poverty threshold (2016)

Barangay	No. of HHs	HHs with income below poverty threshold	
		Magnitude	Proportion
Baluarte	1,646	844	51.3
Casinglot	1,987	843	42.4
Gracia	418	155	37.1
Mohon	987	323	32.7
Natumolan	1,443	661	45.8
Poblacion	1,697	522	30.8
Santa Ana	1,615	688	42.6
Santa Cruz	2,544	1,060	41.7
Sugbongcogon	658	265	40.3
Rosario	216	173	80.1
Total	**13,211**	**5,534**	**41.9**

Note: HHs – households; Source: CBMS Census 2012, Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

The poverty incidence in Manolo Fortich in 2015 is 49.93%. This means that 19, 903 households are living below the poverty line. Of this, 9, 938 households are living below the food threshold.

Poverty incidence in Manolo Fortich is at its highest in barangays Santiago, Guilang-guilang and Minsuro which are also exposed to higher risk for landslide, flood and earthquake along with Maluko, Agusan Canyon and Dalirig.

Sumilao, Bukidnon

The poverty incidence in Sumilao in 2005 is 43% and a poverty gap of 13%. The severity of the poverty in the municipality is at 5%. Sumilao is basically an agriculture-based community where most of the people are dependent on agriculture as its main economic activity and as source of main income. Ordinary farmers are planting rice, corn and vegetables both traditional and high value crops while the large corporations, the DOLE Philippines-Skyland Division and the De Monte Philippines, Inc. are engaged in planting commercial crops of sweet lakatan variety banana and pineapple. There is also an influx of agro-industrial establishment in the area, the piggery and breeder farms but required a minimal employment only. The municipality boasts of its natural and man-made attractions which when developed can be a source of income for the populace. Small cottage industries like broom making made of guiyong, ceramics and pot made of clay and hollow blocks making are gaining headway in the area.

Impasug-ong, Bukidnon

The poverty incidence in Impasug-ong in 2015 is 54.31% with a poverty gap of 17.56%. The severity of the poverty in the municipality is 1.75%. Impasug-ong is home to 67.42% Higaonon. They are distributed in the various barangays of the municipality. The table below shows the IP population and their poverty incidence and the number of households in poverty.

It can be seen that the total poverty incidence of the IP community in Impasug-ong is 63.28% which is higher than the municipality's poverty incidence of 54.31%. The barangay with the highest poverty incidence is Kibenton with 83.3% and 857 households living in poverty.

Table 3-349. IP population and poverty incidence in Impasug-ong

Barangay	Population 2007	IP population	% of Total	Population 2011	IP population	Poverty incidence	No. of HH
Bontongon	837.00	835.00	99.76	876	874	82.1	162
Bulonay	1,377.00	905.00	5.72	1,515	996	80.4	276
Capitan Bayong	2,172.00	1,387.00	63.86	2,560	1,635	47.3	530

Cawayan	1,446.00	686.00	47.44	1,918	910	61.2	412
Dumalaguing	2,626.00	2,592.00	98.71	2,756	2,720	32.5	543
Guihean	1,590.00	1,138.00	71.57	1,880	1,346	57.9	356
Hagpa	2,849.00	1,251.00	43.91	1,658	1,167	68.2	537
Impalutao	4,239.00	2,911.00	68.67	1,484	3,766	66.3	1,145
Kalabugao	4,974.00	2,831.00	56.92	5,412	3,080	64.1	1,099
Kibenton	3,311.00	2,521.00	76.14	4,072	3,100	83.3	857
La Fortuna	3,129.00	2,224.00	71.08	3,835	2,726	48.1	801
Poblacion	6,502.00	4,709.00	72.42	10,061	7,287	61.4	2,180
Sayawan	1,230.00	471.00	38.29	1,272	487	69.8	265
Total	**36,282.00**	**24,461.00**	**7.42**	**44,299**	**9,866**	**63.28**	**9,162**

Note: HH – House hold, IP – Indigenouse people; Source: Impasug-ong CLUP 2019-2028

3.4.5.6.4 Sources of livelihood

Cagayan de Oro City

Residents and those working in the city mostly work in the industrial, agri-industrial and commercial sectors. Cagayan de Oro is mainly industrial with manufacturing, processing, bottling, fabrication, and assembling categories. This also includes small-scale industries like repair shops, food processing and handicraft factories. Mostly, these activities are concentrated along the National Highway. The existing industrial area of the city is 175.58 hectares. The increasing number of industries is attributed to the expansion of the industrial area.

Agricultural areas are located mostly in the rural areas. These areas are located in Barangays Lumbia, Canitoan, Iponan, Bayabas, Bulua and Pagatpat. Existing agro-industrial areas in the city are situated along the strip of Sayre Highway in Upper Puerto and include feed mills, post-harvest and warehousing facilities. This area, abutting the province of Bukidnon caters to its large volume of agricultural production.

Commercial establishments include offices, services, supermarkets, and shopping centers. Regional offices and financial establishments concentrated in the Poblacion (CBD) create pressure in the area. Large-scale shopping centers (such as the Limketkai Mall, Gaisano, Ororama, and Centrio) are also within the CBD. Small-scale operations (like hardware, store and services) are located in all parts of urban area, as well as in dominantly residential areas.

Malaybalay City, Bukidnon

Most of the residents and working population in Malaybalay are mainly employed in farming/ crop production sector followed by government agencies and commercial/private establishments. Agri industries and service sectors registered only about 1.63% and 5.99%, respectively. The lowest is the manufacturing/processing sector at only 0.36 %

For the agricultural sector, its products include rice, corn, sugarcane, vegetables, legumes, root crops, high value crops and commercial crops. Commercial crops are composed of rubber, coffee, banana and pineapple. There are 70 commercial poultry and piggery farms operating in the city. In addition, commercial establishments have proliferated in the past several years.

However, pineapple and banana plantations are now increasing in the outskirts of the city proper. This aggressive expansion even to prime agricultural areas could pose a danger to the local food security. The industrial activities of these companies may pose a problem to the community in the form of flooding and landslides.

Tagoloan, Misamis Oriental

Tagoloan has industrial and agricultural establishments were most of its resident's work. PHIVIDEC industrial economic zone provides employment to residents in Tagoloan. There are also 38 establishments of registered (Phividec-Industrial Estate Misamis Oriental-Special Economic Zone PIEMO-SEZ) manufacturing/processing

firms. These industries are distributed in the eight barangays of Tagoloan. Aside from service-oriented firms, there are also fuel and chemical depots in the municipality.

The commercial sector has also increased in the municipality. There are 315 establishments under the wholesale and retail trade/repair of motor vehicles, motorcycles, personal and household goods as well as hotels and restaurants.

Agriculture plays a major role in Tagoloan's economy, especially towards supporting agri-industrialization. The major agricultural crops in the area are corn, cassava, upland rice, banana, papaya, vegetables, mango, and coconut.
Tagoloan household heads occupation by barangay records show that most head of household come from hired labor where barangay Sta. Cruz has the top most number of household heads as hired laborer, followed by Employed in Private where barangay Casinglot, Poblacion Sta. Cruz, and Natumolan have almost equal number of household head occupation, self-employed/business where barangay Sta. Cruz have the highest household head occupation followed by barangay Baluarte and the rest barangays, then employed in government and private agency followed by farming, Employed in government, fishing, overseas contract worker and lastly the practice on law and medicine and dentistry.

Sumilao, Bukidnon

Most of the people in Sumilao are working in the agriculture sector. Sumilao is an agriculture-based municipality endowed with vast agricultural resources and typical climate for crop and livestock production. More than 85% of its population is dependent on agriculture while the rest are on commercial activities.

There are also multi-national corporations dealing with plantation crops and livestock production. Other residents also work in financial, commercial and small-scale business along Sayre Highway.

Manolo Fortich, Bukidnon

Manolo Fortich is primarily an agricultural area. Farming and working in corn plantations are the predominant type of employment. Some major firms are also located in the municipality which are into processing agricultural products such as pineapple, corn, cut flowers, coffee, rice and livestock. REBISCO, a biscuit factory is also a source of livelihood in the municipality.

Farming is the main income source of 50% of the households while those employed account for 38% only. Others are engaged in business with 8% and 4% depend on retirement or remittances. Other residents are employed by the LGU.

Impasug-ong, Bukidnon

Impasug-ong is an agriculture – based municipality. Ninety percent of the total populace are actual farm tillers, 50% are agricultural farm workers and laborers who are either employed in the multi-national corporations or on poultry farms or breeder farms. For 50 years, the total area utilized for agricultural production has increased to more or less to 20%.

For all the business transactions within the municipality, it generated a total revenue of 7,275,093.75. The whole sale trade and retail contributes the largest in revenue.
Impasug-ong relies heavily in the agriculture sector for livelihood of its residents. In addition, there are manufacturing and processing plants in the municipality. These industries play a vital role in the economy of the municipality, hiring local workers in their companies. Impasug-ong also looks into its tourism sector to generate livelihood for the residents.

3.4.5.6.5 Commercial establishments and activities

Cagayan de Oro City, Misamis Oriental

The presence of all types of commercial establishments in the city is a clear indication that trade and commerce is the prime mover of the city's economy. In 2012, there are five malls in the city, at least nine major Central Business Districts, six public markets, nine neighborhood centers, several commercial complexes and commercial strips rationally distributed all over the city. To these, a total of 18,144 registered businesses as of 2010 make up the bustling city of Cagayan de Oro.

Wholesale and retail trade dominate the businesses in the city reaching a 5-digit number in 2010 or 10,227 permits from 8,521 in 2009 and as compared to other applied categories. The community, social and personal service is second in the most applied at 3,274 in 2010, followed by financing, insurance, real estate and business services at 2,376 on same year. On the summary, there is an increasing trend of investors permitted to venture in the city in the last five years (2006-2010) arriving at 18,144 (**Table 3-350**).

Table 3-350. Business permits issued by type in Cagayan de Oro City

Major industry division	2006	2007	2008	2009	2010
Agriculture, fishery and forestry	-	-	156	13	14
Mining and quarrying	1	4	6	4	11
Manufacturing	671	732	345	209	279
Construction	121	130	272	282	266
Wholesale and retail trade	8,771	8,577	8,431	8,521	10,227
Transportation, storage and communication	260	270	300	340	358
Financing, insurance, real estate and business services	1,776	1,890	2,192	2,303	2,376
Community, social and personal services	3,141	3,238	3,068	2,969	3,274
Others N.E.C.	891	951	1,109	1,245	1,339
Total	**15,632**	**15,792**	**15,879**	**15,886**	**18,144**

Source: Cagayan de Oro City CLUP 2013-2022

Malaybalay City, Bukidnon

The economic activities in Malaybalay City have flourished in the last five years. As shown in **Table 3-351**, almost all types of business establishments have increased in numbers from 2006 to 2010. Wholesale/retail is still the highest in terms of numbers although it decreases from 3,144 to 1,748.

Data from the License Department of the City showed that a majority or 95.87% of the establishments in the city belong to the service sector. Looking at the breakdown, sari-sari stores (37%) make up majority of the establishments in this sector, followed by trade/wholesale/retails (21%) and other, social and personal services (14%). Industry sector and agriculture sector only make up only 2.27% and 1.9%, respectively of all establishments.

Table 3-351. Commercial establishments in Malaybalay city

Economic activities	2010	2011	2012	2013	2014
Agri-based	352	396	497	815	768
Food establishments	369	398	346	543	527
Services	532	591	656	923	888
Wholesale/Retail	1,748	2,115	2,067	4,832	4,462
Manufacturing	6	7	7	32	30
Sports and recreation	33	42	44	147	112
Other services	49	55	59	70	64
Communications	76	89	98	114	102
Banking and finance	64	79	68	130	133
Insurance	13	13	19	21	22
Real estate	171	181	208	278	313
Mining and quarrying	4	5	5	6	6
Processing	3	4	4	2	6

Economic activities	2010	2011	2012	2013	2014
Others				125	135
Total	**3,420**	**3,975**	**4,078**	**8,038**	**7,568**

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Tagoloan is 19 kilometers from Center of Cagayan de Oro City and it is traversed by a national road connecting the southern towns of the province of Misamis Oriental, the creation and implementation of PHIVIDEC Industrial Authority (PIA) specifically the emergence of several industries. The strategic location of the town encourages some merchants and businessmen from other towns to sell their products. Industrialization is an economic activity that is an advantage for Tagoloan.

The Tagoloan Public Market at Poblacion with an area of 5,000 square meters and the immediate commercial areas around it serve as the Central Business District (CBD). There are also strings of commercial establishments such as Grocery/Convenient stores, fast food chains, pawnshops, pharmacies, lending financial institutions, hardware stores, gasoline refilling stations, water refilling stations, and real estate renting hotel and restaurants. The municipality has its own slaughterhouse which is located at Barangay Sta. Cruz. The municipality's population is engaged in various cottage industries like, Furniture Making, Sand and Gravel and Hollow Blocks Making and other concrete products.

In 2017, Municipality of Tagoloan has 315 establishments under the wholesale and retail trade/repair of motor vehicles, motorcycles, personal and household goods (**Table 3-352**). The nine establishments for hotels and restaurants are located in the business center of the municipality Barangay Poblacion. The 92 establishments comprise transport, storage and communication in Barangays of Casinglot, Sugbongcogon, Natumolan, Baluarte Gracia, Sta. Cruz and Mohon. The 38 financial intermediation business establishments are situated Barangay Poblacion.

The real estate renting & business activities are also concentrated in Barangay Poblacion which is the commercial center in the Municipality, Casinglot, where the International Container Port is located and Baluarte where the only tertiary school in the municipality, the Tagoloan Community College is located. The public administration and defense/compulsory social security are situated within various locations comprising mostly of security agencies. While the education business composed of five private schools are located in different Barangays like Poblacion, Natumolan and Sta. Cruz. Health, the 16 health and social work business mostly comprises the pharmacies and clinics and the 93 business establishments comprising other community, social & personal service activities are located around Tagoloan. All business activities except transport, storage and communication cater market outside the municipality.

Table 3-352. Commercial establishment in Tagoloan (2017)

Type of commercial areas	No. of establishments
Wholesale and retail trade/repair of motor vehicles motorcycles personal and household goods	315
Hotels/restaurants	9
Transport, storage and communication	92
Financial intermediation	38
Real estate renting and business activities	28
Public administration and defense/compulsory social security	7
Education	5
Health & social work	16
Other community, social and personal service activities	93

Source: Tagoloan CLUP 2017-2027

The public market is subsidized by the local government unit since the income derived from the stalls and other fees & charges is not enough to sustain its operation. The LGU through its market administrator is

currently looking for ways and means to augment the market income, improve the structural conditions that would be complementary to the imposed stall rentals and eventually eliminate the subsidiary provided by the local government unit.

The municipality economic enterprise comprises the following: public cemetery located in the Barangay Sta. Ana with an approximate land area of 2 hectares, Tagoloan Community College (TCC) located in barangay Baluarte where the only tertiary school and the St. Paul hospital at Poblacion.

Manolo Fortich, Bukidnon

Major firms operating in Manolo Fortich are into production or processing of agricultural products such as pineapple, corn, cut flowers, coffee, rice and livestock. The major investment of REBISCO, a biscuit factory and Del Monte pineapple plantation also generate employment in the municipality. The bulk of investments by sector are paced by infrastructure & services –related from the initiatives of the local government ranging from livelihood programs, schools, electric power, water system and farm-to-market –roads. Canned and fresh fruit pineapple, cut flowers and ornamentals and high valued crops/vegetables are the exported commodities.
Farming is the main income source of 50% of the households while those employed account for 38% only. About 8% are engaged in business while 4% depend on retirement or remittances. Registered and non-registered enterprises classified were mostly micro and cottage enterprises accounting for 94.07% while small enterprises comprised 5.05%.

Based on **Table 3-353**, trading and servicing accounts to 80.99% of the total business activities in Manolo Fortich while 19.01% are into value-adding activities. Retail is the highest type of business, followed by eateries and restaurants.

Table 3-353. Business activities in Manolo Fortich (2012)

Type	Number	Percentage
Trading	25	19.23
Servicing	80	61.53
Manufacturing	6	3.07
Production	19	14.62
Total	**130**	**100.00**

Source: Manolo Fortich CLUP 2013-2022

Sumilao, Bukidnon

Located between two cities of Cagayan de Oro and Malaybalay, Sumilao slowly transformed its economy through mostly micro enterprises. Sumilao is an agricultural and industrial developing municipality. More than 85% of its population is dependent on agriculture while the rest are on commercial activities.

The entry of multi-national corporations dealing with plantation crops and livestock production contributed to rapid increase in population of the place. The existence of financial institutions, commercial establishments and its strategic location being along the Sayre National Highway and as the set of government has categorized barangay Kisolon as the center of trade and industry. Its accessibility and favorable feasibility for more investments would help fare its way towards a well-developed commercial center of the municipality. **Table 3-354** shows the total number of commercial establishments by type present in the municipality.

Table 3-354. Commercial establishments in Sumilao (2009)

Barangay	Type of establishment	Number
Kisolon	Sari-sari store	38
	Tailoring	2
	Meat and Fish Retail	14

Barangay	Type of establishment	Number
	Construction Materials/hardware	5
	Eatery/Carenderia	12
	Gasoline Station	3
	Dry Goods	5
	Motorcycle Spare parts Dealers	4
	Hospital	1
	Agricultural products	4
	Rice and Corn Mill	3
	General Merchandise	4
	Bakery	3
	Billiard Hall	2
	Vulcanizing shop	5
	Drugstore/Pharmacy	3
	Funeral Parlor	2
	Rural Bank	1
	Water Refilling	1
	Photo Center	1
	Cockpit Arena	1
Kulasi	Sari-sari Store	3
Licoan	Sari-sari Store	4
Lupiagan	Sari-sari Store	3
Ocasion	Sari-sari Store	3
Poblacion	Sari-sari Store	24
	General Merchandise	2
	Corn Mill	2
Puntian	Sari-sari Store	5
San Roque	Sari-sari Store	3
San Vicente	Sari-sari Store	8
	Eatery	1
	Agri-business	1
Vista Villa	Sari-sari Store	10
	Rice Mill	2
	Corn Mill	1

Source: Sumilao CLUP 2011-2020

Impasug-ong, Bukidnon

In the urban/urbanizing barangays, there are commercial areas allocated for commercial activities. In Barangay Poblacion, there is a total of 280,000 sq. m. commercial areas. This includes the Public Market, terminal, boarding houses, wholesalers, gasoline stations and funeral parlors, meat shops, bakeries, eateries and many others. In barangay Capitan Bayong, the 20,000 sq. m. allocated for commercial use cater gasoline stations, eatery and other commercial activities.

For the fast five years, there are 6 manufacturers located in the different barangays within the municipality. There are also 2 gasoline stations operating in the municipality, one is located in Purok 9, and the other in Crossing Mt. Kitanglad, both in Poblacion.

In 2018, 148 applied and were granted with business permits for the wholesaler and retailer trade/repair of motor vehicles and household goods. In 2017, there were 11 hotels and restaurants granted with business permit. In 2016, there is only 1 financial intermediator, but it increased to 2 the following year. There are several mining and quarrying in the municipality but in 2017 there were only 2 who possess the business permit and increased to 3 in 2018.

The Municipality has four existing dining facilities namely The Rodeo Drive Grill, Sakuro, Bhog's Restaurant and Catering Services, and Seven Sis Catering Services all located in Barangay Poblacion which caters the needs of the residents of the municipality in terms of dining activities.

There are also two tourist accommodating facilities in the municipality namely the Municipal Tree Park and Communal Ranch which have Cottages & Training Center that could cater Trainings and Seminars.

There are six industrial establishments in the Municipality of Impasugong – the A Brown Energy Resources and Development Inc. (ABERDI), the Impasugong Furniture Shop and Mini Sawmill at Poblacion, the San Miguel Foods, Inc. Impalutao and San Miguel Purefoods Hatchery located at Capitan Bayong. The Del Monte Philippines Inc. and the DOLE-Stanfilco are the manufacturer and wholesaler. Raw materials required by these industrial establishments are provided by the areas in all barangays of the municipality and other areas within Mindanao.

3.4.5.6.6 Banking and financial institutions

Cagayan de Oro city, Misamis Oriental

The banking sector registered a modest average rate of increase of 5.2% on a year-on-year basis, although it posted a negative growth from 2007 to 2008 with the economy not being exempt from the effects brought about by the economic slump during that year. The banking sector, however, immediately recovered on the following year of 2009 posting the biggest increase at 14%. This sector sustained substantial increases onwards between 4% - 5% to 2011 and accounts for about 4.3% to the total financing institutions (**Table 3-355**).

Table 3-355. Banking institution in Cagayan de Oro City (2007 - 2011)

Year	Number	Increase /(Decrease)	Growth rate
2007	88		
2008	86	-2	-2%
2009	98	12	14%
2010	102	4	4%
2011	107	5	5%

Source: Cagayan de Oro City CLUP 2013-2022

Malaybalay City, Bukidnon

The Malaybalay banking sector increased by 108% in the last five years from 2010 to 2014. There were 64 new banking establishments in 2010 which increased to 133 new banking establishments in 2014. This means that the banking institutions in Malaybalay increased by 23% from 2010 to 2011 but it also decreased by 13% from 2011 to 2012. The highest growth of the financial institutions in Malaybalay was in 2013 with 91% increase (**Table 3-356**).

Table 3-356. Banking institutions in Malaybalay City (2010 - 2014)

Year	Number	Increase / (Decrease)	Growth rate
2010	64		
2011	79	15	23%
2012	68	-11	-13 %
2013	130	62	91%
2014	133	3	2%

Source: Malaybalay CLUP 2016-2025

Tagoloan, Misamis Oriental

Tagoloan had 38 banking establishments in 2017 which are all located in Barangay Poblacion. This was an increase of 5.33% from 2013 to 2017. The banking sector in Tagoloan showed a growth from 3.33% increase from 2013 to 2014. There was a high growth from 2014 to 2015 at 9.67% (**Table 3-357**).

Table 3-357. Banking institution in Tagoloan (2013 - 2017)

Year	Number	Increase / (Decrease)	Growth rate

Year	Number	Increase / (Decrease)	Growth rate
2013	30	-	
2014	31	1	3.33%
2015	34	3	9.67%
2016	35	1	2.94%
2017	38	3	8.57%

Source: Tagoloan CLUP 2017-2027

Manolo Fortich, Bukidnon

The banking establishment of Manolo Fortich is booming with four banks. There are also several cooperative banks and financial companies in the municipality. **Table 3-358** shows that there are five banking companies, 13 cooperatives, and two financial companies.

Table 3-358. Banking and financial institutions in Manolo Fortich

Type	Name
Bank	Landbank of the Philippines
	BPI Direct BanKo Inc.
	Asian Hills Bank
	Rural Bank of Manolo Fortich
	Post Bank
Cooperative Bank	Bukidnon Cooperative Bank
	Bukidnon Community Cooperative
	Lunocan Agrarian Reform Beneficiary Primary Multipurpose Cooperative
	Bukidnon Vegetables Producers Multipurpose Cooperative Bank
	Central Manolo Single Motorist Multipurpose Cooperative
	Mindanao Consolidated Cooperative Bank
	DMPI Employees Agrarian Reform Beneficiaries Cooperative
	Mantibugao Small Farmers Multipurpose Cooperative
	Immaculate Conception Equity Development Multipurpose Cooperative
	Kisolon Multipurpose Dairy Cooperative
	Oro Integrated Cooperative
	First Community Cooperative
	North-South Alliance Multipurpose Cooperative
Financial Companies	Gleh Financial Solution
	Macondry Finance Corporation

Sumilao, Bukidnon

There are only three banks in Sumilao such as D' Asian Hills Bank, Western Union, and Rural Bank of Manolo Fortich. In addition, there are several cooperative banks in Sumilao and other financial institutions. Listed in the table below are the financial institutions in Sumilao. There are also 11 cooperative banks and two financial companies that offer loans (**Table 3-359**).

Table 3-359. Banking and financial institutions in Sumilao

Type	Name
Bank	D' Asian Hills Bank
	Western Union
	Rural Bank of Manolo Fortich
Cooperative Bank	Poblacion Sumilao Multipurpose Cooperative Bank
	Kamuty Farmers Multipurpose Cooperative Bank
	Kibenton Farmers Multipurpose Cooperative Bank
	Radiant Sumilao Agro-Industrial-Multipurpose Cooperative Bank
	First Agrarian Reform Multipurpose Cooperative Bank
	Bukidnon Community Cooperative Bank
	Sumilao Sons and Daughters of Veterans Credit Cooperative Bank

Type	Name
	Lunocan Agrarian Reform Beneficiary Primary Multipurpose Bank
	Bukidnon Vegetables Producers Multipurpose Cooperative Bank
	Ilignan Multipurpose Cooperative Bank
	Oro Integrated Cooperative Bank
Financial Companies	Hills Finance Corporation
	Macondry Finance Corporation

Impasug-ong, Bukidnon

Impasug-ong had two new banking establishments in 2018. This was an increase of 20% from 2014 to 2018 (**Table 3-360**). The banking sector in Impasug-ong showed a slow growth for the banking sector.

Table 3-360. Banking institution in Impasug-ong (2013 – 2017)

Year	Number	Increase/(Decrease)
2014	1	-
2015	1	1
2016	1	1
2017	2	2
2018	2	2

Source: Impasug-ong CLUP 2019-2028

3.4.5.6.7 Impact assessment on the generation of local benefits from the Project

Generation of local benefits from the project. The proposed Cagayan de Oro-Malaybalay Standard Highway Project (CMHP) is envisioned to enhance transportation needs and hasten the development of Northern Mindanao in general. The LGU needs additional highways and road considering the trend of urban growth and increasing population and new revenue sources to improve the delivery of basic services and infrastructures.

Enhancement of employment and livelihood opportunities. A new highway infrastructure could reallocate economic activity. It may attract economic activity resulting in gross positive economic effects to the geographic area where the new infrastructure is built. Studies have shown that public sector investments in transportation infrastructure result in long-term economic benefits, including increased output, productivity, and income (Bhatta and Drennan, 2003). The highway project can increase employment opportunities, such that the construction and post-maintenance of roads need to hire local residents, thus creating more employment opportunities.

Labor intensive construction and the use of local labor during the construction will increase benefits to the local community residents who are skilled and semi-skilled such as laborers, truck drivers, cleaning and food catering and the like. Indirectly, other sources of income in each project area will also increase like leasing of office spaces, houses, spaces for temporary facilities; operation of stores, food stalls, laundry shops and others.

Increased business opportunities and associated economic activities. A highway is an important infrastructure which can solve the problem of “difficult travel” and promote economic growth. The direct impact of the highway project is to drive the development of related industries such as the increase in the demand for local raw materials, machinery and other related industries in the process of road construction. In addition, the construction of a highway can accelerate the local industrial layout of the city/municipality to change around the development of roads and transportation. It increases the attractiveness of investment such as promoting the development of restaurants along highways and other service industries such as car repair and car washing, promoting tourism and farmhouses and other tourism industries, and driving slower development areas.

Increased revenue of LGUs. The people within the project area will directly benefit from the project in the following ways: reliable and fast travel leading to greater mobility of people and goods; improved access to markets for the farmers; and better access to wholesalers for the stores. The LGUs within the project area will experience increased population as more lands will be converted for residential development. The increase in business and associated economic activities as well as increased employment and livelihood opportunities will also result in increase in the revenue collection of the LGUs within the project area.

Child labor and school drop-out. Increased opportunities for the host community to sell goods and services to the incoming workers can lead to child labor to produce and deliver these goods and services, which in turn can lead to enhanced school dropout.

Local inflation of prices. Due to labor influx, the demand for goods and services may lead to local price hikes and/or crowding out of community consumers.

3.4.5.7 Traffic congestion

3.4.5.7.1 Methodology

Identification of critical movements

Critical movement is the lane that requires the most time to service its queue. Stations were established in residential areas, where six stations are situated in the national highway and the other four stations are located in barangay roads. The 10 identified critical movements are located in barangays as listed in **Table 3-361** and shown in **Figure 3-118.**

Table 3-361. Traffic count stations

Stn.	Location	Coordinates		Description	Date	Time
		Latitude	Longitude			
1	Brgy. Casinglot, Tagoloan	8°30'55.65"N	124°45'28.77"E	4-way lane, asphalt	April 23, 2021	10:30-22:30
2	Brgy. Mambatangan, Manolo Fortich	8°27'49.98"N	124°48'3.60"E	2-way lane, dirt road, junction	April 24, 2021	14:30-2:30
3	Brgy. Alae, Manolo Fortich	8°24'38.34"N	124°48'16.41"E	2-way lane, dirt road, junction	April 27, 2021	15:30-3:30
4	Brgy. Dicklum, Manolo Fortich	8°22'18.07"N	124°51'11.50"E	4-way lane asphalt, dirt road, concrete road, intersection	April 26, 2021	13:00 – 11:00
5	Brgy. San Roque, Sumilao	8°19'47.64"N	124°56'0.10"E	2-way lane, dirt road	April 30, 2021	10:30-22:30
6	Brgy. Poblacion, Impasug-ong	8°18'45.61"N	124°59'0.77"E	4-way lane, asphalt and concrete	April 28, 2021	6:00-18:00
7	Brgy. La Fortuna, Impasug-ong	8°15'57.05"N	124°59'48.38"E	2-way lane, dirt road	May 1, 2021	13:45-11:45
8	Brgy. Impalutao, Impasug-ong	8°13'59.97"N	125° 1'44.41"E	2-way lane, asphalt	May 3, 2021	9:20 – 21:20
9	Brgy. Patpat, Malaybalay	8°11'42.45"N	125° 3'12.10"E	2-way lane, asphalt	May 4, 2021	10:35 – 22:35
10	Brgy. Kalasungay, Malaybalay	8° 9'57.12"N	125° 6'48.86"E	2-way lane, asphalt, junction	May 5, 2021	13:30-11:30

Data Collection

Traffic data were gathered using 24-hour traffic survey in the ten stations located in the three municipalities of Bukidnon and one municipality of Misamis Oriental. All vehicles that passed by in different bounds were counted according to ten (10) classifications, namely, a) motorcycle/bicycle, b) tricycle, c) car/SUV, d) van, e) jeepneys, f) bus, g) truck, h) over-dimensioned truck, i) government vehicles, and j) others which more likely

consists of L300, multi-cabs and heavy equipment. The volume of traffic in each bound were enlisted in the traffic monitoring sheets by the traffic enumerators.

Trip Generation

Trip generation can predict the number of trips originating in or destined for a particular traffic analysis zone. Traffic flow focuses on both the number of vehicles and human factor or a general trip of people for traffic involves people and trips of vehicle. Passenger Car Equivalent (PCE) is used as a factor to express the number of cars needed to theoretically replace a non-passenger vehicle to simulate the same effect on a road or intersection. Assumed PCE is shown in **Table 3-362**. A trip is a one-way directional travel movement, which is composed of starting and ending points within the study area. Local Trip Generation Rates in person trips is located in **Table 3-363.**

Table 3-362. Assumed passenger car equivalent

Vehicle type	PCEF
Private cars/ van / SUV	1.2
Government vehicle	1.2
Delivery/elf trucks	1.5
Over-dimensioned trucks	2.0
Tricycle/motorcycle/bicycle	0.5
Municipal/provincial buses	2.2
Others	1.5

Source: ITE, 2001; Passenger Car Equivalent Factor

Table 3-363. Local trip generation rates (in person trips)

Land use	Trip production	Trip attraction	Units
Office	0.0027	0.0176	Trips/m2 of GFA
Commercial	0.0576	0.0735	Trips/m2 of GFA
Hotel	2.00	2.55	Trips/hotel room
Residential	2.42	1.52	Trips/dwelling unit
Mixed Use	0.0172	0.0243	Trips/m2 of GFA

Source: Asiaworld Transportation Planning Study, 1997

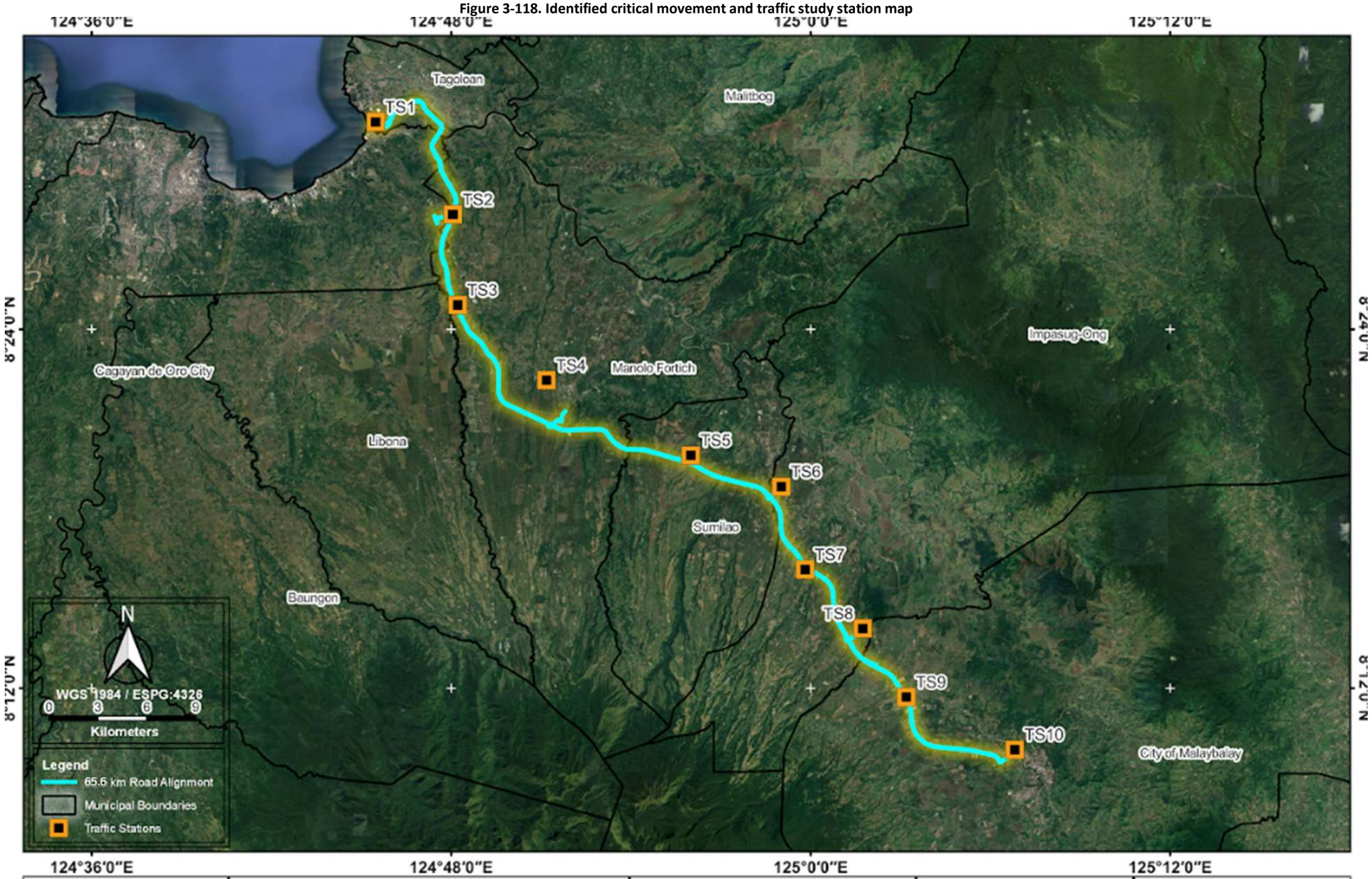
Trip rates show the number of traffic/people movements in and out of a development for a given trip rate parameter factor. Gross Leasable Area (GLA) and Gross Floor Area (GFA) are the factors used for computing the trip rates. Trip rates vary based on the type of development shown in **Table 3-364**.

Table 3-364. Trip rates for different development types

Category	Weekend	Weekday	Unit
Fine Dining Restaurant	0.1165	0.0447	Trips/ m^2 GFA
Office	0.0044	0.0164	Trips/ m^2 GFA
Shopping Center	0.0535	0.0257	Trips/ m^2 GFA
Fast Food	0.5872	0.3768	Trips/ m^2 GFA
Supermarket	0.1319	0.0794	Trips/ m^2 GFA

Source: ITE, 2001

Figure 3-118. Identified critical movement and traffic study station map



	Project Title	Source(s)of Information	Project Proponent	EIA Preparer
Traffic Stations	Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section) Misamis Oriental and Bukidnon, Region X	Google Earth Satellite (Basemap) PSA 2016 (Administrative Boundaries)		

3.4.5.7.2 Baseline traffic

Baseline traffic observation

Peak hour may vary from place to place, from time to time, and seasonally. Based on the observation, most of the study site doesn't have establishments, such as malls, supermarket, and school zone, that could attract travelers. Peak hour was identified by the greatest number of vehicles recorded in a period of time, most of the identified peak hour in the study stations doesn't create a congestion since the demand-supply of traffic network in the area is enough to sustain the volume of vehicle encompasses the study site.

Existing traffic current volumes

The current traffic conditions per stations were discussed in the following section. The summary of the existing and future traffic conditions is shown in **Table 3-365** and illustrated in **Appendix 43.**

Station 1 - Brgy. Casinglot, Tagoloan, Misamis Oriental

Station 1 is located in a residential area, 1.9 km away from the existing Sayre Highway, which is located at Brgy. Puerto, Cagayan De Oro, Misamis Oriental. The national highway is a 4-way lane asphalt road, 2 lanes each bound (West bound and East bound).

West Bound - The total number of vehicles during the 24-hr sampling at the west bound of Station 1 was 14,608 units. Out of this, the identified peak hour was during 16:30-17:30, which consisted of 1,197 units. At this time, a high volume of trucks passing by compared to other time interval. In the said peak hour, 32.16% of which is composed of trucks. It is followed by motorcycle / bicycle with 17.13%, tricycle with 16.71%, and car/SUV with 10.44%. Motorcycle/bicycle had the highest number recorded in the entire sampling period with a total of 3,966 units. Trucks followed it with 2,935 units, car/van with 2,813 units, and tricycle with 2,229 units, and the rest were recorded less than a thousand units (**Appendix 43**)

East Bound - As shown in **Appendix 43**, the total traffic count recorded was 19,806 units. Its peak hour was the same at the west bound, which was 16:30-17:30 PM. During peak hour, the volume of vehicles recorded was 1,483 units. Out of the total traffic count during the 24hr sampling, motorcycle/bicycle had the highest count with total units of 6,376. At said peak hour, motorcycle/bicycle were recorded 33.78 % out of the total, it is followed by car/SUV with 5,059 units (26.77%) and tricycle with 2,455 units (10.52%). Trucks, jeepneys, and over-dimensioned trucks were recorded over thousand units and the rest were recorded less than a thousand.

Station 2 - Brgy. Mambatangan, Manolo Fortich, Bukidnon

Only a few vehicles were recorded at Station 2 because it is a barangay road located 2.1 km away from the existing Sayre Highway. This area is a mix agricultural and residential zones in which no commercial establishments are present. The road condition in this station is a dirt road with single lane in each way bound. **Appendix 43** shows the existing traffic volume in Station 2.

North bound - The total recorded vehicles in the north bound of Station 2 was 221 units. In this station only motorcycles/bicycles, tricycles, cars/SUVs, vans, and trucks were observed during the whole sampling period. Out of the total, motorcycles/bicycles were the highest count with 204 units. The identified peak hour was during 11:30-12:30 where 24 units were recorded. At this time, motorcycle/bicycle consisted of the 91.67% of the total count during the peak hour. Tricycles and cars/SUVs consisted of the 4.17 %.

South bound - The total vehicles counted for south bound was 159 units with only 4 vehicle types recorded. Out of this, 153 units were recorded as motorcycle/bicycle and the other 3 vehicles were recorded with 2 units each. The identified peak hour in this way bound was 9:30-10:30 with 21 units. Most of the vehicles passing by during the peak hour was motorcycle/bicycle with 20 (95.24%) units.

East bound - The total number of vehicles recorded at the east bound of Station 2 was 223 units. The most numbered vehicle was motorcycle/bicycle with 211 units. The identified peak hour in this way bound was 18:30 to 19:30 with a total of 22 units. At this time, only 2 types of vehicles were recorded, 21 units (95.45%) of motorcycle and 1 unit (4.55%) of tricycle. The volume of motorcycle counted in this time was highest compared to the other time intervals.

West bound - Only three vehicle types were observed at the west bound of Station 2. Out of 31 units in total, 27 of which was motorcycle/bicycle. The identified peak hour in this way bound was 11:30 to 12:30 with a total of 5 (100%) units of vehicle passing by. In this way bound only few vehicles were recorded because it is heading to a privately owned farm.

Station 3 - Brgy. Alae, Manolo Fortich, Bukidnon
Station 3 is located 0.74 km away from Camp Philips Road. The road is a single lane dirt road located in a residential and agricultural area.

North bound - A total of 294 units were recorded at the north bound of Station 3. Out of the total count, 285 units of which were motorcycle/bicycle (**Appendix 43**). The identified peak hour was 6:30-7:30 with a total of 90 (100%) units. A high number of motorcycle/bicycles was recorded during peak hour because most of the people living in the area were off to work.

South bound - At the south bound, a total of 180 vehicles were recorded. Peak hour was identified at 17:30-18:30 with a total of 22 units. Motorcycles with 167 (92.78%) units, tricycles with 3 (1.67%) units, cars/SUVs with 1 (0.56%) unit, van with 1 (0.56%) unit, and trucks with 8 (4.44%) units were observed in this way bound with motorcycle/bicycle giving the highest number of units (**Appendix 43**).

West Bound –West bound had the same peak hour (17:30-18:30) with south bound but the number of vehicles at the west bound was higher with a total of 40 units. A total of 284 units were recorded at this way bound with motorcycle/bicycle giving the highest contribution in the traffic count with 265 (93.31%) units (**Appendix 43**).

Station 4 - Brgy. Dicklum, Manolo Fortich, Bukidnon

Station 4 is located in Sayre Highway around a residential area with intersection going to a farm and barangay proper. It is a 4-way asphalt road going to north and south bounds, while going to east (barangay proper) is concrete road, and in west bound (going to farm) is a dirt road. **Appendix 43** shows the current traffic volume in Station 4.

North Bound - A total of 8,879 units were recorded at the north bound of the 4th station. It was mostly consisting of motorcycles/bicycles with a total count of 4,028 (45.37%) units, followed by cars/SUVs with a total of 2,408 (27.12%) units. Peak hour was identified during 13:00-14:00 with a total of 756 units. At this time, motorcycles/bicycles were recorded the highest count with 394 (52.12%) units, followed by cars/SUVs with 190 (25.13%) units. The unit of motorcycle recorded within this time period was relatively higher compared to other time period.

South Bound - South Bound of Station 4 had fewer units of 7,299 vehicles than north bound. The number of motorcycles/bicycles that passed by this way bound was 2,717 (37.16%), the highest number compared to the other vehicle types. It is followed by cars/SUVs with a total of 2,144 (29.37%) units and trucks with 1,486 (20.36%) units. The identified peak hour was 13:00-14:00 PM with 637 recorded units. During this time period the volume of vehicle like tricycle, van, jeepney, bus, government vehicles, and over-dimensioned trucks were relatively higher compared to other time.

West Bound - The total number of vehicles recorded at the west bound of Station 4 was 300 units. Units were fewer at this way bound because it is heading to a farm. Most of the vehicles recorded at this way bound were motorcycles/bicycles with a total of 259 (86.33%) units. The identified peak hour in this way bound was 10:00-11:00 with a total unit of 51. In this time, most of farm workers are heading to the farm.

East Bound - A total of 368 units were recorded at east bound of Station 4. Out of this, 318 (86.41%) units were motorcycles/bicycles. East bound is going towards the barangay thus, fewer vehicles were observed compared to north and south bounds of national highway. The identified peak hour at the east bound was 17:00-18:00 with 62 units in total. Most of the workers at this time are heading towards the barangay proper where they live

Station 5 - Brgy. San Roque, Sumilao, Bukidnon

Station 5 is located in a distant community which is approximately 8.61 km away from the existing Sayre Highway. This community is surrounded by vast pineapple plantation far from civilization. The road condition on the said study area is a single lane dirt road in each way bound.

North bound - At the north bound of Station 5, only seven (7) types of vehicles were recorded. Out of the 262 total units recorded in the sampling duration, 233 (89.27%) units of which were motorcycle/bicycle units. It is followed by trucks with 18 (6.90%) units, cars/SUVs with 7 (2.68%) units, and 1 (0.38%) unit to each of the rest vehicle type observed. The identified peak hour was 17:30-18:30 with 24 units recorded. In the said peak hour, 22 (91.67%) units of which is motorcycle/bicycle, and 2 (8.33%) units were truck. Most of the farmers were observed to be going back to the community during this time (**Appendix 43**).

East bound - A total of 169 units of vehicles were recorded at the east bound of Station 5. Only three (3) types of vehicles were observed at this way bound namely motorcycle/bicycle, car/SUV, and truck. Out of this, 153 (90.53%) units were motorcycle/bicycle units. There were 9 (5.33%) units of trucks and 7 (4.14%) units of cars/SUVs that passed by. The peak hour was 16:30-17:30 with a total of 23 units. During this time most of the workers are going back to their houses after working in the farm (**Appendix 43**).

West bound - A total of 397 units were recorded at the west bound of Station 5 with seven (7) different types of vehicles observed. Motorcycle had the highest number recorded with a total of 355 units. In this way bound, the volume of vehicles recorded is higher compared to the other two way bound, because it's the road going to the nearest civilization in the area. The identified peak hour was 8:30-9:30 which a total of 48 units were recorded. Out of which, 41 (85.42%) units is motorcycle/bicycle and 7 (14.58%) units of trucks. During this time workers are heading to farm (**Appendix 43**).

Station 6 - Brgy. Poblacion, Impasug-ong, Bukidnon

Station 5 is located in Sayre Highway along a tree park and agricultural zone with patches of residential areas. The road condition is a four-lane asphalt, 2 lanes in each way bound.

North Bound –Out of the total vehicle count (5,990 units), motorcycle/bicycle had the highest number of 1,800 (30.05%) units recorded in the whole observation period. It is followed by car/SUV with 1,500 (25.04%) units and truck with 1,170 (19.53%) units. The identified peak hour at this way bound is 14:00-15:00 with 636 units. In the said peak hour, 175 (27.52%) of which is motorcycle/bicycle, followed by car/SUV with 165 (25.94%) units, and truck with 118 (18.55%) units (**Appendix 43**). Peak hour varies in this area since the area where it is located is a park and agricultural zone.

South Bound - At the south bound of Station 6, a total of 5,772 units were recorded in the whole sampling period. Out of this, 1,555 (27.18%) units of motorcycle/bicycle was recorded the highest, followed by car/SUV with 1,517 (26.51%) units. The other types of vehicles were recorded less than a thousand units. The

identified peak hour at this way bound was 14:00-15:00 PM. A total of 118 (27.63%) units of car/SUV and about 113 (26.46%) unit of motorcycle/bicycle were recorded during this time (**Appendix 43**).

Station 7 - Brgy. La Fortuna, Impasug-ong, Bukidnon

Station 7 is an agricultural area located at the foot of the mountain and is 0.72 km away from existing Sayre Highway. There is also a residential area at the side of the area. The road condition is a single lane dirt road in both directions.

North bound - The total number of vehicles recorded at the north bound of Station 7 was 318 units with six (6) vehicle types. Out of this, motorcycle recorded the highest number of 284 (89.31%) units and the other are less than a hundred. The identified peak hour at this way bound was 12:45-13:45 with a total unit of 38. At this time, a total of 35 (92.11%) units of motorcycle/bicycle and 3 (7.89%) units of car/SUV (**Appendix 43**). Most of locals living in the area were going down to the mountain at this time of observation.

South bound - Out of the 10 identified vehicle types, only five (5) were seen at the south bound of Station 7 with a total count of 302 units. Motorcycle/bicycle had the highest number of units recorded with a total of 279 (92.38%) units, other vehicle types had 9 (2.98%) units, truck with 6 (1.99%) units, tricycle with 5 (1.66%) units, and car/SUV with 3 (0.99%) units. The identified peak hour was 7:45-8:45 with 34 units. During this time, 33 (97.06%) of which is motorcycle/bicycle and 1 (2.94%) unit of truck (**Appendix 43**).

Station 8 - Brgy. Impalutao, Impasug-ong, Bukidnon

Station 8 is located along the Sayre Highway. It is situated in an agriculture and patches of residential area that are said to be informal settlers. The road condition in the area is a 2-way asphalt lane, 1 lane for each direction.

North bound - The total vehicle count recorded at the north bound of Station 8 was 6,014 which consisted of all the type of vehicle identified. Motorcycle/bicycle had the highest volume of vehicle recorded during the whole sampling period with 1,866 (31.03%) units. It is followed by car/SUV with 1,526 (25.37%) units recorded and truck with 1,043 (17.34%) units. The other vehicle types recorded were less than a thousand. The identified peak hour was 9:20-10:20 with a total unit of 733. Out of which, 256 (34.92%) units of motorcycle were recorded during this time. It is followed by car/SUV with 173 (23.60%) units, and the other were less than a hundred. The peak hour in this area may also vary since is located in an agricultural area (**Appendix 43**).

South bound - A total of 7,513 units were recorded at the south bound of Station 8 which was higher than north bound. Out of this, 2,320 (30.88%) motorcycle/bicycle units were recorded which the highest number of vehicles was. It is followed by car/SUV with 1,921 (25.57%) units recorded. The peak hour at this way bound was 15:20-16:20 with 771 units (**Appendix 43**). This peak hour may vary because it is located in a national highway in an agricultural zone.

Station 9 - Brgy. Patpat, Malaybalay, Bukidnon

Station 9 is located along the Sayre Highway in an agricultural and residential area. This area is located 1.19 km away from barangay proper. The road condition is a four-way asphalt lane, 2 lanes each direction.

North bound - The volume of vehicles recorded at the north bound of Station 9 was 5,539 units. A total of 2,031 (336.67%) units of motorcycle/bicycle was recorded which was the highest. It is followed by car/SUV with 1,434 (25.89%) units. The peak hour identified at this way bound was 10:35-11:35 with 594 units. It is composed of 107 (18.01%) units of motorcycle/bicycle, 4 (0.67%) units of tricycle, 95 (15.99%) units of car/SUV, 35 (5.89%) of van, 42 (7.07%) units of jeepney, 27 (4.55%) units of bus, 143 (24.07%) units of truck, 13 (2.19%) units of over-dimensioned truck, 12 (2.02%) units of government vehicle, and 116 (19.53%) units

of other vehicles. Peak hour in the area may vary since is it located in an agricultural zone which 1.19 km away from commercial establishments (**Appendix 43**).

South bound –Out of the 5,716 total units of vehicle recorded at the south bound of Station 9, 2,174 (38.03%) units were motorcycle/bicycle, the highest recorded during the whole sampling period. It was followed with car/SUV with 1,453 (25.42%) units recorded. The peak hour identified at this way bound was 16:35-17:35 with 456 units recorded (**Appendix 43**). Peak hour may also vary since the area is located in an agricultural area.

Station 10 - Brgy. Kalasungay, Malaybalay, Bukidnon

Station 10 is located in a residential area, 1 km away from Malaybalay town proper. The road condition in the area is single lane asphalt in each way bound.

North bound - A total of 8,828 units of vehicle was recorded at the north bound of Station 10 which consist of all types of vehicles. Motorcycle/bicycle had the highest volume of vehicles recorded during the whole sampling period with a total of 3,464 (39.24%) units. It is followed by car/SUV with a total of 1,959 (22.19%) units recorded. The peak hour identified at this way bound was 16:30-17:30 with 719 units recorded. During this hour, most of workers in town proper were going out. Out of this, a total of 343 (47.71%) units of motorcycle/bicycle were record, followed by 135 (18.78%) units of car/SUV, and 102 (14.19%) units of jeepneys (**Appendix 43**). The rest were less than a hundred units.

South bound - The volume of vehicle recorded in the south bound of station 10 was 8,730 units in total. The greatest number of vehicles recorded was motorcycle/bicycle with 3,665 (41.98%) units. It is followed by car/SUV with 1,823 (20.88%) units. The peak hour identified at this way bound was 16:30-17:30 with 677 units. During this time, workers are going out form their offices. A total of 308 (45.49%) units of motorcycle/bicycle were recorded, followed by 152 (22.45%) units of car/SUV.

West Bound- Out of the total 70 vehicles recorded, motorcycle/bicycle was the highest with 56 (80%) units during the whole sampling period. It is followed by truck with 10 (14.29%) units and jeepneys with 3 (4.29%) units. The identified peak hour in this way bound is 16:30-17:30 PM with 14 units consist of the 4 identified types of vehicles (**Appendix 43**). During this time, workers are going back from work.

3.4.5.7.3 Estimation of future traffic

Future traffic without the Project

Using the data from the traffic count, the traffic projection starting 2022 to 2040 was estimated in this section. As the number of occupants of the project increases, the projected traffic is further forecasted annually for the analysis of traffic. Person trips are converted to vehicle trips to determine the number of vehicle trips that will mix with the volume of vehicles computed without the Central Mindanao High Standard Highway. Computations of forecasted volume of vehicles were up to year 2040. The future traffic situation without and without the Project is shown in **Table 3-365** and **Appendix 43.**

Future traffic with the Project

The volume of traffic in Sayre Highway was assumed to decrease by 30% of its total traffic volume in the years of operation phase (2026) of the CMH project. The project is a high standard highway, which will be used as a connecting road from Tagoloan, Misamis Oriental to Malaybalay, Bukidnon. The alignment for this high standard highway is much safer and shorter compared to the existing Sayre Highway. **Table 3-365** and **Appendix 43** shows the traffic projection with the Project.

Table 3-365. Existing and future traffic projections at the traffic survey stations

Way bound	Total vehicle volume	Existing	Projections

		2021	2025	2030	2035	2040
Stn. 1 - Casinglot, Tagoloan						
Westbound	without the Project	14608	16200	18437	20982	23878
	with the Project		5531	6294	7163	7163
East bound	without the Project	19806	21965	24997	28448	32375
	with the Project		7499	8534	9712	9712
Stn. 2 - Mambatangan, Manolo Fortich						
North bound	without the Project	221	238	261	286	313
	with the Project		78	86	94	94
South bound	without the Project	159	171	188	206	225
	with the Project		56	62	68	68
Westbound	without the Project	31	33	37	40	44
	with the Project		11	12	13	13
East bound	without the Project	223	240	263	288	316
	with the Project			79	86	95
Stn. 3 - Alae, Manolo Fortich						
North bound	without the Project	294	316	347	380	416
	with the Project			104	114	125
Westbound	without the Project	284	306	335	367	402
	with the Project			100	110	121
South bound	without the Project	180	194	212	233	255
	with the Project			64	70	76
Stn. 4 - Dicklum, Manolo Fortich						
North bound	without the Project	8879	9555	10472	11477	12578
	with the Project			3141	3443	3774
South bound	without the Project	7299	9555	10472	11477	12578
	with the Project			3141	3443	3774
Westbound	without the Project	300	323	354	388	425
	with the Project			106	116	127
East bound	without the Project	368	396	434	476	521
	with the Project			130	143	156
Stn. 5 - San Roque, Sumilao						
North bound	without the Project	262	277	298	320	343
	with the Project			89	96	103
East bound	without the Project	169	179	192	206	221
	with the Project			58	62	66
Westbound	without the Project	397	420	451	484	520
	with the Project			135	145	156
Stn. 6 - Poblacion, Impasug-ong						
North bound	without the Project	5990	6433	7033	7689	8407
	with the Project			2110	2307	2522
South bound	without the Project	5722	6145	6719	7345	8031
	with the Project			2016	2204	2409
Stn. 7 - La Fortuna, Impasug-ong						
North bound	without the Project	318	342	373	408	446
	with the Project			112	122	134
South bound	without the Project	302	324	355	388	424
	with the Project			106	116	127
Stn. 8 - Impalutao, Impasug-ong						
North bound	without the Project	6014	6459	7061	7720	8441
	with the Project			2118	2316	2532
South bound	without the Project	7513	8069	8822	9645	10544
	with the Project			2646	2893	3163
Stn. 9 - Patpat, Malaybalay						
North bound	without the Project	5539	6124	6942	7869	8921
	with the Project			2083	2361	2676
South bound	without the Project	5716	6319	7164	8121	9206
	with the Project			2149	2436	2762
Stn. 9 - Kalasungay, Malaybalay						

Way bound	Total vehicle volume	Existing	Projections			
		2021	2025	2030	2035	2040
North bound	without the Project	8828	9760	11064	12542	14218
	with the Project			3319	3763	4265
South bound	without the Project	8730	9651	10941	12403	14060
	with the Project			3282	3721	4218
East bound	without the Project	70	77	88	99	113
	with the Project			26	30	34

3.4.5.7.4 Traffic analysis

Guidelines and standard requirements in Traffic Impact Assessment are provided in TIA Handbook by National Center for Transportation Studies (NCTS). TIA is conducted in order to address the traffic congestion. Parking space requirements must also be met according to standards administered by National Building Code. Should the project cause a decline in the level of service (LOS) or affect safety concerns, the developer is responsible for the funding of necessary countermeasures.

Road Capacity Analysis

Level of Service (LOS) is a mechanism used to distinguish how well a transportation facility are. Typically, six levels of service are defined and each is assigned a letter designation from A to F, with LOS A representing the best operating conditions, and LOS F the worst (**Table 3-366**).

The Level of Service of peak hour in the following study stations were presented in **Appendix 44.** Most of the identified critical movements in the study stations were classified as Class A to C Level of Service meaning the level of traffic condition is ranging from very light traffic to moderately light traffic. This indicates a free low traffic with low densities where drivers can maintain their desired speed with little or no delay and are unaffected by other vehicles (Class A&B). In Class C, speed remains near free flow speeds, but freedom to maneuver noticeably restricted. This classification was projected in stations 2, 3, 5, 6, 7, 8, 9, & 10 from 2021 to 2040. Class D to F would be projected level of service for Station 1 and Station 4 (north and south bounds). This class is ranging from moderately heavy to very heavy traffic in which speed begins to decline with increasing volume. Freedom to maneuver is further reduced and traffic stream has little space to absorb disruptions, also saturation traffic volumes, stop and go situations.

Table 3-366. Level of Service (LOS) criteria

VCR, V/C	Description	Traffic condition	LOS Rating
0 – 0.20	Free flow, Low Volume and Densities; Drivers can maintain their can maintain their desired speeds with little or no delay and are unaffected by other vehicles.	Very Light	A
0.21 – 0.50	Reasonably free flow, operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speeds.	Light	B
0.51 – 0.70	Speeds remain near free flow speeds, but freedom to maneuver noticeably restricted.	Moderate	C
0.71 – 0.85	Speeds begin to decline with increasing volume. Freedom to maneuver is further reduced and traffic stream has little space to absorb disruptions.	Moderately Heavy	D
0.86 – 1.00	Unstable flow, with volume at or near capacity. Freedom to maneuver is extremely limited and level of comfort afforded the driver is poor. Heavy Traffic	Heavy	E
> 1.00	Saturation traffic volumes, stop and go situations	Very Heavy	F

NOTE: VCR – Volume to Capacity Ratio, VC – Volume to Capacity

3.4.5.7.5 Impact of traffic congestion

Construction - Activities such as clearing operation could create a slight traffic congestion in the areas where heavy equipment will be transported. Transport of construction materials to the Project site and travel to/from project site by construction workers and other personnel will generate additional traffic load on the existing road network near and within the Project site. During construction, in the worst-case scenario, where it is assumed that excavation trucks, concrete mixers, trucks for materials will be arriving, vehicles will operate at the same time, but impacts are expected to be minimal and still under control.

Operation – The Project will positively affect the existing Sayre highway during operational phase by decreasing the possible travelers that will be using the Sayre highway. CMH provides move safe and fast travel from Tagoloan, Misamis Oriental to Malaybalay, Bukidnon and to the municipalities/cities between these two locations.

3.4.6 Mitigating measures

3.4.6.1 Displacement of settler/s

Land Valuation

Pre-construction phase **-** As a mitigating measure, the driver and farmer organizations and local officials must be vigilant to ensure that land sales within the service area are restricted to drive away or discourage the speculators and opportunists.

Relocation of displaced settlers

Pre-construction phase - There is a need to formulate a resettlement plan framework and implementation or action plan for the affected families (Afs) through a participatory process, especially that they belong to a vulnerable sector as poor people. The absence of formal legal title to land should not be a bar to due compensation. The scheme relocation of Afs must foremost gain the full information and tacit approval of the Afs concerned and must be preceded by a social preparation to build their capacity to deal with the situation. The compensation scheme must be mutually acceptable to the Afs and DPWH. Foremost, the provisions of the Philippine Constitution, RA 7279 or 1992 Urban Development and Housing Act (UDHA), Japan International Cooperation Agency (JICA) guidelines for environmental and social consideration the Asian Development Bank (ADB) involuntary resettlement policy must be implemented. The resettlement plan to be formulated must be guided by the following 3 elements:

- compensation for lost assets and loss of livelihood and income
- assistance for relocation including provision of relocation sites with appropriate families and services;
- assistance for rehabilitation to achieve at least the same level of well-being with the project as without it

In addition, according to Lohani, et al. (1997), there is a need to incorporate the following: basic information on the impact of land acquisition and losses to potentially affected families and clear definition of eligibility and entitlement considerations, description of resettlement site development and income restoration programs, institutional and capacity building and training, a realistic budget for land acquisition and resettlement costs and funding allocation sources; and monitoring and evaluation system. It is also important that in the organizational framework of the resettlement plan, the following are included: a grievance/redress committee, cooperating agencies and institutions (GA, LGU, NGO, PO, and Business), livelihood association, and community action group. The latter must have such committees as demolition/relocation/transfer, grievance/complaint, monitoring, environmental protection unit, and monitoring and evaluation (ADB Policy, 1998).

The Japan International Cooperation Agency (JICA) has established comprehensive guidelines addressing environmental and social considerations related to the displacement of settlers for highway projects. These guidelines aim to ensure that such projects are conducted with utmost sensitivity and responsibility towards affected communities. The key aspects of these guidelines generally cover:

- Community Engagement: Encouraging meaningful consultation and participation of affected communities throughout the project lifecycle. This involves informing them about the project, listening to their concerns, and involving them in decision-making processes.

- Social Impact Assessment (SIA): Conducting thorough assessments to identify potential impacts on affected communities, including the displacement of settlers. This involves evaluating social, economic, and cultural factors to mitigate negative consequences.

- Resettlement Planning: Developing comprehensive plans for resettling affected settlers, ensuring adequate compensation, livelihood restoration, and access to essential services such as education, healthcare, and infrastructure.

- Environmental Protection: Implementing measures to minimize environmental impact, preserve natural resources, and prevent any adverse effects on ecosystems caused by the project.

- Capacity Building and Empowerment: Supporting affected communities by enhancing their skills, providing training opportunities, and facilitating their active participation in the project's planning and execution.

- Monitoring and Evaluation: Establishing mechanisms to monitor the project's impact on displaced settlers and the environment, ensuring compliance with guidelines and making necessary adjustments as required.

JICA's guidelines emphasize a holistic approach that considers not only the physical displacement of settlers, but also their socio-economic well-being and the preservation of the environment. These guidelines aim to mitigate potential negative effects on affected communities while fostering sustainable development in the regions where the highway projects are implemented.

Moreover, the Afs may choose to receive actual cash for the family and to decide where to build their residence or to live in the site to be offered by the company. The resettlement area provided by the project holder must have complete provisions for light and water, and health center equipped with medicines and medical staff. The location must also be in proximity to the local schools.

For farmers and other stakeholders whose lands and plants/trees are affected by the highway construction, the principle of equity must be invoked. This means all lands, plants; house and other improvements must be valued and credited as equity. Compensation must be based on mutually agreed or acceptable packages. Equity may also be based on value of labor and materials used.

Some of the areas affected by the project have identified sites for resettlement. For Cagayan de Oro City, there are five resettlement sites identified in relation to Typhoon Sendong victims. These are located in Barangay Canitoan, Camamanan and Indahag. The LGU has already prepared the sites for relocation of the Typhoon Sendong victims and currently there are 500 units turned over to the qualified Sendong victims.

These relocation sites can also be used for Cagayan de Oro relocates of the Central Mindanao High Standard Highway Project.

In Tagoloan, the resettlement areas of PHIVIDEC based on the report declared a total of 82.7 hectares and have developed a total of 28.7 hectares. These resettlement areas are as follows: Sta. Ana Village with declared area of 60 hectares but only 6 hectares developed at sta. Ana, Mohon Relocation with 2.0 hectares declared and developed, Sta. Cruz Re-location with 3.0 hectares declared and developed, Sto. Niño, Baluarte Relocation with 12.0 hectares declared and developed, Gracia Relocation with 1.8 hectares declared and developed, and Villa San Juan, Casinglot Relocation with 3.9 hectares declared and developed. According to the reports there are 2,733 lots awarded to the relocates. In line with this, the Afs of Central Mindanao High Standard Highway Project may look at the resettlement sites identified by PHIVIDEC in coordination with the Tagoloan LGU.

Impasug-ong has also identified Purok 3, Poblacion called the Impasug-ong Village Sites and Services (IVSS) intended for the resettlement of the households living in hazardous areas like river easements and the like. It has 118 units in a 2.5353 hectare-lot purchased for resettlement by the Provincial Government. At present 108 units are being occupied.

Right-of-Way and compensation for land and land improvements

Pre-construction phase - To minimize conflict, a series of genuine consultations must be conducted to ensure participation of all the stakeholders and eventually formulate and establish a mutually agreed just scheme. Resettlement Action Plan is currently on-going of which the land and property owners that will be affected by the Project were informed and consulted. The Journal of Assessment Transactions on Market and Assessed Land Values from the municipal assessor's office must be reviewed by a competent technical committee to ensure that the land value is fair enough and secure RROW prior to construction.

In the case of Del Monte and the ancestral domain lands, this must be resolved by creating a Task Force for this matter to include IP leaders/representatives. There is a need to ensure that all issues and concerns of the landowners and Del Monte will be resolved through negotiation.

3.4.6.2 In-migration (proliferation of informal settlers)

In-migration: labor demand and entry of migrant workers

Construction phase - Local hiring should be prioritized and should be adopted as a policy provided the applicant residents are qualified for the position. Should there be highly technical staff required for certain positions, this should be spelled out in the guidelines for hiring. Job opportunities should be advertised through local media to discourage project "followers" from loitering and/or settling around the project site in hope of job opportunities. Coordination with the local Public Employment Service Office (PESO) is also important to recruit local residents with the right skills. Skills enhancement should be provided to local skilled labor when necessary to ensure their being taken in. Migrant workers, meanwhile, must be oriented on the culture and ways of living in the city/municipality to ensure harmonious relationships between them and local labor.

Proliferation of informal settlers or "followers".

Pre-construction phase - Countering the negative aspects of informal settlements requires the local government, DPWH and the contracting company to recognize the challenges faced by the residents and actively engage them in consultations. Those already formed informal settlements in the cities and municipalities need to be regulated. Key drivers for action by the LGU and concerned government agencies include: recognition of informal settlement and human rights; government leadership in implementing appropriate policies for infrastructure development; systemic and city/municipality wide/at scale approaches that work best with the location; integration of people and systems; provision of affordable and adequate

housing; and developing a participatory, standardized and computerized data collection system for informal settlers.

It is necessary to prepare and implement an Informal Settler Monitoring Plan (ISMP), monitor arrival of informal dwellers within the Project area as well as to prioritize local hiring in order to mitigate the in-migration and proliferation of informal settlers.

Increased pressure on accommodation and rents.

Construction phase - To deal with the challenge of affordable housing, cities and municipalities can explore avenues to repurpose vacant space, apartments or underutilized buildings in the city/municipality for temporary or long-term use for housing migrants or informal settlers. Coordination with NGOs involved in housing programs can also be done for help in deploying a solution. In addition, the LGU can look upon housing as a human right and explore the housing challenge from that perspective. The city or municipality's administrative capacity to manage its housing stock and the services that accompany effective housing developments requires support from multiple stakeholders in the community. The company can also establish a workers' camp with facilities and support staff sufficient for the needs of the workers and subcontractors. This should be included in the contract of funding for the establishment of the worker's camp.

3.4.6.3 Cultural/Lifestyle change

Pre-Construction phase - If inevitably the IPs are affected persons with their lands, plants/trees and houses process should be applied for proper documentation in close coordination with NCIP and their authentic tribal leaders. In the process, a MOA will be coached in a language that they understand and duly agreed upon outlining payment and other forms of compensation for the affected lands, plants/trees, houses and the like. Finally, the Certification Precondition (CP) will be issued after the finalization of Resolution of Consent.

Documentation of customary laws helps preserve their traditions and indigenous knowledge system. This can be done in a participatory method together with the trained and capable locals. This can be carried out with pertinent government agencies and academic institutions. Proper orientation of migrant workers on culture oriented on the culture and ways of living in the city/municipality must also needed to be conducted.

Creation of opportunities for the IPs of various barangay/municipalities to address their most basic assets that will encourage and enhance growth and development within their ancestral domains in order to address their most basic needs. This necessitates capability enhancement training and most importantly alternative livelihood projects that are culture and gender sensitive. Provision of scholarships for youth is also important.

3.4.6.4 Impacts on physical cultural resources.

Pre-construction phase - The identified cultural/historical resources in both Cagayan de Oro and Malaybalay City are not located within the covered project site. Thus, there is no significant impact.

3.4.6.5 Threat to delivery of basic services /resource competition

Threat to delivery of basic services /resource competition

Construction phase - Migration affects the demands on the infrastructure and services in the place of destination. Shifts in demand occur in housing, childcare, power generation, shops, roads, amusement parks, schools, public transport, police, telephones and employment, among others. Inadequacies in the city/municipality's infrastructure and services add to the pressure. The rapid population growth results in migrants having to cope with insufficient infrastructure and cities/municipalities having to manage the lack of planning to meet the needs of all people.

The demand for utilities, such as water, energy and telecommunications, can be put under severe pressure, with those at the lowest income levels suffering disproportionately from a lack of access. The situation gets worse when migrants reside in the same neighborhood as low-income residents already accessing the scarce resources.

With regards to this, it is necessary to provide and implement an Informal Settler Monitoring Plan and conduct a proper coordination between DPWH/contractor with the host LGUs regarding needs of the migrants and residents of the community.

Increased demand on water resources

Construction phase - The affected cities and municipalities have identified various water sources that can be developed to provide for the water supply needs of the community. Coordination with the contractor and the LGU is necessary to increase the water supply to cater to the needs of the migrants and the residents of the community. The contractor can consider recycling of water and the use of rainwater where it is feasible. Proper water management is also essential to ensure sustainability of the water sources of the communities affected by the project. In addition, the LGUs and the contractor can create awareness among residents about saving water (which could reduce the overall cost of water to residents, including migrant workers and the contractor).

Increased demand on power supply

Construction phase - Energy policies of cities and municipalities affected by the project should include assessment of the power supply needs of the potential migrant workers and their families, as well as the construction power supply needs based on the duration of the project. Alternative sources could be provision of solar powered equipment and diesel generators.

Increased demand on Communication Technologies

Construction phase - The country is suffering from slow internet connection which is being addressed by new telecommunication companies. This slow internet connection poses a problem for the workers, students and professionals who use ICT. Thus, there is a proliferation of internet cafes and *piso*-net in the locality. Additionally, the LGUs and the contractor can provide assistance through telecommunications technologies, including through access to the internet (e.g., Wi-Fi hotspots, charging facilities for electronic devices and navigation systems across the city or municipality) for the tech-savvy population.

Peace and order/ safety and security

Construction phase - Some measures that can be integrated in the community includes training and knowledge of precautionary measures to be implemented based on the type of threat. This can be included in the orientation of workers, students, parents and the community at large. It is important to create awareness among residents to help counteract and adequately respond to safety and security.

Increased demand for education facilities

Construction phase - Some cities/municipalities can have specific plans that focus on education to integrate migrants. Other affected cities/municipalities can adapt their strategies to respond to migrants' educational needs. Cities/municipalities and the contractor can coordinate between different stakeholders (e.g., independent training institutions, government agencies, private schools, universities), which interact at the local level but often do not cooperate sufficiently if city/municipal administrations are not involved. Partnerships with national/local and private sector to identify the most appropriate investments in building infrastructure, including academic institutions, innovation centers, industrial parks, and cultural and healthcare institutions; this would include exploring innovative or unconventional methods of providing education to migrants, residents and their children, who otherwise have no access to education.

Increased use of recreational facilities/sports facilities

Construction phase - The contractors may provide recreational and sports facilities near the housing settlements for their migrant workers in order to prevent conflict in the use of the facilities in the city/municipality. However, the affected cities and municipalities have numerous natural and human-made tourist attractions that can cater to a number of visitors.

Food security.

Construction phase - The need to produce more food and to distribute it better is a means to address malnutrition mindful of various social, religious, and cultural functions of food. To address food insecurity in terms of available food supply, sustainable productive farming systems and well managed natural resources should be in place. Improving access requires better market access or better transport for the poor and lowly to generate more income from cash crops, livestock products and other productive enterprises. At the core of food security is access to healthy food and optimal nutrition for all.

3.4.6.6 Threat to public health and safety

Increased risk of communicable diseases and burden on local health services

Construction phase - To mitigate the risks, there is a need to develop tools and solutions that help assess the equity of healthcare in the city/municipality, ensure adequate health planning and help policymakers establish health services that cater equally to the migrant population. In addition, planning is needed on how to make universal healthcare truly inclusive and effective, so that all city's/municipality's residents, including migrants, have access to financial coverage for a wide and adequate range of healthcare services. Proper coordination with local law enforcement must also be conducted.

In regard to communicable diseases, the contractor can vaccinate its workers against common and locally preventable disease, as well as COVID-19 vaccination. Information campaigns about HIV/AIDS and STDs among workers and local residents can also be conducted. The contractor can also establish a health center at the camp and construction sites with free testing facilities for COVID-19 and other communicable diseases. The health center should also provide free condoms and other contraceptives.

Additionally, the contractor can recruit an environmental, health, and safety manager (EHSM) to address health concerns in the work sites and liaise/work with the nearby communities and formulate occupational Health and Safety Protocols and Grievance Redress Mechanisms during construction and operation phases. Workers should also be equipped with personal protection equipment, such as safety boots, helmets, gloves, protective clothing, goggles, and ear protection; provision of clean drinking water to all workers; and adequate protection to the general public, including safety barriers and marking of hazardous areas.

Weather-sensitive diseases and impact aggravation as a result of climate change as projected by PAGASA

Construction phase - Strengthening of public health services needs to be a central component of adaptation to climate change. An effective response will require actions from across society: from individuals, the health sector, and community and political leaders. A fair and effective response will require a sharing of responsibilities between the populations that make the greatest contribution to climate change and those that are most vulnerable to its effects, in order to safeguard and enhance public health security.

Carefully planned climate change mitigation policies bring direct health benefits (WHO, 2009). For example, well-designed transport systems can reduce greenhouse gas emissions, while simultaneously reducing the major health impacts of air pollution and physical inactivity, which kill millions each year. Housing with efficient insulation can cut energy consumption and associated greenhouse gas emissions and reduce deaths from heat.

The contractor can also provide adequate drainage throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form; and septic tank and garbage box will be set up in construction site, which will be periodically cleared by the contractors to prevent outbreak of diseases.

Environmental Health and Sanitation.

Construction phase - To mitigate the pollution generated by the growing population, LGUs and the contractor can develop sanitation systems to handle waste generated from all forms of settlements, including slums and camps. In addition, the LGUs and the contractor can source solutions from the private sector, innovators and other external stakeholders to create awareness of safe waste disposal and better hygiene.

3.4.6.7 Generation of local benefits from the project

Generation of Local Benefits from the project

Operation phase - The proposed Project is envisioned to enhance transportation needs and hasten the development of Northern Mindanao in general. The LGU needs additional highways and road considering the trend of urban growth and increasing population and new revenue sources to improve the delivery of basic services and infrastructures.

Enhancement of employment and livelihood opportunities

Pre-construction, Construction and Operation phase - To enhance the employment and livelihood opportunities in the cities and municipalities where the project is located, there must be policies and resources to address the challenges. Since most of the economies show that agriculture continues to be the biggest source of employment in Bukidnon, there is a risk because of the lack of financial instruments like insurance to weather the shocks. Whether for livelihood or subsistence, most families are forced to supplement their farming income with other sources. Women can also try to expand into non-farm and off-farm opportunities to augment their household income. But they need information and guidance on setting up business and how to get or use credit. Even with a steady growth in formal sources of credit like through microfinance and networks, people typically do not have easy access to mentors who can guide them to use the credit effectively.

The Central Mindanao High Standard Highway Project may allow some of the residents to work in the construction to grow their incomes. This can be done through the conduct skills training at the host LGUs and prepare a local employment plan and prioritize hiring of qualified residents from the host barangays.

- Conduct skills training at the host LGUs
- Prepare a Local Employment Plan (LEP)
- Prioritize hiring of qualified residents from the host barangays
- Enhance the opportunity for new businesses and innovation
- Implement the Local Employment Plan
- Purchase supplies from local sources
- Provide livelihood opportunities if possible
- Prompt payment of taxes and other legal fees

Increased business opportunities and associated economic activities.

Construction and Operation phase - The construction of the Central Mindanao High Standard Highway Project can fuel entrepreneurship and innovation for economic growth. New businesses can create jobs, strengthen market competition, and increase productivity. Thus, the LGU can enhance the opportunity for new businesses and innovation by offering policies that nurture the growth of business. This may include stronger open trade policies that encourage growth and transform the market; make it easier to obtain permits; and reduced approval costs. Reduction in trade-related administrative costs helps strengthen business environment and reduce the costs of doing business in the city/municipality. The Project will enhance the

business opportunities during its constructions through the purchasing of supplies from local sources. Support from government and private financial agencies can also be tapped for 'start-up' businesses.

Although new road alignment has many long-term benefits to a community, they can pose serious challenges especially on the business owner and employee, who operate the business along the existing road. The new road can disrupt patrons' accessibility to businesses, and produce negative impacts on sales revenues especially if the main customers of existing roadside business are travelers or drivers. However, there is no significant negative impact on the business establishments along Sayre Highway since it was assumed that their customers are also within their vicinity or municipality as most of them are traveled by foot or motorcycle. The usual destination of the respondents when using Sayre is within the municipality also indicating that most of their destination is within their vicinity.

Increased revenue of LGUs

Operation phase - Local government units (LGUs) derive their revenues from local and external sources. Local sources include tax revenues from the real property tax and the business tax, and non-tax revenues from fees and charges, receipts from government business operations and proceeds from sale of assets. With the increase in the number of business and other associated economic activities created by the new highway construction project, the LGUs need a better revenue-generation capability. LGUs can boost their revenue-generation capabilities by adopting new digital tools and bolstering institutional development and policy support for property valuation. These tools are important for accurate and transparent reporting and updating of property valuation assessments and tax maps.

Child labor and school drop-out

Construction phase **-** The contractor and LGUs should ensure that children and minors are not employed directly or indirectly in the project. The LGUs through the local PESO and the contractor should clarify the hiring criteria such as minimum age and the applicable laws with regards to child labor.

Local inflation of prices

Operation phase - To mitigate for inflation of prices, an appropriate mix of locally and non-locally procured goods that will allow the local market to benefit while reducing the risk of crowding out and price hikes for local consumers could be done. The LGUs can also monitor the local prices and the security of supply in the market.

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CHAPTER 4 - ENVIRONMENTAL MANAGEMENT PLAN

The **Environmental Management Plan** (EMP) is an environmental management tool to ensure that undue or reasonably avoidable adverse impacts of the pre-construction, construction, operation, and decommissioning of a project are prevented; and that the positive benefits of the projects are enhanced [1]. It is also described as how an action might impact the natural environment where it occurs and set out clear commitments from the person taking the action on how those impacts will be avoided, minimized, and managed so that they are environmentally acceptable [2].

The EMP provides a general guide for managing adverse and enhancing beneficial impacts. It includes options for mitigation or enhancement, implementer, costs, and arrangement to guarantee implementation for the potential impacts during the pre-construction, construction, operation, and abandonment phases of the Project.

The Impact Management Plan template in **Annex 2-17 of the DAO 2003-30 Revised Procedural Manual** was used to craft the EMP of the Project during the pre-construction, construction, operation, and abandonment phases. The indicative costs were assumed to be part of the Project costs in Section 1.9 of the Project Description because it is difficult to assign accurate costs for specific activities at this time.

Although the potential impacts during the Pre-Construction stage are not expected because site development activities have not started, formulating the recommended plans and guidelines in Table 4-1 is due diligence on the part of DPWH and the Contractor(s) to address the anticipated adverse impacts during the Construction and Operation phases. Crafting these during when the construction and operation phases have started is already late because the adverse impacts are already occurring and there will not be time to review and fine-tune the plans and guidelines.

The Construction Plan was also included in the mitigation measures because adverse impacts are likely to be minimized by its strict implementation. A Construction Plan is a set of documents that defines the activities, resources, schedule, and budget during the construction phase. It is a result of the construction planning process and includes the following:

a) A written document that defines the methodologies and approach
b) Blueprints, computer aided designs, photographs, and other images that illustrate the design
c) A work breakdown structure that identifies all the activities that make up the project
d) A construction project schedule that organizes all the project activities on a timeline
e) The construction project participants and stakeholders such as contractors, sponsors, crews, etc.

The strict implementation of the Construction Plan will have a significant contribution in reducing impact intensity and magnitude in addition to specific measures because it defines the Project construction requirements mentioned earlier and considered the results and recommendations the additional site studies conducted.

Abandonment of the Project, i.e., closing of the CMH to public traffic, dismantling of structures, etc., is not expected. In the remote event of abandonment, however, the chapter on decommissioning/abandonment

[1] Lochner, P. 2005. Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town
[2] Environmental Management Plan Guidelines, Commonwealth of Australia, 2014.

will guide the DPWH to address the impacts associated with closing the CMH. It is recommended that the DPWH submits a detailed Abandonment Plan to EMB Central Office one year before the actual abandonment of the CMH.

Table 4-1. Impact Management Plan[1]

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
Pre-Construction: Preparation of sub-studies, architectural and engineering design, procurement of permits and clearances, consultations, etc., and clearing of RROW					
LAND					
1	Land use and classification	Compatibility with existing land use	- Confirm classification of the Project area to the zoning regulation of host cities and municipalities	DPWH	Consultancy fees: 250,000
2		Compatibility with classification as an Environmentally Critical Area (ECA)	- Include susceptibility of the Project area to natural hazards in the Detailed Engineering Design (DED)	Design contractor, DPWH	Consultancy fees: 250,000
3		Existing land tenure issue/s	- Conduct parcellary survey - Secure documents showing authority to develop the Project RROW	DPWH	Part of RAP costs
5		Devaluation of land value because of improper solid waste management and other related impacts	- Identify the final disposal site for solid waste, excavated soil, and hazard waste at each LGU	DPWH	Design & consultancy fees: 300,000
6	Geology	Change in sub-surface geology/underground conditions	- Conduct of factual Geological mapping with focus on the following: geology, geomorphology, geohazards, areas that may be prone to settlement or subsidence. - The outcome of the map are the following Site specific semi-detailed to detailed interpretative factual geological maps with presentation of the base filed information focusing on the following: a. rock type/s variation, the types and density of rock fracturing and geological structures such as faults, joints, etc.; the degree and extent of weathering, morphology and slopes.	Design Contractor, DPWH	Part of design costs-Php 1,000,000

[1] Potential Impact column denotes ADVERSE impact unless specified.

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			b. Identified geohazards to be reflected / included in the interpretative factual geological map.		
7		Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	- Conduct of Engineering Geological and Geohazard Assessment (EGGA) and factual geological mapping focusing on geology, geomorphology, and geohazards. EGGA - Through the conduct of an EGGA, areas that are prone / susceptible to geological hazards such as seismic related hazards (earthquake-induced landslide, ground acceleration, subsidence, etc.) and hydrometeorological hazards (rain-induced landslide, rock fall	Design Contractor, DPWH	Part of design costs-Php 500,000
8		Effects of geohazards to the Project	- Conduct of EGGA	Design Contractor, DPWH	Part of design cost including above
9	Pedology	Soil erosion / Loss of topsoil/overburden	- Formulate a Soil Erosion Management Plan (SEMP) that includes among others minimized cut and fill operations to minimize the modified area to prevent soil erosion of new surface soil due to cut and filling - Ensure the slope protection after cut and filling as soon as possible - to establish the adequate drainage in the construction area	Design Contractor, DPWH	Part of design costs
10		Change in soil quality/fertility	- Identify staging areas. Staging areas is the designated area where supplies and construction equipment are positioned for access to a construction site. - Include a buffer zone during construction and operations. Buffer zones - identified zones are areas outside the boundaries of and immediately adjacent to designated protected areas	Design Contractor, DPWH	Part of design costs
11	Terrestrial ecology	Impacts on terrestrial flora and fauna	- To study the design for minimizing of removing existing vegetation - Validate or conduct a updated flora - Consider the locations of significant flora and fauna during	Design Contractor, DPWH	Part of pre-construction costs - 600,000

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			Project design. If possible, avoid removal of trees along the RROW and include them in the visual design. If not possible, trees will be balled and planted in areas that will not be affected by the project;		
PEOPLE					
12	Displacement	- Displacement of settler/s - Displacement / disturbance of properties - Change/conflict in land ownership	- Authority document over RROW - Conduct census of properties and land affected by the staging areas and RROW - Undergo the FPIC process as prescribed under RA 8371.	DPWH coordinate with NCIP	Part of RAP costs
13	Public Access	- Change/conflict Right of way - Impact on Public Access	- Conduct consultations with the stakeholders and formulate mutually agreed schemes - Review Journal of Assessment Transactions on Market and Assessed Land Values to ensure fair compensation	Community Relations Officer of DPWH	Part of RAP costs
14	Public Involvement	- Informed/empower the public to participate in the decision making process - Threat to public health and safety	- Informed/empower the public to participate in the decision making process -Prepare the following: ・Operation Waste Management Plan (OWMP) (P) : ・Regular maintenance of highway to reduce visual impact due to expected wear and tear. ・Implementation of best housekeeping practices and continue the regularly disposed through LGU garbage collectors.	DPWH	Conduct of IEC and public consultations: 600,000
Construction: Site preparation, installation of structures, temporary ancillary elements					
LAND					
1	Land use and classification	Change/Disturbance in land use pattern due to road construction & ancillary facilities	- Scheduling heavy construction works during the daytime - Construction activities that necessitate utilizing portion of the road/street should be undertaken upon permission by the LGU Traffic management team and outside of traffic rush hours;	DPWH, Contractor, Traffic Management	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			- Construction activities should not be a hindrance to the operations in neighboring area.	Unit of the LGUs	
2		Impairment of visual aesthetics	- To mitigate the changes in visual aesthetics, it is imperative to implement plans such as the establishment of vegetation buffer zones within the Right-of-Way (ROW) vacant areas. - Maintain the construction site/ yards tidy and clean and rehabilitate after construction.	DPWH, Contractor	Part of construction costs
3		Devaluation of land value as a result of improper solid waste management	- Maintain the construction site/ yards tidy and clean and rehabilitate after construction. - Temporary stockpiles of excavated materials from foundation works must be properly covered and regularly hauled to DENR approved disposal sites. - Litters and other types of domestic garbage from construction sites and camps must be properly kept in trash bins and regularly disposed through LGU garbage collectors	DPWH, Contractor	Part of construction costs
4	Geology	Change in surface landform/ topography/ terrain/ slope	- Employ appropriate erosion control and slope protection measures. - Designate a spoils storage area and optimize re-use of spoils. - Increase vegetation and construction drainage canals at the break-of-slope (between the gentle to moderate slopes). - Slope re-contouring, benching or lowering the slope gradient - Drainage system includes drain construction and anchored structures.	DPWH , Contractor	Part of construction costs
5		Change in sub-surface/ underground geomorphology	- Field inspection in active construction sites especially after heavy and prolonged rains and after earthquakes (if it occurs). - Regular inspection of identified areas prone to subsidence particularly those underlain by the limestone. - Follow recommendations of the geotechnical / civil engineer / geologist to address any adverse geological and	DPWH, Contractor, MMT	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			geomorphological conditions.		
6		Inducement of subsidence, liquefaction, landslides, mud/debris flow	- Apply retaining walls and other engineered structures along steep walls - Increase vegetation cover particularly at the vicinity of the break-of-slope - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes) - Slope re-contouring, benching or lowering the slope gradient - Good drainage system including under drain constructions and anchored structures.	DPWH, Contractor	Part of construction costs
7		- Effects of geo- and hydrological hazards	- Install sufficient protection measures such as soil improvements during excavation activities and implement appropriate materials handling program or a site protection and rehabilitation program. - Proper inspection of all installed and constructed / ongoing construction structures and facilities. - Coordinate with the Philippine Institute of Volcanology and Seismology (PHIVOLCS) during earthquake and volcanic events to adjust construction schedule. Conduct earthquake drills for workers	DPWH, Contractor	Part of construction costs
8	Pedology	Soil erosion or loss of topsoil	- Implementation the recommendations of geotechnical engineer and EGGA Report in areas of steep slopes and traversed by surface water channels - Immediate removal of excavated soil stockpiles - Optimize re-use of spoils - Surface drainage control works – construction of drainage canal at the break-of-slope (between the gentle to moderate slopes). - Construct perimeter sediment barriers; - Divert upstream drainage away from the stockpiles	DPWH, Contractor	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			- Install drainage canals and settling pond.		
9		Change in soil quality/fertility	- Proper inspection and maintenance of machines and equipment to avoid unexpected leakage of oil due to malfunctions - Strictly implement solid waste management plan and proper disposal by contractor in accordance with RA 9003, hazardous waste disposal in accordance with RA 6969. - Conduct soil quality monitoring in case of any possible contamination events occur.	DPWH, Contractor	Part of construction costs
10	Terrestrial ecology	Vegetation removal and loss of habitat	- Proper implementation of Tree Cutting Permit conditions by the DENR and DPWH (DAO 2018-16 and DAO 2020-06). Removed trees should be geotagged and recorded prior the extraction. Coordination with CENR office in removal and relocating of trees. - Limit the development activities within the planned structure or component footprint. - Establish on site nurseries in accessible locations - Transplant saplings to affected areas especially riparian zones	DPWH, Contractor	Part of construction costs
11		- Threat to existence of important local species - Threat to abundance, frequency and distribution of important species	- Proper implementation of Tree Cutting Permit conditions by the DENR and DPWH (DAO 2018-16 and DAO 2020-06). Removed trees should be geotagged and recorded prior the extraction. Coordination with CENR office in removal and relocating of trees. - Strict implementation of a "*No Hunting and No Collecting*" policy - Collect saplings of endangered, vulnerable and other threatened species and harden in nurseries for eventual transplanting to target areas, particularly riparian zones - Adoption of lower noise and vibration construction method and machines - Incorporating green infrastructure into road and highway design as roadside vegetation can act as wildlife corridors	DPWH and Contractor	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			- Establishment of underpasses or box culverts - Reduction of light intrusion by modifying the height of streetlamps, lighting intensity, spectral composition.		
WATER					
12	Hydrology/ Hydrogeology	- Change in drainage morphology - Inducement of flooding - Reduction in stream volumetric flow	- Installation of silt fences - Establishment of no intrusion areas during road construction - Rapid re-vegetation of side slopes with anti-erosion cover, and the use of appropriate anti-erosion technologies. - All earthworks for site preparation and trench excavation implemented during the low rainfall period if possible - Reuse excavated earth material for backfilling whenever feasible - Backfilling and leveling of the borrow pits to prevent water ponding - Provide adequate drainage systems to minimize the impact downstream of active construction sites - Limit the area of project activities within the RROW - Regular checking of temporary drainage canals to ensure adequate storm water flow.	DPWH, Contractor	Part of construction costs
13		Change in stream depth	- Installation of erosion control measures - Minimizes disturbance to river sediments - Disposal of unused or excess fill material during construction will comply with the DPWH standard specifications	DPWH, Contractor	Part of construction costs
14		Water resource use and competition	- Use of any open water body or natural water source that are being used by the general populace must not be permitted - Construction of wells as source of potable water shall not be allowed	DPWH, Contractor	Part of construction costs
15	Water quality	Degradation of surface water	- Best housekeeping practices	DPWH,	Part of

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
		quality	- Provide onsite sanitary facilities - Adequate drainage leading to siltation ponds	Contractor	construction costs
16	Freshwater ecology	- Water pollution, Soil Contamination and impact on bottom sediment - Threat to existence and/or loss species of important local and habitat - Threat to abundance, frequency and distribution of species	- Bunded area for tanked fuels, lubricants, etc., at the staging areas with drainage leading to oil-water separator. - Provide onsite sanitation facilities - Contain runoff from construction areas with silt traps or curtains	DPWH, Contractor	Part of construction costs
AIR					
17	Air quality	Fugitive dust pollution	-Replacement of vegetation in non-structure areas to minimize wind erosion of topsoil - Apply dust suppression measures, e.g., water application, in active construction areas; - Compact exposed soil surfaces; - Provide tarpaulin cover on trucks loaded with construction materials; - Haul spoils/excavated earth materials immediately after excavation;	DPWH, Contractor	Part of construction costs
18		Increase in SO_2, NO_2, PM and CO ambient levels	- To avoid unexpected emissions due to malfunctions, regular maintenance of construction equipment and machineries, and vehicles - Use of low-sulfur gasoline	DPWH, Contractor	Part of construction costs
19	Noise	Increase in noise levels	- Provision of Noise barriers and shielding stationary vibrating equipment; and - Scheduling of noisy activities during daytime.	DPWH, Contractor	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			- Install noise control devices such as mufflers and noise suppressors on all construction equipment and machinery. Use of electric instead of diesel-powered equipment, hydraulic tools instead of pneumatic tools. - To avoid unexpected noise due to malfunctions, Daily routine check-up of construction vehicles, equipment, and machineries must be strictly complied with		
PEOPLE					
20	In-migration	Proliferation of informal settlers	- Implement the Informal Settler Monitoring Plan: ・Plan and implement construction schedule to shorten time between the preconstruction and construction as much as possible ・Install fencing and guarding of the proposed project to restrict the public from entering the ROW. - Prioritize local hiring	DPWH, Contractor in coordination with the host LGUs	Part of construction costs
21	Culture/ Lifestyle	Cultural/Lifestyle change (especially on IPs, if any)	- Proper orientation of migrant workers on culture oriented on the culture and ways of living in the city/municipality	DPWH and Contractor in coordination with the host LGUs	Part of construction costs
22	Delivery of basic services /resource	- Land Use Competition: Staging areas may compete with existing land uses, potentially affecting nearby residential, agricultural, or commercial areas. - Noise and Traffic Disruption: Increased construction-related activities in staging areas can lead to noise pollution and	- Coordination of DPWH/contractor with the host LGUs regarding needs of the migrants and residents of the community	DPWH, Contractor in coordination with the host LGUs	Construction costs: 600,000

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
		disruptions in local traffic patterns, impacting daily life for nearby residents. - Construction activities can lead to increased traffic congestion, affecting the flow of vehicles on existing roads and impacting local transportation systems. - Resource Competition: The construction process may require significant resources such as water, energy, and raw materials. Competition for these resources with local communities or other industries can occur. - Construction activities may require excavation near existing utility lines, posing a risk of damage and disruption to essential services like water, electricity, and telecommunications.			
23	Public health and safety	Threat to public health and safety	- Conduct sensitization campaigns both for workers and local communities about illicit behavior and crime. - Coordination with local law enforcement - Implement the Construction Waste Management Plan ・Temporary stockpiles of excavated materials from foundation works must be properly covered and regularly hauled to DENR approved disposal sites.	DPWH, Contractor in coordination with the host LGUs	Part of construction costs

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
			・Litter and other types of domestic garbage from construction sites and camps must be properly kept in trash bins and regularly disposed through LGU garbage collectors.		
24	Local benefits	Generation of local benefits from the Project (BENEFICIAL IMPACT)	- Enhance the opportunity for new businesses and innovation - Purchase supplies from local sources - Provide livelihood opportunities if possible - Prompt payment of taxes and other legal fees	DPWH, Contractor in coordination with the host LGUs	Part of construction costs
25	Traffic	Traffic congestion	- Prepare and implement the Traffic Management Plan including, traffic guide, sign board for construction information, detour route plan and schedule of transportation of construction material smoothly	DPWH, Contractor in coordination with the host LGUs	Part of construction costs
Operation: Project presence, infrastructure maintenance					
LAND					
1	Land use and classification	Impairment of visual aesthetics	- Regular maintenance of the highway	DPWH, O&M Concessionaires	Part of operating cost
2		Devaluation of land value as a result of improper solid waste management and other related impacts	- Regular maintenance of the highway - Best housekeeping practices	DPWH, O&M Concessionaires	Part of operating cost
3	Terrestrial ecology	- Threat to existence of important indigenous species - Threat to Abundance, Frequency, and Distribution of Important Species - Hindrance to Wildlife Access	- Regular maintenance of vegetation planted in the project area - Establishment of underpasses or box culverts may be considered a critical mitigating measure to protect wildlife and promote ecological connectivity	DPWH, O&M Concessionaires	Part of operating cost
WATER					
4	Hydrology/Hydrogeology	Change in drainage morphology/ Inducement of flooding/	- Regular maintenance of drainage canals, pipe culvert, cross drains.	DPWH, O&M Concessionaires	Part of operating cost

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
		Reduction in stream volumetric flow			
5		Change in stream depth	Restoration and maintenance of natural drainage traversed by the alignment.	DPWH, O&M Concessionaires	Part of operating cost
6	Water quality	Degradation of surface water quality	- Best housekeeping practices - Provision of sanitation facilities - Maintain drainage system leading to siltation ponds	DPWH, O&M Concessionaires	Quarterly monitoring: 500,000
7	Freshwater ecology	- Threat to existence and/or loss species of important local and habitat - Threat to abundance, frequency and distribution of species	- Bunded area for tanked fuels, lubricants, etc., with drainage leading to oil-water separator. - Provide onsite sanitation facilities - No wastewater discharges into rivers or streams	DPWH, O&M Concessionaires	Quarterly monitoring: 450,000
- AIR					
8	Meteorology	Contribution in terms of greenhouse gas emissions (or GHG mitigation potential).	- Prohibit idling in parking areas and emergency curb - Establishment of traffic signs to impose speed restrictions	DPWH, O&M Concessionaires, Highway Police	Part of operating cost
9	Air quality	Air pollution from motor vehicles	- Proper installation, and maintenance of selected option, e.g., vegetation barrier. - Establishment of traffic signs to impose speed restrictions	DPWH, O&M Concessionaires, Highway Police	Part of operating cost
10	Noise	Noise pollution from motor vehicles	- Proper design installation and maintenance of selected sound attenuation barriers option, e.g., vegetation barrier. - Establishment of traffic signs to impose speed restrictions - Periodical road surface maintenance	DPWH, O&M Concessionaires	Part of operating cost
PEOPLE					
11	Public health and safety	Threat to public health and safety	- Maintain sanitary facilities - Maintenance of traffic signs for safety	DPWH, O&M Concessionaires	Part of operating cost

No.	Environmental component likely affected	Estimated potential impacts	Proposed mitigation plans	Responsible organization	Cost (php)
12	Local benefits	Generation of local benefits from the Project (BENEFICIAL IMPACT)	- Prioritize hiring of qualified residents from host LGUs - Purchase supplies from local sources - Provide livelihood opportunities if available - Prompt payment of fees and taxes	DPWH, Tollway operator	Part of operating cost
Abandonment: Project closure, decommissioning					
1	Land use and classification	Impact in terms of compatibility with existing land use	- Restore RROW to its state prior to Project implementation if possible or the current land use/zoning of the LGU where a road section is located.	DPWH	To be determined
2		Impairment of visual aesthetics	- Proper demolition of the road, structures, and other ancillaries - Proper disposal of demolition wastes	DPWH, O&M Concessionaires	To be determined
3		Devaluation of land value as a result of improper SW management	- Proper disposal of demolition and solid wastes - Best housekeeping practices	DPWH, O&M Concessionaires	To be determined
4	Geology	Change in surface landform	- Check RROW with destabilized slopes and implement slope stabilization measures	DPWH, O&M Concessionaires	To be determined
5	Pedology	Soil erosion	- Check RROW for soil erosion and implement measures	DPWH, O&M Concessionaires	To be determined
6	Soil quality	Change in soil quality	- Conduct Levels 1 and 2 ESA (ASTM)	DPWH, O&M Concessionaires	To be determined
7	Terrestrial ecology	Impact to terrestrial ecology	- Revegetate areas occupied by the demolished road sections, structures, and other ancillaries.	DPWH, O&M Concessionaires	To be determined

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CHAPTER 5 - ENVIRONMENTAL RISK ASSESSMENT (ERA) & EMERGENCY RESPONSE POLICY AND GUIDELINES

5.1 ENVIRONMENTAL RISK ASSESSMENT

The Environmental Risk Assessment (ERA) in the context of Philippine EIS System (PD 1586) is concerned with human safety where risks are characterized by probabilities, consequences, accidental nature, and acute effects.

On the other hand, geological risks are covered by the Engineering Geological and Geohazard Report (EGGAR) requirement of the Mines and Geosciences Bureau (MGB) and health risks characterized by exposures and chronic human health effects are assessed in the Environmental Health Impact Assessment (EHIA) under the DOH mandate. The EGGAR and EHIA have their own procedural processes that are not covered by the EIA System and not required by the ECC application.

Annex 2-7e of the Revised Procedural Manual (RPM) of the Department Administrative Order No. 30 Series of 2003 (DAO 03-2003) or Implementing Rules and Regulations of PD1586 defines how the ERA should be done in the context of the Philippine EIS System.

In general, an ERA is required if a proposed Project will use, handle, transport, store substances that are explosive, flammable, oxidizing, or toxic. The following list shows the projects in the RPM where the ERA is required:

a) Facilities for the production or processing of organic or inorganic chemicals using:
   - Alkylation, Amination by ammonolysis, Carbonylation, Condensation, Dehydrogenation, Esterification
   - Halogenation and manufacture of halogens, hydrogenation, hydrolysis, oxidation, polymerization
   - Sulphonation, desulphurization, manufacture and transformation of sulphur-containing compounds
   - Nitration and manufacture of nitrogen-containing compounds
   - Manufacture of phosphorus-containing compounds
   - Formulation of pesticides and of pharmaceutical products.
   - Distillation, Extraction, or Solvation
b) Installations for distillation, refining, or processing of petroleum products.
c) Installations for the total or partial disposal of solid or liquid substances by incineration or chemical decomposition.
d) Installations for the production or processing of energy gases, for example, LPG, LNG, SNG.
e) Installations for the dry distillation of coal or lignite.
f) Installations for the production of metals or non-metals by a wet process or by means of electrical energy.
g) Installations for the loading/unloading of hazardous materials as defined by RA 6969 (or DAO 29).

Since the proposed CMH Project does not fall in any category listed above, it is opined that an ERA not needed for the ECC application.

5.2 EMERGENCY RESPONSE POLICY AND GUIDELINES

The Proponent will formulate an Emergency Response Policy and corresponding protocols to address the safety concerns of the Project during the construction and maintenance (operation) phases because it is in the interest of the Proponent to ensure that Project implementation is hazard-free as possible and the factors leading to an accident are minimized if not eliminated. To attain this, the proponent will formulate and implement protocols to address accidents at the workplace, road accidents, and the those resulting from natural hazards.

In general, contingency and emergency planning are necessary to address accidents during the Project implementation. The main components of contingency planning include (a) measures to prevent accidents, (b) methods for response and clean up, and (c) organizing and training of personnel to implement the plan. Among the measures to be instituted, these will include at the minimum:

1. Medical assistance during accidents - Staff shall be trained in first-aid techniques to provide medicines and treat minor wounds and ailments during the plant's operation. A first aid kit shall be placed in a conspicuous place in the staging area, offices, and other structures.

2. Communications - Public address (PA) systems and other means of communication will be installed or provided. These will be used to issue forecasts, alarms, warnings and other information in case of accidents. Hand-held radios will also be issued to selected personnel to coordinate personnel movement during emergencies.

3. Emergency response teams - An emergency response team will be organized, trained, and deployed to implement the necessary remedial measures during accidents.

4. Fire hazards - Fire extinguishers, hoses and other firefighting materials prescribed by the Fire Code of the Philippines must be strategically located at the staging area, offices, and other structures. Fire alarms can also be installed in case of fire or explosions. Fire drills should also be conducted regularly to maintain the alertness of the personnel.

Chapter 6 - SOCIAL DEVELOPMENT PLAN (SDP) AND IEC FRAMEWORK AND PUBLIC PARTICIPATION

The Project itself can be considered as a component of the regional social development program because it will enhance transportation needs and hasten the development of Northern Mindanao in general. With increasing population and movement of people and business growth future developments in this region may be affected if this project will not be implemented.

The preliminary SDP and IEC framework are presented in the succeeding sections. It is worthy to note that some elements of the SDP and the IEC Framework were derived from the KI interviews, community consultations, and EIA Perception Survey. And Public Participation in the EIA Process, Public Scoping and Public Hearing were conducted.

Within the environmental situation of the proposed project area, the future scenarios without the project are as follows:

1. Northern Mindanao constituents will not avail of the opportunity to have a standard highway to meet the potential need of additional modern highway, improve access to easy and safe highway, and eventually contribute to economic development of the locality. Thus, the future of the two cities and four municipalities of Cagayan de Oro and Malaybalay may partly anchor on the implementation of this highway development project.

2. There will be less internally generated funds for the LGUs of Cagayan de Oro and Malaybalay for improved delivery of services and local development projects. The same can be stated for the local IP and non-IP residents.

3. No displacement/disturbance of houses and communities will occur.

4. In terms of socioeconomic improvement, it is likely to be the same if the host communities will not be receptive to the project. The LGU needs additional highways and road considering the trend of urban growth and increasing population and new revenue sources to improve the delivery of basic services and infrastructures. In terms of population and migration, the present trend of migration is anticipated to continue in search of new livelihood opportunities.

6.1 SOCIAL DEVELOPMENT PLAN (SDP) FRAMEWORK

The SDP framework seeks to address the issues and concerns identified during public hearings and the impact assessment. The final SDP will be formulated and finalized through a participatory workshop by the implementing agency, DPWH, after the issuance of the Environmental Compliance Certificate (ECC). Participants include representatives of the LGUs of the affected cities and municipalities, and other stakeholders.

In this context, participatory planning, implementation and monitoring/evaluation of programs must be built-in the program components. Gender sensitivity must ensure balance between the role of men and women in community activities. Moreover, the process must also involve multi-sectoral networking. This means forging links with LGUs, POs, NGOs, government line agencies (e.g., DPWH, NCIP, PENRO, DA/BFAR, DOH, DepED, DSWD), partner funding institutions, and other community development partners. This also entails bolstering efforts and linking together of services, and agencies/institutions so as to coordinate and mobilize resources.

Community development projects must be need-driven, participatory/consultative in nature, and aligned with the declared thrust of the locality or group. DPWH must come up with a workable social development program and implement guidelines to make itself visible to the community with a specific focal person or

division to ensure carrying out of planned projects and activities. Thus, environmental management and planning in development projects take cognizance of the participatory approach, gender concerns, disaster preparedness, and institutional development. These must also propagate capability, responsibility and accountability.

The Environmental Management Plan is embodied in the Social Development Program that plays a crucial role in implementing the project effectively and efficiently. This translates various mitigation and enhancement measures into concrete plans of action for the constituents who will be directly benefited by the project, as well as those who will not directly gain access to the highway or transport services/facilities.

The SDP for the CMH project, comprised of the IP Development Framework, Socioeconomic Program, Alternative Livelihood Development Program, and the Capability Building Program (CBP), are presented in the succeeding sections.

6.2 IP Development Framework (IPDF)

The IPDF is presented to protect and promote the rights of indigenous peoples (IP) in accordance with the Indigenous Peoples' Rights Act of 1997 (Republic Act 8371). The IPRA concretizes the constitutional mandate to recognize, protect and promote the rights of indigenous peoples within the context of national unity and development, especially their rights to their ancestral lands and domain, to the preservation and development of their cultures, traditions and institutions, and to their human rights and freedoms as mandated in the 1987 Philippine Constitution.

The IPDF in cooperation with the NCIP seeks to address the issues of IPs. It is seen to facilitate the planning and implementation of programs in coordination with the LGUs. In coordination with the local government, the DPWH will to provide economic opportunities to uplift majority of them from poverty. These are the 18 ethno-linguistic indigenous peoples who have lived on Mindanao for generations. Notwithstanding the procurement of the Certificate of Precondition after the Free and Prior Informed Consent (FPIC) process under RA 8371, the indicative social development plan for the IP groups is shown in **Table 6-1** which indicated the Lumads or the Mindanao's indigenous people. These are the 18 ethno-linguistic indigenous peoples who have lived on Mindanao for generations.

Table 6-1. Proposed SDP for Indigenous Peoples

Concern	RCM/B	GA/ NGAS	Proponent	Indicative Timeline	Source of fund
Employment Program	Lumad, Talandig, and Bukidnon-Tagolanon leaders in the locality	DPWH , NCIP, LGU	DPWH	2022-2025	DPWH Operational Funds
Alternative Livelihood Development Program	Lumad, Talandig, and Bukidnon-Tagolanon leaders in the locality	DPWH , NCIP, LGU	DPWH	2022-2025	DPWH-SDP Funds
Capability Building Program (CBP) (to include assistance in the enhancement/finalization of the ADSDPP)	Lumad, Talandig, and Bukidnon-Tagolanon leaders in the locality	DPWH , NCIP, LGU	DPWH	2022-2025	DPWH-SDP Funds

NOTES: RCM/B - Responsible Community Member/Beneficiary; GA/NGAS - Government Agency / Non- Government Agency and Services ; Lumads - Mindanao's indigenous people

6.2.1 Socioeconomic Program (SEP)

The SEP aims to ensure provision for local employment and alternative livelihood development program for the IPs, other local residents, especially those in the direct impact area. Except for highly sensitive and technical positions, guidelines for hiring of local residents especially those residing in the direct impact barangays must consider the following:

a) Hiring priority of displaced residents (of their farmlots and land) and those in the direct impact area; and
b) Hiring based on skills or capability and extent of active participation in activities of the community.

6.2.2 Alternative Livelihood Development Program (ALDP)

The ALDP aims to enhance economic activities of local constituents by providing alternative livelihood in coordination with the LGU and Tribal Council. Conducting training, whenever needed as identified, also constitutes as alternative livelihood. The KII with the constituents of the locality revealed various skills possessed by the key informants which included driving, cooking, farming and fishing, food processing, handicraft making, carpentry and related works, computer skills, knife making, among others.

For men and women – The top five alternative livelihood for both men and women included handicraft making, farming, business, livestock raising and TESDA courses as well as ALS courses (orange cells in **Table 6-2**). Other alternative livelihood suggested were establishing a cooperative, construction work, cooking, financial support for farmers, food processing training, food courier/online food selling, rice selling, dressmaking, fish selling, gardening, micro-credit, financial literacy, online selling, and working on tourist attractions.

Table 6-2. Suggested alternative livelihood for men and women

Alternative livelihood	NR	Percent
Handicraft training (rag making, basket weaving, wallets made out of recyclable materials)	14	14.43
Farming	10	11.34
Business, mini market or mini mart, used clothing (*ukay-ukay*) or repair shop	7	7.22
Livestock raising with provision of feeds	7	7.22
TESDA courses (welding, driving, carpentry)	6	6.19
ALS-skills training, food processing	5	5.15
Financial support, post-harvest facilities, skill training for farmers, farm tractor credit	5	5.15
Cooperative	4	4.12
Construction work	4	4.12
Cooking	4	4.12
Food processing training	4	4.12
Food courier/ food vending/ consignment/online food selling	3	3.09
Gardening	3	3.09
Rice selling	2	2.06
Dress making	2	2.06
Enhanced farming skills, enhanced business skills	2	2.06
Fish selling	2	2.06
Bamboo products, corn-innovate products	1	1.03
Computer literacy and education and trainings	1	1.03
Stove pot making	1	1.03
Employment	1	1.03
Improvement training	1	1.03
Micro-credit	1	1.03

Alternative livelihood	NR	Percent
Financial literacy	1	1.03
Motor parts cooperative	1	1.03
Online selling	1	1.03
Seminar on capability building, how to market the products	1	1.03
Small business	1	1.03
Working on tourist attractions	1	1.03
Total	**97**	**100**

Source: Key Informant Interview; NOTE: NR – number of responses

For men only – The top five alternative livelihood for men only were farming and training/financial help, carpentry and equipment, skills training on various skills, agricultural projects, and driving (orange cells in **Table 6-3**). Other suggestions were capital for livestock raising, construction work, fishing, handicraft making, and business on hardware supplies, buy and sell business, electrical training, factory worker, financial assistance for small business, food processing, vegetable growing, online business, and TESDA trainings.

Table 6-3. Alternative livelihood for men only

Alternative Livelihood	NR	Percent
Farming, training on farming, financial assistance	8	15.09
Carpentry and carpentry equipment	7	13.21
Skills training on black smiting, mechanic, carpentry, welding	7	13.21
Agricultural projects/activities	5	9.43
Driving	4	7.55
Capital for backyard livestock raising	3	5.66
Construction work	3	5.66
Fishing	2	3.77
Handicraft making - wallet making	2	3.77
Business involving hardware	1	1.89
Buy and sell business	1	1.89
Electrical training	1	1.89
Factory worker	1	1.89
Financial assistance for small business	1	1.89
Food processing	1	1.89
Home-grown vegetable	1	1.89
Livelihood	1	1.89
Online business	1	1.89
Plantation employment	1	1.89
TESDA training	1	1.89
Employment	1	1.89
Total	53	100

Source: Key Informant Interview; NOTE: NR – number of responses

For women only – The top five alternative livelihood for women only were food processing training, TESDA training on various courses/skills, training on cosmetology, cooking viands, and gardening (orange cells in **Table** 6-4). Other suggestions were handicraft making, financial support for small business, online business training, mental health seminars/webinars, baking and pastry training, bamboo cultivation, buy and sell, farming, flower plantation, rice selling, livestock raising and selling used clothing.

Table 6-4. Alternative livelihood for women only

Alternative Livelihood	NR	Percent
Food processing - cheese making, coffee processing	14	19.18
TESDA training on dress making, face mask, eco-bags, curtains, rag making, soap making, mat weaving	14	19.18
Trainings on cosmetology, massage and spa, housekeeping	9	12.33
Cooking viands	6	8.22
Gardening of vegetables and other plants	5	6.85
Handicraft making - mat weaving, slipper making, bamboo stick making, scrub making	5	6.85
Financial support for small business	4	5.48
On-line business trainings	4	5.48
Mental health seminars/webinars, responsible parenting seminars, women empowerment seminars	3	4.11
Baking and pastry training	2	2.74
Bamboo shoot cultivation and harvesting	1	1.37
Buy and sell	1	1.37
Farming	1	1.37
Flower plantation	1	1.37
Rice selling	1	1.37
Livestock raising	1	1.37
Selling used clothing (ukay-ukay)	1	1.37
Total	73	100

Source: Key Informant Interview; NOTE: NR – number of responses

For youth (boys and girls)- The top five alternative livelihood for the youth were sports activities, livelihood programs/trainings, computer literacy trainings, TESDA trainings, and anti-drug campaigns (orange cells in **Table 6-5**). Other suggestions include community service, provision of school supplies, part time job, handicraft making, mental health and spirituality seminars/webinars, multi-purpose projects, values formation seminars, business trainings, teenage pregnancy seminars, faith-based projects, farming, livelihood trainings, and others.

Table 6-5. Suggested projects for youth (boys and girls)

Alternative Livelihood	Frequency	Percent
Sports – volleyball, cycling, basketball	18	17.82
Livelihood programs, trainings	14	13.86
Computer literacy, digital literacy, vlog making, responsible use of social media	7	6.93
TESDA for out of school youth, technical skills	5	4.95
Anti-drug campaigns, drug awareness seminars	4	3.96
Community service – tree planning, barangay beautification projects	4	3.96
School supplies giving books, life skills training	4	3.96
Part time job	3	2.97
Handicraft making - basket making, rag making,	3	2.97
Mental health, spirituality seminars	3	2.97
Multi-purpose projects	3	2.97
Social responsibilities awareness, values formation	3	2.97
Business, business training, small business	3	2.97
Teenage pregnancy seminars	2	1.98
Faith based projects – Bible study, choir	2	1.98
Farming	2	1.98
Livestock and poultry raising	2	1.98

Alternative Livelihood	Frequency	Percent
Livelihood for out of school youth, skills training	2	1.98
Dressmaking training	2	1.98
Scholarship, funding vocational courses	2	1.98
Gardening, bonsai planting	2	1.98
Advocacy to eradicate gadgets	1	0.99
Bonsai planting	1	0.99
Capability building	1	0.99
Clean up drive	1	0.99
Digital library	1	0.99
Environmental awareness webinars/ seminars	1	0.99
Financial management training	1	0.99
Giving gadgets project	1	0.99
Landscaping	1	0.99
Online selling training	1	0.99
Peace and order seminars	1	0.99
Total	101	100

Source: Key Informant Interview; Note: Multiple responses

6.2.3 Capacity Building Program (CBP)

The CBP aims to increase awareness on the importance of the Project, environmental management, and sustained capacities of Ips and other stakeholders through capability building.

Continuing education and training is important for local residents to acquire and upgrade their skills and knowledge. Training topics suggested are highway and environmental management, alternative livelihood, gender sensitivity training, community disaster preparedness, value formation, conflict mediation, organizational development, and the like. It is worthy to not that these topics are part of the IEC advocacy.

A Training Needs Assessment (TNA) via survey equally represented by men and women may be conducted to determine the potentials and interests of the locals. In the case of alternative livelihood, skills training may be done in any of the areas previously mentioned. In addition, alternative livelihood development programs must be done in coordination with LGU, DPWH, TESDA, Tribal Council/NCIP to enable the residents, especially the affected families and IPs to avail themselves of the alternative livelihood projects.

Continuing education is also important for the IPs and other local residents in acquiring and upgrading their skills and knowledge and training on innovations on the previously mentioned topics. Networking among various sectors to mobilize resources and coordinate activities must also be done. Some of the topics for capability building are incorporated under IEC programs.

6.3 INFORMATION, EDUCATION AND COMMUNICATIONS (IEC)

6.3.1 Pre-Screening IEC Activities

The pre-scoping IEC was conducted from March 22 to 24, 2021 at the six host LGUs at the barangay, municipal, and city levels. Basic project information and the ECC application process were presented to the stakeholders. Issues and concerns about the Project were also solicited and responded to. The summary of the IEC conducted, and participants are shown in **Table 6-6.**

Table 6-6. Outline of Pre-Screening IEC for the CMH Project

Province	LGU/ Barangay	Date and Time/ Venue	Number of Attendances	Stakeholders invited
Misamis Oriental	Municipality of Tagaloan ● *Natumolan* ● *Casinglo*	March 24, 2021 2:00 pm/ Tagoloan Central Elementary School, Tagoloan	Total 27 (Male 15, Female12)	*Barangay level* ● *Barangay officials/ Barangay Council* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *religious organizations* ● *Indigenous People's organization* ● *Women's Organizations* ● *Transportation Organizations* Municipal level ● *Mayor* ● *Municipal Councilors* ● *Municipal Environmental and Natural Resources Officer/representative* ● *Municipal Health Officer/representative* ● *Municipal Planning and Development Officer/representative* ● *Municipal Engineering Officer/representative* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *religious organizations* ● *Indigenous People's organization* ● *Women's Organizations* ● *Transportation Organizations*
	Cagayan De Oro City ● *Bugo* ● *Purto* ● *Balubal*	March 24, 2021 10:00 am/ Puerto Barangay Hall, Cagayan De Oro	Total43 (Male 21, Female 22)	*Barangay level* ● *Barangay officials/ Barangay Council* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *Religious organizations* ● *Indigenous People's organization* ● *Women's Organizations* ● *Transportation Organizations* City level ● *Mayor* ● *City Councilors* ● *City Environmental and Natural Resources Officer/representative* ● *City Health Officer/representative* ● *City Planning and Development Officer/representative* ● *City Engineering Officer/representative*

Province	LGU/ Barangay	Date and Time/ Venue	Number of Attendances	Stakeholders invited
Bukidnon	Municipality of Manolo Fortich ● *Alae* ● *San Miguel* ● *Damilag* ● *Dicklum* ● *Sankana* ● *Tankulan* ● *Ticala* ● *Mambatangan*	March 22, 2021 2:00 pm/ BRCI Bldg., Diclum, Manolo Fortich	Total 65 (Male 40, Female 25)	*Barangay level* ● *Barangay officials/ Barangay Council* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *Religious organizations* ● *Indigenous People's organization* ● *Women's Organizations* ● *Transportation Organizations* Municipal level ● *Mayor* ● *Municipal Councilors* ● *Municipal Environmental and Natural Resources Officer/representative* ● *Municipal Health Officer/representative* ● *Municipal Planning and Development Officer/representative* ● *Municipal Engineering Officer/representative*
	Municipality of Sumilao ● *Puntian* ● *Vista Villa* ● *Culasi* ● *Poblacion* ● *Kisolon* ● *San Roque*	March 24, 2021 10:00 am/ Conference Hall, 2nd Floor, New Building, Sumilao	Total 36 (Male 22, Female 14)	*Barangay level* ● *Barangay officials/ Barangay Council* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *religious organizations* ● *Indigenous People's organization* ● *Women's Organizations* ● *Transportation Organizations* Municipal level ● *Mayor* ● *Municipal Councilors* ● *Municipal Environmental and Natural Resources Officer/representative* ● *Municipal Health Officer/representative* ● *Municipal Planning and Development Officer/representative* ● *Municipal Engineering Officer/representative*
	Municipality of Impasug-ong ● *Poblacion* ● *La Fortuna* ● *Cawayan* ● *Capitan Bayong* ● *Impalutao*	March 23, 2021 2:00 pm/ Conference Hall, Municipal Hall, Impasug-ong	Total 50 (Male 28, Female 22)	*Barangay level* ● *Barangay officials/ Barangay Council* ● *Senior Citizen Organizations* ● *Youth Organizations* ● *Farmer Associations* ● *PWD Organizations* ● *Religious organizations* ● *Indigenous People's organization* ● *Women's Organizations*

Province	LGU/ Barangay	Date and Time/ Venue	Number of Attendances	Stakeholders invited
	• *Kibenton*			• *Transportation Organizations* Municipal level • *Mayor* • *Municipal Councilors* • *Municipal Environmental and Natural Resources Officer/representative* • *Municipal Health Officer/representative* • *Municipal Planning and Development Officer/representative* • *Municipal Engineering Officer/representative*
	City of Malaybalay • *Patpat* • *Kalasungay* • *Sumpong* • *Dalwangan* • *Brg.10*	*March 23, 2021 10:00 am/* Casisang Covered Court, Malaybalay City	Total 44 (Male 28, Female 14)	*Barangay level* • *Barangay officials/ Barangay Council* • *Senior Citizen Organizations* • *Youth Organizations* • *Farmer Associations* • *PWD Organizations* • *Religious organizations* • *Indigenous People's organization* • *Women's Organizations* • *Transportation Organizations* City level • *Mayor* • *City Councilors* • *City Environmental and Natural Resources Officer/representative* • *City Health Officer/representative* • *City Planning and Development Officer/representative.* • *City Engineering Officer/representative*

6.3.2 Stakeholder issues and concerns

The common issues raised during the IEC were compensation of affected properties and IP concerns on consent and intrusion to sacred lands (Table 6-7). The reader is referred to **Annex 14** for the details of the issues and responses.

Table 6-7. Summary of major issues and concerns during the IEC

Host LGU	Major issues and concerns
Municipality of Tagoloan	- Project design (whether or not the road is elevated) - Presence of informal settlers - Necessity of the Project - Project timeline - Resettlement - Presence of IP sacred places - Compensation of the affected properties and untitled lands - Safety - Formulation of the MMT and source of the EGF

Cagayan de Oro City	- Compensation of affected properties - Duration of compensation payment - Compensation for environmental damages
Municipality of Manolo Fortich	- Difference between the proposed highway and the 'Build, Build, Build' project of the government - Conflicts in boundary and right of way - Managing opposition to the Project - Compensation of affected properties - FPIC application - Political change of administration - Existing government projects that might be affected (e.g. irrigation) - Construction waste
Municipality of Sumilao	- Rationale of the Project in the presence of the existing road from Cagayan de Oro to Malaybalay - Toll fee - Environmental considerations in the design (e.g. landslide prone areas in San Vicente in Maluko) - IP consent - Public participation in the project - Compensation of affected landowners
Malaybalay City	- Source of Project funding - Issue of eminent domain - Property demolition and payment - Informing affected property owners - Compliance to FPIC - Coordination between Regional and District DPWH - Coordination with LGU - Affected trees - Secure LGU endorsement

6.3.3 The IEC framework

The IEC framework in this context is a tool to provide the correct and appropriate Project information through different media and materials to the stakeholders at the same time solicit feedback to the proponent on the stakeholders' understanding of the issues and concerns about the Project.

It is also a strategy or approach aimed at changing or reinforcing a set of behaviors in a target population involving a specific issue. The activity is vital in establishing support, linkages, and participation of the stakeholders to generate awareness, informed opinions and views, and suggestions to eventually stimulate support in the implementation of development activities. The IEC activities need to have an appropriate context mindful of the influence of underlying social, cultural, economic, and environmental conditions and producing IEC materials in the local dialect. The strategies that may be adopted are enumerated below.

a) **Use of billboards and signages** posted on public or conspicuous places to display the important features of the highway project to generate enhanced public awareness about the project.
b) **Printed communications and mass media.** The former may take the form of brochures, leaflets, posters, wall calendars, desktops, flip charts, or giveaways. Mass media may include television, radio and audio-visual presentations and other forms of electronic communication, i.e., use of DVDs/VCDs containing taped productions about DPWH and the highway project. The following may be incorporated in IEC and advocacy efforts:

- Highway development

- DPWH corporate social responsibility and social development programs
- Environmental conservation and management
  - Sustainable farming and indigenous knowledge management
  - Solid waste management
  - Climate change and global warming
  - Disaster preparedness, risk reduction and management
- Others: Alternative livelihood, Conflict transformation, Gender sensitivity training, etc.

Public consultations are needed to generate views, opinions, interest, and suggestions/approaches. IEC will primarily consist of information dissemination and advocacy to enlighten the stakeholders about the nature and design of the highway project and environmental consciousness. The variations of IEC may use print or visual, television, or radio as forms of mass media with the following as strategies:

a. Distribution of pamphlets, fact sheets, flyers, and brochures both in English and in Cebuano local dialect
b. Maintaining community billboards in strategic places
c. Barangay assembly meetings and presentations
d. Conduct of workshops and focus group discussions
e. Media: tv, radio programs and internet
f. Publication of a regular newsletter for the IEC or project publications thru CD
g. Text brigade of messages on environmental conservation

As part of the EIA study, the responses on the concerns of the stakeholders that were made during the IEC were answered, continuous IEC activities with stakeholders throughout all the stages of the project will be conducted. The DPWH will closely coordinate with the host LGUs to maintain transparency during the activity.

The proposed IEC for IPs and non-IPs local residents and LGU/GAs are shown in Table 6-8 and Table 6-9 respectively. The initial cost of the IEC during the pre-construction and construction is estimated to be between PhP 3 to PhP 5 million. In the operational phase, a minimum annual budget of PhP500,00.00 may be allocated for the purpose.

Table 6-8. Proposed IEC for IPs

Target sector identified as needing project IEC	*Major topic of concern in relation to project*	*IEC scheme/strategy/ methods*	*Information Medium*	*Indicative timelines and frequency*	*Indicative cost*
Tribal men/women leaders (Datu/Bae) Members of IP Org.	· CMH development · · CMH corporate social responsibility and social development programs	· Printed information about the proposed project · Oral presentation (meetings/forum) · Radio program ·	· Pamphlets, fact sheets, flyers, brochures in local dialect · Assembly meetings · Radio · Billboards/ · Tarpaulin	2024-2025	PhP 1 million
Tribal men/women leaders (Datu/Bae) Members of IP	· Environmental conservation and management To cover · Alternative livelihood · Sustainable farming	· Oral presentation · Handouts ·	· Assembly meetings · Workshops and · Discussions ·	2024-2025	PhP 1 million

Orgs.	and indigenous knowledge management · Conflict Management · Climate change and global warming · Disaster preparedness, risk reduction and management · Others: Solid waste management, Gender Sensitivity, etc ·				

Table 6-9. Proposed IEC for non-IP local residents and LGU/GAs

Target sector identified as needing project IEC	*Major topic of concern in relation to project*	*IEC scheme/strategy/ methods*	*Information medium*	*Indicative timelines and frequency*	*Indicative cost*
Local residents, LGU and govrnment agencies in the DIB	· Highway development and CMH · CMH corporate social responsibility and social development programs	· Printed information about the Project · Oral presentation (meetings/forum) · Radio program	· Pamphlets, fact sheets, flyers, brochures in local dialect · Assembly meetings · Radio · Billboards/Tarpaulin	2024-2025	PhP 1 million
· Local residents in project areas and IIA · LGU and government agencies in the direct impact cities and municipalities	Environmental conservation and management to cover: · Sustainable farming and indigenous knowledge management · Climate change and global warming · Disaster preparedness, risk reduction and management · Conflict transformation · Gender sensitivity training · Others: Solid waste management, sex education, etc	· Oral presentation · Handouts	· Assembly meetings · Workshops and · Discussions ·	2024-2025	PhP 1million

6.4 Public Participation

6.4.1 Public Scoping Meeting

Scoping is another activity where the public can participate in the Philippine EIA process. The Public Scoping was conducted following the EMB Memorandum Circular No. 2020-30 "Interim Guidelines on Public Participation in the Implementation of the Philippine Environmental Impact Statement System (PD 1586) During the State of National Public Health Emergency". Participants of face-to-face meetings were limited according to local ordinances and the Inter-Agency Task Force (IATF) directives. In consideration of this, virtual meeting rooms via Zoom TM were provided to accommodate stakeholders where internet connections are available. Regarding this, locations with adequate ventilation have been put into place to comply with the laws enforced by the government. The public scoping was conducted in combination of English, Filipino and local language (Cebuano) for stakeholder's understanding during the presentation and open forum. According to the protocol, and the laws enforced by the government, ensured that necessary hygiene measures, such as masks and alcohol sanitizer, were in place and keeping distance between seats was maintained for participants in face-to-face sessions. The venue was selected in well-ventilated areas, such as outdoor basketball courts.

Table 6-10 Summary of the Scoping Meeting

Province	City/Municipality	Date and Time	Number of Attendances Total (Male , Female)
Misamis Oriental	Tagoloan, Misamis Oriental	May 28, 2021 10:00-12:00	46 (18, 28)
	Cagayan de Oro City, Misamis Oriental	May 31, 2021 10:00-12:00	37 (25, 12)
Bukidnon	Manolo Fortich, Bukidnon	June 1, 2021 10:00-12:00	67 (41, 26)
	Sumilao, Bukidnon	June 2, 2021 10:00-12:00	35 (18, 17)
	Malaybalay City, Bukidnon	June 3, 2021 10:00-12:00	56 (24, 32)
	Impasug-ong, Bukidnon	June 4, 2021 10:00-12:00	53 (34, 19)

The series of Public Scoping meetings were attended by representatives of the stakeholders from the host LGUs initially identified during the pre-scoping IEC. A total 338 participants (onsite: 176 and online: 162) from different social groups such as NGO, youth, LGBT, and women's associations, and representatives of Central/Regional/Local Government officers joined the meeting.
The open forum provided the avenue for the participant stakeholders to express their opinions and comments or ask questions and clarifications about the project and its potential impacts. The salient issues and concerns raised by city and municipality are summarized below.

<u>Issues raised in Tagoloan, Misamis Oriental</u>

a) Road alignment traversing the water reservoir that the community uses as a water source.
b) Water reservoir should be avoided and not be damaged during construction.
c) Compensation for affected lands and houses
d) Aggravation of flooding along the national highway in Barangay Casinglot
e) In Casinglot, our water reservoir will be affected. What will happen to our water reservoir?
f) Projects or programs for women

Issues raised in Cagayan de Oro City

a) Compensation of affected landowners
b) Compensation for the affected animals
c) Road amenities and local permits
d) Flooding due to overflowing of the canal on the hillside part of Bugo
e) Measures during construction to prevent debris to lower portions
f) Measures for rain induced landslide.

Issues raised in Manolo Fortich, Bukidnon

a) Compensation for affected residential areas and trees
b) Abiding with IP process during the detailed design
c) Mitigation for affected flora and fauna in forested areas
d) Assessment of cultural impacts

Issues raised in Sumilao, Bukidnon

a) Livelihood opportunities
b) Compensation for affected farms
c) Compliance with Free and Prior Informed Consent requirements
d) Relocation

Issues raised in Malaybalay, Bukidnon

a) Compensation of affected lands
b) Compliance with FPIC requirements
c) Identification of the affected roads
d) Classification of the High Standard Highway
e) Toll fee

Issues raised in Impasug-ong, Bukidnon

a) Noise impacts on poultry farms especially from Manolo to Malaybalay
b) Possible access hindrance along the Atugan river
c) Compensation and relocation for affected households Possible re-alignment to avoid infrastructure
d) Impact of the alignment to two irrigation canal structures in San Juan and La Fortuna proper
e) Impact on banana and pineapple plantations
f) Mitigation of impact on the main water line and reservoir
g) Compensation for affected agricultural land
h) Conduct of IP rituals prior to any Project activity

Questions were raised during the open forums regarding the Project description and impacts on the environment. Some barangays raised the same concern while majority of the concerns were focused on resettlement and compensation. The issues and concerns were responded by representatives from the DPWH as the proponent, JICA Study Team, and DENR-EMB. The issues and concerns are enumerated below:

Table 6-11. Summary of the Scoping Meeting

Comment, Questions and Suggestions	Answers
Project Description - *Presence of policy/ordinances for the construction of highway and hierach of arterial and the inclusion of lightning facilities, warning signs and requirements included in the budget.*	- *Information will be obtained on the detailed engineering design and will coordinate with the LGU* - *Proper coordination with LGU will be conducted*

- *Identification of affected roads if there will be barangay road*	
Land - *What measures should be done so that the debris will not go to the lower portion during construction.* - *Identification of disposa site in the plan prior to construction*	- *Geohazard assessment will be conducted and mitigation measures will be done* - *This will be included in the plan and how the wastes will be disposed will be strictly monitored*
Water - *A common concern among the barangays is flooding once the project construction and operation starts.*	- *Flood prone areas will be studied and road alignment will be designed to mitigate flooding*
People - Presence of projects and programs for livelihood for women were asked. - Hoping for the issues and concerns of the IPs in terms of cultural impacts are included in the report - Compensation issues for untitled lands and no legal documents	- *Livelihood project for the women sector will be considered alongside with other sectors in line with GAD* - *The culture sensitivity will be included in the report. Interview will be conducted to determine the lifestyle and practices of the cultural communities*

6.4.2 Public Hearing

The Public Hearing conducted in the affected City of Cagayan de Oro, Municipalities of Tagoloan, Manolo Fortich, Sumilao, and Impasug-ong, and City of Malaybalay achieved the following objectives: presentation of the results of the environmental impact assessment done by sector: Land, Water, Air, and People; and documentation of issues and concerns of the stakeholders on the results of the studies conducted on the proposed project. The aspects that were identified and suggested by the stakeholders during the meeting were documented.

The series of Public Hearing meetings were attended by representatives of the stakeholders from the host LGUs initially identified during the Public Scoping. A total of 178 representatives participated in the meeting.

On September 22, 2023, the Notice of Public Hearing and the copy of the Environmental Impact Assessment (EIA) and Executive Summary for Public (ESP) in two (2) languages, Filipino and English were posted on the EMB website. The notice indicated October 11 to 13, 2023 at 9 o'clock in the morning as the date and time of the hearing to be conducted onsite and online via Zoom. It also included a brief description of the project and information on where to get a copy of the project's EIS which was made available at the EMB website.

Table 6-12 shows the summary of the public hearing meetings.

A copy of the Notice of Public Hearing is provided in **Annex17**. In addition to the website posting, the notice of hearing was published in the national newspaper Daily Tribune on September 25 and October 2, 2023. This was done in accordance with DAO 2017-05, Guidelines on Public Participation under the Philippine Environmental Impact Statement (EIS) System. Copy of the Affidavit of Publication from Daily Tribune is provided in **Annex 17**.

Letters of invitation were also sent to the following offices/groups/organizations:

- Municipal and City Local Government Units and concerned departments
- Affected barangay LGUs
- Non-Government Organizations
- Local Groups/Organizations

Table 6-12. Outline of Public Hearing

Province	City/Municipality	Venue	Date and TIme	No. of Attendances
Misamis Oriental	Tagoloan and Cagayan De Oro City	Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental	October 11, 2023 9:00 am to 5:00 pm	Total 61 (40 males and 21 females)
Bukidnon	Sumilao and Malaybalay City	2nd Flr., New Bldg., Sumilao Municipal Hall	October 12, 2023 9:00 am to 5:00 pm	Total 66 (46 males & 20 females)
Bukidnon	Impasug-ong and Manolo Fortich	Kaamulan Folk Arts Theatre Kaamulan	October 13, 2023 9:00 am to 5:00 pm	Total 51 (29 males & 22 females)

Issues and Concerns Issues raised in Cagayan De Oro and Tagoloan, Misamis Oriental

Participated in by a total of 61 stakeholders (40 males & 21 females) from pertinent government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a) Road alignment impact to the traffic congestion in Tagoloan, Misamis Oriental
b) Aggravation of flooding and landslides along Brgy. Bugo, Cagayan De Oro
c) Measures for identifying the properties and families to be affected by flooding and landslide
d) Multipartite Monitoring Team (MMT) purpose and function
e) Necessary documents and papers to be prepared for land negotiation for those to be affected
f) Measures to consider for planning of drainage system: climate projection, history and amount of rainfall volume and the sea level rise.
g) Measures on monitoring of the sand/gravel quarrying by the provincial government to safeguard the river in compliance with the standards set by MGB and EMB.
h) Suggestion to include planting strips for green spaces in highway design considering that Cagayan De Oro is one of the green cities in the country.
i) Inquiry on whether the feasibility study includes specific designated places for the electrical posts and drainage.
j) Highway structures caused also accidents since there are roads that have too many curves or zigzags
k) Incorporation of the 4 lanes to avoid posts and plants that remain as observed in the past with road widening.
l) Inquiry if this project will affect the Metro Rail Project for Mindanao
m) Other Matters: These need to be brought to the attention of the DPWH District Office.
   - There are other existing JICA projects that have caused environmental damage such as the perennial flooding problem in Bugo, CDO.
   - In Bugo National High School, there is an existing pipe from which mud flows thereby filling the ground floor of the school.

Issues raised in Sumilao and Malaybalay City, Bukidnon

Participated by a total of 66 stakeholders (46 males & 20 females) coming from government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a) Road alignment traversing the specific barangays and schools
b) Compensation on affected of untitled lands and landowners
c) Issue of genuine claimant of real property
d) Request of tax declaration documents

e) IPs' lump-sum payments should be different for several barangays and holding of rituals are believed to be protection for untoward incidents
f) Toll fee
g) Safety features of a high standard highway with 80 kilometers per hour - emergency safety area
h) Other Matters
- Mt Kitanglad circumferential road: Observed to have environmental damage and should be monitoring of TSS in the rivers.
- Another project near the Atugan River regarding the New Sayre highway project where private properties were included: no consultations and corresponding payments to owners have not been done

Issues raised in Manolo Fortich and Impasug-ong Bukidnon Cluster

Participated in by a total of 51 stakeholders (29 males & 22 females) coming from government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a) Road alignment traversing the specific barangays and houses
b) Conduct of IP rituals prior to any Project activity
c) Compensation to affected land and crops of IPs
d) Design for relocation and specific area for the relocation site of affected people
e) Clarification on the role of the DPWH District
f) Request for the file of the proposed road alignment for planning purposes of LGU
g) Basis and standard payment for land and crops.
h) Land ownership status and documents of the affected lands
i) Other Matters
- Issue of unpaid affected lands until the present citing the case of a bridge whose landowner is demanding for a toll fee

Questions were raised during the open forums regarding the Project description and impacts on the environment. Some barangays raised the same concern while majority of the concerns were focused on resettlement and compensation. The issues and concerns were responded by representatives from the DPWH as the proponent, JICA Study Team, and DENR-EMB. The issues and concerns are enumerated below:

Table 6-13. Summary of comments, questions and suggestion during Public Hearing

No.	Comment, Questions and Suggestions	Answers
1	***Project Alignment*** - *Impact to traffic congestion* - *Request for the file of the proposed road alignment for planning purposes of LGU* - *Suggestion to include planting strips for green spaces in highway design*	- *This alignment was chosen as this is the most economical and to relieve traffic.* - *The file of the TIS thatw as submitted for applying for ECC will be not issued until the ECC is issued* - *The suggestion is noted and will be evaluated if it can be added to the current design.*
2	***Water and Land*** - Aggravation of flooding and landslides in some areas - Measures for identifying the properties and families to be affected by flooding and landslide	- *Will be addressed during the detailed engineering design. As part of this study, natural drainage systems will be studied* - *There will be MMT and there will be representatives coming from barangays. So in during monitoring, concern such as flooding particularly on Brgy. Bugo will be addressed and mitigated*

3	***Water*** - Measures to consider for planning of drainage system, climate projection, history and amount of rainfall volume and the sea level rise	- *This will be considered in the detailed engineering design and a hydrologist will be available and will coordinate with LGUs because of the need of secondary data aside from the primary data from other agencies*
4	***People*** - Holding rituals are believed to be protection for untoward incidents - Compensation for the affected of untitled lands and landowners. Necessary documents and papers to be prepared for land negotiation for those to be affected	- *This is noted. Conduct of the holding of rituals and conduct it per barangay so that no accident will happen and is also protection for those who will do the construction.* - *The construction will not start until the land acquisition is not finished or the land owner received the payment.* - *Guided by Republic Act 10752, also known as the Right-of-Way Acquisition Act. There is a commissioned third-party appraiser authorized by the Bangko Sentral ng Pilipinas to be neutral so, there will be a fair and just assessment and evaluation of the property that will be affected*
5	**Others** - Multipartite Monitoring Team (MMT) purpose and fu	- MMT comes from the different stakeholders. from the government to represent. Usually, the monitoring is quarterly. Unless there is a really special team meeting as to where to complain, the MMT can also accept complaints, and the MMT will take care of them.

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Chapter 7 – Grievance Redress Mechanism

7.1 Objectives of the Grievance Redress Mechanism

The Grievance Redress Mechanism (GRM) is an effective tool for early identification, assessment, and resolution of complaints on projects. GRM will serve as a venue for receiving aggrieved stakeholders' concerns and acting on the concerns, but it does not hinder them from their right to judicial action if the decision is unacceptable. The DPWH will establish a GRM with these objectives:

- Receive and facilitate the resolution of the stakeholders' concerns and grievances about environment-related project impacts, which cannot be settled during public consultations, paying particular attention to the impacts on vulnerable groups;
- Measure to the risks and adverse impacts of the project; and
- Address project stakeholders' concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to the country's judicial or administrative remedies.

7.2 Information Dissemination

GRM will be established during the DED Stage. The Unified Project Management Office (UPMO) will consult the affected people through their representative and make necessary revision in this GRM to make this more effective. This will ensure the stakeholders are aware of the existence of this GRM. The consultation includes providing the contact information of the UPMO (hotlines, email, etc.)

7.3 Levels of Grievance Redress Mechanism

The GRM is composed of four (4) levels (Table 7-1). The Grievance officer of DPWH-UPMO will be the contact point for receiving the grievances/complaints from the stakeholders.

Table 7-1. Levels Of Grievance Redress Mechanism

Level	Environment Issue	Health and Safety Issue	Timeline
Contact Point	Grievance Officer of DPWH-UPMO		Same day
1st Level	HSEO of UPMO		3 working days
2nd Level	HSEC		7 working days
3rd Level	MMT	DPWH	15 working days
4th Level	DENR EMB	Court of Justice	

Note: HSEO – Health, Safety and Environment Officer, HSEC - Health, Safety and Environment Committee, MMT – Multipartite Monitoring Team

As part of the basic policies for the GRM, a grievance will be resolved in a timely manner at the lowest level possible. However, (a) if not settled at the lowest level, (b) if the aggrieved stakeholders are not satisfied with the action taken, or (c) the case is not acted upon after 15 days, the issue or concern will be taken to the next level.

The DENR and the Court of Justice will be the final decision maker for the complaint and grievance. All cases elevated to the 4th level will be outside the jurisdiction and control of this GRM.

7.4 Roles and Responsibilities

7.4.1 The Grievance Officer of DPWH-UPMO

The Grievance Officer will be appointed as a complaint contact point of DPWH-UPMO to receive all project-related complaints. The Grievance Officers will be provided with sufficient training prior to deployment.

The following are the roles and responsibilities of the Grievance Officer of the DPWH-UPMO:

- Screening of complaint if it is project-related or not. If the complaint is project-related (health, safety, and environment issue), the complaint will be forwarded to the HSEO, HSEC or MMT. If the complaint to the appropriate agency or LGUs who will act on the complaint.
- Receiving the written, verbal or electronically forwarded complaint from the aggrieved stakeholder and explaining the grievance redress process. Acknowledge receipt (and entering it into the records) of the complaint and provide a copy of the complaint including the contact details where the complaint will be forwarded and who will act on it within the day of receipt.
- Constant communication with the with the aggrieved stakeholder.
- Following up with the HSEO, HSEC, and/or MMT on their action on the complaint.
- Providing feedback to the UPMO on the status of the complaint and corresponding action/decision of the HSEO, HSEC, and/or MMT.
- Maintaing records of the complaints and corresponding actions and decisions. Prepare reports on Grievance Redress.

7.4.2 1st Level: Health, Safety and Environment Officer (HSEO)

The HSEO will be responsible for receiving, assessing, evaluating, and providing findings and recommendations on the complaints forwarded by the Grievance Officer. In addition, the HSEO will:

- Act and decide within three (3) working days on the complaint forwarded by the Grievance Officer.
- Provide feedback to the aggrieved stakeholder on the status and/or decision of the complaint through the Grievance Officer.

7.4.3 2nd Level: Health, Safety and Environment Committee (HSEC)

The HSEC, composed of HSEO, General Contractor, and Contractor, will be responsible to receive all complaints forwarded by the Grievance Officer. In addition, the HSEC will:

- Discuss forwarded grievances on regular meetings.
- Act and decide within 10 working days on the complaint forwarded by the Grievance Officer.
- Provide feedback to the aggrieved stakeholder on the status and/or decision of the complaint through the Grievance Officer.

7.4.4 3rd Level: MMT / DPWH

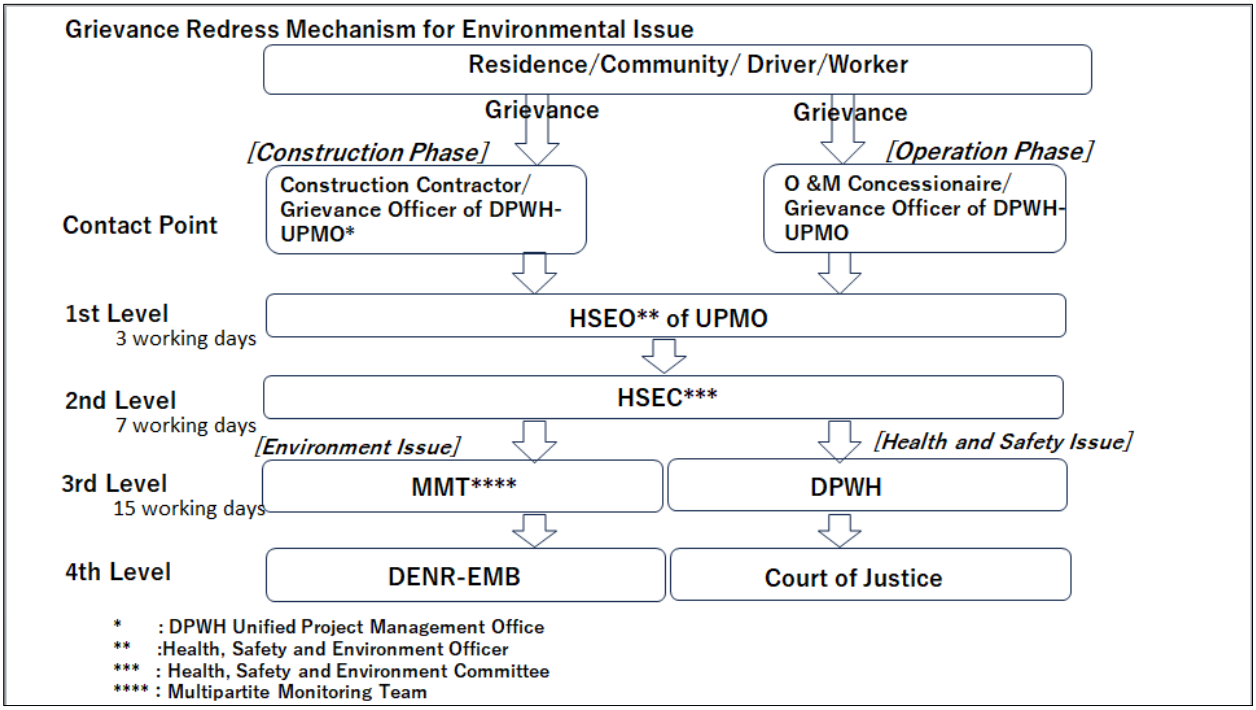
The UPMO will initiate the formation of the MMT in accordance with DAO 2017-15. Part of the responsibilities of the MMT is to handle environmental issues while health and safety issues will be handled by the DPWH. In addition, the two bodies will:

- Convene immediately once a complaint forwarded by the Grievance Officer has not been resolved in the 1st and 2nd level.
- Act and decide within 15 working days on the complaint filed by aggrieved stakeholder who is not satisfied with the action or decision of HSEC.
- Provide feedback to the aggrieved stakeholder on the status and/or decision of the complaint through the Grievance Officer.

7.4.5 4th Level: DENR

Issues related to the environment not addressed in the third level will be elevated to DENR-EMB.

Figure 7-1. Diagram flow for handling complaints regarding environmental aspects during construction and operation stage.



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Chapter 8 ENVIRONMENTAL COMPLIANCE MONITORING

The Environmental Compliance Monitoring (ECM) system ensures compliance to environmental laws which in turn minimizes the adverse effects of a Project to its immediate surroundings and protects health of the affected public. The ECM system specified by MC 2010-14 is composed of three components: a) Self-Monitoring Plan, b) multi-sectoral monitoring framework (for ECPs and EIS-based non-ECPs as deemed necessary by EMB Regional Office), and c) the Environmental Guarantee and Monitoring Fund Commitment (for ECPs and EIS-based non-ECPs as deemed necessary by EMB Regional Office).

Screening of the project using Annex A of the EMB Memorandum Circular 005 July 2014 classifies the proposed CMH as Category A: ECP project (*3.4.1 Roads, new construction*). The required document for the ECC application is the Environmental Impact Statement (EIS) submitted to the EMB-Central Office for review and subsequent issuance of the ECC.

8.1 SELF-MONITORING PLAN (SMP)

The proposed SM Plans during the pre-construction, operation, and abandonment phases formulated using the recommended format in Annex 2-20 of RPM DAO 2003-30 are shown in **Table 8-1**, **Table 8-2**, and **Table 8-3**. A qualitative SMP for environmental aspects with no standard is also included (**Table 8-4**).

The final SMP shall be formulated once the ECC has been issued. The more detailed SMP will establish the final Environmental Quality Performance Levels (EQPL) for monitoring, budget, accountability, stakeholder participation, complaints management, communication and reporting, environmental impact event/action response plan, audit program and schedule for baseline monitoring and preparation of the environmental management audit manual. Initially, the SMP will shall have the following objectives:

a. Ensure that all emissions and effluents as a result of the Project are according to DENR Rules and Regulations which include but not be limited to RA 8749 (Clean Air Act) and PD 984 (Pollution Control Law), PD 1586, RA 6969;
b. Validate the changes in the various environmental media (impact monitoring) as discussed in the impact assessment.
c. Provide early warning information of unacceptable environmental conditions; and
d. Encourage stakeholder participation.

The initial conditions to calculate the EQPL Alert, Action, and Limit values are enumerated below.

a) ALERT - 85% of the LIMIT
b) ACTION – 90% of the LIMIT
c) LIMIT – 90% of the threshold (CAA, WQG, Dutch Soil standards)

Table 8-1. Quantitative Self-Monitoring Plan during construction

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost (Philippine Peso)	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
Preparation of staging areas, Site preparation, Road construction, Construction of major components, Dismantling of staging areas	(LC) Soil contamination	Arsenic	(c)	Quarterly	Staging areas	(i)	Quarterly monitoring cost: 300,000	42.075	44.55	49.5	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Benzene	(b)	Quarterly	Staging areas	(i)		0.8415	0.891	0.99	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Ethylbenzene	(b)	Quarterly	Staging areas	(i)		244.8	259.2	288	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Toluene	(b)	Quarterly	Staging areas	(i)		84.15	89.1	99	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Xylenes	(b)	Quarterly	Staging areas	(i)		13.005	13.77	15.3	(n)	(o)	(p)
	(LC) Soil contamination	Cadmium	(c)	Quarterly	Staging areas	(i)		9.18	9.72	10.8	(n)	(o)	(p)
	(LC) Soil contamination	Chromium	(c)	Quarterly	Staging areas	(i)		290.7	307.8	342	(n)	(o)	(p)
	(LC) Soil contamination	Lead	(c)	Quarterly	Staging areas	(i)		405.45	429.3	477	(n)	(o)	(p)
	(LC) Soil contamination	Mercury	(c)	Quarterly	Staging areas	(i)		7.65	8.1	9	(n)	(o)	(p)
Preparation of staging areas, Site preparation, Road construction, Construction of major components, Dismantling of staging areas	(AC) Ambient air pollution	24h TSP	(d)	Quarterly	(q)	(i)	Quarterly monitoring cost: 500,000	175.95	186.3	207	(n)	(o)	(p)
	(AC) Ambient air pollution	24h PM10	(d)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Ambient air pollution	24h SO_2	(e)	Quarterly	(q)	(i)		137.7	145.8	162	(n)	(o)	(p)
	(AC) Ambient air pollution	24h NO_2	(f)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Noise pollution	Sound levels	(k)	Quarterly	(q)	(i)		1dB (l)	2dB (l)	2dB (m)	(n)	(o)	(p)
Preparation of staging areas, Site preparation, Road construction, Construction of major components,	(WC) Stream pollution	Arsenic	(g)	Quarterly	(h)	(i)	Quarterly monitoring cost: 300,000	0.0153	0.0162	0.018	(n)	(o)	(p)
	(WC) Stream	BOD	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost (Philippine Peso)	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
Dismantling of staging areas	pollution												
	(WC) Stream pollution	Cadmium	(g)	Quarterly	(h)	(i)		0.003825	0.00405	0.0045	(n)	(o)	(p)
	(WC) Stream pollution	COD	n/a	n/a	n/a	n/a		No WQG value			n/a	n/a	n/a
	(WC) Stream pollution	Color	(g)	Quarterly	(h)	(i)		57.375	60.75	67.5	(n)	(o)	(p)
	(WC) Stream pollution	Cyanide as Free CN-	(g)	Quarterly	(h)	(i)		0.0765	0.081	0.09	(n)	(o)	(p)
	(WC) Stream pollution	DO	(g)	Quarterly	(h)	(i)		3.825	4.05	4.5	(n)	(o)	(p)
	(WC) Stream pollution	Fecal Coliform	(g)	Quarterly	(h)	(i)		153	162	180	(n)	(o)	(p)
	(WC) Stream pollution	Hex Chromium (Cr^{6+})	(g)	Quarterly	(h)	(i)		0.00765	0.0081	0.009	(n)	(o)	(p)
	(WC) Stream pollution	Lead	(g)	Quarterly	(h)	(i)		0.03825	0.0405	0.045	(n)	(o)	(p)
	(WC) Stream pollution	Mercury	(g)	Quarterly	(h)	(i)		0.00153	0.00162	0.0018	(n)	(o)	(p)
	(WC) Stream pollution	Nitrate (NO_3-N)	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)
	(WC) Stream pollution	Oil and Grease	(g)	Quarterly	(h)	(i)		1.53	1.62	1.8	(n)	(o)	(p)
	(WC) Stream pollution	pH	(g)	Quarterly	(h)	(i)		4.7 - 5.3	5.36 - 7.3	5.8 - 8.1	(n)	(o)	(p)
	(WC) Stream pollution	Phosphate	(g)	Quarterly	(h)	(i)		0.3825	0.405	0.45	(n)	(o)	(p)
	(WC) Stream pollution	Chloride	(g)	Quarterly	(h)	(i)		267.75	283.5	315	(n)	(o)	(p)
	(WC) Stream pollution	Sulfate	(g)	Quarterly	(h)	(i)		210.375	222.75	247.5	(n)	(o)	(p)
	(WC) Stream	Surfactants	(g)	Quarterly	(h)	(i)		1.1475	1.215	1.35	(n)	(o)	(p)

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost (Philippine Peso)	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
	pollution	(MBAS)											
	(WC) Stream pollution	Temperature	(g)	Quarterly	(h)	(i)		24.8	25.11	27.9	(n)	(o)	(p)
	(WC) Stream pollution	TSS	(g)	Quarterly	(h)	(i)		61.2	64.8	72	(n)	(o)	(p)

NOTES: LC – Land Component; AC – Air Component; WC – Water Component; TDB – to be determined prior to start of construction. In the vicinity of staging areas and active construction sites

(a) EQPL values: Limit = 90% of the standard; Alert ☹85% of Limit; Action ☹90% of Limit; Final values for limits, action, and alert levels will be determined from monitoring data; Units: ug/ncm for ambient air, mg/li for water quality parameters, decibel for sound

(b) USEPA Method 8260B Btex

(c) EPA Method 3050B metals in soil

(d) Sampling method: 24h High Volume Sampler; Analytical method: Gravimetric USEPA 40 CFR, Part 50, Appendix B

(e) Sampling method: 24-hr Gas Bubbler; Analytical method: Pararosaniline Method

(f) Sampling method: 24-hr Gas Bubbler; Analytical method: Griess-Saltzman or Chemiluminescence Method

(g) EMB Approved Methods of Analysis for Water and Wastewater (EMB Memorandum Circular #012 Series of 2016)

(h) Location and coordinates of surface water monitors

Station ID	River	Latitude	Longitude
WQ1	Tagoloan River	8.52971N	124.78861E
WQ2	Dicklum River	8.35425N	124.84182E
WQ3	Kumaykay Stream	8.34422N	124.87815E
WQ4	Puntian River	8.29619N	124.91088E
WQ5	Tagalongon River	8.29878N	124.92311E
WQ6	Mapolo River	8.31123N	124.96838E
WQ7	Ipoon River	8.21708N	125.02844E
WQ8	Komotal River	8.21528N	125.03030E
WQ9	Sawaga River	8.17999N	125.05012E
WQ10	Sawaga River	8.16246N	125.11364E

(i) Contractor

(j) Monitoring included in total construction cost

(k) Noise meter with data logger @ 5-min intervals

(l) above the Limit

(m) less than DENR EQSN for a particular time and category

(n) ID pollutant source (construction activity or equipment)

(o) Implement appropriate corrective action at identified pollutant source

(p) Temporary stoppage or replacement of identified construction activity or equipment
(q) Location and coordinates of ambient AQ and sound monitors

Station ID	Barangay	Latitude	Longitude
AQ1	Zone 2B, Casinglot	124.757942	8.515825
AQ2	Purok 7, Mambatangan	124.800872	8.463833
AQ3	Zone 4, Alae	124.804962	8.412193
AQ4	Zone 1, Diclum	124.852996	8.371687
AQ5	Purok 4, San Roque	124.933255	8.329792
AQ6	San Antonio	124.983626	8.312317
AQ7	Purok 7, La Fortuna	124.996892	8.266137
AQ8	Zone 3, Impalutao	125.028944	8.232600
AQ9	Zone 9, Patpat	125.053188	8.195157
AQ10	Casanova St. Kalasungay	125.113440	8.165801

Table 8-2. Quantitative Self-Monitoring Plan during operation

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
Opening of the CMH to traffic Regular maintenance road, bridges, interchanges, underpass, overpass, and other components	(AC) Ambient air pollution	24h TSP	(d)	Quarterly	(q)	(i)	Quarterly monitoring cost: 500,000	175.95	186.3	207	(n)	(o)	(p)
	(AC) Ambient air pollution	24h PM10	(d)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Ambient air pollution	24h SO_2	(e)	Quarterly	(q)	(i)		137.7	145.8	162	(n)	(o)	(p)
	(AC) Ambient air pollution	24h NO_2	(f)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Noise pollution	Sound levels	(k)	Quarterly	(q)	(i)		1dB (l)	2dB (l)	2dB (m)	(n)	(o)	(p)
Opening of the CMH to traffic Regular maintenance road, bridges, interchanges, underpass, overpass, and other components	(WC) Stream pollution	Arsenic	(g)	Quarterly	(h)	(i)	Quarterly monitoring cost: 300,000	0.0153	0.0162	0.018	(n)	(o)	(p)
	(WC) Stream pollution	BOD	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)
	(WC) Stream pollution	Cadmium	(g)	Quarterly	(h)	(i)		0.003825	0.00405	0.0045	(n)	(o)	(p)
	(WC) Stream pollution	COD	n/a	n/a	n/a	n/a		No WQG value			n/a	n/a	n/a
	(WC) Stream pollution	Color	(g)	Quarterly	(h)	(i)		57.375	60.75	67.5	(n)	(o)	(p)
	(WC) Stream pollution	Cyanide as Free CN-	(g)	Quarterly	(h)	(i)		0.0765	0.081	0.09	(n)	(o)	(p)
	(WC) Stream pollution	DO	(g)	Quarterly	(h)	(i)		3.825	4.05	4.5	(n)	(o)	(p)
	(WC) Stream pollution	Fecal Coliform	(g)	Quarterly	(h)	(i)		153	162	180	(n)	(o)	(p)
	(WC) Stream pollution	Hex Chromium (Cr^{6+})	(g)	Quarterly	(h)	(i)		0.00765	0.0081	0.009	(n)	(o)	(p)
	(WC) Stream pollution	Lead	(g)	Quarterly	(h)	(i)		0.03825	0.0405	0.045	(n)	(o)	(p)
	(WC) Stream pollution	Mercury	(g)	Quarterly	(h)	(i)		0.00153	0.00162	0.0018	(n)	(o)	(p)
	(WC) Stream pollution	Nitrate (NO_3-N)	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)
	(WC) Stream pollution	Oil and Grease	(g)	Quarterly	(h)	(i)		1.53	1.62	1.8	(n)	(o)	(p)
	(WC) Stream pollution	pH	(g)	Quarterly	(h)	(i)		4.7 - 5.3	5.36 - 7.3	5.8 - 8.1	(n)	(o)	(p)
	(WC) Stream pollution	Phosphate	(g)	Quarterly	(h)	(i)		0.3825	0.405	0.45	(n)	(o)	(p)
	(WC) Stream pollution	Chloride	(g)	Quarterly	(h)	(i)		267.75	283.5	315	(n)	(o)	(p)
	(WC) Stream pollution	Sulfate	(g)	Quarterly	(h)	(i)		210.375	222.75	247.5	(n)	(o)	(p)
	(WC) Stream pollution	Surfactants (MBAS)	(g)	Quarterly	(h)	(i)		1.1475	1.215	1.35	(n)	(o)	(p)
	(WC) Stream pollution	Temperature	(g)	Quarterly	(h)	(i)		24.8	25.11	27.9	(n)	(o)	(p)
	(WC) Stream pollution	TSS	(g)	Quarterly	(h)	(i)		61.2	64.8	72	(n)	(o)	(p)

NOTES: LC – Land Component; AC – Air Component; WC – Water Component; TDB – to be determined prior to start of construction. In the vicinity of staging areas and active construction sites

(a) EQPL values: Limit = 90% of the standard; Alert ☹85% of Limit; Action ☹90% of Limit; Final values for limits, action, and alert levels will be determined from monitoring data; Units: ug/ncm for ambient air, mg/li for water quality parameters, decibel for sound
(b) USEPA Method 8260B Btex
(c) EPA Method 3050B metals in soil
(d) Sampling method: 24h High Volume Sampler; Analytical method: Gravimetric USEPA 40 CFR, Part 50, Appendix B
(e) Sampling method: 24-hr Gas Bubbler; Analytical method: Pararosaniline Method
(f) Sampling method: 24-hr Gas Bubbler; Analytical method: Griess-Saltzman or Chemiluminescence Method
(g) EMB Approved Methods of Analysis for Water and Wastewater (EMB Memorandum Circular #012 Series of 2016)
(h) Location and coordinates of surface water monitors

Station ID	River	Latitude	Longitude
WQ1	Tagoloan River	8.52971N	124.78861E
WQ2	Dicklum River	8.35425N	124.84182E
WQ3	Kumaykay Stream	8.34422N	124.87815E
WQ4	Puntian River	8.29619N	124.91088E
WQ5	Tagalongon River	8.29878N	124.92311E
WQ6	Mapolo River	8.31123N	124.96838E
WQ7	Ipoon River	8.21708N	125.02844E
WQ8	Komotal River	8.21528N	125.03030E
WQ9	Sawaga River	8.17999N	125.05012E
WQ10	Sawaga River	8.16246N	125.11364E

(i) DPWH/O&M Concessionaires
(j) Monitoring included in total construction cost
(k) Noise meter with data logger @ 5-min intervals
(l) above the Limit
(m) less than DENR EQSN for a particular time and category
(n) ID pollutant source (construction activity or equipment)
(o) Implement appropriate corrective action at identified pollutant source
(p) Temporary stoppage or replacement of identified construction activity or equipment
(q) Location and coordinates of ambient AQ and sound monitors

Station ID	**Barangay**	**Latitude**	**Longitude**
AQ1	Zone 2B, Casinglot	124.757942	8.515825
AQ2	Purok 7, Mambatangan	124.800872	8.463833
AQ3	Zone 4, Alae	124.804962	8.412193
AQ4	Zone 1, Diclum	124.852996	8.371687
AQ5	Purok 4, San Roque	124.933255	8.329792
AQ6	San Antonio	124.983626	8.312317
AQ7	Purok 7, La Fortuna	124.996892	8.266137
AQ8	Zone 3, Impalutao	125.028944	8.232600
AQ9	Zone 9, Patpat	125.053188	8.195157
AQ10	Casanova St. Kalasungay	125.113440	8.165801

Table 8-3. Quantitative Self-Monitoring Plan during abandonment[1]

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
Demolition of road, structures, ancillaries Disposal of demolition and solid wastes	(LC) Soil contamination	Arsenic	(c)	Quarterly	(r)	(i)	Quarterly monitoring cost: 300,000	42.075	44.55	49.5	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Benzene	(b)	Quarterly	(r)	(i)		0.8415	0.891	0.99	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Ethylbenzene	(b)	Quarterly	(r)	(i)		244.8	259.2	288	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Toluene	(b)	Quarterly	(r)	(i)		84.15	89.1	99	(n)	(o)	(p)
	(LC) Soil contamination	BTEX - Xylenes	(b)	Quarterly	(r)	(i)		13.005	13.77	15.3	(n)	(o)	(p)
	(LC) Soil contamination	Cadmium	(c)	Quarterly	(r)	(i)		9.18	9.72	10.8	(n)	(o)	(p)
	(LC) Soil contamination	Chromium	(c)	Quarterly	(r)	(i)		290.7	307.8	342	(n)	(o)	(p)
	(LC) Soil contamination	Lead	(c)	Quarterly	(r)	(i)		405.45	429.3	477	(n)	(o)	(p)
	(LC) Soil contamination	Mercury	(c)	Quarterly	(r)	(i)		7.65	8.1	9	(n)	(o)	(p)
Demolition of road, structures, ancillaries Disposal of demolition and solid wastes	(AC) Ambient air pollution	24h TSP	(d)	Quarterly	(q)	(i)	Quarterly monitoring cost: 500,000	175.95	186.3	207	(n)	(o)	(p)
	(AC) Ambient air pollution	24h PM10	(d)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Ambient air pollution	24h SO_2	(e)	Quarterly	(q)	(i)		137.7	145.8	162	(n)	(o)	(p)
	(AC) Ambient air pollution	24h NO_2	(f)	Quarterly	(q)	(i)		114.75	121.5	135	(n)	(o)	(p)
	(AC) Noise pollution	Sound levels	(k)	Quarterly	(q)	(i)		1dB (l)	2dB (l)	2dB (m)	(n)	(o)	(p)
Demolition of road, structures, ancillaries Disposal of demolition and solid wastes	(WC) Stream pollution	Arsenic	(g)	Quarterly	(h)	(i)	Quarterly monitoring cost: 300,000	0.0153	0.0162	0.018	(n)	(o)	(p)
	(WC) Stream pollution	BOD	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)
	(WC) Stream pollution	Cadmium	(g)	Quarterly	(h)	(i)		0.003825	0.00405	0.0045	(n)	(o)	(p)
	(WC) Stream pollution	COD	n/a	n/a	n/a	n/a		No WQG value			n/a	n/a	n/a
	(WC) Stream pollution	Color	(g)	Quarterly	(h)	(i)		57.375	60.75	67.5	(n)	(o)	(p)
	(WC) Stream pollution	Cyanide as Free CN-	(g)	Quarterly	(h)	(i)		0.0765	0.081	0.09	(n)	(o)	(p)
	(WC) Stream pollution	DO	(g)	Quarterly	(h)	(i)		3.825	4.05	4.5	(n)	(o)	(p)
	(WC) Stream pollution	Fecal Coliform	(g)	Quarterly	(h)	(i)		153	162	180	(n)	(o)	(p)
	(WC) Stream pollution	Hex Chromium (Cr^{6+})	(g)	Quarterly	(h)	(i)		0.00765	0.0081	0.009	(n)	(o)	(p)
	(WC) Stream pollution	Lead	(g)	Quarterly	(h)	(i)		0.03825	0.0405	0.045	(n)	(o)	(p)
	(WC) Stream pollution	Mercury	(g)	Quarterly	(h)	(i)		0.00153	0.00162	0.0018	(n)	(o)	(p)

[1] Monitoring stations will depend on the phasing and location of demolition

Key environmental aspects per project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Estimated annual cost	EQPL MANAGEMENT SCHEME					
			Method	Frequency	Location			EQPL range (a)			Management measure		
								ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
	(WC) Stream pollution	Nitrate (NO_3-N)	(g)	Quarterly	(h)	(i)		5.355	5.67	6.3	(n)	(o)	(p)
	(WC) Stream pollution	Oil and Grease	(g)	Quarterly	(h)	(i)		1.53	1.62	1.8	(n)	(o)	(p)
	(WC) Stream pollution	pH	(g)	Quarterly	(h)	(i)		4.7 - 5.3	5.36 - 7.3	5.8 - 8.1	(n)	(o)	(p)
	(WC) Stream pollution	Phosphate	(g)	Quarterly	(h)	(i)		0.3825	0.405	0.45	(n)	(o)	(p)
	(WC) Stream pollution	Chloride	(g)	Quarterly	(h)	(i)		267.75	283.5	315	(n)	(o)	(p)
	(WC) Stream pollution	Sulfate	(g)	Quarterly	(h)	(i)		210.375	222.75	247.5	(n)	(o)	(p)
	(WC) Stream pollution	Surfactants (MBAS)	(g)	Quarterly	(h)	(i)		1.1475	1.215	1.35	(n)	(o)	(p)
	(WC) Stream pollution	Temperature	(g)	Quarterly	(h)	(i)		24.8	25.11	27.9	(n)	(o)	(p)
	(WC) Stream pollution	TSS	(g)	Quarterly	(h)	(i)		61.2	64.8	72	(n)	(o)	(p)

NOTES: LC – Land Component; AC – Air Component; WC – Water Component; TDB – to be determined prior to start of construction. In the vicinity of staging areas and active construction sites

(a) EQPL values: Limit = 90% of the standard; Alert ≥85% of Limit; Action ≥90% of Limit; Final values for limits, action, and alert levels will be determined from monitoring data; Units: ug/ncm for ambient air, mg/li for water quality parameters, decibel for sound

(b) USEPA Method 8260B Btex

(c) EPA Method 3050B metals in soil

(d) Sampling method: 24h High Volume Sampler; Analytical method: Gravimetric USEPA 40 CFR, Part 50, Appendix B

(e) Sampling method: 24-hr Gas Bubbler; Analytical method: Pararosaniline Method

(f) Sampling method: 24-hr Gas Bubbler; Analytical method: Griess-Saltzman or Chemiluminescence Method

(g) EMB Approved Methods of Analysis for Water and Wastewater (EMB Memorandum Circular #012 Series of 2016)

(h) Location and coordinates of surface water monitors

Station ID	River	Latitude	Longitude
WQ1	Tagoloan River	8.52971N	124.78861E
WQ2	Dicklum River	8.35425N	124.84182E
WQ3	Kumaykay Stream	8.34422N	124.87815E
WQ4	Puntian River	8.29619N	124.91088E
WQ5	Tagalongon River	8.29878N	124.92311E
WQ6	Mapolo River	8.31123N	124.96838E
WQ7	Ipoon River	8.21708N	125.02844E
WQ8	Komotal River	8.21528N	125.03030E
WQ9	Sawaga River	8.17999N	125.05012E
WQ10	Sawaga River	8.16246N	125.11364E

(i) DPWH/O&M Concessionaires, Contractor

(j) Monitoring included in total construction cost

Quarterly cost that is for the whole monitoring for 10 stations
(k) Noise meter with data logger @ 5-min intervals
(l) above the Limit
(m) less than DENR EQSN for a particular time and category
(n) ID pollutant source (construction activity or equipment)
(o) Implement appropriate corrective action at identified pollutant source
(p) Temporary stoppage or replacement of identified construction activity or equipment
(q) Location and coordinates of ambient AQ and sound monitors

Station ID	Barangay	Latitude	Longitude
AQ1	Zone 2B, Casinglot	124.757942	8.515825
AQ2	Purok 7, Mambatangan	124.800872	8.463833
AQ3	Zone 4, Alae	124.804962	8.412193
AQ4	Zone 1, Diclum	124.852996	8.371687
AQ5	Purok 4, San Roque	124.933255	8.329792
AQ6	San Antonio	124.983626	8.312317
AQ7	Purok 7, La Fortuna	124.996892	8.266137
AQ8	Zone 3, Impalutao	125.028944	8.232600
AQ9	Zone 9, Patpat	125.053188	8.195157
AQ10	Casanova St. Kalasungay	125.113440	8.165801

(r) Location and coordinates of soil quality monitoring stations

Station ID	Latitude	Longitude	Location
S1	8.509855	124.791145	Bugo, CDO
S2	8.313177	124.965641	Kisolon, Sumilao
S3	8.165251	125.113072	Kalasungay, Malaybalay

Table 8-4. Qualitative Self-Monitoring Plan

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
PRE-CONSTRUCTION PHASE											
RROW acquisition	Inadequate land valuation	Affected land and compensation	- Ocular inspection - Photo documentation - Meetings - Minutes of meetings and attendance sheets - Unstructured interviews - Review of assessed market value	As necessary until agreement and just compensation given	Affected areas in the host LGUs	Community Relations Officer of DPWH	Included in the RAP	Criteria to be determined by stakeholders (e.g., authentic landowners, LGU, tribal leaders) in consensus		Post ECC Agreement between DPWH and DENR	
	(LAND) Vegetation removal and loss of habitat	- Number and species of trees removed - Number and species of saplings collected, hardened - Number and species transplanted Number of species of fauna affected	- Census/Inventory - Establishment of on-site nurseries - Collection of saplings - Hardening of saplings in nurseries - Transplanting of saplings to target reforestation areas - Sampling collection of endangered, vulnerable and	Prior to and during site development activities	Initially all identified riparian zones during the EIA; Transects 1, 2, 3, 7, 9 in during the EIA	Third Party	Php 1,000,000	- Inadequate sapling collection of important species Low survival rate of samplings in target reforestation areas		Institute measures to a) increase number of saplings collected, and b) survival rate of transplanted saplings	

[2] Indicative annual cost. May change during implementation.

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
			other threatened species such as necessary to implement a *"no hunting, no collection"* policy on wildlife during the construction.								
CONSTRUCTION PHASE[3]											
	(LAND) Changes in surface landforms / geomorphology / topography / terrain / slope	Surface land form	Field mapping, observations	- Semi-annually to annually - After inclement weather conditions	Areas with moderate to steep slopes identified during the EIA	Contractor	20,000	Observe landslide zone areas traversed by the alignment	Observed landslides in areas traversed by the alignment	- Report any changes on the surface landforms - Prepare incident report highlighting observed changes - Recommend remedial measures.	- Execute remedial measures such retaining walls and other engineered structures - Increase vegetation cover.
	(LAND) Soil erosion	Soil erosion	Field mapping, observations	Semi-annually	Areas identified with rill and gully erosion.	Geologist under DPWH	10,000	Potential rill or gully erosion adjacent to the road alignment.	Actual occurrence of rill or gully erosion adjacent to the road alignment.	- Report areas susceptible to rill and gully erosion. - Prepare incident report highlighting accelerated soil erosion. Provide	- Surface drainage control works. - Implement erosion control measures

[3] Preparation of staging areas, Preparation of segment construction site, Road construction, Construction of components (underpass, overpass, interchanges, toll booths, offices, bridges)

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
										recommendation if necessary	
	(LAND) Susceptibility to earthquake-induced and hydrological hazards	Susceptibility to earthquake-induced and hydrological hazards	Field mapping, observations	Semi-annually to annually or after increment weather conditions	Areas identified during the EIA with moderate to steep slopes and prone to flooding	Geologist under DPWH	20,000	Observe landslide zone areas traversed by the alignment	Observed landslides in areas traversed by the alignment	- Report areas affected by earthquake and hydrogeological hazards. - Prepare incident report and provide recommendation as necessary	- Implement recommended measures. - Conduct IEC
	(LAND) Soil contamination	Municipal solid and hazardous wastes, Fuel spillages, Oil contamination	Ocular	Daily	Staging areas and active construction sites	Contractor	Part of construction cost	Report slight presence of MSW and oil spillage	Report massive presence of MSW and oil spillage	- Prepare Incident Report - Determine cause or source - Implement corrective actions	- Determine cause or source - Implement corrective actions. - Conduct training
	(LAND) Vegetation removal and loss of habitat	- Number and species of trees removed - Number and species of saplings collected, hardened - Number and species	- Census/Inventory - Establishment of on-site nurseries - Collection of saplings - Hardening of saplings in nurseries - Transplanting of saplings to target reforestation	Prior to and during site development activities	Initially all identified riparian zones during the EIA; Transects 1, 2, 3, 7, 9 in during the EIA	Third Party under DPWH	1,000,000	- Inadequate sapling collection of important species - Low survival rate of samplings in target reforestation areas		Institute measures to a) increase number of saplings collected, and b) survival rate of transplanted saplings	

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
		transplanted - Number of species of fauna affected	areas - Sampling collection of endangered, vulnerable and other threatened species such as necessary to implement a *"no hunting, no collection"* policy on wildlife during the construction.								
	(WATER-Hydrology) River siltation	Complaints and visible turbidity or discoloration of water bodies	- Ocular inspection and visual observation - Complaints lodged	During rainy days	Streams near active construction sites	Contractor	Part of construction cost	Significant visual water discoloration.	Severe visual water discoloration.	Conduct immediate investigation on the possible source of discoloration	Temporary suspension of earthmoving works and check soil erosion control measures.
	(WATER-Aquatic ecology) Displacement of species	Phytoplankton diversity and abundance	20-µm plankton sieve	Once for low and high rainfall period	All stations except A1	Contractor	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	(WATER-Aquatic ecology) Displacement of species	Zooplankton diversity and abundance	90-µm plankton sieve	Once for low and high rainfall period	All stations except A1	Contractor	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	(WATER-Aquatic ecology)	Diversity and abundance of fishes and	Dip net sampling	Once for low and high rainfall period	All stations except A1	Contractor	100,000	Determine the significant degree of diversity and abundance change. Use this		Determine causes of significant	Corrective action on cause of

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
	Displacement of species	macrobenthic fauna						to determine the Alert and Action levels		change	significant change
	(WATER-Aquatic ecology) Displacement of pollution-sensitive species	Diversity and abundance of aquatic insects	Dip net sampling	Low and high rainfall period	All stations except A1	Contractor	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	Proliferation & entry of migrant workers or "followers"	Number of migrants	- Photo documentation - Consultation, dialogues - Minutes of meetings and attendance sheets - Written guidelines regarding entry of workers	Monthly meeting	Affected areas in host LGUs	Contractor	included in the Construction Cost	Alert, action, limit criteria to be determined by multi-stakeholders in consensus w/LGU, tribal leaders, DPWH and contracting agency		Post ECC Agreement between DPWH and DENR	
	Traffic congestion	Traffic	24-hour traffic survey	As needed	Existing roads affected by the Project	Contractor	TBD	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
OPERATION PHASE											
	(LAND) Changes in surface landforms / geomorphology / topography / terrain / slope	Surface land form	Field mapping, observations	- Semi-annually to annually After inclement weather conditions	Areas with moderate to steep slopes identified during the EIA	DPWH	20,000	Observe landslide zone areas traversed by the alignment	Observed landslides in areas traversed by the alignment	- Report any changes on the surface landforms - Prepare incident report highlighting	- Execute remedial measures such retaining walls and other

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
										observed changes - Recommend remedial measures.	engineered structures - Increase vegetation cover.
	(LAND) Soil erosion	Soil erosion	Field mapping, observations	Semi-annually	Areas identified with rill and gully erosion.	Geologist	10,000	Potential rill or gully erosion adjacent to the road alignment.	Actual occurrence of rill or gully erosion adjacent to the road alignment.	- Report areas susceptible to rill and gully erosion. - Prepare incident report highlighting accelerated soil erosion. Provide recommendation if necessary	- Surface drainage control works. - Implement erosion control measures
	(LAND) Susceptibility to earthquake-induced and hydrological hazards	Susceptibility to earthquake-induced and hydrological hazards	Field mapping, observations	Semi-annually to annually or after increment weather conditions	Areas identified during the EIA with moderate to steep slopes and prone to flooding	Geologist	20,000	Observe landslide zone areas traversed by the alignment	Observed landslides in areas traversed by the alignment	- Report areas affected by earthquake and hydrogeological hazards. - Prepare incident report and provide recommendation as necessary	- Implement recommended measures. - Conduct IEC
	(LAND) Vegetation removal and loss of habitat	Tree density	Census/Mapping	Biannual	- Entire stretch of the road alignment - All 13	Third Party	300, 000	Five percent decrease from previous census	10 percent decrease from previous census	Determine cause of decrease	Corrective measures on cause of decrease

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
					Wildlife (riparian) sampling stations						
	Threat to abundance, frequency and distribution of important species	Diversity and abundance of birds, bats, frogs	Wildlife Surveys	Annual	All 13 Wildlife (riparian) sampling stations	Third Party	300,000	Five percent decrease from previous census	10 percent decrease from previous census	Determine cause of decrease	Corrective measures on cause of decrease
	(WATER-Hydrology) Flooding	Water level	Water level logger	Daily	Near main Tagoloan River	DPWH/O&M Concessionaires	420,000	Within the annual maximum flood level	One meter above annual maximum water flood level	Conduct more frequent monitoring	Corrective action on cause of water level rise
	(WATER-Aquatic ecology) Displacement of species	Phytoplankton diversity and abundance	20-µm plankton sieve	Once for low and high rainfall period	All stations except A1	DPWH/O&M Concessionaires	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	(WATER-Aquatic ecology) Displacement of species	Zooplankton diversity and abundance	90-µm plankton sieve	Once for low and high rainfall period	All stations except A1	DPWH/O&M Concessionaires	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	(WATER-Aquatic ecology) Displacement of species	Diversity and abundance of fishes and macrobenthic fauna	Dip net sampling	Once for low and high rainfall period	All stations except A1	DPWH/O&M Concessionaires	100,000	Determine the significant degree of diversity and abundance change. Use this to determine the Alert and Action levels		Determine causes of significant change	Corrective action on cause of significant change
	(WATER-Aquatic ecology)	Diversity and abundance of aquatic	Dip net sampling	Low and high rainfall period	All stations except A1	DPWH/O&M Concessionaires	100,000	Determine the significant degree of diversity and abundance change. Use this		Determine causes of significant	Corrective action on cause of

Project phase	Potential impacts per environmental sector	Parameter to be monitored	Sampling & Measurement Plan			Lead person	Cost[2] *Php- Philippine Peso	EQPL MANAGEMENT SCHEME			
								EQPL range		Management measure	
			Method	Frequency	Location			ALERT	ACTION	ALERT	ACTION
	Displacement of pollution-sensitive species	insects						to determine the Alert and Action levels		change	significant change

8.2 MULTI-SECTORAL MONITORING FRAMEWORK (MMF)

The MMF guides the proponent in creating the Multi-partite Monitoring Team (MMT). Section 16.1 of the DENR AO 2017-15 stipulates that a Multi-partite Monitoring Team (MMT) is required for projects classified as an ECP. The MMT, a recommendatory body to EMB, is organized to encourage public participation, to promote greater stakeholder vigilance and to provide appropriate check and balance mechanisms in the monitoring of project implementation[4]. The MMT has the primary responsibility of validating the Proponent's environmental performance.

One salient revision in the DENR AO 2017-15 was that project proponents and EMB are no longer members. The EMB is now tasked to provide oversight guidance to the MMT and consider its reports and recommendations in the evaluation of impacts and compliance. The composition of the reconstituted MMT stipulated in DENR AO 2017-15 are enumerated below.

1. Host LGUs (one representative each)
   - Municipal Environment and Natural Resources Officer (or representative)
   - Municipal Planning and Development Officer (if there is no MENRO)
   - Rural Health Unit (RHU) Chief
   - Barangay Captains

2. Representatives from two (2) non-government organizations (NGO) accredited by the host LGUs
   - One (1) representative from local recognized community leaders representing vulnerable sectors, e.g., women and senior citizens.
   - One (1) representative from the academe
   - Representative from the IP groups

The MMT functions are enumerated below.

1. Quarterly site visit to validate the proponent's compliance with the ECC conditions, EMP, SMP, and compliance reporting. The MMT may also observe sampling activities conducted by the DPWH;
2. Prepare and submit semi-annual reports to EMB Central Office and EMB Regional Office using prescribed formats; and
3. Institute an environmental emergency and complaints mechanism.

The proposed MMT members are expected to exceed the 10-member limit because the proposed CMH traverses two provinces (Bukidnon and Misamis Oriental), four municipalities, and two cities in Region X. In addition it is proposed that two MM Teams will be organized for each province with jurisdiction of the CMH alignment. The project proponent (DPWH) will provide funds for the MMT activities based on the Annual Work and Financial Plan approved by EMB.

Table 8-5. Proposed MMT for the CMH section in Misamis Oriental

Local government unit	Agency/Department/Organization	MMT Position
Province of Misamis Oriental	Representative, PG-ENRO	Chairman
Cagayan de Oro City	Representative, City ENRO	Member
Municipality of Tagoloan	Representative, Municipal ENRO	Member
Cagayan de Oro City	Representative, Rural Health Unit	Member
Municipality of Tagoloan	Representative, Rural Health Unit	Member
Cagayan de Oro City	Chairman, Barangay Bugo	Member
Cagayan de Oro City	Chairman, Barangay Puerto	Member
Cagayan de Oro City	Chairman, Barangay Balubal	Member
Municipality of Tagoloan	Chairman, Barangay Casinglot	Member

[4] Revise Procedural Manual for DENR Administrative Order No. 30 Series of 2003 (DAO 03-30)

Local government unit	Agency/Department/Organization	MMT Position
Municipality of Tagoloan	Chairman, Barangay Natumolan	Member
Province of Misamis Oriental	Representative, accredited NGOs	Member
Province of Misamis Oriental	Representative, IP Groups	Member
Province of Misamis Oriental	Representative, Farmer associations	Member
Province of Misamis Oriental	Representative, PWD organizations	Member
Province of Misamis Oriental	Representative, Women's Organizations	Member
Province of Misamis Oriental	Representative, Transportation Organizations	Member
Province of Misamis Oriental	Representative, DA Region X	Member
Province of Misamis Oriental	Representative, NCIP Region X	Member
Province of Misamis Oriental	Representative, PENRO Misamis Oriental -DENR Region X	Member

Table 8-6. Proposed MMT for the CMH section in Bukidnon

Local government unit	Agency/Department/Organization	MMT Position
Province of Bukidnon	Representative, PG-ENRO	Chairman
Municipality of Manolo Fortich	Representative, Municipal ENRO	Member
Municipality of Sumilao	Representative, Municipal ENRO	Member
Municipality of Impasug-ong	Representative, Municipal ENRO	Member
City of Malaybalay	Representative, City ENRO	Member
Municipality of Manolo Fortich	Representative, Rural Health Unit	Member
Municipality of Sumilao	Representative, Rural Health Unit	Member
Municipality of Impasug-ong	Representative, Rural Health Unit	Member
City of Malaybalay	Representative, Rural Health Unit	Member
Municipality of Manolo Fortich	Chairman, Barangay Alae	Member
Municipality of Manolo Fortich	Chairman, Barangay San Miguel	Member
Municipality of Manolo Fortich	Chairman, Barangay Damilag	Member
Municipality of Manolo Fortich	Chairman, Barangay Dicklum	Member
Municipality of Manolo Fortich	Chairman, Barangay Sankanan	Member
Municipality of Manolo Fortich	Chairman, Barangay Tankulan	Member
Municipality of Manolo Fortich	Chairman, Barangay Ticala	Member
Municipality of Manolo Fortich	Chairman, Barangay Mambatangan	Member
Municipality of Sumilao	Chairman, Barangay Puntian	Member
Municipality of Sumilao	Chairman, Barangay Vista Villa	Member
Municipality of Sumilao	Chairman, Barangay Culasi	Member
Municipality of Sumilao	Chairman, Barangay Poblacion	Member
Municipality of Sumilao	Chairman, Barangay Kisolon	Member
Municipality of Sumilao	Chairman, Barangay San Roque	Member
Municipality of Impasug-ong	Chairman, Barangay Poblacion	Member
Municipality of Impasug-ong	Chairman, Barangay La Fortuna	Member
Municipality of Impasug-ong	Chairman, Barangay Cawayan	Member
Municipality of Impasug-ong	Chairman, Barangay Capitan Bayong	Member
Municipality of Impasug-ong	Chairman, Barangay Impalutao	Member
City of Malaybalay	Chairman, Barangay Dalwangan	Member
City of Malaybalay	Chairman, Barangay Patpat	Member
City of Malaybalay	Chairman, Barangay Kalasungay	Member
Province of Bukidnon	Representative, accredited NGOs	Member
Province of Bukidnon	Representative, IP Groups	Member
Province of Bukidnon	Representative, Farmer associations	Member
Province of Bukidnon	Representative, PWD organizations	Member
Province of Bukidnon	Representative, Women's Organizations	Member
Province of Bukidnon	Representative, Transportation Organizations	Member
Province of Bukidnon	Representative, DA Region X	Member
Province of Bukidnon	Representative, NCIP Region X	Member
Province of Bukidnon	Representative, PENRO Bukidnon - DENR Region X	Member

8.3 ENVIRONMENTAL GUARANTEE AND MONITORING FUND COMMITMENTS

8.3.1 Environmental Guarantee Fund (EGF)

DENR Administrative Order No. 2003-3 states that an EGF shall be established for all co-located or single projects that have been determined by DENR to pose a significant public risk or where the project requires rehabilitation or restoration. An EGF Committee shall be formed to manage the fund. It shall be composed of representatives from the EMB Central Office, EMB Regional Office, affected communities, concerned LGU's, and relevant government agencies identified by EMB. An integrated MOA on the MMT-EMF-EGF shall be entered into among the EMB Central Office, EMB Regional Office, the proponent, and representatives of concerned stakeholders.
DENR Administrative order NO.2003-3 states also the objective of establishing the EGF as follows. The EGF is a fund that proponents commit when an ECC is issued for projects or undertakings determined by EMB to pose significant damage risk to life, property, and the environment. The fund is established and used for the following risk-management related purposes[5]:

a) immediate rehabilitation of areas affected by damage to the environment and the resulting deterioration of environmental quality as a direct consequence of project construction, operation, and abandonment;
b) the just compensation of parties and communities affected by the negative impacts of the project;
c) the conduct of scientific or research studies that will aid in the prevention or rehabilitation of accidents and/or risk-related environmental damages; or
d) contingency clean-up activities, environmental enhancement measures, damage prevention program including the necessary IEC and capability building activities to significantly minimize or buffer environmental risk- related impacts.

The two major components of the EGF are described below:

a) The **Trust Fund** is a form of a guarantee instrument used to compensate aggrieved parties for any damages to life or property, undertake community-based environmental programs, and conduct environmental research aimed at strengthening measures to prevent environmental damage, and finance restoration and rehabilitation of environmental quality damages caused by the project. This could be in the form of insurance, letters of credit, trust funds, other financial instruments and other similar guarantee instruments. Unless extreme circumstances warrant, surety or performance bonds are not acceptable forms of EGF trust fund.

b) The **Environmental Guarantee Cash Fund** is allotted for immediate rehabilitation and compensation of affected communities in case of damage or accidents and to cover the administrative costs of managing the fund by an MMT-authorized fund manager. The part of the fund for emergency response may be placed in a government bank guarantee, withdrawable within a 24-hour or other short-term notice by the proponent or the MMT. The rest of the Cash Fund may be placed in an interest-bearing account with the interest accruing to the Cash Fund. The fund is required to be replenished when it reaches a certain level agreed upon by the MMT but not be lower than 50%.

Because of the absence of explicit provisions under DAO 2003-30 in determining the amount of the EGF, experiences of projects with similar nature with EGF funds can be used to initially determine the amount and adjusted through discussions between the proponent and EMB considering the following factors:

a) EIS committed programs
b) Degree of environmental risk involved (based on number and extent of potential damage)
c) Valuation of resources that would most likely to be affected; and
d) Proponent's ability to provide funds for the EGF

[5] Annex 3-6 of the RPM of DAO2003-30

A Contractor's All Risk Insurance (CARI) required by the DPWH covers cases of untoward incidents during the construction stage. The CARI as the EGF is initially set at Php7 billion (assuming 10 percent[6] of the indicative project cost of Php70 billion in *Section 1.9* of the PD). The CARI will be used as the EGF during the construction phase and as such will follow the purpose, administration, and management of the EGF.

8.3.2 Environmental Monitoring Fund (EMF)

The EMF (required for MMTs) is a fund that a Proponent commits to establish to support the activities of the MMT for the compliance monitoring. The initial determination of the EMF is included as part of the Environmental Management and Monitoring Plan and as established in the ECC for a particular project or undertaking. The actual amount however is determined by the Annual Work and Financial Plan (AWFP) agreed upon with the MMT and derived from the Proponent's Environmental Monitoring Plan (EMoP). The final amount is specified in the MOA between EMB and the Proponent with conformity of the MMT members.

Initially, the basis for determining the EMF is the cost of monitoring activities and mitigating measures proposed by the Proponent in the Environmental Management Plan. The rates or amounts for the preparation of the Work and Financial Plan will be according to the limits set prescribed in pertinent government guidelines.

The EMF will be exclusively used for all costs related to the operation of the MMT, the activities of which are detailed in the MMT Manual of Operations (MOO). The following activities/costs are covered by the EMF:

a) Cost of transportation, board and lodging;
b) MMT meetings;
c) Equipment rental;
d) Documentation (photos, video, etc.);
e) Sampling, shipment or transport of samples including laboratory analysis;
f) Hiring external experts or subcontracting of a monitoring work to a neutral party;
g) MMT training;
h) Preparation of monitoring reports and distribution; and
i) Public information campaign/dissemination

An initial amount of PhP500,000.00 per year will be allotted for the Environmental Monitoring Fund to be finalized upon the creation of the MMT.

8.4 PEMAPS QUESTIONNAIRE

Project Name	:	Central Mindanao High Standard Highway Project
Project Location	:	Cagayan de Oro City, Malaybalay City, Municipalities of Tagoloan, Manolo Fortich, Sumilao, Impasug-ong
DPWH	:	Department of Public Works and Highway – Central Office
Pollution Control Officer	:	To be appointed
Tel. No./Fax No./Email	:	
Project Type	:	Category A:ECP (3.4.1 Roads, new construction, NATIONAL ROAD: ≥20.0 km (length with no critical slope) OR ≥10.0 km (length with critical slope))

[6] 10 percent of the Total Contract Cost, Bidding Documents for Infrastructure, Annex II-1.1: DPWH Standard, Volume II – Infrastructure, Department of Public Works and Highways Procurement Manual, 27 September 2016.

Project Status : Proposed

I. PROJECT CONSIDERATIONS

Size and Type:

- Length: 65.5 km
- Area: 3,936,000m^2 (393.6ha)
- Type: Road Project

Size based on number of employees

Project Type

ECP: X

Non-ECP but in ECA:

Non-ECP and Non-ECA

Specify number of employees: Construction: 50,000

Waste Generation and Management

Category	Waste	Type		Quantity
		Hazardous	Non-Hazardous	
Air	Fugitive dust		x	TBD
	Vehicle emissions		x	TBD
Liquid	Domestic wastewater		x	TBD
Solid	Municipal wastes		x	TBD
	Hazardous wastes	x		TBD

TBD - To be determined

Pollution Control System (PCS)

Category	PCS/Waste Management Method Used	Remarks
CONSTRUCTION PHASE		
Air/Noise	- Air / Noise: Scheduled or appropriate maintenance or repair of machinery/ equipment especially those that have high noise levels; - Noise: Placement of appropriate covers or barriers on machinery/equipment - Fugitive Dust: Dust suppression measures	- Activity: use of heavy equipment during construction. - Part of Environmental Management Plan (EMP). - To be enforced by the proponent thru the PCO. - To be monitored for compliance.
Liquid	- Surface Run-Off: Erosion control measures - Domestic wastewater: Onsite sanitary facilities - Hazardous wastes, e.g., used oil: Construction Waste Management Plan	- Activity: Earthmoving activities during rainy days - Part of Environmental Management Plan (EMP). - To be put in place prior to construction activities. - To be enforced by the DPWH thru the PCO. - To be monitored for compliance.
Solid	Construction solid wastes: Construction Waste Management Plan for Municipal Solid Wastes and Hazardous Wastes	- Activity: During entire construction period. - Part of Environmental Management Plan (EMP). - To be enforced by the proponent thru the PCO. - To be monitored for compliance.
OPERATION PHASE		

Category	PCS/Waste Management Method Used	Remarks
Liquid	- Water conservation plan - Treatment of process wastewater - Sludge: Hauling by DENR Accredited hauler	- Part of Environmental Management Plan (EMP).
Solid	Municipal and hazardous wastes: Waste Management Plan	- Part of Environmental Management Plan (EMP). - To be enforced by the proponent thru the PCO. - To be monitored for compliance.

II. PATHWAYS

Prevailing wind towards barrio or city? Yes X No ____
Rainfall (impacts surface & groundwater pathways)
Average annual net rainfall: 2,136.6 mm[7]
Maximum 24-hour rainfall: 284.5mm

Terrain (select one and mark) Flat Rolling X Steep X
Is the facility located in a flood-prone area? Yes X (some portions) No __

Ground Water
Depth of groundwater table (meter)

0 to less than 3	
3 to 10	X
Greater than 10	X

III. RECEIVING MEDIA/RECEPTORS

Air (Distance to nearest community)

0 to less than 0.5 km	X
0.5 to 1 km	X
Greater than 1 km	X

Receiving Surface Water Body
Distance to receiving surface water:

0 to less than 0.5 km	X
0.5 to 1 m	
Greater than 1 km	

Size of population using receiving surface water: indeterminate

Fresh Water
Classification of fresh water

AA	
A	
B	
C	X
D	

Size of fresh water body: 949,000 hectares
Economic value of water use

Drinking	X

[7] Average of normal data at the Lumbia Airport and Malaybalay PAGASA stations (1981-2010)

Domestic	X
Recreational	X
Fishery (marginal)	X
Industrial	X
Agricultural	X
Others: recipient of surface runoff	X
Recipient of domestic discharges	X

Salt water (not applicable)

Ground Water

Distance to nearest recharge area

0 to less than 0.5 km	
0.5 to 1 km	
Greater than 1 km	X

Distance to nearest well used

0 to less than 0.5 km	
0.5 to 1 km	X
Greater than 1 km	

Groundwater use within the nearest well

Drinking	X
Industrial	X
Agricultural	X

Land

Indicate current/actual land uses within 0.5 km radius:

Residential	X
Commercial/Institutional	X
Industrial	X
Agricultural/Recreational	X
Protected Area	

Potential/proposed land uses within 0.5 km

Residential	X
Commercial/Institutional	X
Industrial	X
Agricultural/Recreational	X
Protected Area	

Number of affected Environmentally Critical Areas within 1 km: 3 (natural calamities, water bodies, agricultural area)

Distance to nearest ECA

0 to less than 0.5km	X
0.5 to 1 km	
Greater than 1 km	

IV. ENVIRONMENTAL PERFORMANCE

Compliance (will be double-checked with PCD files)

Law	Violation	Type (specify number of times committed)				Type of Admin Violation	Additional Remarks/ Status of Compliance
		STANDARD					
		Emission/ Effluent/ Discharge	Ambient	Human Impact	Admin/ ECC		
RA 8749	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RA 9275	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RA 6969	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PD 1586	n/a	n/a	n/a	n/a	n/a	n/a	n/a
RA 9003	n/a	n/a	n/a	n/a	n/a	n/a	n/a

n/a – not applicable

Number of Valid Complaints
Citizen and NGOs: n/a
Others (other Govt. Agencies, Private Institutions): n/a

(To be filled up by EMB Personnel)
RECOMMENDATION/S:

Noted By: Assessed By:

ACCOUNTABILITY STATEMENT OF PROJECT PROPONENT

This is to certify that all information in the submitted Project Environmental Monitoring and Audit Prioritization Scheme (PEMAPS) Questionnaire of the CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT of the DEPARTMENT OF PUBLIC WORKS AND HIGHWAY – CENTRAL OFFICE located in the provinces of Misamis Oriental and Bukidnon is true, accurate and complete. Should we learn of any information, which makes this inaccurate, we shall bring said information to the Environmental Management Bureau Central Office.

In witness whereof, I hereby set out my hands this _____ day of _____ at _____.

CONSTANTE A. LLANES, JR.
Acting Undersecretary for Planning Service
DPWH – Central Office

SUBSCRIBED AND SWORN to before me this ___ day of _____ at _____ Affiant exhibiting to me his _____ issued on _____ at _____.

Doc. No. _____
Page No. _____
Book No. _____
Series _____

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CHAPTER 9 – DECOMMISSIONING/ ABANDONMENT/ REHABILITATION POLICY

Abandonment in this context means dismantling of the staging areas (barracks, equipment, support facilities) during construction of the alignment segments. To comply and support the requirements of the Philippine EIS System on abandonment, decommissioning, and rehabilitation, e.g., RPM of DAO 2003-30, MC 2010-14, it will be the policy of DPWH to ensure that abandonment of staging areas, decommissioning of equipment, and rehabilitation will have the least environmental impact and comply with existing laws. The Proponent (DPWH, Contractor) will formulate an Environmental, Health, and Safety policy during the dismantling of staging areas for each road segment.

The detailed Staging Area Abandonment and Decommissioning Plan (ADP) will be formulated during the pre-construction phase and submitted to the EMB-Central Office.

The ADP will include a) land or soil restoration, decontamination, and remediation, and b) strategies and methods for rehabilitating the staging areas. The proposed activities and components of the ADP are enumerated below.

a) Procedures for the decommissioning of equipment
b) Transport/disposal of equipment and other materials used during construction;
c) Remediation of contaminated soil and water resources due to spills and leakage of chemicals and other materials used; and
d) Procedures for rehabilitating of the staging area close to its original condition

The wastes expected in the event of dismantling the staging areas are:

1. Demolition wastes - waste building materials, packaging, and rubble resulting from renovation, repair.
2. Bulky wastes - Oversized wastes which, because of large size, preclude or complicates their handling by normal solid waste collection, processing, or disposal methods.
3. Special Wastes - Wastes that may have particular health, safety, and environmental concerns. These include materials with lead-based paint coatings, lighting wastes (e.g., mercury containing lamps, PCB containing ballast's), electrical components (e.g., oil containing switches and transformers), and other equipment.
4. Unused fuels and lubricants

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Chapter 10 - INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

The Institutional Plan ensures the proper implementation of the requirements in Chapters 3, 5, and 6 (EMP, SMP, MMT, SDP, IEC) during the pre-construction, construction, and operation (maintenance) of the CMH Project. The Institutional Plan will ensure:

a) Compliance with ECC conditions;
b) Effectiveness of environmental measures for adverse impacts and enhancing beneficial ones; and
c) Continued updating of the EMP, SMP, MMT, SDP, and IEC for sustained responsiveness to Project implementation and impacts.

10.1 The Environmental Unit

The Proponent (DPWH) has an Environmental Unit (EU) to implement the environmental compliance requirements and conduct regular coordination with EMB Region 10. The DPWH EU will also be responsible for ensuring compliance with other environmental rules and regulations that the EMB may impose.

The Environmental Unit (EU) shall have the following responsibilities:

a) Monitor actual project impacts the predicted impacts and management measures in the EIS;
b) Recommend revisions to the EMoP, whenever necessary subject to the approval of the EMB-CO;
c) Ensure that data gathered during monitoring activities are properly documented, assessed, evaluated, and reported in accordance with the standard formats; and d. Ensure that monitoring and submission of reports to EMB-CO are carried out as required.

10.2 Compliance Reporting

Regular compliance reporting to EMB-R10 indicated in the EMP will be undertaken by the EU. The Proponent after the issuance of the ECC will ensure that the contractors and toll operator during the construction and operation phases will implement the EMP and SMP in addition to compliance to the same during the operation phase. The Proponent will also ensure that the quarterly Self-Monitoring Reports (SMR) and bi-annual Compliance Monitoring Reports (CMR) are submitted on the regular and timely basis.

10.3 Organizational Structure

The DPWH as the Proponent has the Environmental and Social Safeguards Division (ESSD) under the Office of the Undersecretary for Planning as an organic structure tasked to ensure the integration and implementation of environment and social safeguards for its projects. The ESSD is mainly responsible for monitoring the overall operation and effectiveness of the Impact Management Plan (IMP) during the construction and operational phases. See the Table 10-1-for the Roles of the Relevant Agencies on EIA of this project ,Table 10-2 for Environmental Management and Monitoring Implementation Organization. Also in the Figure 10-5 Environmental Management and Monitoring Implementation Organization indicated the flow of the submissions of the reports.

The role of the ESSD shall cover project planning, preparation, design, implementation, monitoring and post implementation evaluation. The ESSD shall coordinate closely with the other concerned offices of the DPWH to enable it to provide assistance during various stages of project planning and implementation. The functions of the ESSD are as follows:

a) Conduct assessments for environmental, social impact and land acquisition.
b) Prepare relevant reports such as Initial Environmental Examinations (IEE), Environmental Impact Statements (EIS), Environmental Management Plans (EMP), Resettlement Action Plans (RAP), Gender Development Plan (GAD) and other necessary documents.

c) Facilitate consultation and information dissemination to project affected persons and other relevant stakeholders.
d) Conduct environmental monitoring;
e) Monitor RAP implementation and conduct post implementation evaluation. Provide guidance to regional and district level DPWH staff and local authorities in carrying out the above studies, preparation of documents and RAP implementation.
f) Provide training at regional, district and local level for consultation/participation, RAP implementation, environmental management planning, environmental monitoring, EIA tools and other new techniques.
g) Maintain and update the existing data bank and Geographical Information System (GIS).
h) Coordinate environmental concerns with other DPWH offices, Government Agencies, Local Government Units and Non-Governmental Organizations.
i) The roles of ESSD have been extended beyond EIA compliance to include the design and implementation of Resettlement Action Plans (RAPs), public consultation and information dissemination, and providing guidance and training to all DPWH offices

The ESSD is divided into three (3) units, namely: a) Environmental Safeguards Section (ESS), b) Social Safeguards and Right-of-Way Section (SSROW); and c) National Sewerage and Septage Management Program Section (NSSMP).

Environment Safety and Health (ESH) Officer - shall be assigned by the main Contractor during the construction phase. In coordination with the Senior Environmental Specialist of Construction Supervision Consultant, the ESH Officer is responsible for implementing the Impacts Management Plan (IMP) and the Self-monitoring Plan (SMP). The main duties of the ESH Officer are enumerated below.

a) Ensure that all concerned supervisors and staff understand and properly undertake their responsibilities;
b) Ensure proper and timely conduct of environmental monitoring activities;
c) Implement an effective preventive and corrective control system, particularly in terms of environmental emergency preparedness and response procedures;
d) Conduct or initiate training of contractors (and sub-contractors, if any) on environmental awareness; and
e) Collate performance data and prepare reports which include performance assessment in comparison with the Impacts Management Plan (IMP) objectives and targets for submission to the Construction Supervision Consultant's Senior Environmental Specialist.
f) To ensure effectiveness of the IEC, act as a liaison between DPWH- Unified Project Management Office (UPMO) and the primary stakeholders, particularly the host LGUs, affected barangays, and other government agencies.

Safety Officer - The main Contractor will engage a Safety Officer to review and recommend amendments and updates to the DPWH and authorized company circulars and bulletins pertaining to environmental safety, with special attention to the protection of human lives and properties against fire, and natural disasters such as typhoons, earthquake, and other calamities. The Safety Officer in coordination with the ESH Officer shall also take charge of posting environmental information and internal/external communications regarding environmental quality and safety.

Aside from these two key staff, each Sub-Contractor is required to assign Environmental Coordinators to undertake site supervision and inspection during the implementation of the Environmental Monitoring Plan as well as in maintaining cleanliness and aesthetic appeal at the staging areas and active construction areas. The Environmental Coordinators are also responsible for liaising with other government agencies with regards to licensing and securing permits, as required.

Pollution Control Officer (PCO) - The duties and responsibilities stipulated in DENR AO 21 of the accredited Pollution Control Officer are enumerated below.

a) Attend to the environmental compliance requirements of the EMB and LGU prior to the construction or installation of pollution control facilities;
b) Monitor activities during the installation or construction of pollution source and control facilities to ensure compliance with the air, noise and water quality standards;
c) Supervise the proper operation and maintenance of pollution source and control facilities;
d) Report to the immediate supervisor within reasonable time if any pollution control facility breaks down including the estimated and actual date of completion/repair;
e) Promptly submit validated/certified periodic reports;
f) Be updated and familiar with the requirements of the DENR-EMB and the latest available technology on the pollution prevention, control, and abatement;
g) Maintain liaison with the host LGU pollution control or environmental officers;
h) Attend meetings for PCOs called by the DENR-EMB;
i) Facilitate compliance to DENR-EMB requirements during Project implementation;
j) Recommend the installation and operation of additional equipment for the pollution control; and
k) Handle other environmental matters as required.

The structures that include the EU of the DPWH and other actors of the overall Implementation Plan during the construction and operation phases are shown in **Figure 10-1** –**Figure 10-4** respectively. Also **Table 10-1**-for the Roles of the Relevant Agencies on EIA of this project and **Table 10-2** for Environmental Management and Monitoring Implementation Organization

The DPWH-UPMO is responsible for ensuring compliance to the ECC provisions, EMP, and SMP during Project implementation. The ESSD and its Environmental Unit is directly in-charge to handle the management and technical works necessary to comply with the environmental requirements of the Project. The Unit will also coordinate and provide the necessary information and assistance to other parties, e.g., EMB, host LGUs, other government agencies, people's organization and the stakeholders. The ESSD is responsible for implementing the RAP as a member of the Resettlement Implementation Committee.

The main Project contractor will have its own environmental unit and PCO during the construction stage to ensure compliance to the Construction Environmental Management Plan. The sub-contractors will have at least an Environmental Coordinator to monitor activities and environmental performance.

A Project Management Team or Project Management Office (PMO) will be established on-site to directly manage the construction activities, including environmental compliance monitoring.

The DPWH Regional Office may be designated by the DPWH-UPMO during the operation stage of the project (because it is long term) to monitor and comply with the environmental requirements. The regional office will constitute an Environmental Unit/PCO solely dedicated to the CMH Project.
The description of the roles of other key actors in the institutional arrangement are described below.

1. **EMB** - Primarily responsible for the over-all evaluation/audit of the Proponent's monitoring activities.

2. **Other Parties/Stakeholders** - Other parties such as the host LGUs (city, municipality, barangay), national and other government agencies, and community/people's organization have their respective roles and responsibilities in monitoring project implementation and the environmental performance of the proponent.
   a) Mayors of host LGUs or representatives – Mayors of Tagoloan, Cagayan De Oro, Sumilao, Malaybalay, Manolo Fortich and Impasug-ong
   b) UPMO/Field Offices

c) Host LGU government officers - Tagoloan, Cagayan De Oro, Sumilao, Malaybalay, Manolo Fortich and
Impasug-ong
   - Brgy Bugo, Puerto, Balubal Cagayan De Oro Misamis Oriental
   - Brgy.Casinglot, Natumolan Tagoloan, Misamis Oriental
   - Brgy. Alae, Brgy. San Miguel, Brgy. Damilag, Brgy. Dicklum, Brgy.Sankanan, Brgy. Tankulan, Brgy. Ticala, Mambatangan Manolo Fortich Bukidnon
   - Brgy. Puntian, Brgy. Vista Villa, Brgy. Culasi, Brgy. Poblacion, Brgy. Kisolon, Brgy. San Roque, Brgy. Kisolon Sumilao Bukidnon
   - Brgy. Poblacion, Brgy. La Fortuna, Brgy. Capitan Bayong, Brgy. Cawayan, Brgy. Impalutao Impasug-ong Bukidnon
   - Brgy. Patpat, Brgy. Kalasungay, Brgy. Dalwangan, Barangay 10 Malaybalay Bukidnon

d) Representative of PAPs of the host barangaysBrgy Bugo, Puerto, Balubal Cagayan De Oro Misamis Oriental
   - Brgy.Casinglot, Natumolan Tagoloan, Misamis Oriental
   - Brgy. Alae, Brgy. San Miguel, Brgy. Damilag, Brgy. Dicklum, Brgy.Sankanan, Brgy. Tankulan, Brgy. Ticala, Mambatangan Manolo Fortich Bukidnon
   - Brgy. Puntian, Brgy. Vista Villa, Brgy. Culasi, Brgy. Poblacion, Brgy. Kisolon, Brgy. San Roque, Brgy. Kisolon Sumilao Bukidnon
   - Brgy. Poblacion, Brgy. La Fortuna, Brgy. Capitan Bayong, Brgy. Cawayan, Brgy. Impalutao Impasug-ong Bukidnon
   - Brgy. Patpat, Brgy. Kalasungay, Brgy. Dalwangan, Barangay 10 Malaybalay Bukidnon
   - Representative of NGOs within the jurisdiction of the host LGUs

e) Representatives of assisting regional government offices such as NHA, Department of Labor and Employment (DOLE), Technical Education and Skills Development Authority (TESDA), Department of Social Welfare and Development (DSWD), Department of Trade and Industry (DTI) and others if necessary

3. **Resettlement Implementation Committee (RIC)** - The RIC is a local coordinating and consultative body for implementing the RAP. It is set-up by the DPWH UPMO by a MOA with concerned parties prior to the commencement of the detailed engineering design. The composition and functions of the RIC are presented below.

<u>Members</u>

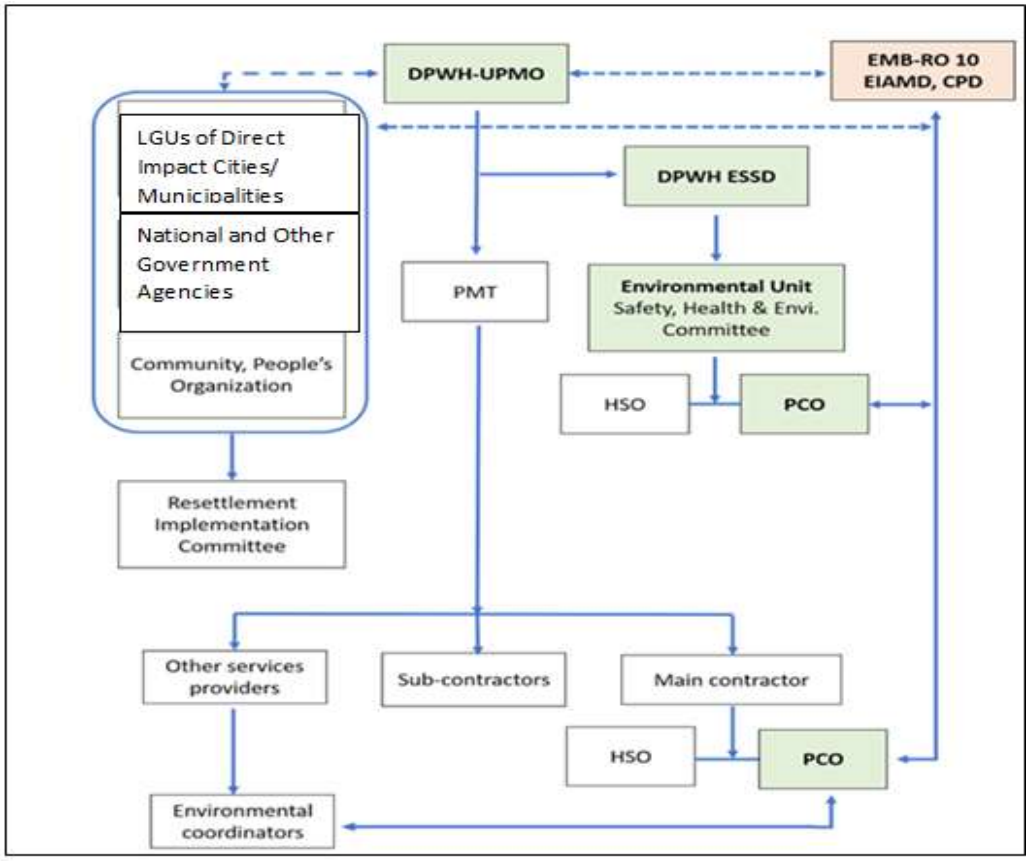
a) Mayors of host LGUs or representatives
b) UPMO/Field Offices
c) Host LGU government officers
d) Barangay Chairpersons of the host barangays
e) Representative of PAPs of the host barangays
f) Representative of NGOs within the jurisdiction of the host LGUs
g) Representatives of assisting regional government offices such as NHA, Department of Labor and Employment (DOLE), Technical Education and Skills Development Authority (TESDA), Department of Social Welfare and Development (DSWD), Department of Trade and Industry (DTI) and others if necessary.

<u>Functions</u>

a) Assist UPMO in preparing and validating the list of PAFs and affected assets;
b) Assist UPMO and ESSD during consultation meetings and information dissemination of PAPs and other relevant stakeholders during Reprocess;
c) Assist UPMO and ESSD in monitoring the implementation of RAP during the process;

d) Assist the host LGUs in coordination with concerned government agencies regarding enforcement of laws and ordinances regarding encroachment to the Project RROW;
e) Receive complaints and grievances of PAPs and other stakeholders and act accordingly; and
f) Maintain records of all public meetings, complaints, and actions taken

Figure 10-1. Institutional arrangement scheme during construction



NOTES: DPWH UPMO - DPWH Unified Project Management Office, DPWH ESSD – DPWH Environmental and Social Safeguards Division, PMT – Project Management Team, HSO – Health and safety Officer, PCO – Pollution Control Office

NOTES : Solid Arrow - direction or reporting
Dotted arrow –coordination

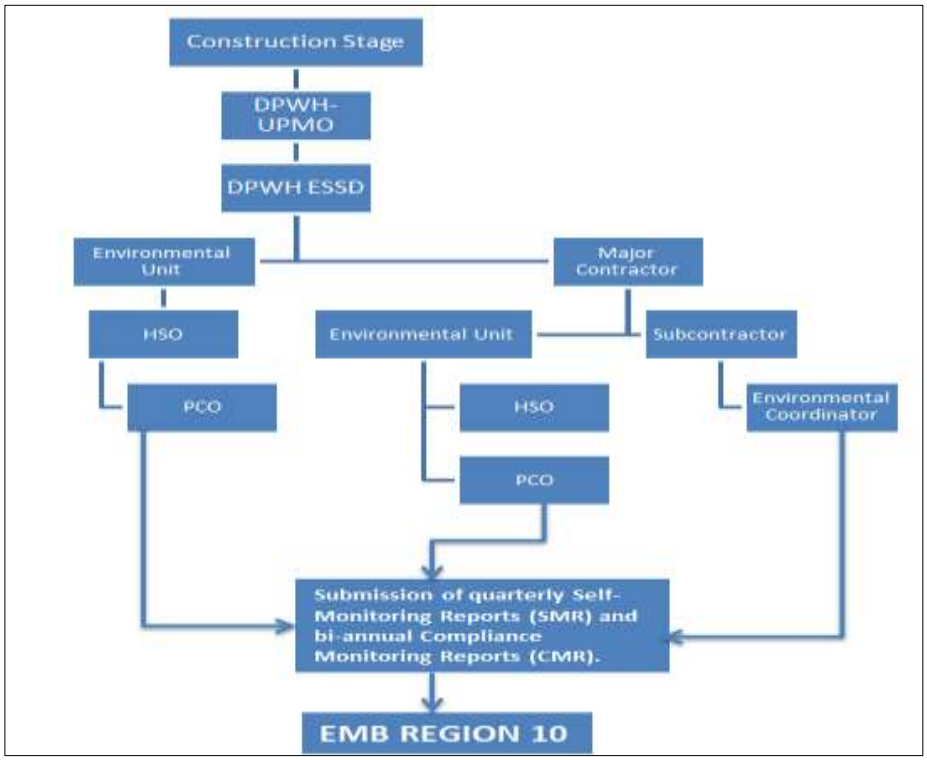
Legend:

Orange- Institution primarily responsible for the over-all evaluation/audit of the Proponent's monitoring and the MMT validation.

Green- Proponent/Key Institutions and roles

White – Proponent Driven but outside of EIA Process as requirements are under the mandate of other entities

Figure 10-2. Flowchart of submission of monitoring reports to EMB R10



NOTES: DPWH UPMO - DPWH Unified Project Management Office, DPWH ESSD – DPWH Environmental and Social Safeguards Division, PMT – Project Management Team, HSO – Health and safety Officer, PCO – Pollution Control Officer
PCO – Pollution Control Officer

Figure 10-3. Institutional arrangement scheme during operation

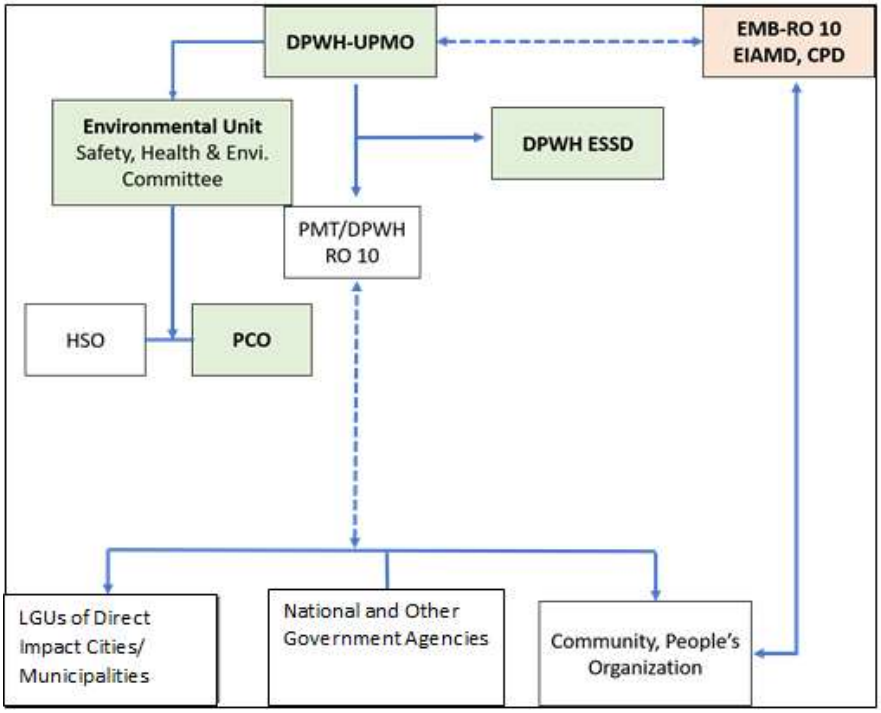


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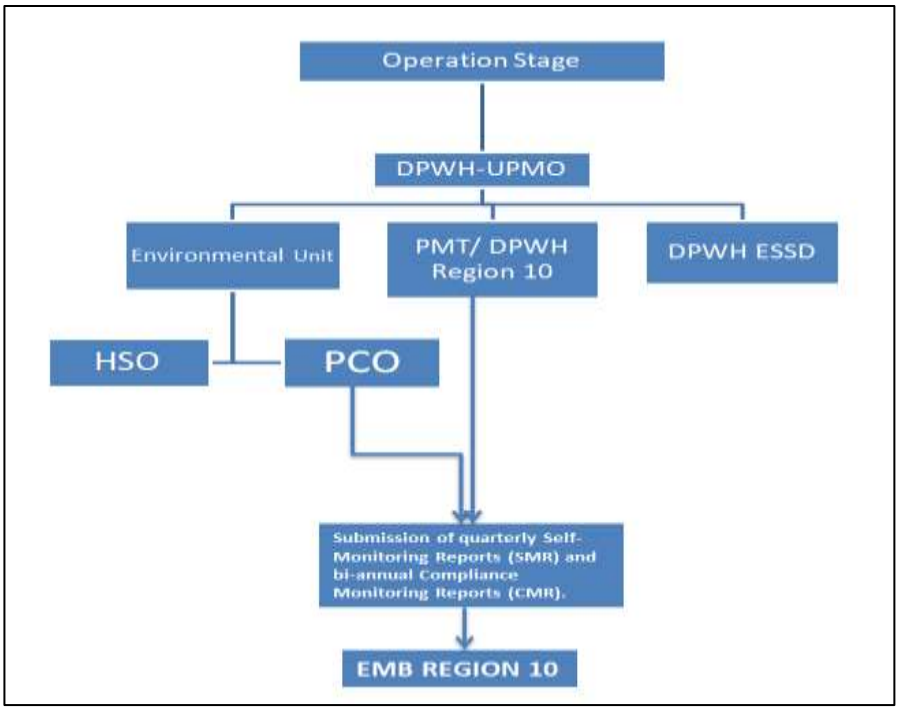
Figure 10-4. Flowchart of submission of monitoring reports to EMB R10



NOTES: DPWH UPMO - DPWH Unified Project Management Office, DPWH ESSD - DPWH Environmental and Social Safeguards Division, PMT – Project Management Team, HSO – Health and safety Officer, PCO – Pollution Control Officer

Table 10-1 Roles of the Relevant Agencies on EIA of this project

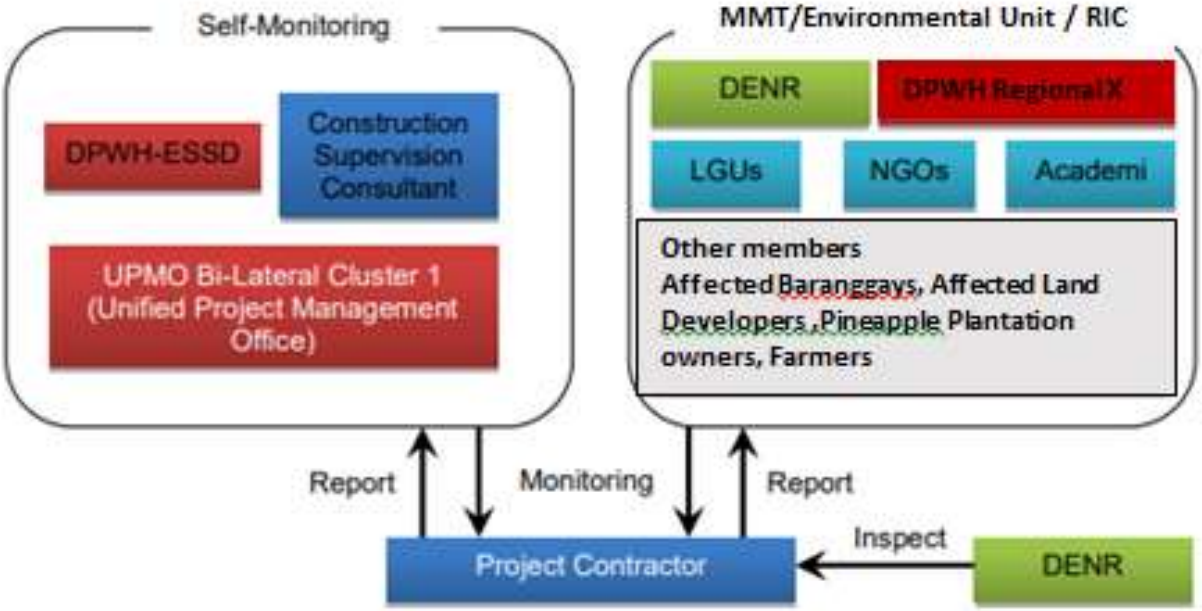
Relevant Agency		Roles
Department of Public Works and Highways (DPWH)		To proceed with the project of EIA procedure as the project proponent Detailed roles are show below; ・ Holding of a meeting for Information, Education and Communication (IEC) ・ Holding a meeting for Public Scoping for EIA ・ Preparation & submission of project description for scoping (PDS) and Environmental Impact Statement (EIS) ・ Payment of EIA review support fund ・ Making the necessary logistical arrangements for public consultation ・ Submission of final EIS and Environmental Performance Report and Management Plan (EPRMP)
Department of Environment and Natural Resources (DENR)	CO EMB	Responding to the application from the proponents, management of EIA review committee (EIARC) and the Director of EMB will issue the environmental compliance certificates (ECCs) for the port project Detailed roles are shown below; ・ Facilitating of EIA Review Committee (EIARC) (scoping stage and substantive review stage) ・ Scoping ・ Procedural screening of EIS ・ Conduct of public consultation ・ Preparation of decision document ・ Approval of ECCs from EMB Director / DENR Secretary
	RO EMB	Supporting of EIA process in the project area; ・ Participation of public scoping facilitated by proponent of the project ・ Making the necessary arrangements for EIARC site validation and public consultation

Table 10-2. Environmental Management and Monitoring Implementation Organization

Stage	Name of Organization	Role and Responsibility
Pre-Construction and Construction Phases	DPWH-Environment and Social Safeguards Division (ESSD)	・ Assist the UPMO Bi-Lateral Cluster 1 and the Contractor in the setting up of the Multi-Partite Monitoring Team (MMT); ・ Overseeing the implementation of the EMP by the Contractor/s; ・ Overseeing the updating of the Resettlement Action Plan (RAP) after the DED; ・ Assisting in the conduct of IEC Meetings as enumerated in the IEC Framework of this EIS; ・ Monitoring actual payments of compensation to affected landowners, structure owners, and crops/trees owners; ・ In coordination with the Misamis Oriental and Bukidnon City District Engineering Office prepare periodic supervision and monitoring reports on RAP implementation; and ・ Other necessary roles upon finalization of the RAP during the DED stage
	The Construction Supervision Consultant	・ Inspection of mitigation measures and environmental monitoring conducted by the contractor based on the approved EIS ・ Report the monitoring result to DPWH and donor (JICA) on monthly report

Stage	Name of Organization	Role and Responsibility
	DPWH UPMO Bi-Lateral Cluster 1	• Ensure that compliance to all conditions stipulated in the ECC are included as provisions in the Bid Documents to be issued to prospective Contractors; • Ensure that all engineering interventions in the approved EMP, RAP, and ECC issued are included in the Terms of Reference (TOR) of the Detailed Engineering Design; • Execution of MOA with DENR-EMB Region X, Misamis Oriental and Cagayan De Oro LGUs regarding formation and operationalization of the Multi-Partite Monitoring Team (MMT) for implementing the EMoP; and • Other necessary roles upon finalization of the RAP during the DED stage
	Multi-Partite Monitoring Team (MMT)/ EU/RIC Shall be composed of representatives of DPWH, DENR-EMB-FMB, LGUs, NGOs, academia, representative of affected persons and organizations and associations.	• Validate project compliance with the conditions stipulated in the ECC and the EMP; • Validate DPWH's conduct of self-monitoring; • Receive complaints, gather relevant information to facilitate determination of validity of complaints or concerns about the project and timely transmit to the Proponent and EMB recommended measures to address the complaint; • Prepare, integrate and disseminate simplified validation reports to community stakeholders; and • Make regular and timely submission of MMT Reports based on the EMB-prescribed format • Observe/participate as applicable during conduct of monitoring activities; • Coordinate with the Pollution Control Officer (PCO) of Contractors assigned to the Project, to ensure that conditions stipulated in the ECCs are properly complied with, including the gathering of baseline data on air and water quality, and subsequent monitoring of such; • Notify DPWH ESSD about any act or activity by the Contractors that are deemed as violations to the stipulations in the ECCs and amendments issued, and recommend immediate courses of action to avoid or mitigate any violation to said stipulations; and • Compile monitoring data gathered by the Contractors and supervise preparation of semi-annual monitoring reports to be submitted to the DENR
	POs and NGOs (Pineapple Plantation Owners, , and Farmers' Associations)	• Actively participate in ALL activities of the MMT; • Receive complaints from Barangay Homeowners' Associations, women's organizations, and other concerned sectors; • Gather relevant information to facilitate determination of validity of complaints or concerns about the project; • Promptly transmit to the MMT recommended measures to address the complaint; and • Prepare, integrate and disseminate simplified validation reports and feedback to community stakeholders
	The Contractor	• Ensuring that all engineering interventions in the approved EMP, RAP, and ECC issued are included in the Terms of Reference (TOR) of the Detailed Engineering Design; • Implementation of mitigation measures and monitoring based on the approved EMP on EIS and RAP

Figure 10-5. Environmental Monitoring Implementation and Reporting Flow



NOTES: DPWH UPMO - DPWH Unified Project Management Office, DPWH ESSD - DPWH Environmental and Social Safeguards Division, PMT – Project Management Team, HSO – Health and safety Officer, PCO – Pollution Control Officer

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Appendix 1. Accountability statement of the proponent

ACCOUNTABILITY STATEMENT OF PROJECT PROPONENT

This is to certify that all information and commitments in this **ENVIRONMENTAL IMPACT STATEMENT REPORT** of **DEPARTMENT OF PUBLIC AND HIGHWAY – CENTRAL OFFICE** for the **CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT** located in the cities of Cagayan de Oro, Misamis Oriental and Malaybalay, Bukidnon and Municipalities of Tagoloan, Misamis Oriental, Manolo Fortich, Sumilao and Impasug-ong Bukidnon are accurate and complete to the best of my knowledge, and that an objective and thorough assessment of the project was undertaken in accordance with the dictates of professional and reasonable judgement. Should I learn of any information, which would make this ENVIRONMENTAL IMPACT STATEMENT REPORT inaccurate, I shall immediately bring the said information to the attention of DENR-EMB.

I hereby certify that no DENR-EMB personnel were directly involved in the preparation of ENVIRONMENTAL IMPACT STATEMENT REPORT other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 Revised Procedural Manual.

I hereby bind myself to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this ENVIRONMENTAL IMPACT STATEMENT REPORT.

In witness whereof, I hereby set out of my hand this JAN 0 4 2023 day of _____ at QUEZON CITY

CONSTANTE A. LLANES, JR.
Acting Undersecretary for Planning Service
DPWH – Central Office

JAN 0 4 2023

SUBSCIRBED AND SWORN to before me this _____ day of _____ at QUEZON CITY Affiant exhibiting to me his _____ issued on _____ at _____.

ATTY. ALEJO Y. SEDICO
NOTARY PUBLIC
UNTIL DECEMBER 31, 2024
PTR NO. 4028160 D 1-3-2023 / Q.C.
IBP NO. 181195 / 1-03-23 / Q.C
ROLL NO. 36198
Office Address E-13
Muñoz Bldg., EDSA, Q.C
TIN No. 141-415-007
MCLE NO. VI-0030770/4-14-2022

Doc. No. 4
Page No. 1
Book No. 1
Series 2023

Appendix 2. Accountability statement of the preparer

SWORN STATEMENT OF ACCOUNTABILITY OF THE PREPARERS

This is to certify that all the information and commitments in this Environmental Impact Statement Report of **DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS – CENTRAL OFFICE** for the **Central Mindanao High Standard Highway Project** located in the cities of Cagayan de Oro, Misamis Oriental and Malaybalay, Bukidnon and municipalities of Tagoloan, Misamis Oriental, Manolo Fortich, Sumilao and Impasug-ong Bukidnon, are accurate and complete to the best of my knowledge, and that an objective and thorough assessment of the Project was undertaken in accordance with the dictates of professional and reasonable judgment. Should I learn of any information, which would make this Environmental Impact Statement Report inaccurate, I shall immediately bring the said information to the attention of DENR-EMB Central Office.

I hereby certify that no DENR-EMB Central Office personnel were directly involved in the preparation of Environmental Impact Statement Report other than to provide procedural and technical advice consistent with the guidelines in the DAO 03-30 Revised Procedural Manual.

I hereby bind myself to answer any penalty that may be imposed arising from any misrepresentation or failure to state material information in this Initial Environmental Impact Statement Report.

In witness whereof, I hereby set my hand this DEC 2 2 2022 day of _____ at Quezon City.

Name	EIA Module	Signature
Jethro Alden C. Hipe	Team Leader	
Samuel Sendon	Geology	
Jaime Namocatcat	Flora and Fauna	
Emerson Darroles	Hydrology	EDarroles
Jethro Alden C. Hipe	Air	
Nimfa Bracamonte	People	NBracamonte
Jethro Alden C. Hipe	Environmental Risk Assessment	

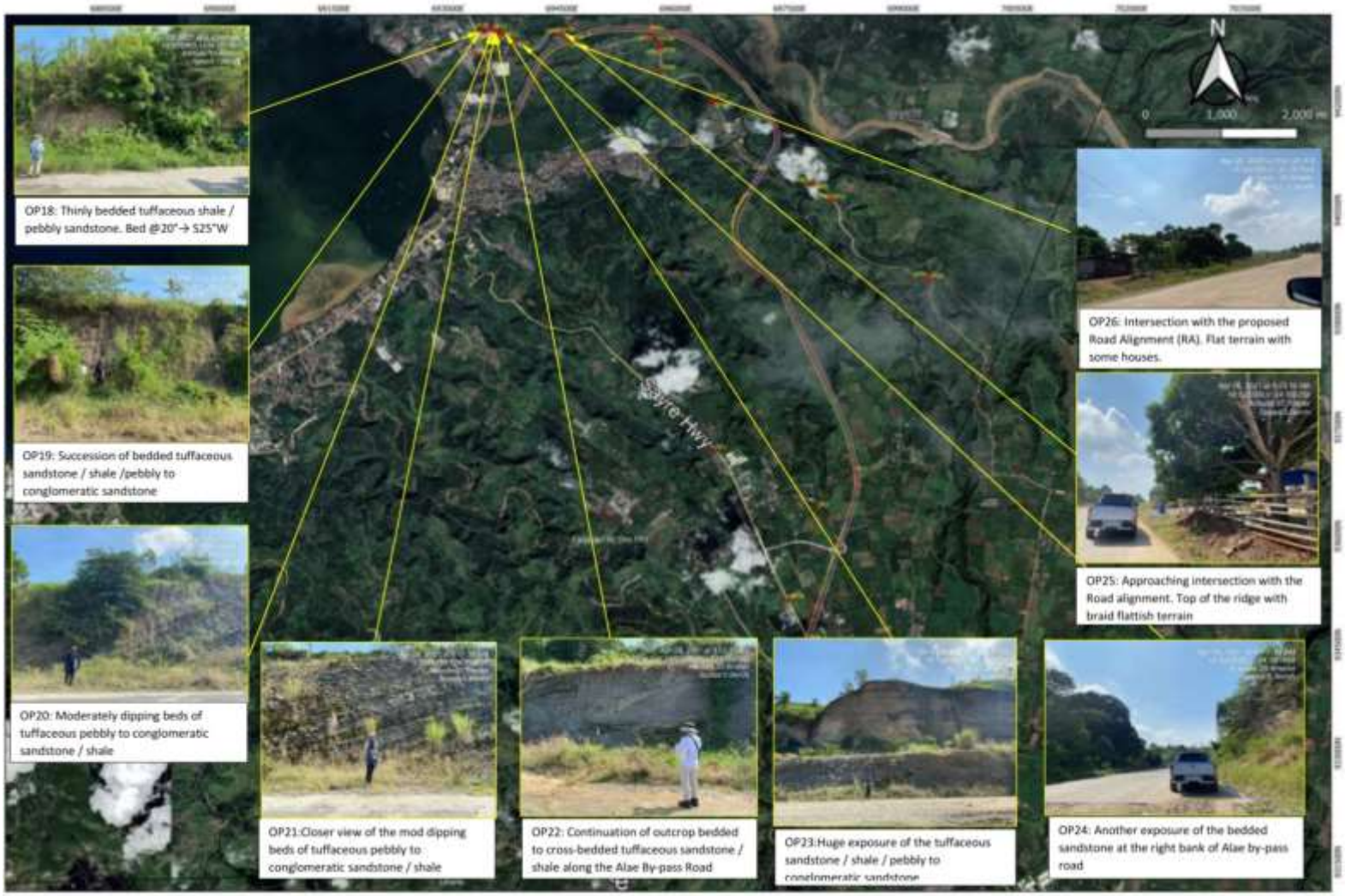
SUBSCRIBED AND SWORN TO before me, this ____ day of DEC 2 2 2022, _____ affiants exhibiting their valid IDs as follows

Name	ID No.	Place of issue	Date of issue
Jethro Alden C. Hipe	0016260	Manila	
Samuel Sendon	0000607	Manila	
Jaime Namocatcat	CRN – 006-0063-1452-9	General Santos City	
Emerson Darroles	P00147240		
Nimfa Bracamonte	0762	Iligan City	

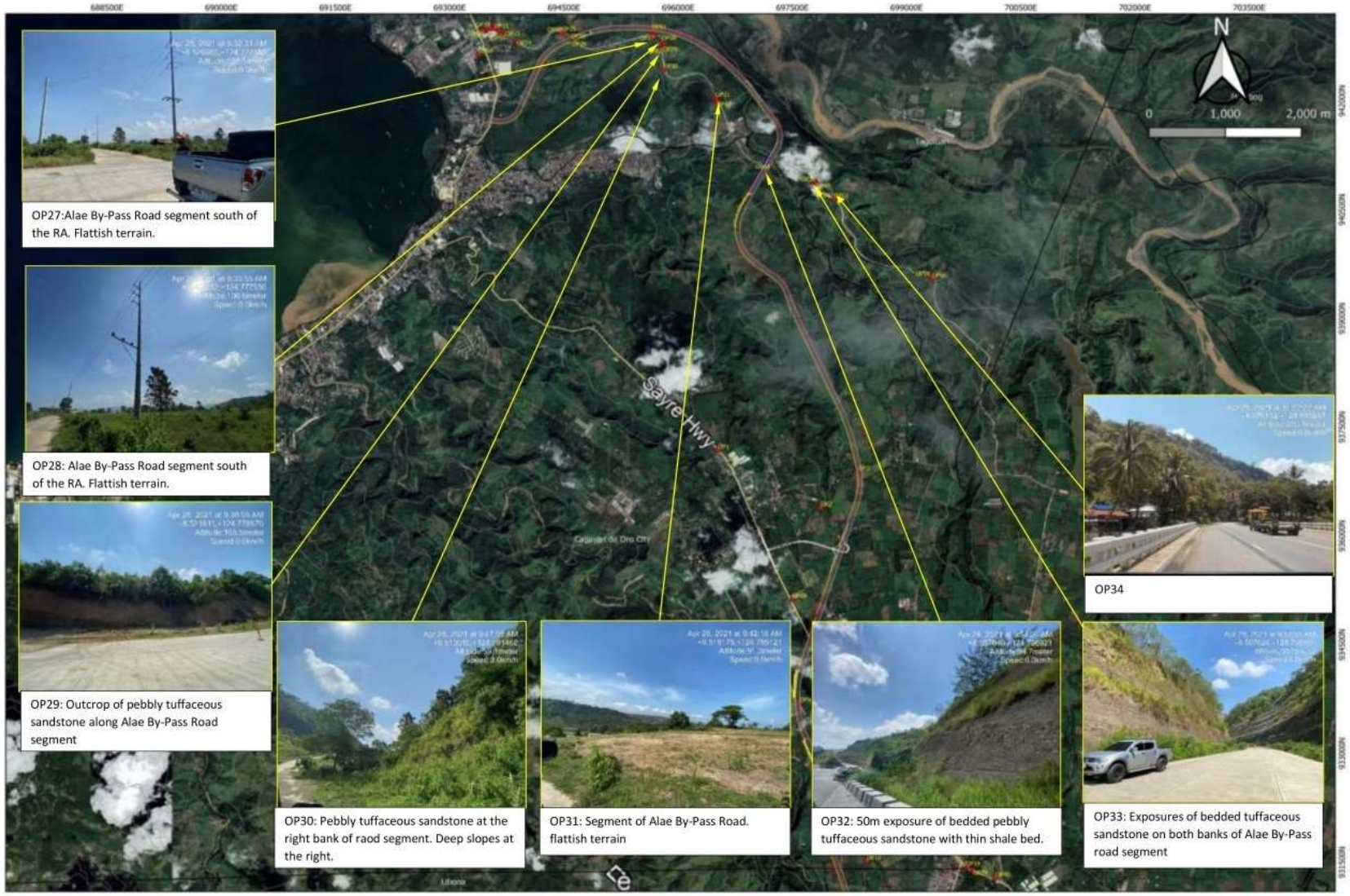
ATTY. ALEJO Y. SOLIGO
NOTARY PUBLIC
VALID UNTIL DECEMBER 31, 2022
PTR NO. 24632568 1-2-2022 Q.C.
IBP NO. 174094 1-3-2022 Q.C.
MCLE NO. VI-0030770 4-14-2022
ATTORNEY'S ROLL NO. 36198
ADD. PASILIO D11 MUÑOZ BLDG.
EDSA. QUEZON CITY

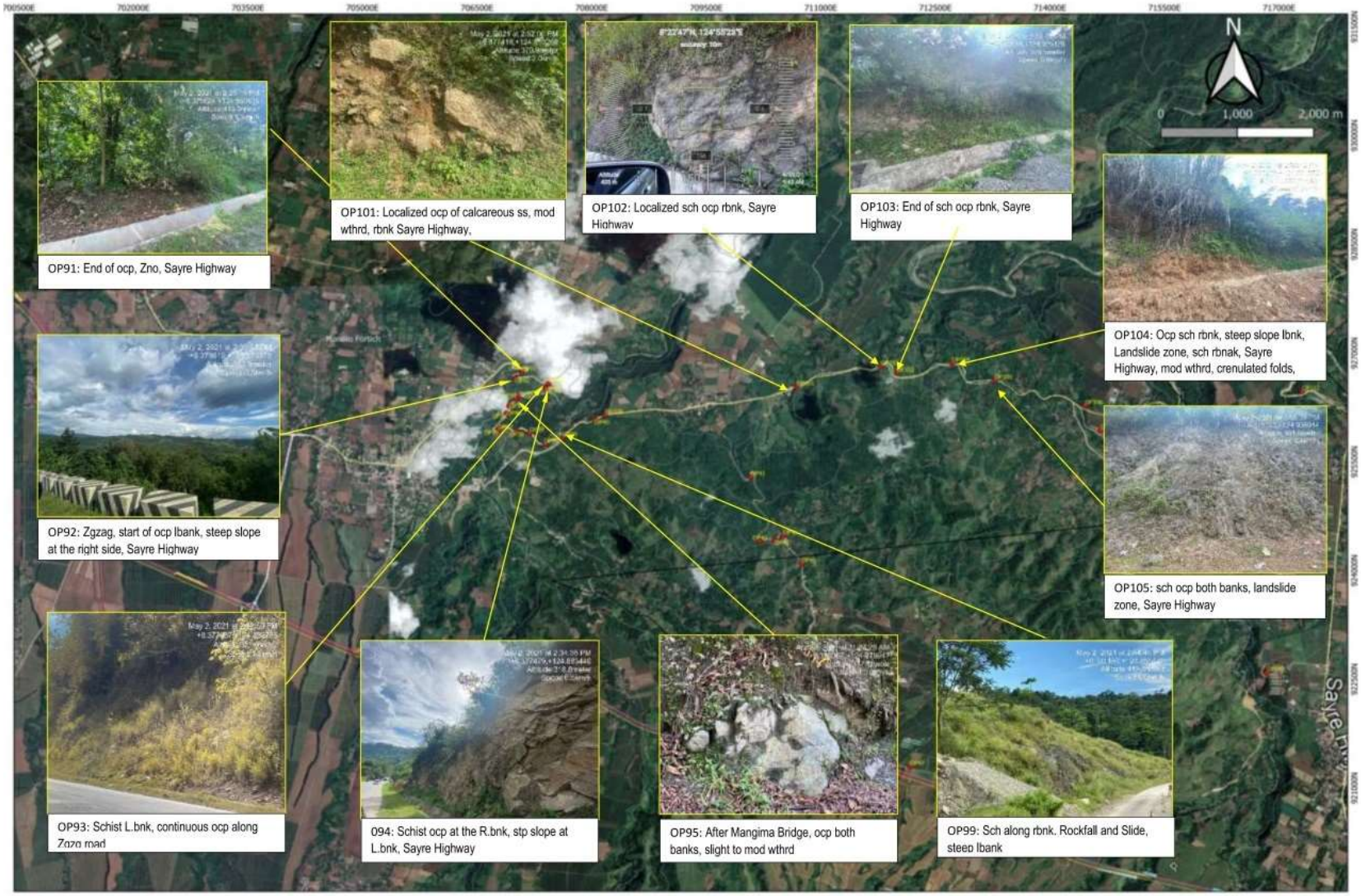
Doc. No. 408
Page No. 82
Book No. 12
Series of No. 2022

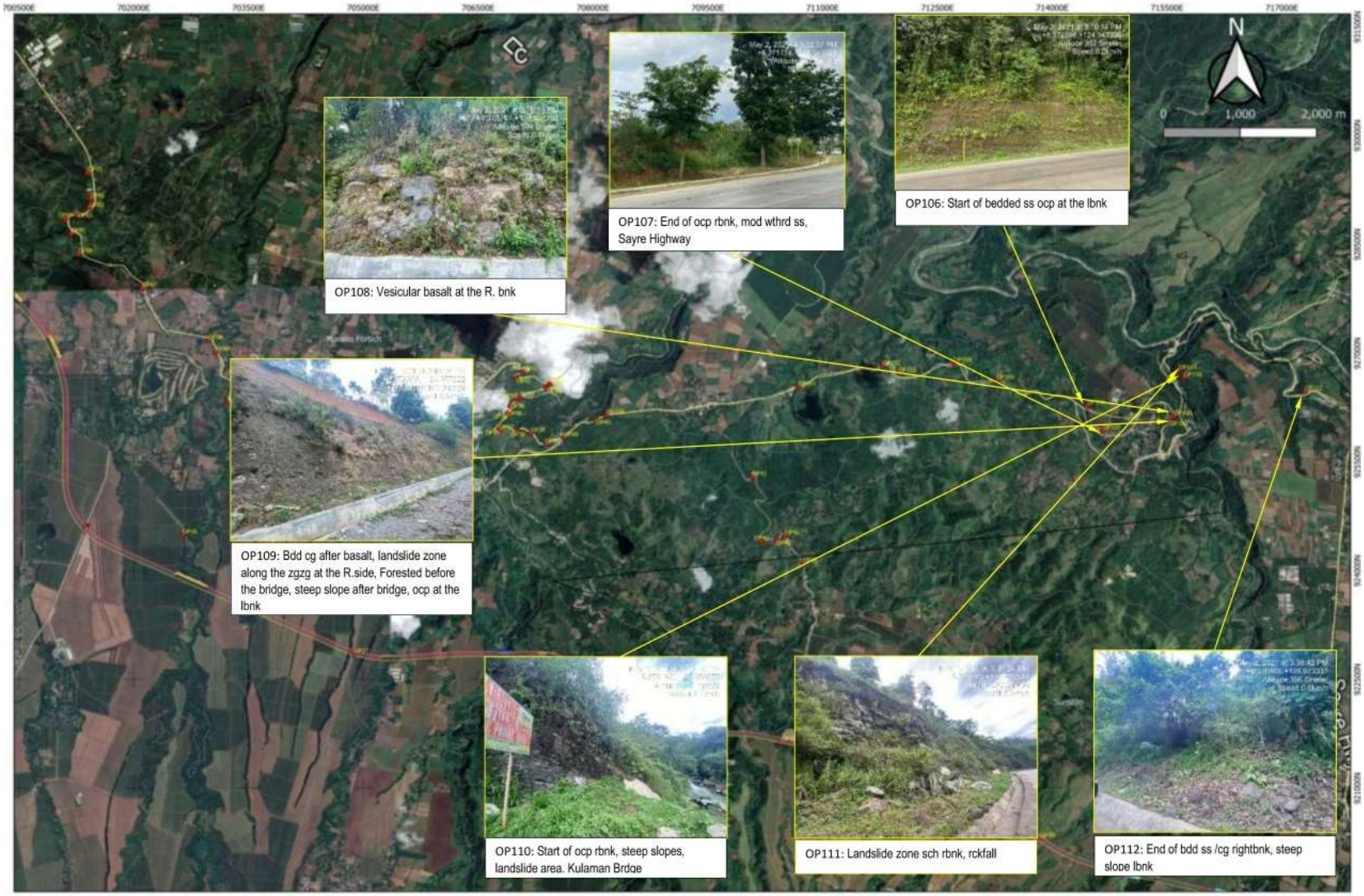
Appendix 3. Photographs of the geological conditions at the observation points



Appendices


N
0
1,000
2,000 m
Sayre Hwy
OP27:Alae By-Pass Road segment south of the RA. Flattish terrain.
OP28: Alae By-Pass Road segment south of the RA. Flattish terrain.
OP29: Outcrop of pebbly tuffaceous sandstone along Alae By-Pass Road segment
OP30: Pebbly tuffaceous sandstone at the right bank of raod segment. Deep slopes at the right.
OP31: Segment of Alae By-Pass Road. flattish terrain
OP32: 50m exposure of bedded pebbly tuffaceous sandstone with thin shale bed.
OP33: Exposures of bedded tuffaceous sandstone on both banks of Alae By-Pass road segment
OP34


N
0
1,000
2,000 m
OP91: End of ocp, Zno, Sayre Highway
OP101: Localized ocp of calcareous ss, mod wthrd, rbnk Sayre Highway,
OP102: Localized sch ocp rbnk, Sayre Highway
OP103: End of sch ocp rbnk, Sayre Highway
OP104: Ocp sch rbnk, steep slope lbnk, Landslide zone, sch rbnak, Sayre Highway, mod wthrd, crenulated folds,
OP92: Zgzag, start of ocp lbank, steep slope at the right side, Sayre Highway
OP105: sch ocp both banks, landslide zone, Sayre Highway
OP93: Schist L.bnk, continuous ocp along Zaza mad
094: Schist ocp at the R.bnk, stp slope at L.bnk, Sayre Highway
OP95: After Mangima Bridge, ocp both banks, slight to mod wthrd
OP99: Sch along rbnk. Rockfall and Slide, steep lbank
Sayre Hwy

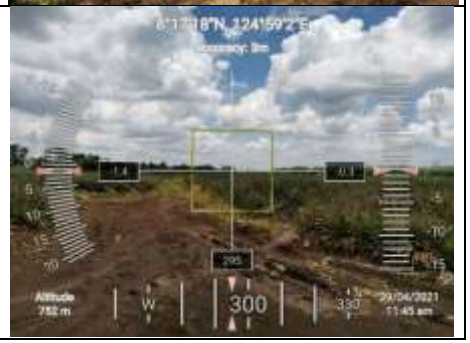

N
0
1,000
2,000 m
OP106: Start of bedded ss ocp at the lbnk
OP107: End of ocp rbnk, mod wthrd ss, Sayre Highway
OP108: Vesicular basalt at the R. bnk
OP109: Bdd cg after basalt, landslide zone along the zgzg at the R.side, Forested before the bridge, steep slope after bridge, ocp at the lbnk
OP110: Start of ocp rbnk, steep slopes, landslide area. Kulaman Brdge
OP111: Landslide zone sch rbnk, rckfall
OP112: End of bdd ss /cg rightbnk, steep slope lbnk

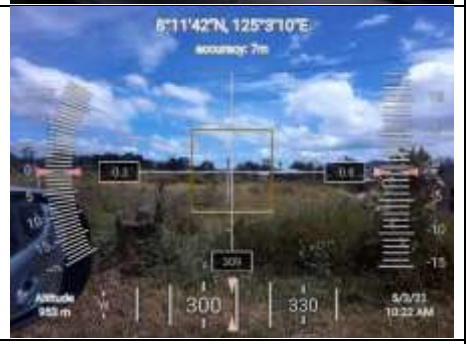
Appendix 4. Field logs summary for road alignments

Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Brgy. Puerto, CDO	1.	8°26’33”	124°47’41”	432	Road Alignment 5: Steep slope, localized road slip, potential landslide.	
Brgy. Sugbongcogon, Tagoloan, Alae Bypass Road North end	2.	8°31'31.55"	124°46'4.87"	100	Road Alignment 1: Broadly undulating terrain	
Brgy. Natulmolan, Tagoloan, Alae Bypass Road	3.	8°31'34.07"	124°46'39.36"	105	Immediately south of Road Alignment 2: Broadly undulating to flattish terrain	

Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Brgy. Natulmolan, Tagoloan, Alae Bypass Road	4.	8°31'36.67"	124°46'31.01"	107	Road Alignment 3: Alae By-pass Road. Flat to broadly undulating terrain, No outcrop observed.	
Brgy. Natulmolan, Tagoloan, Alae Bypass Road	5.	8°30'36.19"	124°47'29.26"	46	Road Alignment 4: Slightly weathered bedded tuffaceous shale / pebbly sandstone in both road banks.	
Brgy. Villa Vista, Manolo Fortich	6.	8°19'59.23"	124°54'39.85"	609	Road Alignment 7: Adjacent to creek.	

Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Brgy. Villa Vista, Manolo Fortich	7.	8°19'47.88"	124°55'35.51"	630	Road Alignment 8: Broadly undulating terrain, pineapple palnatation. Limestone cliffs at the background	
Brgy. San Roque Manolo Fortich	8.	8°19'31.10"	124°56'2.47"E	600	Road Alignment 9: Steep slope at the road bank	
Brgy. San Roque Manolo Fortich	9.	8°19'19.35"	124°56'22.78"	626	Road Alignment 10: Broadly undulating terrain, pineapple plantation, clayey reddish-brown soil.	

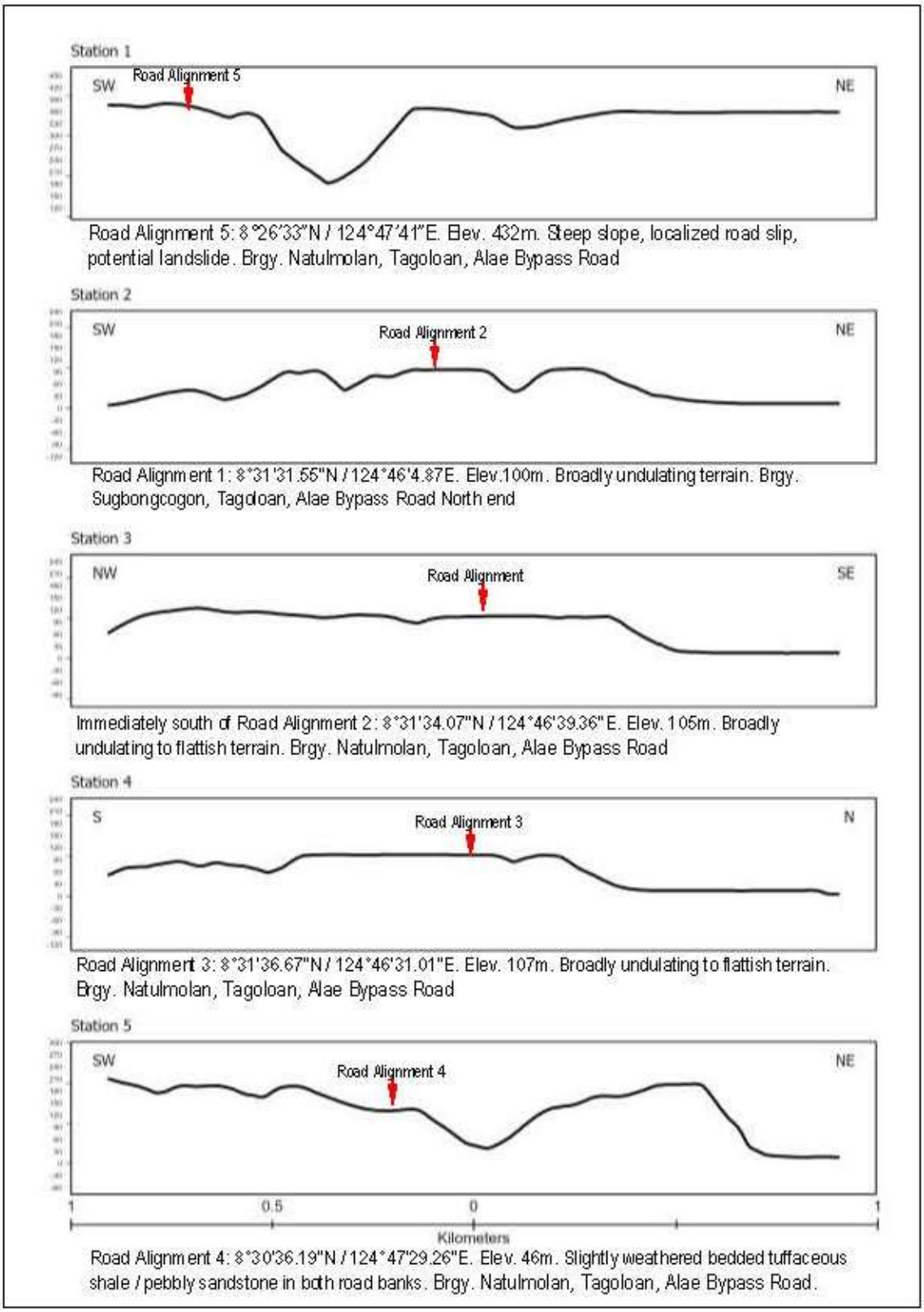
Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Brgy. San Roque Manolo Fortich	10.	8°19'15.36"	124°56'30.19"	623	Road Alignment 11: Broadly undulating terrain, pineapple plantation, clayey reddish-brown soil.	
Brgy. Kisolon, Sumilao Adjacent to Road Alignment	11.	8°18’44”	124°58’10”	664	Road Alignment 12: Broad undulating terrain with localized steep gullies. Farm lots. Pineapple plantation.	
Brgy. Poblacion, Sumilao	12.	8°17’18”	124°59’2”	752	Road Alignment 13: Broadly undulating terrain, pineapple plantation	

Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Brgy. 11, Malaybalay	13.	8°9'34"	125°6'17"	757	Road Alignment 14: broad undulating to flattish terrain	
Brgy. Dalwangan, Malaybalay	14.	8°11'42"	125°3'10"	953	Road Alignment 18: Intersection with Sayre Highway, flat to very gently sloping.	
Brgy. Dalwangan, Malaybalay	15.	8°12'51.73"	125° 1'59.12"	888	Road Alignment 15: Valley lft side, flt ride, wtrhd rock ocp, thin 1m brown soil exposed locally	
Brgy. Dalwangan, Sayre Highway intersection with RA, Malaybalay	16.	8°11'48.86"	125° 2'58.09"	884	Road Alignment 16: Lbnk. Loclzed highly wthrd ocp 50m	
May 3 Sayre Highway, Brgy. Dalwangan, Malaybalay	17.	8°12'51.73"	125° 1'59.12"	888	Road Alignment 19: valley at the left side, flattish Terain, wtrhd rock ocp, thin 1m brown soil exposed locally	
Malaybalay Diversion	18.	8°10'20.89"	125° 3'36.54"	852	Road alignment 17:	

Location and Date	Observation Points	N. Latitude	E. Longitude	Elev. in meter	Description	Photo Documentation
Road, Brgy. Lapu-lapu					1.5m thick soil 59m wide. Heavily weathered on both both sides.	
Malaybalay Diversion Road, Brgy. Kalasungay	19.	8°10'3.93"	125° 4'3.22"	839	Road alignment 20: 3m thick, moderately weathered, brown to yellowish brown soil, broadly undulating to gentle sloping terrain.	
Malaybalay Diversion Road	20.	8°9'56"	125°6'50"	733	Adjacent to Road Alignment: Fresh to slightly weathered, andesite outcrop along access road, localized rockfall.	

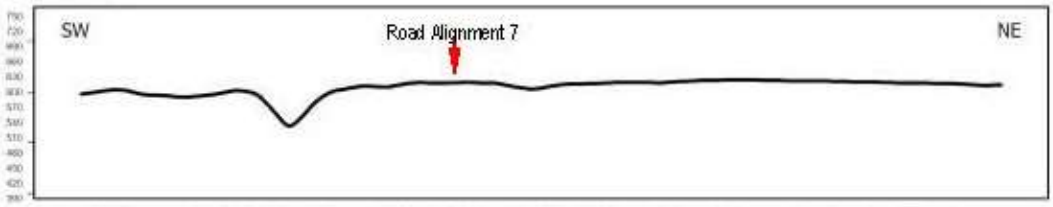
Appendix 5. Road Alignment Profiles

Profiles at road alignment 1 to 5



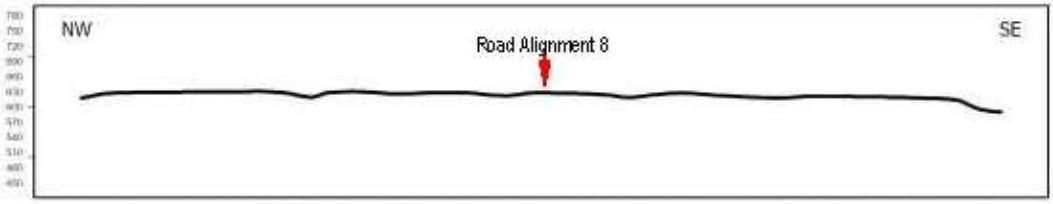
Profiles at road alignment 6 to 10

Station 6



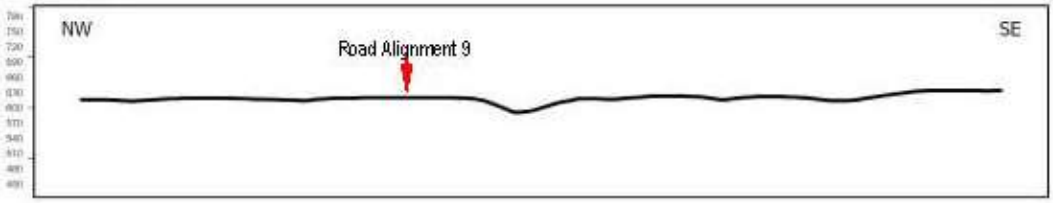
Road Alignment 7: 8°19'59.23"N / 124°54'39.85"E. Elev. 609m. Adjacent to creek. Brgy. Villa Vista, Manolo Fortich

Station 7



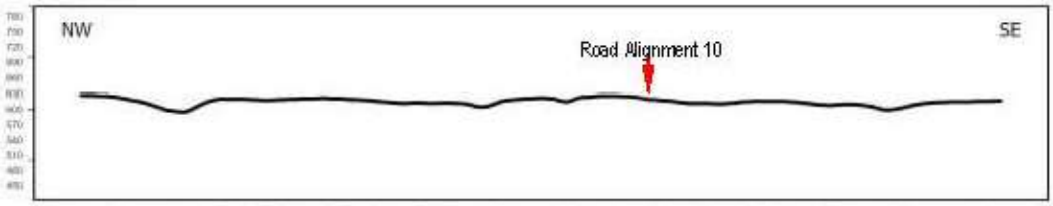
Road Alignment 8: 8°19'47.88"N / 124°55'35.51"E. Elev. 630m. Broadly undulating to flattish terrain. Brgy. Villa Vista, Manolo Fortich.

Station 8



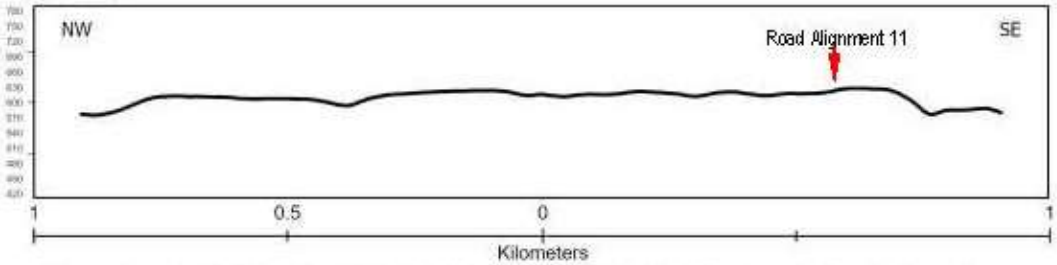
Road Alignment 9: 8°19'31.10"N / 124°56'2.47""E. Elev. 630m. Steep slope at the road bank. Brgy. San Roque Manolo Fortich

Station 9



Road Alignment 10: 8°19'19.35"N / 124°56'22.78"E. Elev.626m. Broadly undulating terrain, pineapple plantation, clayey reddish brown soil. Brgy. San Roque Manolo Fortich

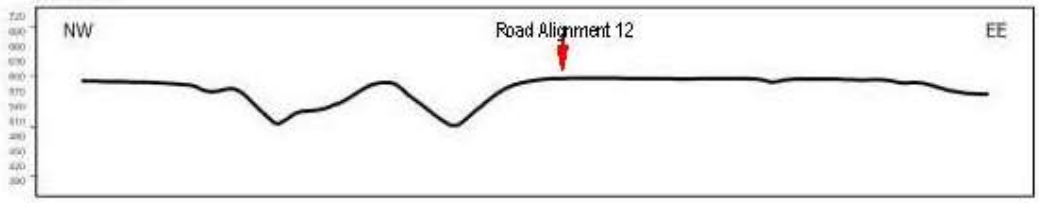
Station 10



Road Alignment 11: 8°31'36.67"N / 124°46'31.01"E. Elev.623m. Broadly undulating terrain, pineapple plantation, clayey reddish brown soil. Brgy. San Roque Manolo Fortich

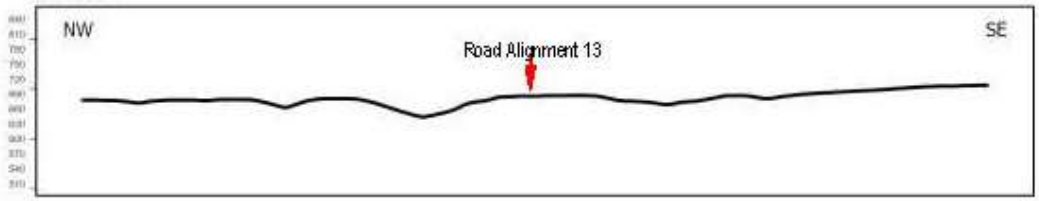
Profiles at road alignment 11 to 15/17

Station 11



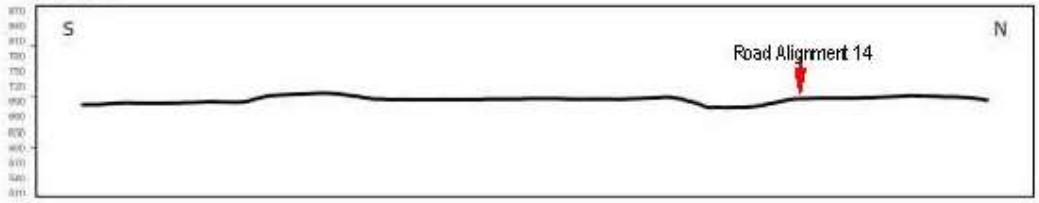
Road Alignment 12: 8°18'44"N / 124°58'10"'E. Elev. 664m. Broad undulating terrain with localized steep gullies. Farm lots. Pineapple plantation. Brgy. Kisolon, Sumilao.Adjacent to Road Alignment

Station 12



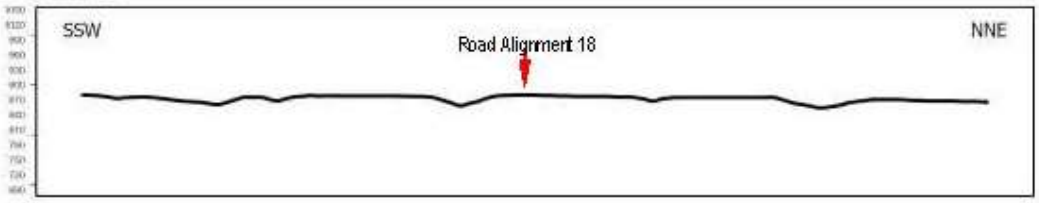
Road Alignment 13: 8°17'18"N / 124°59'2"E. Elev. 752m. Broadly undulating terrain, pineapple plantation

Station 13



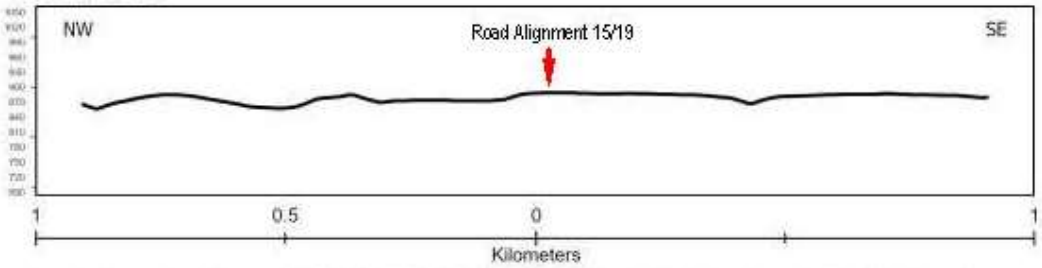
Road Alignment 14: 8°9'34"N / 124°6'17"E. Elev. 757m. Broadly undulating to flattish terrain. Brgy. 11, Malaybalay

Station 14



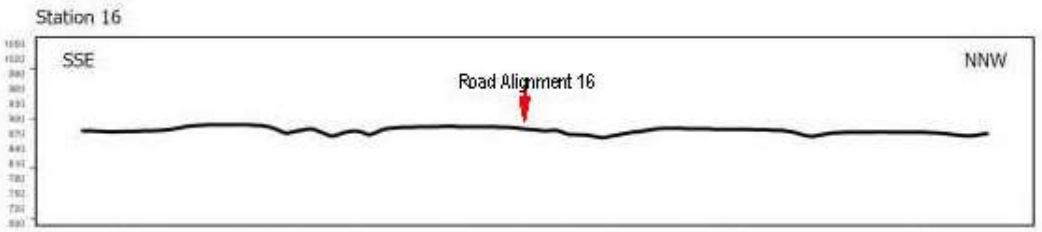
Road Alignment 18: 8°311'42"N / 124°3'10E. Elev. 953m. Intersection with Sayre Highway, flat to very gently sloping. Brgy. Dalwangan, Malaybalay

Station 15 & 17

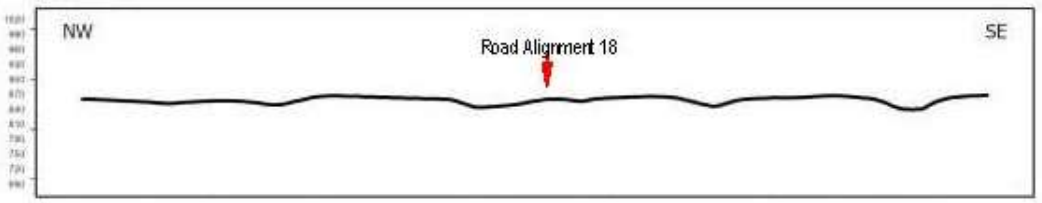


Road Alignment 15/19: 8°12'51.73"N / 125° 1'59.12"E. Elev. 888m Valley at the west side. Weathered rock with thin 1m brown soil exposed locally. Brgy. Dalwangan, Malaybalay

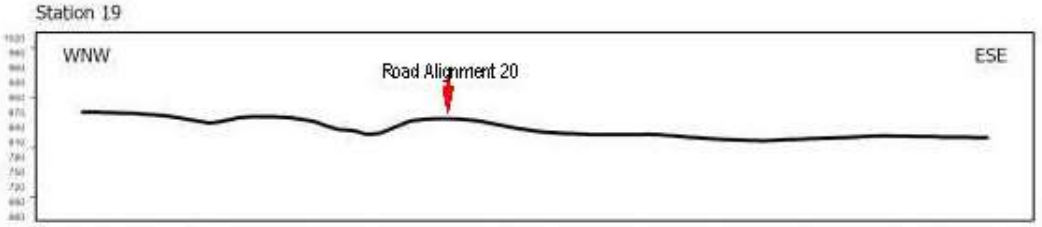
Profiles at road alignment 16 to 20



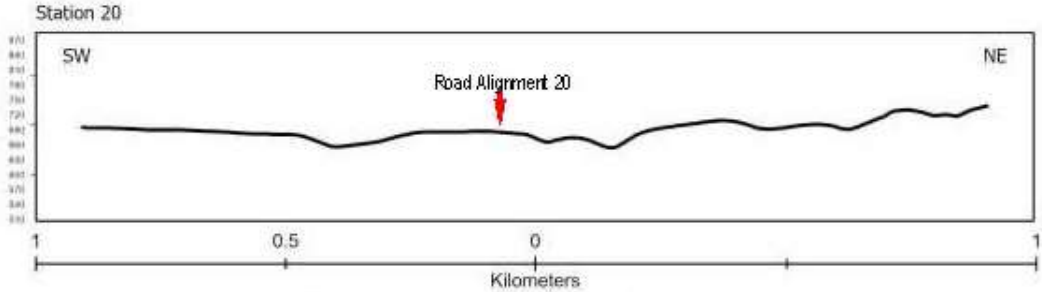
Road Alignment 16: 8°11'48.86"N / 125° 2'58.09""E. Elev. 884m. Localized highly weathered outcrop of andesitic volcaniclastics. Brgy. Dalwangan, Sayre Highway intersection with RA, Malaybalay



Road Alignment 17: 18°10'20.89"N / 125° 3'36.54"E. Elev. 852m 1.5m thick soil, 59m wide. Heavily weathered on both both sides. Malaybalay Diversion Road, Brgy. Lapu-lapu



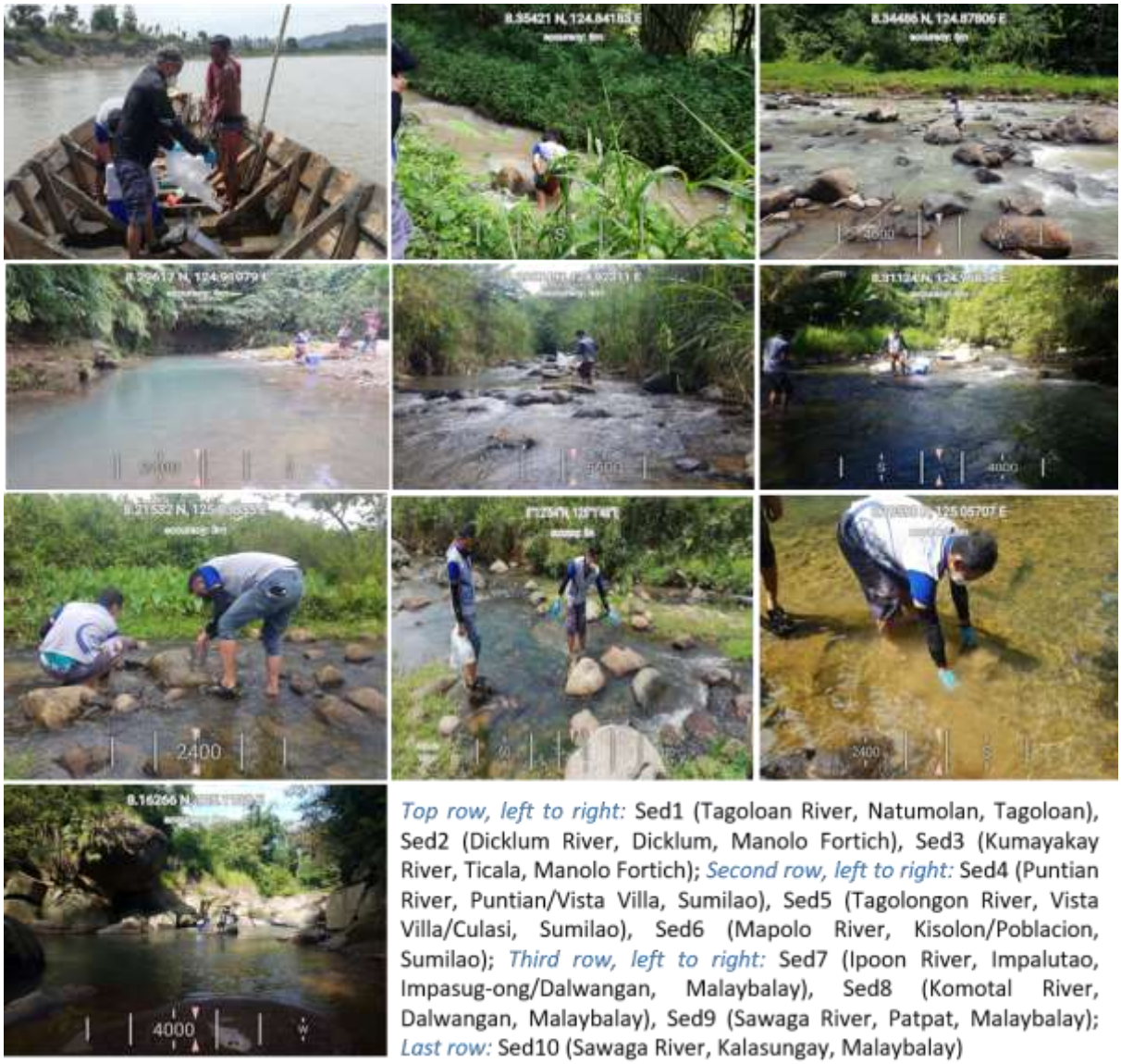
Road Alignment 20: 8°10'3.93"N / 125° 4'3.22"E. Elev. 839m. 3m thick, moderately weathered, brown to yellowish brown soil, broadly undulating to gentle sloping terrain. Malaybalay Diversion Road, Brgy. Kalasungay



Road Alignment 1: 8°9'56"N / 125°6'50"E. Elev. 733m. Adjacent to Road Alignment. Fresh to slightly weathered, andesite outcrop along access road, localized rockfall. Malaybalay Diversion Road

Appendix 6. Photographs of the soil quality sampling stations

Appendix 7. Photographs of the sediment sampling stations



Top row, left to right: Sed1 (Tagoloan River, Natumolan, Tagoloan), Sed2 (Dicklum River, Dicklum, Manolo Fortich), Sed3 (Kumayakay River, Ticala, Manolo Fortich); *Second row, left to right:* Sed4 (Puntian River, Puntian/Vista Villa, Sumilao), Sed5 (Tagolongon River, Vista Villa/Culasi, Sumilao), Sed6 (Mapolo River, Kisolon/Poblacion, Sumilao); *Third row, left to right:* Sed7 (Ipoon River, Impalutao, Impasug-ong/Dalwangan, Malaybalay), Sed8 (Komotal River, Dalwangan, Malaybalay), Sed9 (Sawaga River, Patpat, Malaybalay); *Last row:* Sed10 (Sawaga River, Kalasungay, Malaybalay)

Appendix 8. Tree inventory data

Species (98)	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Grand Total	RA (%)
Acacia mangium Willd.					16												1	2		3	22	0.20
Albizia saman (Jacq.) F.Muell	17	3																			20	0.18
Albizia saponaria (Lour.) Blume ex Miq									1												1	0.01
Alstonia scholaris (L.) R.Br.				1																	1	0.01
Anacardium occidentale L.	1						1														2	0.02
Annona muricata L.	1		2	1					1												5	0.05
Annona squamosa L.	1																				1	0.01
Antidesma ghaesembilla Gaertn.	3		7																		10	0.09
Araucaria heterophylla																4					4	0.04
Artocarpus blancoi (Elmer) Merr.	47	18	17	30	19	3	4	7	10	4			3					1		1	164	1.50
Artocarpus heterophyllus Lam.	2	1	5	2	5		1	4			1		1			5	5	5		7	44	0.40
Artocarpus odoratissimus Merr.	17			1	2	1	1		2	2	3	12	3		3	4	1	4	1	5	62	0.57
Astronia sp.																			1		1	0.01
Azadirachta excelsa (Jack) Jacobs	2												1								3	0.03
Azadirachta indica A.Juss.	1																				1	0.01
Barringtonia reticulata Miq.	2																				2	0.02
Caesalpinia pulcherrima (L.) Sw.																				5	5	0.05
Canarium ovatum	2																				2	0.02
Casia fistula L.			1		2	1															4	0.04
Ceiba pentandra (L.) Gaertn	12	3	1	3					3	3			1							1	27	0.25
Chrysophyllum cainito L.	2		3										1							1	7	0.06
Cinnamomum mercadoi S. Vidal							1														1	0.01
Cocos nucifera L.	71						2														73	0.67
Cratoxylum sumatranum (Jack) Blume								3	3	1							1				8	0.07
Dendrocalamus asper (Schult.f.) Backer ex Heyne			40			94		465		77	110		135		35			10	38	274	1,278	11.69
Dendrocnide sp.						1															1	0.01
Diplodiscus paniculatus Turcz.													3								3	0.03
Duabanga sp.	1																				1	0.01
Durio zibethinus L.															5	422		2		26	455	4.16
Elaeocarpus sp.								4	1												5	0.05
Erythrina variegata L. in Stickm.					1								3								4	0.04

Species (98)	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Grand Total	RA (%)
Eucalyptus camaldulensis Dehnh.															7						7	0.06
Eucalyptus deglupta Blume			1														2				3	0.03
Falcataria moluccana (Miq.) Barneby & J.W.Grimes			700	1	3					16		1		2		5	3		400		1,131	10.35
Ficus ampelas Burm.f.													1								1	0.01
Ficus balete Merr.	1			2																	3	0.03
Ficus fiskei Elmer										1											1	0.01
Ficus magnoliifolia Blume	12		1																		13	0.12
Ficus minahassae (Teijsm. & Vriese) Miq.					2	1	1		1	6	2		2			1	11			1	28	0.26
Ficus nota (Blanco) Merr.					1	1	1			6	4		1			2			1		17	0.16
Ficus pseudopalma Blanco	7									1	2										10	0.09
Ficus ruficaulis Merr.	6	4	12			1															23	0.21
Ficus septica Burm.f.	1					1			1												3	0.03
Ficus sp.					1		2	1	1		1								1	2	9	0.08
Ficus sp. 2																3			1		4	0.04
Ficus sp. 3	1															1		1			3	0.03
Ficus sp. 4																		1			1	0.01
Garcinia mangostana L.																1				1	2	0.02
Gmelina arborea Roxb. ex Sm.	59	23	31	33	2		10	5	2	7	5	2	4		14	32	2	32		29	292	2.67
Greeniopsis sp.										2	1								1		4	0.04
Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.												1,700			175			962	1,250	816	4,903	44.86
Hydroanthus chrysotrichus (Mart. Ex DC) Mattos			5							1										4	10	0.09
Kleinhovia hospita L.	1																				1	0.01
Lansium domesticum Correa				1	1			6	16							157		27		119	327	2.99
Leucaena leucocephala (Lam.) de Wit	31			3	35	1			1	2	1			1	1		2	3	1		82	0.75
Litsea cordata (Jack) Hook.f.																			1		1	0.01
Litsea philippinensis Merr.			1		2	1	2	9	9		1		1		3		2	3	1	1	36	0.33
Macaranga bicolor Mull.Arg.	2							6		1			1			1	2		2		15	0.14
Macaranga hispida (Blume) Mull.Arg. in DC	14	1	13	3		3							1						1		36	0.33
Macaranga sp.									1				1								2	0.02
Macaranga tanarius (L.) Mull.Arg. in DC	22	3	2		1	1	6	3	4		3		8								53	0.48
Mallotus sp.	12																		1		13	0.12
Mangifera indica L.	40	2	80	137											5	5	1	1		1	272	2.49

Species (98)	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Grand Total	RA (%)
Melanolepis multiglandulosa (Reinw. ex Blume) Rchb. & Zoll.	27	2	4	27	8	2	1	2	2	2										2	79	0.72
Melicope triphylla (Lam.) Merr.								1											1		2	0.02
Morinda citrifolia L.							2														2	0.02
Neonauclea sp	1									1											2	0.02
Nephelium lappaceum L.			1	1												491					493	4.51
Omalanthus populneus (Geiseler) Pax								2	1								1				4	0.04
Osmoxylon sp.					1	1	1			1	1		1								6	0.05
Palaquium sp.	1																				1	0.01
Pangium edule Reinw. ex Blume							4														4	0.04
Persea americana Mill.	1			2			2								2	2					9	0.08
Pinus kesiya Royle ex Gordon					45							1			11	3		1			61	0.56
Pithecellobium dulce (Roxb.) Benth. in Hook	3						1		1	2	1										8	0.07
Polyalthia longifolia Benth. & Hook.f. ex Hook.f			7																		7	0.06
Polyscias nodosa (Blume) Seem	2	1	1		4	2	2	2	2		1				2	1		1			21	0.19
Pometia pinnata J.R. Forst. & G.Forst.	9						3			1			1								14	0.13
Psidium guajava L.	2		1						1							1					5	0.05
Pterocarpus indicus Willd.	5			3			2			2		3			5	1	1	6		5	33	0.30
Rhamnus philippinensis C.B.Rob																			1		1	0.01
Rhus taitensis Guill.								2	5												7	0.06
Sandoricum koetjape (Burm.f.) Merr.	3		2	2	6				1				2			5		1		2	24	0.22
Saurauia sp.								1									2				3	0.03
Schizolobium parahyba (Vell.) S.F.Blake	6		12					3	3	6								21		26	77	0.70
Semecarpus sp.	1					1		1													3	0.03
Shorea contorta S.Vidal															1						1	0.01
Spathodea campanulata P.Beauv.	1		1	47	44	2	3	5	2	2		1	4	1	4	63	5	16	2	13	216	1.98
Spiraeopsis sp.						1															1	0.01
Sterculia rubiginosa Vent.	2						1		1												4	0.04
Streblus asper Lour.	1																				1	0.01
Swietenia macrophylla King	1	24	38	12	45	1	1	4	1			16	2		4	1				82	232	2.12
Syzygium aqueum (Burm.f.) Alston																1					1	0.01
Syzygium cumini (L.) Skeels	2																				2	0.02
Terminalia catappa L.	3				1											1					5	0.05
Trema orientalis (L.) Blume	34	1	27		5				1				1			2		1			72	0.66

Species (98)	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Grand Total	RA (%)
Vitex parviflora Juss.	2	2																			4	0.04
Ziziphus jujuba Mill.		1																			1	0.01
Grand Total	**498**	**89**	**1,016**	**312**	**252**	**120**	**55**	**536**	**78**	**147**	**137**	**1,736**	**182**	**4**	**277**	**1,215**	**42**	**1,101**	**1,705**	**1,427**	**10,929**	

Appendix 9. Importance values of trees recorded across the stations

Species Name	Abundance	Frequency	Density/ ha	RA (%)	RF (%)	RD (%)	IV
Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	4,903	0.25	296.46	44.86	1.18	45.91	91.95
Dendrocalamus asper (Schult.f.) Backer ex Heyne	1,278	0.5	76.19	11.69	2.36	11.80	25.85
Falcataria moluccana (Miq.) Barneby & J.W.Grimes	1,131	0.45	46.49	10.35	2.12	7.20	19.67
Nephelium lappaceum L.	493	0.15	40.24	4.51	0.71	6.23	11.45
Durio zibethinus L.	455	0.2	36.20	4.16	0.94	5.61	10.71
Gmelina arborea Roxb. ex Sm.	292	0.85	18.41	2.67	4.01	2.85	9.53
Spathodea campanulata P.Beauv.	216	0.9	12.54	1.98	4.25	1.94	8.16
Lansium domesticum Correa	327	0.35	20.66	2.99	1.65	3.20	7.84
Swietenia macrophylla King	232	0.7	9.43	2.12	3.30	1.46	6.88
Mangifera indica L.	272	0.45	13.43	2.49	2.12	2.08	6.69
Artocarpus blancoi (Elmer) Merr.	164	0.65	8.35	1.50	3.07	1.29	5.86
Artocarpus odoratissimus Merr.	62	0.8	4.12	0.57	3.77	0.64	4.98
Leucaena leucocephala (Lam.) de Wit	82	0.55	4.19	0.75	2.59	0.65	3.99
Melanolepis multiglandulosa (Reinw. ex Blume) Rchb. & Zoll.	79	0.55	4.16	0.72	2.59	0.64	3.96
Litsea philippinensis Merr.	36	0.7	1.99	0.33	3.30	0.31	3.94
Artocarpus heterophyllus Lam.	44	0.65	2.56	0.40	3.07	0.40	3.87
Macaranga tanarius (L.) Mull.Arg. in DC	53	0.5	3.20	0.48	2.36	0.50	3.34
Polyscias nodosa (Blume) Seem	21	0.6	1.13	0.19	2.83	0.18	3.20
Trema orientalis (L.) Blume	72	0.4	3.88	0.66	1.89	0.60	3.15
Schizolobium parahyba (Vell.) S.F.Blake	77	0.35	4.43	0.70	1.65	0.69	3.04
Pterocarpus indicus Willd.	33	0.5	2.30	0.30	2.36	0.36	3.02
Ficus minahassae (Teijsm. & Vriese) Miq.	28	0.5	1.94	0.26	2.36	0.30	2.92
Sandoricum koetjape (Burm.f.) Merr.	24	0.45	1.27	0.22	2.12	0.20	2.54
Macaranga bicolor Mull.Arg.	15	0.45	0.99	0.14	2.12	0.15	2.41
Ceiba pentandra (L.) Gaertn	27	0.4	1.60	0.25	1.89	0.25	2.38
Ficus nota (Blanco) Merr.	17	0.4	1.27	0.16	1.89	0.20	2.24

Species Name	Abundance	Frequency	Density/ ha	RA (%)	RF (%)	RD (%)	IV
Pinus kesiya Royle ex Gordon	61	0.25	2.71	0.56	1.18	0.42	2.16
Macaranga hispida (Blume) Mull.Arg. in DC	36	0.3	1.85	0.33	1.42	0.29	2.03
Cocos nucifera L.	73	0.1	5.08	0.67	0.47	0.79	1.93
Ficus sp. 1	9	0.35	0.42	0.08	1.65	0.07	1.80
Osmoxylon sp.	6	0.3	0.35	0.05	1.42	0.05	1.52
Persea americana Mill.	9	0.25	0.61	0.08	1.18	0.09	1.36
Ficus ruficaulis Merr.	23	0.2	1.08	0.21	0.94	0.17	1.32
Acacia mangium Willd.	22	0.2	0.79	0.20	0.94	0.12	1.27
Pometia pinnata J.R. Forst. & G.Forst.	14	0.2	0.89	0.13	0.94	0.14	1.21
Pithecellobium dulce (Roxb.) Benth. in Hook	8	0.2	0.54	0.07	0.94	0.08	1.10
Cratoxylum sumatranum (Jack) Blume	8	0.2	0.42	0.07	0.94	0.07	1.08
Chrysophyllum cainito L.	7	0.2	0.35	0.06	0.94	0.05	1.06
Psidium guajava L.	5	0.2	0.29	0.05	0.94	0.04	1.03
Annona muricata L.	5	0.2	0.22	0.05	0.94	0.03	1.02
Casia fistula L.	4	0.2	0.12	0.04	0.94	0.02	1.00
Ficus pseudopalma Blanco	10	0.15	0.78	0.09	0.71	0.12	0.92
Albizia saman (Jacq.) F.Muell	20	0.1	1.35	0.18	0.47	0.21	0.86
Hydroanthus chrysotrichus (Mart. Ex DC) Mattos	10	0.15	0.41	0.09	0.71	0.06	0.86
Terminalia catappa L.	5	0.15	0.32	0.05	0.71	0.05	0.80
Greeniopsis sp.	4	0.15	0.31	0.04	0.71	0.05	0.79
Sterculia rubiginosa Vent.	4	0.15	0.21	0.04	0.71	0.03	0.78
Ficus sp. 3	3	0.15	0.24	0.03	0.71	0.04	0.77
Semecarpus sp.	3	0.15	0.16	0.03	0.71	0.03	0.76
Ficus septica Burm.f.	3	0.15	0.13	0.03	0.71	0.02	0.76
Mallotus sp.	13	0.1	0.89	0.12	0.47	0.14	0.73
Ficus magnoliifolia Blume	13	0.1	0.88	0.12	0.47	0.14	0.73
Antidesma ghaesembilla Gaertn.	10	0.1	0.46	0.09	0.47	0.07	0.63
Rhus taitensis Guill.	7	0.1	0.26	0.06	0.47	0.04	0.58

Species Name	Abundance	Frequency	Density/ ha	RA (%)	RF (%)	RD (%)	IV
Elaeocarpus sp.	5	0.1	0.27	0.05	0.47	0.04	0.56
Ficus sp. 2	4	0.1	0.29	0.04	0.47	0.05	0.55
Vitex parviflora Juss.	4	0.1	0.24	0.04	0.47	0.04	0.55
Omalanthus populneus (Geiseler) Pax	4	0.1	0.23	0.04	0.47	0.04	0.54
Erythrina variegata L. in Stickm.	4	0.1	0.22	0.04	0.47	0.03	0.54
Saurauia sp.	3	0.1	0.22	0.03	0.47	0.03	0.53
Azadirachta excelsa (Jack) Jacobs	3	0.1	0.21	0.03	0.47	0.03	0.53
Eucalyptus deglupta Blume	3	0.1	0.19	0.03	0.47	0.03	0.53
Ficus balete Merr.	3	0.1	0.17	0.03	0.47	0.03	0.52
Neonauclea sp	2	0.1	0.15	0.02	0.47	0.02	0.51
Garcinia mangostana L.	2	0.1	0.12	0.02	0.47	0.02	0.51
Melicope triphylla (Lam.) Merr.	2	0.1	0.11	0.02	0.47	0.02	0.51
Anacardium occidentale L.	2	0.1	0.11	0.02	0.47	0.02	0.51
Macaranga sp.	2	0.1	0.09	0.02	0.47	0.01	0.50
Eucalyptus camaldulensis Dehnh.	7	0.05	0.72	0.06	0.24	0.11	0.41
Polyalthia longifolia Benth. & Hook.f. ex Hook.f	7	0.05	0.25	0.06	0.24	0.04	0.34
Araucaria heterophylla	4	0.05	0.33	0.04	0.24	0.05	0.32
Caesalpinia pulcherrima (L.) Sw.	5	0.05	0.19	0.05	0.24	0.03	0.31
Pangium edule Reinw. ex Blume	4	0.05	0.15	0.04	0.24	0.02	0.30
Diplodiscus paniculatus Turcz.	3	0.05	0.20	0.03	0.24	0.03	0.29
Barringtonia reticulata Miq.	2	0.05	0.14	0.02	0.24	0.02	0.28
Canarium ovatum	2	0.05	0.14	0.02	0.24	0.02	0.28
Syzygium cumini (L.) Skeels	2	0.05	0.14	0.02	0.24	0.02	0.28
Morinda citrifolia L.	2	0.05	0.08	0.02	0.24	0.01	0.27
Shorea contorta S.Vidal	1	0.05	0.10	0.01	0.24	0.02	0.26
Ficus sp. 4	1	0.05	0.09	0.01	0.24	0.01	0.26
Syzygium aqueum (Burm.f.) Alston	1	0.05	0.08	0.01	0.24	0.01	0.26
Ficus fiskei Elmer	1	0.05	0.08	0.01	0.24	0.01	0.26

Species Name	Abundance	Frequency	Density/ ha	RA (%)	RF (%)	RD (%)	IV
Annona squamosa L.	1	0.05	0.07	0.01	0.24	0.01	0.26
Azadirachta indica A.Juss.	1	0.05	0.07	0.01	0.24	0.01	0.26
Duabanga sp.	1	0.05	0.07	0.01	0.24	0.01	0.26
Kleinhovia hospita L.	1	0.05	0.07	0.01	0.24	0.01	0.26
Palaquium sp.	1	0.05	0.07	0.01	0.24	0.01	0.26
Streblus asper Lour.	1	0.05	0.07	0.01	0.24	0.01	0.26
Ficus ampelas Burm.f.	1	0.05	0.07	0.01	0.24	0.01	0.26
Ziziphus jujuba Mill.	1	0.05	0.05	0.01	0.24	0.01	0.25
Astronia sp.	1	0.05	0.05	0.01	0.24	0.01	0.25
Litsea cordata (Jack) Hook.f.	1	0.05	0.05	0.01	0.24	0.01	0.25
Rhamnus philippinensis C.B.Rob	1	0.05	0.05	0.01	0.24	0.01	0.25
Alstonia scholaris (L.) R.Br.	1	0.05	0.05	0.01	0.24	0.01	0.25
Cinnamomum mercadoi S. Vidal	1	0.05	0.04	0.01	0.24	0.01	0.25
Dendrocnide sp.	1	0.05	0.03	0.01	0.24	0.00	0.25
Spiraeopsis sp.	1	0.05	0.03	0.01	0.24	0.00	0.25
Albizia saponaria (Lour.) Blume ex Miq	1	0.05	0.03	0.01	0.24	0.00	0.25
Total	**10,929**	**21.2**	**645.73**	**100**	**100**	**100**	**300**

Appendix 10. Species and conservation status of trees documented across stations

Family	Species	Conservation status	Distribution	Family	Species	Conservation status	Distribution
Achariaceae	1. *Pangium edule* Reinw. ex Blume	Least concern		Lamiaceae	34. *Gmelina arborea* Roxb. ex Sm.	Least concern	Invasive
Actinidiaceae	2. *Saurauia* sp.	Least concern		Lauraceae	35. *Litsea cordata* (Jack) Hook.f.	Least concern	
Adoxaceae	3. *Sambucus javanica* Reinw. Ex Blume	Least concern			36. *Litsea philippinensis* Merr.	Least concern	Endemic
Anacardiaceae	4. *Anacardium occidentale* L.	Least concern	Introduced		37. *Persea americana* Mill.	Least concern	
	5. *Mangifera indica* L.	Least concern		Lithocarpaceae	38. *Lithocarpus* sp.	Least concern	
	6. *Semecarpus* sp.	Least concern		Melastomataceae	39. *Astronia* sp.	Least concern	Endemic
Araliaceae	7. *Osmoxylon* sp.	Least concern		Meliaceae	40. *Dysoxylum* sp.	Least concern	
	8. *Polyscias nodosa* (Blume) Seem	Least concern			41. *Lansium domesticum* Jack	Least concern	
Bignoniaceae	9. *Spathodea campanulata* P.Beauv.	Least concern			42. *Sandoricum koetjape* (Burm.f.) Merr.	Least concern	
	10. *Tabebuia chrysotricha* (Mart. ex DC.) Standl.	Least concern			43. *Swietenia macrophylla* King	Least concern	
	11. *Spathodea campanulata* P.Beauv.	Least concern		Moraceae	44. *Artocarpus blancoi* (Elmer) Merr.	Least concern	Endemic
Bombacacee	12. *Ceiba pentandra* (L.) Gaertn	Least concern			45. *Artocarpus heterophyllus* Lam.	Least concern	
Brownlowiaceae	13. *Diplodiscus paniculatus* Turcz.	Least concern	Endemic		46. *Artocarpus odoratissimus* Merr.	Least concern	Naturalized
Cannabaceae	14. *Trema orientalis* (L.) Blume	Least concern			47. *Ficus ampelas* Burm.f.	Least concern	
Cunoniacee	15. *Caldcluvia* sp.	Least concern			48. *Ficus fiskei* Elmer	Least concern	Endemic
Elaeocarpaceae	16. *Elaeocarpus* sp.	Least concern		Moraceae	49. *Ficus minahassae* (Teijsm. & Vriese) Miq.	Least concern	
Euphorbiaceae	17. *Macaranga bicolor* Mull.Arg.	Least concern	Endemic		50. *Ficus nota* (Blanco) Merr.	Least concern	
	18. *Macaranga hispida* (Blume) Mull.Arg. in DC	Least concern			51. *Ficus pseudopalma* Blanco	Least concern	Endemic
	19. *Macaranga* sp.	Least concern			52. *Ficus septica* Burm.f.	Least concern	
	20. *Macaranga tanarius* (L.) Mull.Arg. in DC	Least concern			53. *Ficus ruficaulis*Merr.	Least concern	
	21. *Mallotus* sp.	Least concern			54. Ficus sp. 1	Least concern	
	22. *Melanolepis multiglandulosa* (Reinw. ex Blume) Rchb. & Zoll.	Least concern			55. *Ficus sp. 2*	Least concern	
	23. *Omalanthus macradenius* Pax & Hoffm.	Least concern	Endemic		56. *Ficus sp. 3*	Least concern	
Fabaceae	24. *Acacia mangium* Willd.	Least concern		Myrtaceae	57. *Eucalyptus camaldulensis* Dehnh.	Least concern	Invasive
	25. *Casia fistula* L.	Least concern	Introduced		58. *Eucalyptus deglupta* Blume	Least concern	
	26. *Erythrina variegata* L.	Least concern			59. *Psidium guajava* L.	Least concern	Invasive
	27. *Falcataria moluccana* (Miq.) Barneby & J.W. Grimes	Least concern	Introduced and naturalized in the Philippines	Rubiaceae	60. *Greeniopsis* sp.	Least concern	
	28. *Leucaena leucocephala* (Lam.) de Wit	Least concern	Invasive species		61. *Neonauclea* sp.	Least concern	
	29. *Pithecellobium dulce* (Roxb.) Benth. in Hook	Least concern			62. *Wendlandia luzoniensis* DC	Least concern	
	30. *Pterocarpus indicus* Willd.	Vulnerable		Rutaceae	63. *Melicope triphylla* (Lam.) Merr.		
	31. *Schizolobium parahyba* (Vell.) S.F.Blake	Least concern		Sapindaceae	64. *Pometia pinnata* J.R. Forst. & G. Forst.	Least concern	
Hypericaceae	32. *Cratoxylum sumatranum* (Jack) Blume	Least concern		Sterculiaceae	65. *Sterculia rubiginosa* Vent.	Least concern	
Juglandaceae	33. *Engelhardia spicata* Lechen. ex Blume	Least concern		Urticaceae	66. *Dendrocnide* sp.	Least concern	

Appendix 11. Photographs of tree representatives recorded across the stations

Artocarpus heterophyllus

Schizolobium parahyba

Dendrocalamus asper

Polyscias nodusa

Cassia fistula

Ficus nota

Pterocarpus indicus Wild.a

Vitex parviflora

Azadirachta excelsa

Canarium ovatum

Cinnamomum mercadoi

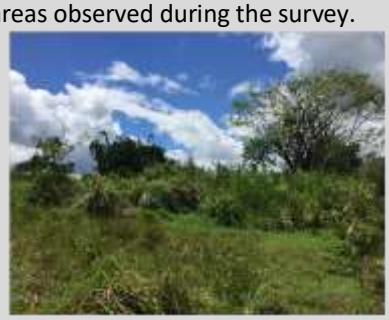
Appendix 12. List of Flora Species indicated in IUCN Red List

Scientific Name: *Pterocarpus indicus* Wild.	**Common Name: Smooth Narra**	**IUCN Red List: Endangered DAO 2017-11: Vulnerable**
Population	There is little precise population information available for *P. indicus.* Although the species is found across Indonesia the subpopulation is scattered and the species is described as uncommon (Barstow, 2018).	
Geographic Range	This species is native to much of south and Southeast Asia. The species was previously more widespread but the subpopulation within Vietnam is now considered extinct and upon the last survey of Sri Lanka the species could not be found. The species occurs at a wide range of altitude from 600 to 1,300 m above sea level (Barstow, 2018). *Source: IUCN Red List of Threatened Species*	
Habitat	This large tree species can grow up to 40 m in height. It grows within lowland rainforests as an emergent, canopy or subcanopy tree. It can occur in both primary and less commonly in secondary forests. The tree can grow on all soils types and is most frequent along tidal creeks, rocky shore and some coastal sites (Barstow, 2018).	
Local Information	*Pterocarpus indicus* flowers annually and the species is insect pollinated. The species is a pioneer as it grows best in open forest however seedlings are slow growing (Barstow, 2018).	
Situation of site during the site survey	The species was present within stations T1, T4, T7, T10, T12, T15, T16, T17, T18, and T20. These established stations situated both in agricultural plantation and riparian forest. The majority of the species exist in secondary forests, which are areas where land has been cleared of its original vegetation and woody vegetation has begun to regenerate. Furthermore, riparian forests are among the most diverse and complex habitats, serving as	

	corridors and improving connectivity by connecting forest patches.
Record of existing survey	At a country level, in China, the subpopulation is scattered and the species is considered uncommon. Although the species is found across Indonesia the subpopulation is scattered and the species is described as uncommon. A similar description is given for the subpopulations in Malaysia, Myanmar, Thailand and Viet Nam. The species is experiencing decline in all of these countries, and consequently it will be becoming more scattered and even less common (Barstow, 2018).
Photos	*Source: https://www.gbif.org/*

Scientific Name: ***Vitex parviflora***	**Common Name:** **Molave**	**IUCN Red List: Least Concern** **DAO 2017-11: Endangered**
Population	In the Philippines all major mature populations have now been logged. There is no further information about the population size and trends of this species (de Kok, 2020).	
Geographic Range	This tree species is native to the Philippines and Indonesia (Moluccas and Lesser Sunda Islands) and East Timor. Introduced as a timber tree on many tropical countries (de Kok, 2020). *Source: IUCN Red List of Threatened Species*	
Habitat (inhabitation feeding area, breeding area, and nesting area)	This species is a tree between 4–15 (– 30) m high. It grows in secondary or mixed primary forest, often along streams, between 30–400 (– 650) m altitude (de Kok 2009).	
Local Information	Reported to be one of the dominant trees in the Philippine monsoon forest (de Kok 2009).	
Situation of site during the site survey	The species were found along the transects 1 and 2. Transect 1 was located in a secondary forest patch where underlying vegetation (grasses and saplings) and intermediate vegetation were also found. Two (2) trees were found in transect 2, which was situated in a riparian forest.	
Record of existing survey	It has a relatively large extent of occurrence (EOO of 1,367,808 km², but most of this is sea) and area of occupancy (AOO of 48 km²). It is known not known from a protected area, but it is very likely that it does occur in protected areas in the Philippines.	

Photos	 *Source: https://www.gbif.org/*

Scientific Name: Shorea contorta	**Common Name: White Lauan**	**IUCN Red List: Least Concern DAO 2017-11: Endangered**
Population	There is no overall population information. The species is considered very common in every area it inhabits (EDC, 2020).	
Geographic Range	*Shoreacontorta* is endemic to the Philippines and naturally occurs in lowland forest where it remains throughout the country. Distribution data has not been mapped for this species (EDC, 2020).	
Habitat (inhabitation feeding area, breeding area, and nesting area)	*Shoreacontorta* is a large tree, found in lowland seasonal semi-evergreen dipterocarp forest. This species is likely to be positively affected by future climate (EDC, 2020).	
Local Information/	The species is recorded from Babuyan islands (Calayan), Luzon (in most provinces), Polillo, Mindoro, Sibuyan, Marinduque, Masbate, Negros, Leyte, Samar, Mindanao and Basilan (EDC, 2020). It is recorded to be flowering in the months of March (Laguna, Palawan), April (Laguna), May (Quezon) (EDC, 2020).	
Situation of Site During the Site Survey	The species were identified in transect 15 where pineapple plantation and cornfields were located. There were open areas observed during the survey.  Transect 15 (Impasug-ong, Bukidnon)	
Record of existing survey	Approximately more than 10,000 mature individuals are recorded during the BINHI-EDC explorations (EDC, 2020)	

Photos	 *Source: https://binhi.ph/tree/white-lauan/*

Scientific Name: *Azadirachta excelsa*	Common Name: Philippine Neem Tree	IUCN Red List: Least Concern DAO 2017-11: Vulnerable
Population	There is limited population information for this species. As the extent of decline from country to country varies so widely and the overall popuation size or density across the range is not known, it is not possible to calculate an accurate population decline for this species (Barstow, 2018).	
Geographic Range	This species is widespread in southeast Asia. Where it is found from Viet Nam south to Papua New Guinea, occurring on Borneo and most islands of Indonesia and Philippines in between. The species is cultivated within Singapore (Barstow, 2018). *Source: IUCN Red List of Threatened Species*	
Habitat (inhabitation feeding area, breeding area, and nesting area)	*Azadirachtaexcelsa* is a large tree species up to 50 m in height. It grows in lowland, monsoon rainforests. The species can be evergreen or deciduous depending on the local climate. The species habitat is currently in decline as lowland rain forests are targeted for logging and conversion to plantations within southeast Asia (Barstow, 2018). The species is sensitive to shade, poor soil nutrition and drought but in ideal growth conditions it has been found to grow quickly (Barstow, 2018).	
Local Information	It is fast becoming a favorite plantation species as an alternate source of logs or timber. The species is found growing naturally in Palawan. It can be harvested in 3 to 15 years depending on the planting requirements or planned end-use (ERDB, 2001).	
Situation of Site During the Site Survey	There were 2 individuals found in transect 1 near the residential area and along the conducted bypass road. Only 1 individual found in transect 13, where plantations of pineapple, sugarcane and corn were located.	
Record of existing survey	The species is confirmed to be common within southeast Viet Nam. Within Borneo there has been an estimated loss of forest cover of 30% since the 1970's, with extent loss from each country varying from 8.8% in Brunei Darussalam up to 39.5% in Sarawak. While in Papua New Guinea 15% of forest loss is estimated tohave been cleared between 1972 and 2002 and in Indonesia rate of forest loss is between 0.76 and 0.98% per year (Barstow, 2018).	

Photos	 *Source: www.nparks.gov.sg*

Scientific Name: *Canarium ovatum*	Common Name: Pili	IUCN Red List: Least Concern DAO 2017-11: Other Threatened Species
Population	*Canarium ovatum* was found to have a considerably large extent of occurrence of 278,000 km^2 it was expected that it has a relatively large total population number. However, due to the continuous decline of the forest resources of its type locations and the provinces where it can be found there is an expected future population decline to its total population in the non-distant future indicating a 126,000 hectares of tree cover loss from 2001 to 2018 (EDC, 2020).	
Geographic Range	*Canarium ovatum* is an endemic species in the Philippines which was found native in Luzon region, where it was found to be occurring in the provinces of Quezon, Laguna, Camarines Sur, Bohol, Albay, Sorsogon, Catanduanes, Masbate, Leyte, Samar and Antique. It also occurs in Mindanao, particularly in the provinces of Bukidnon, Surigao, Agusan del Norte, and Davao del Sur (EDC, 2020).Distribution data has not been mapped for this species.	
Habitat	*Canarium ovatum* is a tree and is found mostly in lowland forests with warm temperatures and well distributed rainfalls. This species of *Canarium* typically grows up to 20 m tall in light and heavy soils. The phenology of this species is between March and June. Seeds are dispersed by some wildlife (i.e. hornbills, wild pigs, wild deer, rodents, etc.) consuming the pulp and leaving the nuts (EDC, 2020).	
Local Information	*Canarium ovatum* (known locally as pili and pilaui) is the most important nut-producing species in the Philippines. Although one of the more typhoon-resistant species, severe typhoons have led to significant destruction of pili trees. The most severe threat is posed by humans who have felled pili trees to sell as lumber or fuelwood in periods of food insecurity following a major typhoon (Coronel, 1996).	
Situation of site during the site survey	Found along the Transect 1. Transect 1 is near residential areas with coconut and mango plantation areas, open grassland, and residual secondary forest patches at the ravines.	

Record of existing survey	It has a relatively large extent of occurrence (EOO) of around 300,000 km2 where its prominent geographic distribution indicates its well-adaptability in the country's various provinces. It also considered to have a large total population given its wide distribution (EDC, 2020).
Photos	 *Source: http://regenerag.org/*

Scientific Name: *Cinnamomum mercadoi*	Common Name: Kalingag	IUCN Red List: Least Concern DAO 2017-11: Other Threatened Species
Population	Currently, the population size of the species remains uncertain due to lack of research which can be addressed by further inventory and documentation. Its minimum area of occupancy is 252 km² (EDC, 2020). (EDC, 2020).	
Geographic Range	*Cinnamomum mercadoi* is an endemic tree species in the Philippines. The number of locations were estimated at 50. Distribution data has not been mapped for this species.	
Habitat (inhabitation feeding area, breeding area, and nesting area)	*Cinnamomum mercadoi* is a small tree species with height ranging from five to 15 meters and can usually be found in lowland to high-elevated primary forests at 150 to 985 m asl. Other herbarium records indicate its suitability in forest ridges, dipterocarp forests, logged-over secondary forests, as well as in extreme ultrabasic areas. It is also abundant in lower montane to upper montane forests at 2,050 to 2,300 m asl. e.g. Mt Kitanglad Mountain Range. Its complete flowering and fruiting cycle has yet to be determined but flowering has been observed during from January to May, while fruits were observed from March to November (EDC, 2020).	
Local Information/	*Cinnamomum mercadoi* is an endemic tree species in the Philippines which naturally thrives in low to high-elevated primary forests in various provinces and localities in Luzon to Mindanao islands. It has a calculated extent of occurrence (EOO) of 667,408 km² and a minimum area of occupancy (AOO) of 252 km² which account for 50 estimated locations (EDC, 2020).	
Situation of site during the site survey	It is found along Transect 7. The transect is along Mangima river. It is a mix agroforest area on both sides of the ravine with cornfields near the river and pineapple plantation at the top of the plateau Transect 7(Manolo Fortich, Bukidnon)	

Record of existing survey	It has a calculated extent of occurrence (EOO) of 667,408 km² and a minimum area of occupancy (AOO) of 252 km² which account for 50 estimated locations based on currently available species' information. Given its large distribution throughout the country and its very common habitat requirements, it is expected that it is abundantly occurring within its known localities (EDC, 2020).
Photos	*Source: http://phytoimages.siu.edu/*

Appendix 13. Importance values of grassland and understory vegetation recorded across the stations

Species Name (64)	Density	Frequency	Cover	RD (%)	RF (%)	RC (%)	SIV
Asytasia gangetica subsp. Micrantha	441.47	9.70	4.66	28.37	17.00	28.69	74.06
Axonopus compressus	350.83	6.18	3.38	22.54	10.82	20.82	54.18
Rottboella cochinchinensis	66.33	4.15	1.11	4.26	7.27	6.84	18.37
Sphagneticola trilobata	110.10	1.03	0.72	7.07	1.81	4.43	13.32
Oplimenus hirtellu	76.96	2.10	0.62	4.95	3.68	3.85	12.48
Drynaria cordata	53.51	1.11	0.43	3.44	1.95	2.63	8.01
Ageratum conyzoides	23.33	2.65	0.26	1.50	4.64	1.62	7.75
Mimosa pudica	16.42	2.56	0.33	1.06	4.50	2.02	7.57
Arachis hypogea	59.65	0.57	0.42	3.83	1.00	2.57	7.40
Eleusine indica	17.81	2.21	0.39	1.14	3.86	2.38	7.39
Chromolaena odorata	24.22	2.12	0.28	1.56	3.71	1.72	6.99
Centrosa pubescens	14.41	1.48	0.31	0.93	2.60	1.92	5.44
Borreria laevis	24.89	1.30	0.13	1.60	2.28	0.79	4.67
Calopogonium mucunoides	7.74	1.35	0.23	0.50	2.36	1.42	4.28
Kylinga nemoralis	28.90	0.81	0.12	1.86	1.42	0.72	3.99
Euphorbia hirta	18.36	1.18	0.11	1.18	2.07	0.67	3.92
Stachytarpheta jamaicensis	7.42	1.18	0.21	0.48	2.07	1.32	3.86
Commelina diffusa	24.06	0.77	0.13	1.55	1.35	0.79	3.69
Sida rhombifolia	6.89	0.94	0.18	0.44	1.65	1.11	3.20
Crotalaria pallida	4.56	1.07	0.11	0.29	1.87	0.67	2.84
Synedrella nodiflora	10.71	0.88	0.10	0.69	1.54	0.60	2.83
Mimosa diploticha	7.75	0.41	0.24	0.50	0.71	1.46	2.67
Euphorbia heterophylla	12.21	0.57	0.13	0.78	1.00	0.78	2.56
Solanum torvum	2.95	1.09	0.07	0.19	1.90	0.45	2.55
Crassocephalum crepidiodes	4.28	0.91	0.08	0.28	1.60	0.48	2.35
Chamaecrista nictitans	9.25	0.60	0.11	0.59	1.06	0.66	2.31
Spilanthes paniculata	5.89	0.71	0.09	0.38	1.24	0.54	2.16
Digitaria ciliaris	14.85	0.30	0.07	0.95	0.53	0.42	1.90
Richardia grandiflora	7.23	0.55	0.07	0.46	0.96	0.43	1.86
Acmella paniculata	4.05	0.68	0.06	0.26	1.18	0.35	1.80
Tradescantia fluminensis	11.85	0.20	0.11	0.76	0.35	0.65	1.76
Oldenlandia corymbosa	13.79	0.11	0.10	0.89	0.18	0.63	1.70
Christella normalis	2.86	0.59	0.05	0.18	1.04	0.34	1.56
Euphorbia prostata	14.21	0.16	0.05	0.91	0.28	0.29	1.48
Nephrolepis bisserata	3.84	0.39	0.08	0.25	0.69	0.47	1.41
Amaranthus spinosus	1.65	0.45	0.07	0.11	0.79	0.42	1.32
Erigeron canadensis	1.54	0.57	0.03	0.10	1.01	0.19	1.29
Cloeme rutidosperma	3.27	0.47	0.03	0.21	0.82	0.16	1.19
Ipomea batatas	1.43	0.28	0.09	0.09	0.48	0.54	1.12
Eclipta prostata	1.65	0.25	0.05	0.11	0.44	0.30	0.84
Peperomia pellucida	7.19	0.08	0.03	0.46	0.13	0.19	0.79
Echinocloa colona	5.14	0.08	0.05	0.33	0.14	0.31	0.78
Colocasia esculenta	0.94	0.31	0.03	0.06	0.54	0.17	0.77
Melothria pendula	2.06	0.23	0.03	0.13	0.40	0.21	0.75
Lantana camara	1.45	0.25	0.02	0.09	0.44	0.11	0.64
Borreria ocymoides	2.78	0.20	0.02	0.18	0.35	0.10	0.63
Cornus sericea	0.83	0.18	0.04	0.05	0.31	0.27	0.63
Ruella tuberosa	3.23	0.13	0.03	0.21	0.22	0.18	0.61
Grona trifloral	5.92	0.03	0.02	0.38	0.05	0.12	0.55

Species Name (64)	Density	Frequency	Cover	RD (%)	RF (%)	RC (%)	SIV
Eragotis amabilis	1.85	0.05	0.03	0.12	0.09	0.18	0.39
Amaranthus viridis	1.70	0.12	0.01	0.11	0.22	0.05	0.37
*Coffea arabica** seedlings	3.24	0.03	0.02	0.21	0.05	0.11	0.37
Swietenia sapling	0.45	0.15	0.01	0.03	0.26	0.06	0.36
Ananas comosus	0.30	0.05	0.04	0.02	0.09	0.22	0.33
Odontonema cuspidatum	1.10	0.05	0.03	0.07	0.09	0.16	0.32
Phaulopsis imbritica	0.20	0.15	0.00	0.01	0.26	0.01	0.28
Cyathillium cinereum	1.76	0.03	0.01	0.11	0.06	0.09	0.26
Tridax procumbens	1.52	0.03	0.01	0.10	0.06	0.08	0.24
Manihot esculenta	0.10	0.10	0.01	0.01	0.18	0.03	0.22
Polygonum tomentosum	0.74	0.05	0.01	0.05	0.09	0.05	0.19
Corchorus olitorus	0.10	0.05	0.01	0.01	0.09	0.06	0.15
Piper sarmentosum	0.20	0.05	0.01	0.01	0.09	0.04	0.14
Alocasia cucullate	0.05	0.05	0.00	0.00	0.09	0.00	0.09
Melonchia corchorifolia	0.33	0.03	0.00	0.02	0.04	0.02	0.09
Total	**1556.25**	**57.06**	**16.23**	**100**	**100**	**100**	**300**

Appendix 14. Abundance and distribution of birds across stations

Low rainfall period

Family	Species	Transect																				Total	RA (%)
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20		
Accipitridae	Brahminy kite (Haliastur indus)							1		1	2											4	0.5
Accipitridae	Philippine serpent-eagle (Spilornis cheela)									1												1	0.12
Alcedinidae	Collared Kingfisher (Todiramphus chloris)	3		1	1		3	5		1	5		1			2			3		8	33	4.08
Alcedinidae	Southern silvery kingfisher (Ceyx argentatus)								1													1	0.12
Alcedinidae	White-throated kingfisher (Halcyon gularis)	1					2	2						1					3			9	1.11
Anatidae	Philippine Duck (Anas luzonica)															1						1	0.12
Apodidae	Glossy swiftlet (Collocalia esculenta)	20	2	10				15	1	5	7					8	3	6	9		3	89	11.01
Ardeidae	Cattle egret (Bubulcus ibis)															14						14	1.73
Artamidae	White breasted wood swallow (Artamus leucoryn)	1	2			1		1			6			3		1			1		1	17	2.1
Campephagidae	Pied triller (Lalage nigra)	1										1										2	0.25
Columbidae	Grey-capped emerald dove (Chalcophaps indica)								1	1				1								3	0.37
Columbidae	Philippine Cuckoo Dove (Macropygia tenuirostris)		1																			1	0.12
Columbidae	White-eared brown dove (Phapitreron leucotis)	2				1	2	4	3	5	3	2		1		7			1			31	3.84
Columbidae	Zebra dove (Geopelia striata)	3			1		1	1	1		1							2	13	4	30	57	7.05
Corvidae	Large-billed crow (Corvus macrorhynchos)													1		1					3	5	0.62
Cuculidae	Black-faced coucal (Centropus melanops)									1									1		1	3	0.37
Cuculidae	Philippine coucal (Centropus viridis)	1												1								2	0.25

Appendices

Family	Species	Transect																				Total	RA (%)
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20		
Dicaeidae	Fire-breasted flowerpecker (Dicaeum ignipectus)								1		1											2	0.25
Dicaeidae	Red keeled flowerpecker (Dicaeum austral)							3			2			1		1			4			11	1.36
Estrildidae	Chestnut munia (Lonchura atricapilla)							1													4	5	0.62
Falconidae	Philippine falconet (Microhierax erythrogenys)								1		1											2	0.25
Laniidae	Long-tailed shrike (Lanius schach)										1								2		1	4	0.5
Locustellidae	Striated grassbird (Megalurus palustris)	1						1	1		2	1				2						8	0.99
Locustellidae	Tawny grassbird (Megalurus timoriensis)											1										1	0.12
Megalaimidae	Coppersmith barbet (Psilopogon haemacephalus)				1			2			1					2						6	0.74
Meropidae	Blue-throated bee-eater (Merops viridis)	3					2	4								1						10	1.24
Motacillidae	Eastern Yellow Wagtail (Motacilla flava)											1										1	0.12
Muscicapidae	Blue-and-white flycatcher (Cyanoptila cyanomelana)						1	1			1			1								4	0.5
Muscicapidae	Oriental magpie-robin (Copsychus saularis)						1		1	1	1								1			5	0.62
Muscicapidae	Pied Buschat (Saxicola caprata)									1												1	0.12
Nectariniidae	Brown-throated sunbird (Anthreptes malacensis)																				11	11	1.36
Nectariniidae	Lina's sunbird (Aethopyga linaraborae)	1						3														4	0.5
Nectariniidae	Olive-backed sunbird (Cinnyris jugularis)		2		1		3	2	2	7	1	1	1	1		2			8		7	38	4.7
Pachycephalidae	White-vented whistler																		3			3	0.37

Family	Species	Transect																				Total	RA (%)
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20		
	(Pachycephala homeyeri)																						
Passeridae	Eurasian tree sparrow (Passer montanus)	7	4	2			1	3	1	4	20	1	1	5	12	34	2	6	49	20	67	239	29.58
Psittacidae	Philippine hanging parrot (Loriculus philippensis)							2														2	0.25
Pycnonotidae	Philippine bulbul (Hypsipetes philippinus)							4		1	2	2				2						11	1.36
Pycnonotidae	Yellow-vented bulbul (Pycnonotus goiavier)	10	4		1		2	3		4	4			1	3	15	2		20	14	19	102	12.62
Rallidae	Barred rail (Hypotaenidia torquata)		1					1		2						1						5	0.62
Rhipiduridae	Black-and-cinnamon fantail (Rhipidura nigrocinnamomea)																				2	2	0.25
Rhipiduridae	Philippine pied fantail (Rhipidura nigritorquis)	2			1			1		2						1			4			11	1.36
Sturnidae	Asian glossy starling (Aplonis panayensis)	4						2		1	17					9			2			35	4.33
Sturnidae	Coleto (Sarcops calvus)		1								1											2	0.25
Timaliidae	Brown tit-babbler (Macronus striaticeps)							1								2						3	0.37
Turdidae	Island thrush (Turdus poliocephalus)															1						1	0.12
Turnicidae	Barred Button quail (Turnix suscitator)															1						1	0.12
Tytonidae	Eastern Grass-owl (Tyto longimembris)															2						2	0.25
Zosteropidae	Mountain white-eye (Zosterops japonicus)									1	1	1										3	0.37
	Total	**60**	**17**	**13**	**6**	**2**	**18**	**63**	**14**	**39**	**80**	**11**	**3**	**17**	**15**	**110**	**7**	**14**	**124**	**38**	**157**	**808**	

High rainfall period

Family	Species	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Total	RA %
Accipitridae	Black-shouldered kite (*Elanus axillaris*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	**2**	**0.27%**
Accipitridae	Brahminy kite (*Haliastur indus*)	0	0	1	0	1	0	3	1	0	0	0	1	0	0	1	2	1	0	1	1	**13**	**1.73%**
Alcedinidae	Collared Kingfisher (*Todiramphus chloris*)	7	0	2	3	1	1	1	0	0	0	0	0	1	0	1	2		1	1	2	**23**	**3.07%**
Alcedinidae	White-throated kingfisher (*Halcyon gularis*)	3	1	0	2	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**9**	**1.20%**
Apodidae	Fork-tailed swift (*Apus pacificus*)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**2**	**0.27%**
Apodidae	Glossy swiftlet (*Collocalia esculenta*)	68	1	11	15	3	1	0	1	0	1	17	0	0	0	2	4		8	1	25	**158**	**21.07%**
Apodidae	House swift (*Apus nipalensis*)	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**3**	**0.40%**
Ardeidae	Cattle egret (*Bubulcus ibis*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	**2**	**0.27%**
Artamidae	White breasted wood swallow (*Artamus leucoryn*)	0	4	6	0	0	0	1	0	0	0	0	0	0	1	2	0	1	0	1	32	**48**	**6.40%**
Bucerotidae	Mindanao hornbill (*Penelopides affinis*)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.13%**
Columbidae	Grey-capped emerald dove (*Chalcophaps indica*)	2	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**	**0.53%**
Columbidae	Philippine Cuckoo Dove (*Macropygia tenuirostris*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**	**0.13%**
Columbidae	Pied imperial pigeon (*Ducula bicolor*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.13%**
Columbidae	Red collared dove (*Streptopelia tranquebarica*)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	**2**	**0.27%**
Columbidae	White-eared brown dove (*Phapitreron leucotis*)	0	0	1	0	1	0	0	0	2	0	0	0	1	0	1	0	0	1	0	2	**9**	**1.20%**
Columbidae	Zebra dove (*Geopelia striata*)	13	1	2	8	4	0	1	1	1	0	0	0	1	0	1	1	1	0	1	5	**41**	**5.47%**
Corvidae	Large-billed crow (*Corvus macrorhynchos*)	3	0	3	0	0	0	0	0	1	0	1	1	4	0	2	1	0	1		6	**23**	**3.07%**
Cuculidae	Black-faced coucal (*Centropus melanops*)	2	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	5	**10**	**1.33%**
Cuculidae	Philippine coucal (*Centropus viridis*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**1**	**0.13%**
Dicaeidae	Fire-breasted flowerpecker	1	0	0	0	1	1	1	0	1	1	0	0	1	0	1	0	0	1	0	2	**11**	**1.47%**

Family	Species	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Total	RA %
	(*Dicaeum ignipectus*)																						
Dicaeidae	Red keeled flowerpecker (*Dicaeum austral*)	7	1	1	4	0	0	0	0	0	1	0	0	1	0	1	1	0	5	1	1	**24**	**3.20%**
Estrildidae	Chestnut munia (*Lonchura atricapilla*)	0	0	0	1	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	5	**12**	**1.60%**
Estrildidae	White-bellied Munia (*White-bellied Munia*)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**2**	**0.27%**
Hirundinidae	Barn swallow (*Hirundo rustica*)	0	2	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**7**	**0.93%**
Laniidae	Long-tailed shrike (*Lanius schach*)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	**4**	**0.53%**
Locustellidae	Striated grassbird (*Megalurus palustris*)	3	1	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	**8**	**1.07%**
Locustellidae	Tawny grassbird (*Megalurus timoriensis*)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	1	0	1	0	1	**6**	**0.80%**
Megalaimidae	Coppersmith barbet (*Psilopogon haemacephalus*)	0	0	0	0	2	0	1	0	3	0	0	0	0	0	0	0	0	1	0	0	**7**	**0.93%**
Meropidae	Blue-throated bee-eater (*Merops viridis*)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.13%**
Monarchidae	Black-naped monarch (*Hypothymis azurea*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**0.13%**
Muscicapidae	Oriental magpie-robin (*Copsychus saularis*)	2	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	1	**7**	**0.93%**
Muscicapidae	Pied Buschat (*Saxicola caprata*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	**0.13%**
Nectariniidae	Lina's sunbird (*Aethopyga linaraborae*)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.13%**
Nectariniidae	Olive-backed sunbird (*Cinnyris jugularis*)	9	1	4	1	1	0	1	0	0	1	1	0	1	0	0	1	0	4	1	2	**28**	**3.73%**
Oriolidae	Black-naped oriole (*Oriolus chinensis*)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	**0.13%**
Passeridae	Eurasian tree sparrow (*Passer montanus*)	45	8	17	42	2	1	6	1	0	0	1	1	1	1		4	1	3	3	8	**145**	**19.33%**
Psittacidae	Philippine hanging parrot (*Loriculus philippensis*)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.13%**
Psittaculidae	Guaiabero (*Bolbopsittacus lunulatus*)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**0.13%**

Appendices

Family	Species	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16	T17	T18	T19	T20	Total	RA %
Pycnonotidae	Philippine bulbul (*Hypsipetes philippinus*)	3	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	**7**	**0.93%**
Pycnonotidae	Yellow-vented bulbul (*Pycnonotus goiavier*)	32	3	5	4	5	3	2	1	0	1	1	0	1	1	0	2	1	8	1	2	**73**	**9.73%**
Rallidae	Barred rail (*Hypotaenidia torquata*)	2	1	0	0	1	0	0	1	0	0	1	0	0	0	1		1	1	1		**10**	**1.33%**
Rhipiduridae	Philippine pied fantail (*Rhipidura nigritorquis*)	1	0	1	1	2	0	0	0	0	1	0	0	0	0	1	1	1	1	1	5	**16**	**2.13%**
Sturnidae	Asian glossy starling (*Aplonis panayensis*)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	**3**	**0.40%**
Turnicidae	Barred Button quail (*Turnix suscitator*)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1		1	0	0		**3**	**0.40%**
Tytonidae	Eastern Grass-owl (*Tyto longimembris*)	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	1	**1**	**0.13%**
Zosteropidae	Mountain white-eye (*Zosterops japonicus*)	0	0	0	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	**16**	**2.13%**
	Total	**204**	**25**	**62**	**85**	**29**	**10**	**20**	**11**	**10**	**6**	**23**	**3**	**30**	**3**	**20**	**27**	**12**	**40**	**14**	**116**	**750**	**100.00%**

Appendix 15. Photographs of the captured bird at the survey stations

White-collared kingfisher
(*Todiramphus chloris*)

Coppersmith barbet
(*Psilopogon haemacephalus*)

Glossy swiftlet
(*Collocallia esculenta*)

White-eared brown fruit dove
(*Phapitreron leucotis*)

Southern silvery kingfisher
(***Ceyx argentatus)***

Philippine Duck
***(Anas luzonica*)**

Mindanao Tarictic Hornbill
(***Penelopides affinis***)

Lina's sunbird
(***Aethopyga linaraborae***)

Appendix 16. List of Important Avifaunal Species indicated in IUCN Red List

Scientific Name: *Ceyx argentatus*	Common Name: Southern silvery kingfisher	IUCN Red List: Near Threathened DAO 2019-09: Vulnerable
Population	The population is estimated to number 2,500-9,999 individuals (BirdLife, 2017).	
Geographic Range	*Ceyxargentatus* is endemic to the Philippines, where it occurs on Dinagat, Siargao, Mindanao and Basilan. Since 1980, documented observations are confined to east Mindanao, although there are also recent sightings from the Zamboanga Peninsula, particularly within the Lituban-Quipit Watershed IBA (BirdLife, 2017). *Source: IUCN Red List of Threatened Species*	
Habitat (inhabitation feeding area, breeding area, and nesting area)	It appears to be reliant upon forested streams and ponds. It occurs below 1,000 m (with one record from 1,120-1,350 m), and will tolerate secondary and selectively logged forest and even streamside vegetation within coconut plantations, close to forest edge, but terminalia and sago are the principal forest types where the highest densities were recorded during mist-netting in 2002-2003. It breeds in riverside banks and is apparently sedentary (BirdLife, 2017).	
Local Information/ The situation at the time of the discovery during field survey	Since 1980, documentedobservations are confined to east Mindanao, although there are also recent sightings from the Zamboanga Peninsula, particularly within the Lituban-Quipit Watershed IBA. It is shy and inconspicuousand very likely under-recorded(BirdLife, 2017). It is found during the low rainfall period.	

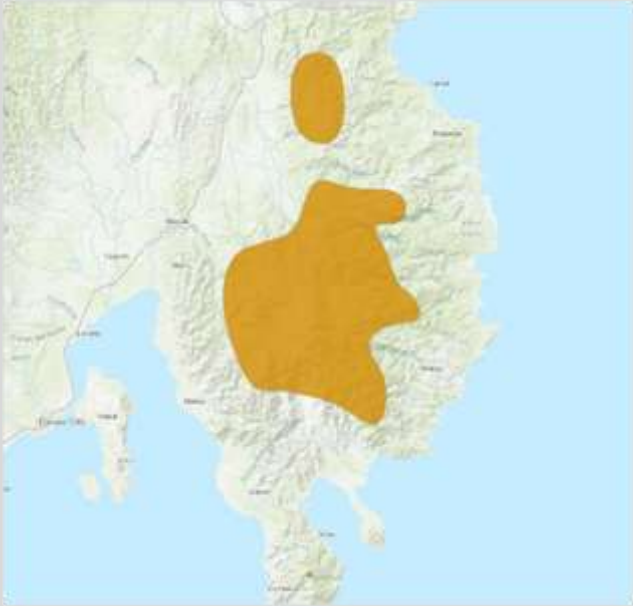
Situation of Site (Photo, how many locations) during the site survey	Found along W8. Cornfields and pineapple plantations at the top of the ravines with thick agroforest patches near and along the river. W8 (Impasug-ong, Bukidnon)
Record of existing survey	Formerly widespread and locally common, a comparison of pre- 1970 and more recent records indicate a decline throughout its range. Since 1980, documented observations are confined to east Mindanao, although there are also recent sightings from the Zamboanga Peninsula, particularly within the Lituban-Quipit Watershed IBA (BirdLife, 2017).
Photos	*Source:* ebird.org

Scientific Name: ***Anas luzonica***	**Common Name:** **Philippine Duck**	**IUCN Red List: Vulnerable** **DAO 2019-09: Vulnerable**
Population	A total of 4,632 individuals were counted in the Asian Waterbird Census in 2004, and 4,428 in 2005. The total population is likely to fall between 5,000-10,000 individuals, roughly equating to 3,300-6,700 mature individuals (BirdLife, 2016).	
Geographic Range	*Anas luzonica* is endemic to the Philippines, being recorded from all the major islands and eight smaller islands. Records are mostly from Luzon and Mindanao (BirdLife, 2016). *Source: IUCN Red List of Threatened Species*	
Habitat (inhabitation feeding area, breeding area, and nesting area)	It frequents most freshwater and saltwater habitats, including mangroves, open sea and watercourses inside forest. It appears to be sedentary although some seasonal aggregation occurs. It feeds on fish, shrimps, insects, rice and young vegetation (BirdLife, 2016).	
Local Information/ The situation at the time of the discovery during field survey	*Anas luzonicais* endemic to the **Philippines**, being recorded from all the major islands and eight smallerislands. Records are mostly from Luzon and Mindanao. Records from Siquijor and the Sulus remainunsubstantiated. A steep population decline was evident by the mid-1970s, with high numbers recordedat only a few sites in the following decade. It was found during the low rainfall period.	

Situation of Site (Photo, how many locations) during the site survey	*A. luzonica* is found along W10. The station is a pineapple and cornfields with minimal vegetation and open grasslands. W10 (Impasug-ong, Bukidnon)
Record of existing survey	Steep population decline was evident by the mid-1970s, with high numbers recorded at only a few sites in the following decade, e.g. Candaba Marsh (Luzon) which probably supported many thousands in the early 1980s, though in 2012 only 390 individuals were recorded. Important current areas include Malasi Lake (7000 individuals in 2013), Brgy. Perlas (3252 in 2013, San Roque Multipurpose Project (3500 individuals in 2013), Biong&Pandan. Cabusao Wetland Area (3000 individuals in 2011, though only 2 in 2013), Subic Bay (600 seen in 1997, 400 in 2003), Magat dam (2,000 were seen in 2001, 495 in 2013) and Malasi lakes (1,320 were recorded in 2002 and 7,000 in 2013). Other recent records come from Mangatarem, Pangasinan (east of Zambales Mountains IBA) where 70 individuals were counted on the Barabac River inside the Manleluag Spring National Park, Cantilan mangroves in Surigao del Sur and from a mangrove fishpond in Bicol Region, Southern Luzon (BirdLife, 2016).
Photos	*Source:* ebird.org

Scientific Name: *Penelopides affinis*	**Common Name: Mindanao Tarictic Hornbill**	**IUCN Red List: Least Concern DAO 2019-09: Vulnerable**
Population	The global population size has not been directly quantified, but the species is reported to be common in primary forest and the population is believed to be well over 10,000 birds (BirdLife, 2020a).	
Geographic Range	*This species is found on the island of Mindanao and adjacent smaller islands in the Philippines. Only 6,307 km2 of its habitat is considered to be optimal (BirdLife, 2020a).* *Source: IUCN Red List of Threatened Species*	
Habitat (inhabitation feeding area, breeding area, and nesting area)	The species is found in both primary and secondary rainforests and forest edges, up to elevations of 900m. It moves below the canopy and is seen in pairs or small groups of up to 12 individuals. It appears to be both sedentary and territorial. It feeds on both fruits, seeds and prey such as lizards and beetles. The pair breeds between April and May. The incubation period lasts 25 days and a nesting period of 47- 54 days was observed in captivity when 3 eggs were laid (BirdLife, 2020a).	
Local Information/ The situation at the time of the discovery during field survey	This species is found on the island of Mindanao and adjacent smaller islands in the Philippines. Only 6,307 km^2 of its habitat is considered to be optimal. The population is suspected to be in decline locally owing to ongoing habitat destruction and hunting forfood *P. affinis* has been observed during the high rainfall period	
Situation of Site (Photo, how many locations) during the site survey	The species is found in W4. The station is along Mangima river. It is a mix agroforest area on both sides of the ravine with cornfields near the river and pineapple plantation at the top of the plateau. Station W4 (Manolo Fortich, Bukidnon)	

Record of existing survey	This species is found on the island of Mindanao and adjacent smaller islands in the Philippines. Only 6,307 km^2 of its habitat is considered to be optimal (BirdLife, 2020a).
Photos	*Source: ebird.org*

Scientific Name: *Aethopyga linaraborae*	Common Name: Lina's sunbird	IUCN Red List: Near Threathened DAO 2019-09: Vulnerable
Population	The global population size has not been quantified, but the species is described as fairly common within its very small total range (BirdLife, 2020b).	
Geographic Range	Aethopyga linaraborae is endemic to Mindanao, Philippines, It is relatively common in suitable habitat within its altitudinal range; assuming that it generally occurs in all available remaining habitat above 1,000 m, its total range likely comprises c. 1,200 km^2(BirdLife, 2020b).  *Source: IUCN Red List of Threatened Species*	

Habitat (inhabitation feeding area, breeding area, and nesting area)	It occupies montane mossy forest from 970-2,000 m and above. Breeding appears to take place in May, but may happen at other times of year (BirdLife, 2020b).
Local Information/ The situation at the time of the discovery during field survey	*Aethopyga linaraboraeis* currently known from Mts Mayo, PutingBato (Tagub) and Pasian in the eastern provinces of Davao del Norte and Davao Oriental. However, it has also been recorded in the lower montane forest of Mt. Hamiguitan at an elevation of 1,000-1,100 m (Mohagan et al. 2015).Habitat degradation due to mining may affect the population in some parts of its range(BirdLife, 2020b). Found along the Transect 1 and Station W4 during the low rainfall while it is observed in Station W3 during the high rainfall
Situation of Site (Photo, how many locations) during the site survey	Found in T1, W3 and W4. Transect 1 is near residential areas with coconut and mango plantation areas, open grassland, and residual secondary forest patches at the ravine. Station W3 is composed of agroforest near the river surrounded by pineapple plantation and along a recently constructed bypass road. W4 is along Mangima river. It is a mix agroforest area on both sides of the ravine with cornfields near the river and pineapple plantation at the top of the plateau T1 (Tagoloan, Msi. Or.) (for insert) Station W3 (Manolo Fortich, Bukidnon)

	 Station W4 (Manolo Fortich, Bukidnon)
Record of existing survey	it is currently known from MtsMayo, PutingBato (Tagub) and Pasian in the eastern provinces of Davao del Norte and Davao Oriental.However, it has also been recorded in the lower montane forest of Mt. Hamiguitan at an elevation of1,000-1,100 m (BirdLife, 2020b).

Photos	 *ource: ebird.org*

Appendix 17. Total bat captures across stations in the Project Site

Low rainfall period

Family	Species Name	Abundance	Frequency	RA (%)	RF (%)
Pteropodidae	*Ptenochirus jagori*	50	0.82	70.42	42.86
Pteropodidae	*Cynopterus brachyotis*	14	0.455	19.72	23.81
Pteropodidae	*Macroglossus minimus*	2	0.18	2.82	9.52
Pteropodidae	*Rousettus amplexicaudatus*	3	0.27	4.23	14.29
Pteropodidae	*Haplonycteris fischeri*	1	0.09	1.41	4.76
Hipposideridae	*Hipposideros diadema*	1	0.09	1.41	4.76
	Total	71	1.905	100	100

NOTE: RA – relative abundance; RF – relative frequency

High rainfall period

Family	Species	Abundance	Frequency	RA (%)	RF (%)
Pteropodidae	*Ptenochirus jagori*	80	1.00	55.56	32.47
Pteropodidae	*Cynopterus brachyotis*	30	0.917	20.83	29.76
Pteropodidae	*Ptenochirus minor*	18	0.50	12.50	16.23
Pteropodidae	*Macroglossus minimus*	9	0.42	6.25	13.53
Pteropodidae	*Rousettus amplexicaudatus*	7	0.25	4.86	8.12
	Total	144	3.087	100.00	100.00

NOTE: RA – relative abundance; RF – relative frequency

Appendix 18. Individual morphometrics of bats captured per site

Low rainfall period

Station	Species Name	Sex	Age	Forearm (mm)	Hind foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Total Length (mm)	Weight (g)
1	*Ptenochirus jagori*	♀	Adult	51	8	65	145	8	10	75	87
	Ptenochirus jagori	♂	Juvenile	34	8	51	130	8	7	58	31
	Cynopterus brachyotis	♂	Adult	12	7	39	111	6	7	46	21
	Ptenochirus jagori	♂	Adult	52	9	74	122	9	9	83	83
	Ptenochirus jagori	♂	Juvenile	35	8	48	125	8	8	56	40
	Ptenochirus jagori	♀	Adult w/pup	53	10	72	130	9	10	82	94
2	*Haplonycteris fischeri*	♂	Adult	55	10	60	150	11	15	75	90
	Hipposideros diadema	♂	Adult	32	8	46	111	8	12	58	21
3	*Ptenochirus jagori*	♂	Juvenile	37	8	48	125	9	9	57	32
	Ptenochirus jagori	♀	Juvenile	25	9	50	125	8	8	58	48
	Cynopterus brachyotis	♂	Juvenile	29	9	45	127	9	7	52	28
	Ptenochirus jagori	♀	Juvenile	57	9	60	130	9	9	69	108
4	No Captures										
5	*Ptenochirus jagori*	♂	Adult	48	9	45	160	9	8	53	53
	Ptenochirus jagori	♀	Adult/with pup	45	9	65	130	9	8	73	70
	Rousettus amplexicaudatus	♀	Adult	25	9	48	143	9	15	63	68
	Ptenochirus jagori	♀	Adult	60	9	62	145	9	9	71	55
	Ptenochirus jagori	♀	Adult	55	9	70	165	9	15	85	78
	Macroglossus minimus	♀	Juvenile	10	8	35	80	8	Absent	80	16
6	*Ptenochirus jagori*	♂	Adult w/pup	53	8	71	170	8	10	81	88
	Ptenochirus jagori	♀	Juvenile	15	5	20	75	4	5	25	22
	Cynopterus brachyotis	♀	Juvenile	25	6	35	111	5	6	41	24
	Ptenochirus jagori	♂	Juvenile	25	8	44	130	8	8	52	35
	Rousettus amplexicaudatus	♀	Adult	55	11	57	131	10	15	72	88
	Ptenochirus jagori	♂	Adult	55	11	55	180	10	11	66	100
	Cynopterus brachyotis	♀	Juvenile	22	5	35	128	4	4	39	24
	Ptenochirus jagori	♀	Adult	57	11	17	150	10	10	27	89

Station	Species Name	Sex	Age	Forearm (mm)	Hind foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Total Length (mm)	Weight (g)
	Cynopterus brachyotis	♀	Juvenile	15	7	30	116	7	5	35	17
	Cynopterus brachyotis	♂	Juvenile	25	7	25	112	7	8	33	25
	Cynopterus brachyotis	♂	Juvenile	20	8	26	121	8	1	27	19
	Ptenochirus jagori	♀	Adult	33	7	42	130	7	7	49	38
7	*Ptenochirus jagori*	♂	Adult w/pup	53	8	71	170	8	10	81	88
	Ptenochirus jagori	♀	Juvenile	15	5	20	75	4	5	25	22
	Cynopterus brachyotis	♀	Juvenile	25	6	35	111	5	6	41	24
	Ptenochirus jagori	♂	Juvenile	25	8	44	130	8	8	52	35
	Rousettus amplexicaudatus	♀	Adult	55	11	57	131	10	15	72	88
	Ptenochirus jagori	♂	Adult	55	11	55	180	10	11	66	100
	Cynopterus brachyotis	♀	Juvenile	22	5	35	128	4	4	39	24
	Ptenochirus jagori	♀	Adult	57	11	17	150	10	10	27	89
	Cynopterus brachyotis	♀	Juvenile	15	7	30	116	7	5	35	17
	Cynopterus brachyotis	♂	Juvenile	25	7	25	112	7	8	33	25
	Cynopterus brachyotis	♂	Juvenile	20	8	26	121	8	1	27	19
	Ptenochirus jagori	♀	Adult	33	7	42	130	7	7	49	38
8	*Ptenochirus jagori*	♀	Juvenile	25	8	36	130	8	9	45	46
	Ptenochirus jagori	♂	Adult	45	8	72	165	8	7	79	78
	Ptenochirus jagori	♂	Adult	51	9	70	153	9	8	78	74
	Ptenochirus jagori	♀	Juvenile	57	9	60	130	8	9	69	76
	Ptenochirus jagori	♂	Adult	32	9	37	125	8	8	45	33
	Ptenochirus jagori	♂	Adult	53	9	62	160	8	10	72	75
	Ptenochirus jagori	♂	Juvenile	25	8	36	118	8	8	44	35
	Ptenochirus jagori	♂	Adult	35	8	37	125	8	8	45	31
9	*Ptenochirus jagori*	♂	Adult	60	10	85	165	11	10	95	89
	Ptenochirus jagori	♂	Adult	55	8	71	140	9	8	79	73
	Ptenochirus jagori	♂	Juvenile	32	8	65	130	8	7	72	52
10	*Ptenochirus jagori*	♀	Adult	55	9	82	150	9	9	91	89
	Ptenochirus jagori	♂	Juvenile	39	8	45	130	8	7	52	35
	Ptenochirus jagori	♀	Juvenile	35	7	47	127	8	7	54	34

Appendices

Station	Species Name	Sex	Age	Forearm (mm)	Hind foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Total Length (mm)	Weight (g)
11	*Ptenochirus jagori*	♂	Juvenile	33	6	122	123	5	5	127	30
	Cynopterus brachyotis	♀	Adult	62	6	70	132	5	8	78	80
	Ptenochirus jagori	♂	Adult	54	9	71	170	8	5	76	86
	Ptenochirus jagori	♂	Juvenile	32	8	43	130	8	7	50	35
	Ptenochirus jagori	♀	Adult	56	18	81	139	8	7	88	110
	Ptenochirus jagori	♂	Juvenile	30	8	71	130	8	8	79	36
	Ptenochirus jagori	♀	Adult	55	9	72	175	15	12	84	118
	Ptenochirus jagori	♀	Juvenile	31	10	85	167	9	6	91	86
	Ptenochirus jagori	♀	Juvenile	35	9	46	125	8	9	55	33
	Ptenochirus jagori	♀	Adult	45	9	80	145	10	8	88	68
	Ptenochirus jagori	♂	Adult	43	9	80	145	10	8	88	84
	Ptenochirus jagori	♀	Juvenile	25	9	36	125	8	7	43	65
	Ptenochirus jagori	♀	Juvenile	32	7	53	121	8	8	61	32
	Macroglossus minimus	♂	Juvenile	11	8	27	101	8	Absent	101	13
	Cynopterus brachyotis	♂	Adult	31	7	50	125	8	8	58	60

High rainfall period

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
1	*Rousettus amplexicaudatus*	♀	Adult	85	16	91	215	19	11	101
	Cynopterus brachyotis	♀	Juvenile	56	10	72	165	13	6	27
	Ptenochirus jagori	♀	Adult	76	14	108	221	14	8	82
	Ptenochirus jagori	♀	Adult	84	14	103	253	13	15	88
	Ptenochirus jagori	♂	Adult	81	16	115	215	13	15	76
	Cynopterus brachyotis	♀	Adult	63	10	82	169	12	9	29
	Ptenochirus minor	♂	Adult	64	9	87	181	11	9	34
2	*no sampling.*									
3	*Rousettus amplexicaudatus*	♀	Adult	85	17	75	213	16	20	75
	Cynopterus brachyotis	♀	Adult	61	12	66	185	13	7	27
	Ptenochirus jagori	♂	Adult	83	13	119	243	17	5	75
	Ptenochirus jagori	♀	Juvenile	63	11	85	163	12	7	37
	Ptenochirus jagori	♀	Adult	82	11	90	243	13	6	97
	Macroglossus minimus	♀	Adult	43	10	62	133	11	-	25
	Ptenochirus jagori	♂	Adult	83	14	100	238	15	7	90
	Ptenochirus jagori	♂	Juvenile	65	12	80	185	14	6	15
	Ptenochirus jagori	♂	Juvenile	64	12	82	191	15	9	35
	Macroglossus minimus	♂	Adult	41	7	64	138	11	-	23
	Cynopterus brachyotis	♂	Adult	59	11	81	178	11	6	27
	Ptenochirus jagori	♀	Adult	64	11	88	188	11	10	50
	Ptenochirus jagori	♀	Juvenile	57	11	66	170	12	9	30
	Ptenochirus jagori	♀	Adult	80	15	117	246	19	9	87
	Macroglossus minimus	♂	Adult	44	9	57	130	13	-	25
	Macroglossus minimus	♂	Juvenile	39	9	52	132	9	-	27
	Cynopterus brachyotis	♀	Adult	59	12	92	179	13	8	50

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
	Macroglossus minimus	♂	Juvenile	39	10	56	117	10	-	15
	Ptenochirus jagori	♀	Adult	86	15	95	248	12	9	85
	Ptenochirus jagori	♀	Adult	83	14	93	244	11	13	87
	Ptenochirus jagori	♀	Juvenile	56	11	74	184	16	8	26
	Macroglossus minimus	♂	Juvenile	40	7	55	119	11	-	26
	Macroglossus minimus	♀	Adult	42	9	60	134	12	-	25
4	*Ptenochirus jagori*	♀	Adult	84	14	86	245	15	10	89
	Cynopterus brachyotis	♂	Adult	64	13	80	172	8	9	36
	Rousettus amplexicaudatus	♂	Adult	69	13	73	196	12	13	53
	Rousettus amplexicaudatus	♂	Adult	70	18	73	198	14	16	45
	Ptenochirus jagori	♂	Adult	85	12	114	230	12	13	86
	Ptenochirus jagori	♂	Adult	83	16	119	248	15	14	88
	Ptenochirus jagori	♂	Adult	82	13	104	257	12	14	94
	Cynopterus brachyotis	♂	Adult	58	8	80	178	13	7	27
	Cynopterus brachyotis	♂	Juvenile	57	11	57	176	14	6	24
	Cynopterus brachyotis	♂	Adult	59	12	78	167	13	9	27
	Ptenochirus minor	♀	Adult	76	17	95	227	16	12	66
	Ptenochirus jagori	♂	Adult	85	16	120	240	16	11	98
	Ptenochirus jagori	♀	Adult	86	13	115	234	16	14	95
	Ptenochirus jagori	♀	Adult	84	13	103	233	14	11	81
	Cynopterus brachyotis	♂	Adult	61	9	79	186	14	7	30
	Cynopterus brachyotis	♀	Adult	58	11	68	155	13	8	22
	Rousettus amplexicaudatus	♂	Adult	74	15	87	203	18	11	32
	Ptenochirus minor	♂	Juvenile	51	8	69	140	8	6	19
5	*Ptenochirus jagori*	♀	Adult	80	15	112	234	12	10	100
	Ptenochirus minor	♀	Juvenile	60	11	72	174	12	7	30

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
	Ptenochirus minor	♀	Adult	62	10	81	183	12	10	55
	Ptenochirus minor	♀	Adult	75	12	85	211	10	11	70
	Ptenochirus jagori	♀	Adult	81	16	115	236	12	9	106
	Ptenochirus minor	♀	Adult	73	12	104	193	14	12	59
	Ptenochirus minor	♂	Adult	76	14	82	225	17	7	60
	Ptenochirus minor	♀	Adult	73	11	89	205	12	12	74
6	*Ptenochirus jagori*	♂	Juvenile	61	10	78	183	13	7	33
	Ptenochirus jagori	♂	Adult	76	12	79	220	13	10	65
	Ptenochirus jagori	♂	Juvenile	56	8	68	155	9	9	17
	Ptenochirus jagori	♀	Adult	77	14	88	205	12	15	62
	Cynopterus brachyotis	♂	Juvenile	60	10	68	175	12	11	40
	Ptenochirus jagori	♀	Adult	81	17	109	248	14	10	95
	Ptenochirus jagori	♀	Juvenile	55	13	66	176	11	7	29
	Ptenochirus minor	♂	Adult	72	13	85	206	12	9	46
	Cynopterus brachyotis	♂	Adult	60	9	82	183	12	10	31
	Ptenochirus jagori	♂	Juvenile	58	9	79	175	13	8	24
	Ptenochirus jagori	♂	Adult	87	12	101	228	15	15	93
	Ptenochirus minor	♂	Adult	75	14	93	232	18	12	84
	Ptenochirus jagori	♂	Adult	80	14	110	222	15	15	80
	Ptenochirus jagori	♂	Juvenile	79	15	101	234	14	14	59
	Macroglossus minimus	♀	Adult	41	7	52	124	10	0	17
	Cynopterus brachyotis	♀	Adult	68	11	85	191	10	10	-
	Ptenochirus minor	♂	Adult	74	14	87	228	17	12	52
	Ptenochirus jagori	♂	Adult	80	15	110	239	13	12	90
	Ptenochirus jagori	♂	Juvenile	65	13	75	153	10	7	25
7	*Cynopterus brachyotis*	♂	Juvenile	62	9	73	158	11	8	21

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
	Ptenochirus jagori	♂	Juvenile	60	11	81	177	12	7	32
	Ptenochirus jagori	♂	Adult	80	15	94	216	13	10	58
	Cynopterus brachyotis	♂	Juvenile	63	10	78	183	12	9	30
	Ptenochirus minor	♂	Adult	73	14	73	194	15	13	42
	Cynopterus brachyotis	♀	Adult	63	12	75	187	11	7	-
	Ptenochirus jagori	♀	Adult	83	13	106	212	16	13	96
	Ptenochirus jagori	♀	Juvenile	65	12	90	186	17	10	45
	Ptenochirus jagori	♂	Adult	85	17	107	248	14	14	90
	Ptenochirus minor	♂	Adult	73	11	75	194	15	10	53
	Ptenochirus minor	♀	Adult	78	11	85	237	14	10	59
	Ptenochirus minor	♀	Adult	77	16	97	196	14	13	-
	Ptenochirus jagori	♂	Adult	83	15	101	240	15	10	-
	Ptenochirus jagori	♂	Adult	84	17	82	231	19	11	85
	Ptenochirus jagori	♂	Juvenile	62	13	83	188	12	8	52
8	*Ptenochirus jagori*	♀	Adult	85	14	115	263	13	9	98
	Cynopterus brachyotis	♀	Adult	58	11	73	184	15	9	48
	Ptenochirus jagori	♂	Adult	81	12	84	209	12	12	75
	Ptenochirus jagori	♂	Adult	83	13	117	217	16	9	74
	Cynopterus brachyotis	♀	Adult	64	9	88	186	10	11	-
9	*Ptenochirus jagori*	♀	Adult	76	12	76	231	12	10	76
	Cynopterus brachyotis	♀	Adult	60	11	80	205	10	7	44
	Ptenochirus jagori	♀	Adult	86	11	123	246	15	13	120
	Ptenochirus jagori	♀	Adult	80	11	92	230	13	12	56
	Ptenochirus minor	♂	Adult	75	15	82	225	12	12	60
	Ptenochirus minor	♀	Adult	75	11	98	200	16	12	75
	Ptenochirus jagori	♀	Juvenile	65	13	58	185	10	10	44

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
	Ptenochirus jagori	♀	Adult	76	16	80	220	15	13	55
10	*Ptenochirus jagori*	♀	Adult	87	14	114	243	15	11	-
	Ptenochirus jagori	♀	Adult	83	19	96	245	18	11	-
	Ptenochirus jagori	♂	Adult	79	17	100	236	11	13	-
	Cynopterus brachyotis	♀	Adult	62	14	89	192	16	9	-
11	*Ptenochirus jagori*	♂	Adult	80	15	106	242	12	7	-
	Ptenochirus jagori	♀	Adult	82	14	118	237	15	8	-
	Rousettus amplexicaudatus	♀	Adult	80	18	92	228	16	15	-
	Cynopterus brachyotis	♀	Adult	60	12	83	183	12	3	-
	Cynopterus brachyotis	♀	Juvenile	55	12	70	172	12	7	-
12	*Cynopterus brachyotis*	♂	Adult	61	12	86	153	13	6	-
	Cynopterus brachyotis	♂	Adult	60	12	78	156	15	4	-
	Ptenochirus jagori	♀	Adult	84	18	120	240	15	12	-
	Cynopterus brachyotis	♂	Adult	59	13	81	181	13	5	-
	Ptenochirus jagori	♀	Adult	83	19	124	249	13	5	-
	Ptenochirus jagori	♀	Adult	87	16	120	249	15	10	-
	Ptenochirus jagori	♂	Adult	71	16	89	225	13	7	-
	Cynopterus brachyotis	♂	Adult	62	13	92	193	17	4	-
	Cynopterus brachyotis	♀	Adult	63	12	77	169	15	8	-
	Ptenochirus jagori	♂	Adult	82	18	87	234	15	15	-
	Ptenochirus jagori	♂	Adult	78	15	108	227	14	10	-
	Ptenochirus jagori	♀	Adult	77	16	98	229	16	5	-
	Ptenochirus jagori	♀	Adult	79	17	97	210	14	7	-
	Macroglossus minimus	♀	Adult	41	9	47	122	12	-	-
	Rousettus amplexicaudatus	♂	Juvenile	73	13	70	211	7	10	-
	Ptenochirus jagori	♂	Juvenile	73	13	70	211	7	10	-

ID	Species	Sex	Age	Forearm (mm)	Hind Foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Weight (g)
	Ptenochirus jagori	♂	Juvenile	70	14	87	232	17	8	-
	Ptenochirus jagori	♀	Adult	80	16	91	237	18	8	-
	Ptenochirus jagori	♂	Adult	78	17	99	244	15	14	-
	Ptenochirus jagori	♀	Adult	77	12	107	222	15	14	-
	Ptenochirus jagori	♀	Adult	77	19	113	238	19	8	-
13	*Cynopterus brachyotis*	♂	Adult	61	12	99	196	15	12	-
	Cynopterus brachyotis	♂	Adult	62	12	78	201	13	4	-
	Ptenochirus jagori	♂	Adult	85	14	106	246	16	7	-
	Ptenochirus jagori	♀	Adult	90	17	118	271	14	5	-
	Ptenochirus jagori	♀	Adult	84	20	122	228	15	13	-
	Ptenochirus jagori	♂	Adult	80	16	107	238	15	7	-
	Ptenochirus jagori	♀	Adult	83	17	108	262	15	12	-
	Ptenochirus jagori	♀	Adult	86	17	93	246	16	8	-
	Ptenochirus jagori	♀	Adult	87	15	122	250	20	9	-
	Ptenochirus jagori	♀	Adult	83	16	124	249	14	10	-
	Ptenochirus jagori	♀	Adult	87	17	112	228	16	7	-

Average Morphometrics of bats captured across the faunal station

Low rainfall period

Species	Sex	Age	Forearm (mm)	Hind foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Total Length (mm)	Weight (g)
Ptenochirus jagori	♀=2; ♂=26	A=28; J=22	60 ± 15	18 ± 5	122 ± 17	180 ± 75	15 ± 4	15 ± 5	127 ± 25	118 ± 22
Cynopterus brachyotis	♀=7; ♂=7	A=3; J=11	31 ± 12	9 ± 7	50 ± 25	127 ± 111	9 ± 6	8 ± 1	58 ± 27	60 ± 19
Rousettus amplexicaudatus	♀=3; ♂=0	A=3; J=0	55 ± 25	11 ± 9	57 ± 48	143 ± 131	10 ± 9	15	72 ± 63	88 ± 68
Macroglossus minimus	♀=1; ♂=1	A=0; J=2	11 ± 10	8	35 ± 27	101 ± 80	8	Absent	101 ± 80	16 ± 13
Haplonycteris fischeri	♀=0; ♂=1	A=1; J=0	55	10	60	150	11	15	75	90
Hipposideros diadema	♀=0; ♂=1	A=1; J=0	32	8	46	111	8	12	58	21

high rainfall period

Species	Sex	Age	Forearm (mm)	Hind foot (mm)	Body Length (mm)	Wing Span (mm)	Ear (mm)	Tail (mm)	Total Length (mm)	Weight (g)
Ptenochirus jagori	♀=44; ♂=36	A=63; J=17	90 ± 55	20 ± 8	124 ± 58	271 ± 153	20 ± 7	15 ± 5	139 ± 63	118 ± 22
Cynopterus brachyotis	♀=14; ♂=16	A= 24; J=6	68 ± 55	14 ± 8	99 ± 57	205 ± 153	17 ± 8	12 ± 3	111 ± 30	60 ± 19
Ptenochirus minor	♀= 9; ♂= 9	A=16; J=3	78 ± 51	17 ± 8	104 ± 69	237 ± 140	18 ± 8	13 ± 6	117 ± 75	88 ± 68
Macroglossus minimus	♀=4; ♂=5	A=6; J=3	44 ± 39	10 ± 7	64 ± 47	138 ± 117	13 ± 9	Absent	64 ± 47	16 ± 13
Rousettus amplexicaudatus	♀=3; ♂=4	A=6; J=1	85 ± 69	18 ± 13	92 ± 70	228 ± 196	19 ± 7	16 ± 10	108 ± 77	101 ± 32

Appendix 19. Photographs of bat representatives captured across stations

Harpy fruit bat
(*Haplonycteris fischeri*)

Lesser short-nosed fruit bat
(*Cynopterus brachyotis*)

Geoffrey's Rousette
(*Rousettus amplexicaudatus*)

Lesser longue-tongued fruit bat
(*Macroglossus minimus*)

Round-leafed bat
(*Hipposiderus diadema*)

Musky fruit bat
(*Ptenochirus jagori*)

Appendix 20. Abundance of murid species collected across the stations

Low rainfall period

Species name	Station											Total
	1	2	3	4	5	6	7	8	9	10	11	
Muridae												
Rattus tanezumi	-	-	-	1	-	-	-	-	-	-	-	1
Total	**-**	**-**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

NOTE: RA – relative abundance

High rainfall period

Scientific name	Station													Total	RA (%)
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Muridae															
Rattus norvegicus		1					1							2	50
Rattus tanezumi			1											1	25
Rattus rattus						1								1	25
Total		**1**	**1**			**1**	**1**							**4**	

NOTE: RA – relative abundance

Appendix 21. Photos of non-volant mammals captured across stations

Rattus rattus

Rattus norvegicus

Rattus tanezumi

Appendix 22. Relative abundance of herpetofauna captured

FROGS

Low rainfall

Species Name	Station													Total	RA (%)
	1*	2	3	4	5	6*	7	8	9	10	11	12	13		
Microhyalidae															
Kaloula pulchra		1										1		1	2.94
Dicroglossidae															
Limnonectes magnus		2	13					9						24	70.59
Bufonidae															
Rhinela marina		2				2			1	1	2	1		9	26.47
Grand Total	**5**	**13**			**2**		**9**	**1**	**1**	**2**	**2**			**34**	100.00

NOTE: RA – relative abundance

High rainfall

Species Name	Station													Total	RA (%)
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Bufonidae															
Rhinela marina	2		8											10	33.33
Ceratobatrachidae															
Platymantis sp. 1							1							1	3.33
Dicroglossidae															
Limnonectes magnus	1			2					2	8	2	1		16	53.33
Megophrydae															
Megophrys stejnegeri						1								1	3.33
Microhyalidae															
Kaloula picta							1							1	3.33
Kaloula pulchra								1						1	3.33
Total	**3**			**2**		**1**	**2**	**1**	**2**	**8**	**2**	**1**		**30**	

NOTE: RA – relative abundance

Snakes and lizards

High rainfall only

Species Name	Station													Total	RA (%)
	1	2	3	4	5	6	7	8	9	10	11	12	13		
Colubridae															
Coelognathus sp.								1			1		1	3	75.00
Varanidae															
Varanus cumingi				1										1	25.00
Grand Total				**1**				**1**			**1**		**1**	**4**	

NOTE: RA – relative abundance

Appendix 23. Photographs herpetofauna representatives captured across stations during low rainfall

Frogs

Snakes and lizards

Appendix 24. List of Herpetofauna species indicated in the IUCN Red List

Scientific Name: *Limnonectes magnus*	Common Name: Giant Philippine Frog	IUCN Red List: Near Threatened DAO 2019-09: Other Threatened Species
Population	Generalized surveys are still recording the species within the last five years, however fewer large individuals are being observed (IUCN SSC Amphibian Specialist Group, 2020)	
Geographic Range	This species complex is found on Mindanao, Basilan, Bohol, Camiguin, Samar and Leyte Islands in the Philippines, from 0-1,800 masl. (IUCN SSC Amphibian Specialist Group, 2020) Source: IUCN Red List of Threatened Species	
Habitat (inhabitation feeding area, breeding area, and nesting area)	It inhabits undisturbed and disturbed streams and rivers in lower montane and lowland forests. It breeds and deposits egg clutches in quiet side pools of forested riverine habitats(IUCN SSC Amphibian Specialist Group, 2020)	
Local Information	The species is frequently observed in its natural habitat, but some subpopulations are experiencing a decline due to excessive exploitation. Despite this, recent surveys have detected the species within the past five years, but there are fewer sightings of larger individuals. This information was reported by the IUCN SSC Amphibian Specialist Group in 2020.	
Situation of Site (Photo, how many locations) during the site survey	*L. magnus* has been observed on the stations A2, A3, A8 during the low rainfall period while on the stations A1, A4, A9, A10, A11, A12 during the high rainfall period. All the stations are located along the streams and rivers (IUCN SSC Amphibian Specialist Group, 2020).	

Record of existing survey	In the Philippines, threats include habitat loss due to agriculture and logging, and pollution of streamsand rivers from agricultural pesticides, herbicides, and mine-tailings. On Mindanao, the major threat isthe destruction and conversion of both lowland and montane rainforest habitat due to small-scale agricultural activities, large-scale oil palm plantations, wood collection for charcoal production, andexpanding human settlements (IUCN SSC Amphibian Specialist Group, 2020)
Photos	 *Source: Photo during the survey*

Appendix 25. Terrestrial insect distribution and abundance at the sampling sites

Low rainfall

Family	Species Name	Station											
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	Total
Coleoptera	Metallic flea beetle (*Alticini sp.*)	1				1	1		2	2			7
Coleoptera	Jewel beetle (Buprestidae)				1								1
Coleoptera	Tortoise beetle (Cassidinae)			1				1					2
Coleoptera	Leaf beetle (Chrysomelidae)	2					1	2	1				6
Coleoptera	Long nose weevil (*Rhinotia sp.)*			11					1				12
Coleoptera	Asian lady beetle (*Harmonia sp.*)	1		1				1				1	4
Coleoptera	Firefly (Lampyridae)			1		1			1		1		4
Coleoptera	Broad nose weevil (Curculionidae)	1		4	2	2	1	3	5	1	3	8	30
Coleoptera	Long horn beetle (*Oberea nigriventis*)	1								1			2
Coleoptera	Weevil (*Pseudapocyrtus sp.*)	1									3		4
Diptera	Mosquito hawk (Tipulidae)						1						1
Hemiptera	Red cotton stainer (*Dysdercus cingulatus*)			1				1				1	3
Hymenoptera	Carpenter ant (Camponotus)						1						1
Hymenoptera	Yellow spotted mason wasp *(Odynerus bicinctus)*								2				2
Lepidoptera	Common grass yellow *(Eurema hecabe)*											1	1
Lepidoptera	Blue moon butterfly *(Hypolimas bolina philippinensis)*							2				1	3
Odonata	Dancer Damselfly *(Argia sp.)*											1	1
Odonata	Ebony jewel wing (*Calopteryx maculata*)				2					2			4
Odonata	Blue ground Skimmer (*Diplacodes trivialis*)											1	1
Odonata	Red parasol dragonfly (*Neurothermis terminata*)				1		1						2
Odonata	Slender skimmer (*Orthetrum sabina sabina*)											1	1
Odonata	Black bambootail damselfly (*Prodasineura verticalis*)								2				2
Odonata	Jewel damselfly (*Rhinocypha colorata*)						4			1		1	6
Odonata	Red-veinted darter dragonfly (*Sympetrum fonscolombii*)									3			3
Odonata	Pigmy skimmer dragonfly (*Tetrathemis platyptera*)							1					1
Orthoptera	Grasshopper (Caelifera)				4								4
	Total	**7**	**0**	**19**	**10**	**4**	**10**	**11**	**14**	**10**	**7**	**16**	**108**

High rainfall

Family	Species Name	Stations											
		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	Total
Blattodea	Roach								1				**1**
Coleoptera	Asian lady beetle (*Harmonia sp.*)						1	3			2	2	**8**
Coleoptera	Broad nose weevil (Curculionidae)		2	7	3	4		8	3		1	6	**34**
Coleoptera	Firefly (Lampyridae)		1					1			1		**3**
Coleoptera	Leaf beetle (Chrysomelidae)						3	1				2	**6**
Coleoptera	Long horn beetle (Cerambycidae)								1		1		**2**
Coleoptera	Metallic flea beetle (*Alticini sp.*)		2				1			2	1	2	**8**
Coleoptera	Tiger beetle (*Neocollyris sp.*)							1					**1**
Coleoptera	Tiger beetles (Cicindelinae)				3								**3**
Coleoptera	Weevil (*Pseudapocyrtus sp.*)		1		6				3	1	3		**14**
Hemiptera	Assasin bug (*Rhynocoris iracundus*)								1				**1**
Hemiptera	Kissing bug (Triatominae)									1			**1**
Hemiptera	Red cotton stainer (*Dysdercus cingulatus*)		2										**2**
Hymenoptera	Velvet ant (Mutillidae)										1		**1**
Lepidoptera	Common Mormon (*Papilio polytes alphenor*)		2										**2**
Lepidoptera	Metalmark moths (Choreutidae)				1								**1**
Lepidoptera	Scarlet Mormon (*Papilio rumanzovia*)											1	**1**
Odonata	Blue ground Skimmer (*Diplacodes trivialis*)		1						1				**2**
Odonata	Crimson marsh glider (*Trithemis aurora*)									3			**3**
Odonata	Green skimmer (*Orthetrum serapia*)								1	1			**2**
Odonata	Jewel damselfly (*Rhinocypha colorata*)											1	**1**
Odonata	Slender skimmer (*Orthetrum sabina sabina*)						1						**1**
Orthoptera	Grasshopper (Caelifera)					1							**1**
Phasmatodea	Stick insect						1						**1**
	Grand Total	**0**	**11**	**7**	**13**	**5**	**7**	**14**	**11**	**8**	**10**	**14**	**100**

Appendix 26. Photographs of representative insect species captured across stations

Asian lady beetle (*Harmonia sp.*)

Broad-nose weevil (Curculionidae)

Firefly (Lampyridae)

Leaf beetle (Chrysomelidae)

Long-horn beetle (Cerambycidae)

Metallic flea beetle (*Alticini sp.*)

Tiger beetle (*Neocollyris sp.*)

Tiger beetle (Cicindelinae)

Weevil (*Pseudapocyrtus sp.*)

Weevil (Curculionidae)

Assasin bug (*Rhynocoris iracundus*)

Kissing bug (Triatominae)

Red cotton stainer (*Dysdercus cingulatus*)

Velvet ant (Mutillidae)

Appendix 27. Photographs of the hydrology survey

LOW RAINFALL

Hydrology survey Stations H1 to H4

Top row, left to right: H1 (Tagoloan River, Natumolan, Tagoloan), H2 (Dicklum River Tributary, Dicklum, Manolo Fortich); *Bottom row, left to right*: H3 (Kumaykay River, Ticala, Manolo Fortich), H4 (Mangima River Tributary, Vista Villa-Puntian Boundary, Puntian, Sumilao)

Hydrology survey Stations H5 to H8

Top row, left to right: H5 (Kulaman River Tributary, Poblacion-Kisolon Boundary, Sumilao), H6 (Kulaman River Tributary, Culasi-Poblacion Boundary, Sumilao, Bukidnon); *Bottom row, left to right*: H7 (Ipoon River, Dalwangan, Malaybalay), H8 (Komotal River, Dalwangan, Malaybalay)

Hydrology survey stations H9 to H10

Left: H9 (Sawaga River, Patpat, Malaybalay); *Right*: H10 (Sawaga River, Sumpong, Malaybalay)

HIGH RAINFALL

Top row, left to right: H1 (Tagoloan River, Natumolan, Tagoloan), H2 (Dicklum River, Dicklum, Manolo Fortich), H3 (Kumayakay River, Ticala, Manolo Fortich); *Second row, left to right:* H4 (Puntian River, Puntian/Vista Villa, Sumilao), H5 (Tagolongon River, Vista Villa/Culasi, Sumilao), H6 (Kulaman River, Poblacion, Sumilao); *Third row, left to right:* H7 (Ipoon River, Impalutao, Impasug-ong/Dalwangan, Malaybalay), H8 (Komotal River, Dalwangan, Malaybalay), H9 (Sawaga River, Patpat, Malaybalay); *Last row:* H10 (Sawaga River, Kalasungay, Malaybalay)

Appendix 28. Estimated monthly discharges of the Tagoloan River Basin

Estimated monthly discharges (in LPS) based on the generated monthly runoffs over the 177,300.16-Ha area of
the Tagoloan River Basin (Simulation Year 1985-2020)

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	13,133.34	4,446.18	2,394.10	1,162.85	4,377.78	4,309.38	9,576.40	60,126.09	76,611.18	72,164.99	42,136.15	86,461.19
1986	101,236.20	46,582.33	24,009.40	12,791.33	8,823.97	10,602.44	10,534.04	17,579.53	35,227.46	57,321.58	27,839.95	14,638.21
1987	6,908.69	5,335.42	2,052.09	752.43	4,104.17	6,840.28	6,977.09	28,866.00	11,354.87	6,498.27	6,224.66	3,351.74
1988	684.03	820.83	1,162.85	1,710.07	3,420.14	5,814.24	8,618.76	4,514.59	66,077.14	53,080.60	58,347.62	38,100.38
1989	19,905.23	11,628.48	7,113.90	3,214.93	34,338.22	117,105.66	89,812.93	71,686.17	85,298.34	79,620.90	39,400.03	20,726.06
1990	9,986.81	4,514.59	2,599.31	1,231.25	8,960.77	6,703.48	27,292.73	13,954.18	83,246.25	49,386.85	202,198.79	93,506.68
1991	47,745.18	23,188.56	14,090.98	8,139.94	5,130.21	7,319.10	47,197.96	21,683.70	12,586.12	35,911.49	27,908.36	12,038.90
1992	5,951.05	2,941.32	1,710.07	752.43	2,736.11	7,661.12	16,348.28	20,247.24	32,012.53	50,070.88	22,025.71	13,201.75
1993	6,498.27	8,071.53	2,394.10	1,504.86	1,436.46	2,736.11	8,413.55	6,908.69	106,845.23	102,672.66	54,995.88	83,109.45
1994	38,442.39	21,204.88	11,765.29	9,165.98	6,224.66	102,399.05	66,213.95	84,477.50	62,930.61	32,286.14	14,911.82	10,055.22
1995	6,019.45	2,736.11	2,941.32	1,162.85	3,078.13	7,045.49	14,159.39	69,976.10	89,334.11	62,451.79	42,888.58	78,936.87
1996	38,373.99	38,647.60	17,989.95	16,348.28	11,149.66	36,048.30	21,546.89	14,159.39	32,764.96	46,240.32	80,988.96	37,758.37
1997	22,641.34	10,055.22	7,866.33	2,257.29	5,745.84	6,840.28	25,103.84	11,081.26	63,341.03	73,054.23	34,269.82	17,921.54
1998	8,687.16	4,172.57	2,120.49	1,026.04	2,257.29	4,377.78	6,635.08	9,302.79	17,169.11	9,234.38	80,920.56	37,416.35
1999	26,266.69	70,660.13	38,168.78	37,758.37	34,201.42	17,442.72	89,539.31	65,324.71	37,621.56	42,546.57	54,722.27	93,643.48
2000	44,188.23	25,309.05	13,817.37	14,775.01	7,866.33	83,451.46	65,871.93	82,083.41	40,494.48	104,040.72	79,757.71	38,989.62
2001	19,015.99	12,038.90	8,755.56	3,214.93	8,892.37	5,951.05	63,341.03	70,112.91	79,484.10	43,435.80	93,233.07	57,868.80
2002	29,002.80	16,827.10	8,892.37	4,104.17	6,156.26	52,396.57	33,106.97	36,937.53	106,366.41	65,871.93	32,149.33	16,143.07
2003	8,755.56	4,240.98	1,983.68	957.64	4,788.20	8,960.77	34,269.82	54,927.48	106,366.41	66,282.35	33,243.78	117,926.49
2004	53,422.62	29,550.03	14,706.61	7,387.51	7,319.10	7,729.52	6,019.45	4,514.59	4,309.38	4,925.00	684.03	2,804.52
2005	1,026.04	342.01	2,325.70	136.81	6,361.46	6,977.09	9,507.99	45,829.90	83,793.48	58,552.83	27,566.34	18,673.97
2006	9,097.58	6,293.06	3,078.13	2,052.09	2,530.90	8,892.37	21,957.31	16,485.08	29,550.03	50,686.50	23,188.56	12,380.91
2007	8,345.15	4,309.38	1,436.46	1,504.86	4,993.41	8,618.76	10,328.83	44,188.23	44,051.43	56,363.94	49,181.64	25,240.65
2008	41,725.73	20,794.46	11,696.89	13,748.97	23,325.37	50,891.71	66,897.98	59,168.45	88,923.69	93,848.69	46,103.51	37,074.34
2009	146,382.07	107,324.05	50,139.28	29,755.23	20,520.85	29,139.61	79,962.92	40,631.29	52,259.77	26,129.88	91,044.18	41,110.11
2010	25,172.24	9,986.81	5,814.24	3,078.13	6,498.27	5,951.05	32,217.74	43,914.62	72,507.01	93,575.08	44,119.83	25,514.26
2011	32,286.14	41,110.11	27,224.33	12,586.12	9,713.20	11,970.50	24,419.81	48,224.00	63,683.04	64,503.88	33,859.40	98,773.70
2012	44,530.25	26,061.48	13,201.75	8,003.13	7,934.73	6,293.06	23,188.56	25,445.86	42,614.97	45,829.90	21,204.88	26,471.90
2013	51,233.73	25,103.84	13,064.94	8,550.35	9,644.80	59,168.45	78,184.44	69,155.27	49,113.24	51,165.32	38,921.21	30,370.86
2014	112,591.07	58,484.43	54,790.67	34,680.24	61,972.97	115,942.81	84,340.70	114,985.17	93,233.07	77,021.60	68,266.03	40,768.09
2015	32,628.15	16,758.70	10,055.22	8,345.15	7,182.30	35,022.25	67,513.60	59,168.45	51,986.16	43,230.59	75,790.34	55,064.28
2016	27,908.36	16,621.89	6,908.69	7,250.70	16,348.28	113,275.10	77,842.43	67,103.18	94,874.74	96,721.61	120,594.20	111,975.45
2017	194,058.85	136,532.06	193,306.42	135,164.01	235,374.16	221,693.60	196,589.76	169,707.44	165,261.26	144,672.00	185,303.29	240,435.97
2018	236,195.00	229,012.70	149,049.78	160,131.04	197,136.98	138,926.16	68,608.05	37,484.76	21,888.91	74,011.87	141,525.47	134,069.56

2019	121,346.63	57,526.79	34,133.02	37,005.94	27,839.95	133,317.13	112,249.06	56,090.33	38,716.01	56,021.92	42,067.75	37,826.77
2020	17,442.72	9,234.38	5,609.03	3,214.93	7,866.33	8,823.97	51,849.35	75,516.73	74,148.68	87,008.41	48,702.82	74,832.70
Mean	***44,689.85***	***30,790.78***	***21,343.59***	***16,517.39***	***22,673.64***	***40,462.18***	***46,006.61***	***47,821.18***	***61,556.85***	***60,456.71***	***57,952.40***	***52,366.17***
Max	***236,195.00***	***229,012.70***	***193,306.42***	***160,131.04***	***235,374.16***	***221,693.60***	***196,589.76***	***169,707.44***	***165,261.26***	***144,672.00***	***202,198.79***	***240,435.97***
Min	***684.03***	***342.01***	***1,162.85***	***136.81***	***1,436.46***	***2,736.11***	***6,019.45***	***4,514.59***	***4,309.38***	***4,925.00***	***684.03***	***2,804.52***
Std Dev	***53,845.76***	***44,548.86***	***38,991.32***	***33,547.27***	***48,631.03***	***52,281.78***	***39,479.36***	***33,713.74***	***33,555.84***	***28,501.41***	***44,406.27***	***47,259.95***

Estimated monthly discharges (in LPS) based on the generated monthly runoffs over the 177,300.16-Ha area of
the Tagoloan River Basin (Simulation Year 2050 Projection)

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1985	13,201.75	4,446.18	2,325.70	1,162.85	3,693.75	4,104.17	9,097.58	33,038.57	58,484.43	58,142.41	30,576.07	78,321.25
1986	94,737.93	43,299.00	22,230.92	11,696.89	7,866.33	9,986.81	7,934.73	5,882.64	6,635.08	31,875.72	15,117.03	8,276.74
1987	3,762.16	3,762.16	1,162.85	410.42	3,214.93	6,429.87	6,566.67	8,071.53	1,162.85	1,436.46	3,693.75	2,120.49
1988	68.40	547.22	820.83	1,299.65	2,804.52	5,472.23	8,208.34	4,240.98	33,722.60	31,875.72	43,299.00	27,361.14
1989	14,501.40	9,029.17	5,267.02	2,325.70	9,507.99	76,953.19	59,305.26	46,308.72	67,650.41	65,803.53	32,422.95	17,305.92
1990	8,276.74	3,625.35	2,052.09	957.64	7,319.10	6,293.06	7,387.51	3,967.36	44,461.84	24,967.04	185,371.69	85,161.53
1991	43,641.01	21,068.07	12,517.72	7,182.30	4,446.18	6,908.69	16,074.67	6,224.66	4,993.41	14,159.39	12,517.72	4,377.78
1992	2,052.09	1,026.04	684.03	273.61	2,120.49	7,182.30	8,618.76	5,403.82	6,087.85	31,670.51	12,791.33	8,687.16
1993	4,240.98	6,977.09	1,641.67	1,094.45	1,094.45	2,530.90	7,934.73	6,498.27	77,295.21	82,972.64	41,110.11	72,985.83
1994	33,380.58	18,742.38	10,055.22	7,729.52	5,198.62	65,598.32	38,168.78	59,168.45	45,487.89	23,598.98	10,534.04	7,934.73
1995	4,925.00	2,188.89	2,257.29	889.24	2,462.50	6,635.08	8,481.95	35,501.07	67,376.80	46,513.93	30,370.86	70,249.71
1996	33,996.21	30,234.05	13,543.76	11,970.50	6,977.09	8,139.94	5,198.62	4,582.99	6,566.67	17,921.54	62,246.58	28,455.58
1997	18,058.35	7,797.92	6,087.85	1,641.67	4,651.39	6,429.87	9,439.59	3,351.74	33,654.20	53,149.00	24,351.41	12,996.54
1998	6,156.26	2,941.32	1,436.46	684.03	1,778.47	4,104.17	6,224.66	8,755.56	5,745.84	3,556.95	54,790.67	24,351.41
1999	16,143.07	59,510.47	28,866.00	17,305.92	11,012.86	6,224.66	52,328.17	37,142.74	19,905.23	27,497.94	42,683.37	85,161.53
2000	39,947.26	23,188.56	12,107.30	9,029.17	4,856.60	41,110.11	34,543.43	55,269.49	27,361.14	87,282.02	66,761.17	32,559.75
2001	15,801.06	10,465.63	7,182.30	2,599.31	7,319.10	5,609.03	12,791.33	33,927.81	56,432.34	28,455.58	79,552.50	47,745.18
2002	24,009.40	14,364.60	7,182.30	3,351.74	5,061.81	24,967.04	11,560.08	14,501.40	90,154.94	52,670.19	25,514.26	12,859.73
2003	7,113.90	3,420.14	1,573.27	752.43	3,967.36	8,413.55	9,713.20	31,807.32	89,881.33	53,012.20	26,608.70	108,418.50
2004	48,566.01	27,155.93	13,133.34	6,635.08	6,293.06	7,250.70	5,677.44	4,240.98	4,240.98	4,925.00	684.03	2,872.92
2005	1,026.04	342.01	1,915.28	68.40	5,267.02	6,635.08	7,045.49	7,797.92	48,702.82	35,843.09	16,211.47	13,133.34
2006	6,293.06	4,925.00	2,120.49	1,504.86	1,983.68	8,345.15	7,250.70	4,651.39	5,814.24	28,660.79	12,175.71	6,908.69
2007	5,677.44	3,009.72	752.43	1,026.04	3,967.36	8,139.94	6,908.69	10,260.43	22,025.71	40,289.27	36,663.92	19,015.99
2008	31,944.13	15,937.86	8,755.56	7,866.33	6,361.46	8,208.34	32,696.56	32,354.54	70,591.73	79,757.71	39,058.02	25,651.06
2009	139,268.18	100,894.19	46,855.94	27,292.73	18,263.56	12,038.90	32,012.53	15,527.44	26,061.48	13,064.94	74,764.30	33,038.57
2010	21,204.88	7,934.73	4,651.39	2,462.50	5,335.42	5,540.63	11,696.89	16,143.07	53,559.42	78,868.47	36,800.73	21,888.91
2011	18,810.78	31,465.31	16,485.08	7,387.51	6,498.27	9,097.58	6,703.48	8,550.35	38,647.60	46,855.94	23,804.19	87,829.24
2012	38,921.21	23,325.37	11,423.27	6,840.28	6,703.48	5,882.64	9,439.59	5,951.05	7,319.10	22,983.35	9,781.61	12,928.14
2013	41,452.12	20,247.24	10,260.43	6,771.88	7,797.92	12,654.52	43,435.80	41,452.12	30,097.25	36,595.52	27,087.52	20,999.67
2014	106,229.61	51,712.55	32,764.96	17,989.95	18,879.18	80,099.72	54,995.88	86,734.80	73,601.45	61,494.15	55,406.30	30,918.08
2015	24,009.40	12,449.32	7,319.10	6,361.46	5,677.44	9,029.17	24,419.81	26,471.90	30,028.85	26,540.30	62,041.37	44,530.25

2016	22,641.34	14,090.98	5,472.23	5,882.64	9,507.99	61,836.17	41,520.52	37,005.94	74,217.08	80,646.95	107,460.86	102,330.65
2017	187,834.19	130,444.21	153,564.37	93,780.29	168,202.58	174,222.03	158,968.19	137,352.90	143,509.15	128,392.13	172,101.54	232,501.25
2018	230,380.76	224,292.90	125,382.40	118,405.31	138,926.16	98,978.91	48,702.82	27,292.73	16,895.50	43,435.80	121,141.43	121,004.62
2019	111,633.43	52,601.78	30,576.07	18,605.57	11,560.08	77,432.01	72,507.01	36,185.10	21,410.09	33,996.21	25,993.08	26,266.69
2020	11,628.48	6,361.46	3,830.56	2,257.29	6,293.06	8,208.34	9,439.59	38,784.41	50,618.10	69,839.30	35,090.66	65,119.50
Mean	***39,764.85***	***27,606.25***	***17,062.71***	***11,485.98***	***14,524.20***	***24,908.13***	***24,805.53***	***26,122.28***	***40,566.68***	***43,576.41***	***46,016.11***	***44,507.45***
Max	***230,380.76***	***224,292.90***	***153,564.37***	***118,405.31***	***168,202.58***	***174,222.03***	***158,968.19***	***137,352.90***	***143,509.15***	***128,392.13***	***185,371.69***	***232,501.25***
Min	***68.40***	***342.01***	***684.03***	***68.40***	***1,094.45***	***2,530.90***	***5,198.62***	***3,351.74***	***1,162.85***	***1,436.46***	***684.03***	***2,120.49***
Std Dev	***52,717.31***	***43,197.75***	***31,630.99***	***23,937.61***	***34,114.84***	***36,565.58***	***29,272.01***	***26,972.32***	***31,589.33***	***27,236.79***	***41,834.88***	***45,910.24***

Appendix 29. Photograph of the surface water quality sampling stations

Low rainfall

First row, left to right: WQ1 (Tagoloan River, Natumolan), WQ2 (Diclum River, Diclum, Manolo Fortich), WQ3 (Kumaykay River, Ticala, Manolo Fortich); *Second row, left to right*: WQ4 (Puntian River, Puntian, Sumilao), WQ5 (Mapolo River, Poblacion/Kisolon, SUmilao), WQ6 (Tagolongon River, Vista Villa/Culasi, Sumilao); *Third row, left to right*: WQ7 (Agutan River Tributary/Ipoon River, Poblacion/Kisolon, Sumilao), WQ8 (Komotal/Kubatan River, La Fortuna, Impasug-ong), WQ9 (Sawaga River, Patpat, Malaybalay); *Last row*: WQ10 (Sawaga River, Kalasungay, Malaybalay)

High rainfall

Top row, left to right: WQ1 (Tagoloan River, Natumolan, Tagoloan), WQ2 (Dicklum River, Dicklum, Manolo Fortich), WQ3 (Kumayakay River, Ticala, Manolo Fortich); *Second row, left to right:* WQ4 (Puntian River, Puntian/Vista Villa, Sumilao), WQ5 (Tagolongon River, Vista Villa/Culasi, Sumilao), WQ6 (Mapolo River, Kisolon/Poblacion, Sumilao); *Third row, left to right:* WQ7 (Ipoon River, Impalutao, Impasug-ong/Dalwangan, Malaybalay), WQ8 (Komotal River, Dalwangan, Malaybalay), WQ9 (Sawaga River, Patpat, Malaybalay); *Last row:* WQ10 (Sawaga River, Kalasungay, Malaybalay)

Appendix 30. Photographs of the groundwater quality sampling stations

Top row, left to right: GW1 (Purok 6 Tubod Casinglot Reservoir, Casinglot Tagoloan), GW2 (Purok A1 Spring, San Miguel, Manolo Fortich), GW3 (Enlapay Spring, Ticala, Manolo Fortich); *Second row, left to right:* GW4 (Lumok Spring, Puntian, Sumilao), GW5 (Briana Spring, Poblacion, Sumilao), GW6 (Kisolon Reservoir, Kisolon Sumilao); *Third row, left to right:* GW7 (Kalahi Seeds Reservoir, Capitan Bayong, Impasug-ong), GW8 (Bureau of Soils Reservoir, Dalwangan, Malaybalay), GW9 (Patpat Waterbrake, Patpat, Malaybalay); *Last row:* GW10 (Kalasungay Spring, Malaybalay)

Appendix 31. Photographs of the aquatic ecology sampling stations during

Low rainfall

Top row, left to right: **AS1** (Tagoloan River, Natumolan, Tagoloan Misamis Oriental), **AS2** (Diclum River, Diclum, Manolo Fortich, Bukidnon, **AS3** (Tankulan, Manolo Fortich, Bukidnon); *Middle row, left to right*: **AS4** (Ticala, Manolo Fortich, Bukidnon), **AS5** (San Roque, Sumilao, Bukidnon), Aquatic Station 6 (La Fortuna, Impasug-ong, Bukidnon); *Bottom row, left to right*: **AS7** (Dalwangan, Malaybalay City), **AS8** (Dalwangan, Malaybalay City), **AS9** (Patpat, Malaybalay City)

Top row, left to right: AS10 (Brgy. 10 Poblacion, Malaybalay City), New WQ4 (Puntian, Sumilao), New WQ5 (Vista Villa and Culasi, Sumilao); *Middle row, left to right*: In-situ measurement of physico-chemical parameters in AS8, Collection of water samples for plankton community assessment in AS4, Collection and sorting of aquatic insects and freshwater fishes in AS5; *Bottom*: Cleaning debris, sorting aquatic insects and fishes, and sample preservation in AQS9

High rainfall

Top row, left to right: A1 (Tagoloan River, Natumolan/Sta. Ana, Tagoloan), A2 (Natumolan, Tagoloan/Bugo, CDO), A3 (Alae/Damilag, Manolo Fortich); *Second row, left to right:* A4 (Dicklum River, Damilag/Dicklum, Manolo Fortich), A5 (Ticala River, Sankanan/Ticala, Manolo Fortich), A6 (Puntian River, Puntian/Vista Villa, Sumilao); *Third row, left to right:* A7 (Tagolongon River, Vista Villa/Culasi, Sumilao), A8 (Kulaman River, Culasi/Poblacion, Sumilao), A9 (Poblacion/Kisolon, Sumilao); *Last row:* A10 (Kisolon, Sumilao/Poblacion, Impasug-ong)

Top row, left to right: A11 (Atugan River, La Fortuna/Capitan Bayong, Impasug-ong), A12 (Ipoon River, Impalutao/Dalwangan, Malaybalay City) A13 (Komotal River, Dalwangan, Malaybalay City); *Second row, left to right:* A14 (Sawaga River, Patpat, Malaybalay City), A15 (Sawaga River Patpat, Malaybalay City), A16 (Kalasungay – Brgy. 10 Poblacion, Malaybalay City); *Third row, left to right:* A17 (Sawaga River, Kalasungay – Brgy. 10 Poblacion, Malaybalay City)

Appendix 32. Phytoplankton abundance and distribution at the sampling sites during

Low rainfall

Group/Taxa	Station														Total	Relative abundance (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	NWQ10	NWQ4	NWQ5	NWQ9		
Bacillariophyta	**228**	**26**	**97**	**65**	**292**	**560**	**138**	**336**	**1,611**	**63**	**98**	**443**	**139**	**559**	**4,654**	**18.7**
Actinocyclus	2								40						42	0.17
Amphora sp. 1	4			13	5	8		9		6	8	3	4	12	70	0.28
Amphora sp. 2								3							3	0.01
Asterionella			6			5		13						13	36	0.15
Caloneis	14		3	15	8	73	4	99	33		2		1	7	257	1.03
Coscinodiscus						3		5	36				3	3	49	0.2
Diadesmis	2				5		4	8	5					4	28	0.11
Diploneis			2												2	0.01
Fragilaria	106	3	14	20	13	63	33	31	217	7	13	98	12	56	683	2.74
Gomphonema					250	20	2		42	2		8	1	6	331	1.33
Gyrosigma		3	2			10	4			4	4	4	20		51	0.2
Haematococcus		3				3		2							7	0.03
Melosira	2		50			193		2	328	11	15	53	8	275	936	3.76
Navicula	33	16	2	18	10	140	67	149	247	15	38	40	43	115	932	3.74
Nitzschia	13		2			40		7	7		6	4	13	4	95	0.38
Pinnularia		2				3	11	4		2		21	8		49	0.2
Stephanodiscus						3									3	0.01
Synedra	2								233	5	2	81	2	11	334	1.34
Tabellaria	51		16		3		13	6	424	12	10	133	26	54	748	3.01
Chlorophyta	**36**	**58**	**163**	**78**	**6,039**	**35**	**21**	**101**	**70**	**31**	**69**	**164**	**80**	**148**	**7,092**	**28.5**
Actinastrum											18				18	0.07
Ankistrodesmus	15	23	3	3	10	5	19	22	2		13	4	18	8	143	0.58
Chlorella	2	14		35	5,996	3	2	12	4	3	2			48	6,121	24.6
Cladophora				33											33	0.13
Closterium	2							6			2	36	8	2	55	0.22
Coelastrum			138					38							175	0.7
Cosmarium				5	3	10		4	2			43	11	7	84	0.34
Kirchneriella					9										9	0.04

Group/Taxa	Station														Total	Relative abundance (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	NWQ10	NWQ4	NWQ5	NWQ9		
Monoraphidium	18	13			8	5			4	17	31	46	10	32	183	0.74
Oedogonium									53			13		15	80	0.32
Pleurotaenium			7			8		6				1			22	0.09
Scenedesmus					10						2				12	0.05
Selenastrum				3				2		5		18	23		51	0.2
Tetraedron			4		2	5		11	4			1	2		30	0.12
Treubaria		8	12		3					6		3	9	37	77	0.31
Chrysophyta														**2**	**2**	**0.01**
Mallomonas														2	2	0.01
Cyanophyta	**77**	**181**	**238**	**75**	**6,947**	**2,528**	**375**	**319**	**286**	**66**	**68**	**319**	**1,478**	**150**	**13,105**	**52.66**
Anabaena								40							40	0.16
Chroococcus		4			1,225			10						10	1,248	5.02
Cryptomonas						3									3	0.01
Cylindrospermopsis								2		63					65	0.26
Gleocapsa					5,375									20	5,395	21.68
Leptolyngbya		25		50	3	10		142							229	0.92
Lyngbya			40				2	3	11	3			43	18	120	0.48
Merismopedia												40			40	0.16
Microcystis			188			2,500									2,688	10.8
Nostoc					44								8		51	0.21
Oscillatoria	75	150			100		313	109	188		66	275	1,394		2,669	10.72
Romeria							38								38	0.15
Spirulina	2							8	88				30	82	209	0.84
Stigonema			9	25	190	15	19							19	276	1.11
Trachelomonas		2	2		11		4	6			2	4	3	2	36	0.14
Dinophyta			**3**						**2**			**10**	**7**	**2**	**23**	**0.09**
Ceratium			3						2			9	3		17	0.07
Peridinium												1	4	2	7	0.03
Euglenophyta				**3**		**3**	**2**					**1**			**8**	**0.03**
Euglenoid				3											3	0.01
Phacus						3	2					1			6	0.02
Others																28.23

Group/Taxa	Station														Total	Relative abundance (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	NWQ10	NWQ4	NWQ5	NWQ9		
Grand Total	**341**	**264**	**500**	**220**	**13,277**	**3,125**	**537**	**756**	**1,970**	**160**	**234**	**936**	**1,704**	**860**	**24,884**	**100**

High rainfall

Group/Taxa	Station																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	R.A. %
Bacillariophyta	366	94	2	26	366	214	311	996	248	311	388	231	270	154	41	126	56	67.46
Amphora	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	2	2	0.12
Ankistrodesmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0.06
Aulacoseira	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0.03
Caloneis	2	2	0	0	0	0	0	0	6	6	8	0	6	17	0	0	2	0.75
Coscinodiscus	0	0	0	0	2	0	0	4	2	0	0	4	2	0	0	0	0	0.21
Cymbella	2	0	0	4	2	0	0	23	13	26	11	2	4	6	4	23	4	1.96
Diadesmis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.03
Diploneis	0	0	0	0	0	0	0	0	8	0	0	0	2	0	0	0	0	0.15
Fragilaria	139	34	0	8	204	49	137	234	13	71	66	58	43	6	23	6	4	17.57
Gomphonema	0	0	0	0	0	4	2	2	4	0	0	0	4	2	0	2	0	0.3
Gyrosigma	0	2	0	0	0	2	8	2	26	11	0	0	6	4	0	6	8	1.18
Hyalodiscus	0	0	0	0	0	4	0	0	0	2	0	0	0	0	0	0	0	0.09
Melosira	99	0	0	2	13	38	0	566	4	8	88	15	6	17	4	0	0	13.8
Navicula	26	17	2	4	30	30	51	62	113	92	39	28	99	62	8	36	11	11.39
Nitzschia	8	6	0	0	34	11	26	34	19	6	21	4	8	8	2	13	13	3.37
Pinnularia	0	0	0	2	4	6	0	8	11	0	0	2	2	9	0	0	0	0.69
Stephanodiscus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0.12
Surirella	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0.03
Synedra	90	34	0	8	77	69	88	62	28	88	156	118	88	24	2	28	11	15.61
Chlorophyta	2	11	0	64	21	2	4	2	26	148	28	62	79	54	11	6	34	8.89
Ankistrodesmus	0	6	0	17	6		2	0	2	0	2	0	0	4	0	2	0	0.63
Chlorella	0	0	0	4	0	0	0	0	0	4	6	47	2	0	0	0	0	0.99
Closterium	2	4	0	0	0	0	0	0	0	4	0	2	4	0	0	4	4	0.36

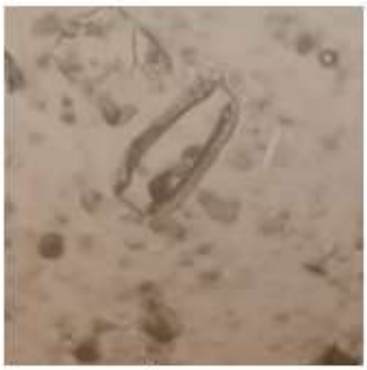
Group/Taxa	Station																	
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	R.A. %
Coelastrum	0	0	0	0	0	0	0	0	0	2	0	9	0	0	0	0	0	0.18
Cosmarium	0	2	0	0	8	2	2	2	11	8	13	4	2	9	0	0	2	1.02
Crucigenia	0	0	0	0	0	0	0	0	0	45	0	0	0	0	0	0	23	1.08
Golenkia	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.03
Haematococcus	0	0	0	0	0	0	0	0	2	2	0	0	0	2	0	0	0	0.09
Monoraphidium	0	0	0	41	4	0	0	0	9	2	0	0	4	8	8	0	4	1.27
Oedogenium	0	0	0	0	4	0	0	0	0	2	0	0	53	21	0	0	0	1.27
Pleurotaenium	0	0	0	0	0	0	0	0	2	6	4	0	2	11	4	0	2	0.48
Scenedesmus	0	0	0	0	0	0	0	0	0	0	4	0	11	0	0	0	0	0.24
Spyrogyra	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	1.21
Tetraedron	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0.03
Cyanophyta	19	131	0	38	94	19	0	240	0	75	0	19	188	77		516	21	23.05
Aphanizomenon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94	0	1.51
Chroococcus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.03
Oscillatoria	0	56	0	38	94	19	0	53	0	0	0	0	131	56	0	234		10.94
Spirulina	0	75	0	0	0	0	0	0	0	0	0	19		19	0	188	19	5.12
Stigonema	19	0	0	0	0	0	0	188	0	75	0	0	56	2	0	0	0	5.45
Dinophyta	2	0	0	6	6	0	0	0	2	8	2	0	2	0	0	0	0	0.42
Ceratium	2	0	0	2	6	0	0	0	0	0	0	0	0	0	0	0	0	0.15
Peridinium		0	0	4		0	0	0	2	8	2	0	2	0	0	0	0	0.27
Euglenophyta	6	0	0	0	0	0	0	0	0	2	2	0	0	0	0	2	0	0.18
Euglena	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0.06
Trachelomonas	4	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0.12
Grand Total	**394**	**236**	**2**	**133**	**486**	**234**	**315**	**1,238**	**276**	**544**	**420**	**311**	**538**	**285**	**53**	**649**	**111**	**100**

Appendix 33. Photographs of recorded phytoplankton species at the sampling stations

Low rainfall

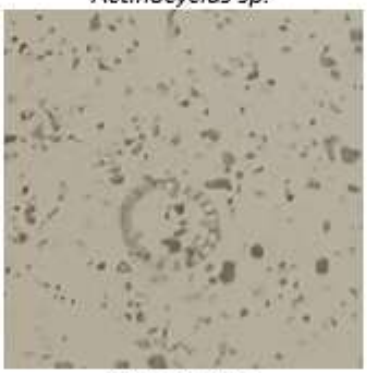
Actinastrum sp.

Actinocyclus sp.



Amphora sp. 1

Amphora sp. 2



Anabaena sp.

Ankistrodesmus sp.

Asterionella sp.

Caloneis sp.

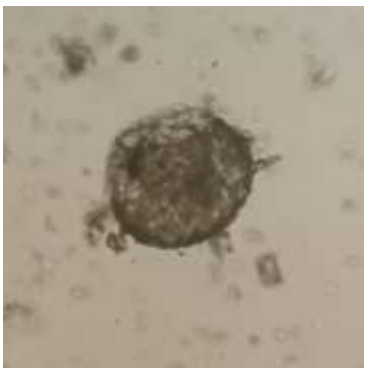
Ceratium sp.

Chlorella sp.

Chlorella vulgaris

Chroococcus sp.

Arcella sp.



Centropyxis sp.

Cyclops sp.

Cyclops sp. (nauplius)

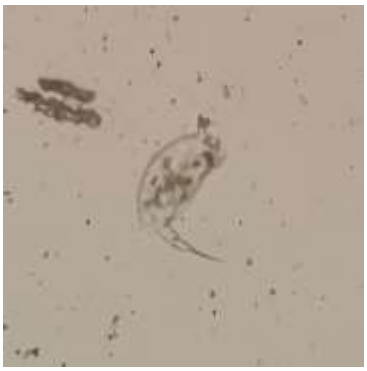
Filinia sp.

Hydrozoa sp. 1

Hydrozoa sp. 2

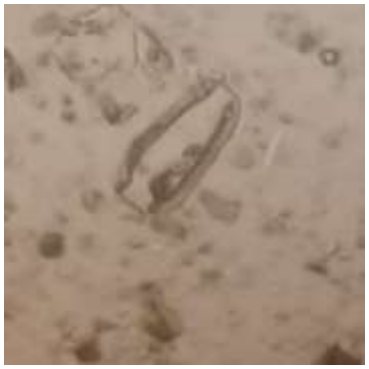
Hydrozoa sp. 3

Nematode



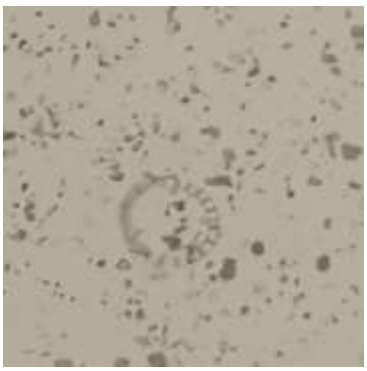
Actinastrum sp.

Actinocyclus sp.



Amphora sp. 1

Amphora sp. 2



Anabaena sp.

Ankistrodesmus sp.

Asterionella sp.

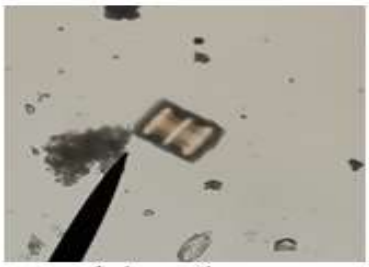
Caloneis sp.

Ceratium sp.

High rainfall

Bacillariophyta

Amphora sp.

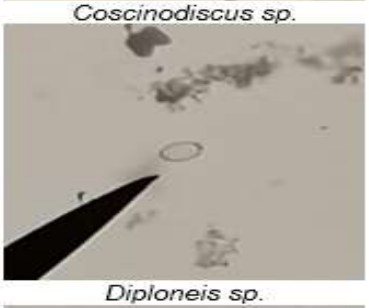

Aulacoseira sp.

Caloneis sp.

Coscinodiscus sp.

Cymbella sp.

Diadesmis sp.


Diploneis sp.

Fragilaria sp.

Gomphonema sp.

Gyrosigma sp.

Hyalodiscus sp.

Melosira sp.

Navicula sp.

Nitzschia sp.

Pinnularia sp.

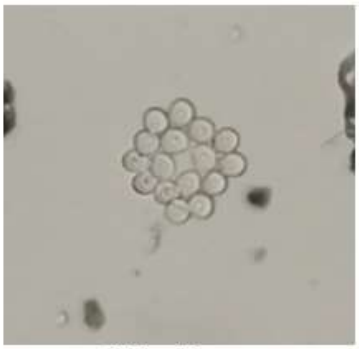
Stephanodiscus sp.

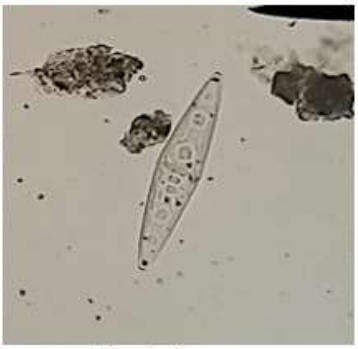
Surirella sp.

Synedra sp.

Chlorophyta

Ankistrodesmus sp.


Chlorella sp.

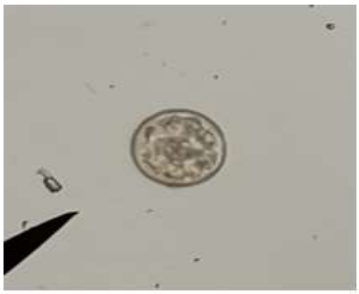

Closterium sp.

Coelastrum sp.

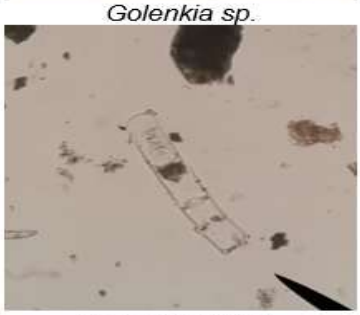
Cosmarium sp.

Crucigenia sp.

Golenkia sp.

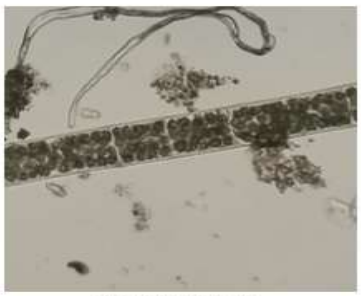

Haematococcus sp.

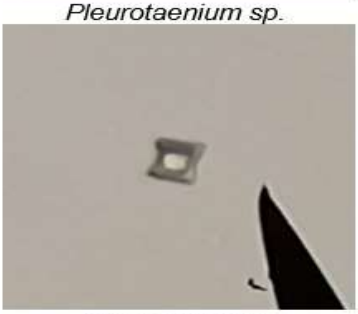
Monoraphidium sp.


Oedogenium sp.

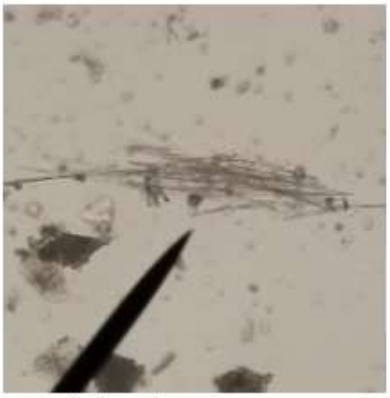
Pleurotaenium sp.

Scenedesmus sp.


Spyrogyra sp.


Tetraedron sp.

Cyanophyta



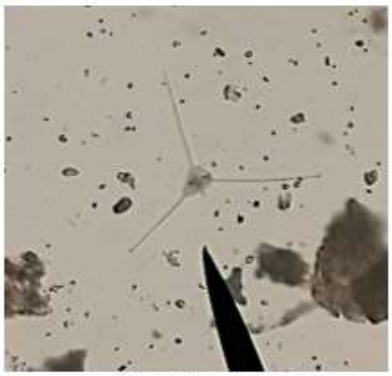
Aphanizomenon sp.

Chroococcus sp.

Oscillatoria sp.

Spirulina sp.

Stigonema sp.



Ceratium sp.

Peridinium sp.

<u>Euglenophyta</u>

Euglena sp.

Trachelomonas sp.

Appendix 34. Zooplankton diversity, abundance, and distribution at the sampling stations

Low rainfall

Group/Taxa	STATION														Total	Relative abundance (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14		
Amoebozoa	9						2		2		1	3		1	17	32.45
Arcella sp.	5										1	3		0	9	16.62
Centropyxis sp.	5						2		2					1	8	15.84
Arthropoda					2										2	3.52
Diaptomus sp.					2										2	3.52
Cnidaria	2	1	7	2	2	3	1		2	2	1		1		22	41.94
Hydrozoa (?) sp. 1	2	1	6	2	2		1		2	2	1		1		19	34.90
Hydrozoa (?) sp. 2			1												1	1.17
Hydrozoa (?) sp. 3						3									3	5.87
Nematoda					1	1	3				1		1		6	11.24
Nematode					1	1	3				1		1		6	11.24
Rotifera				2			1		1		3				6	10.85
Filinia sp.				2			1				1				4	6.74
Lecane sp. 1											1				1	1.56
Lecane sp. 2											1				1	1.56
Trichotria sp.									1						1	0.98
Grand Total	**11**	**1**	**7**	**3**	**5**	**4**	**6**		**4**	**2**	**6**	**3**	**2**	**1**	**53**	**100.00**

NOTE: All values are in individuals/L

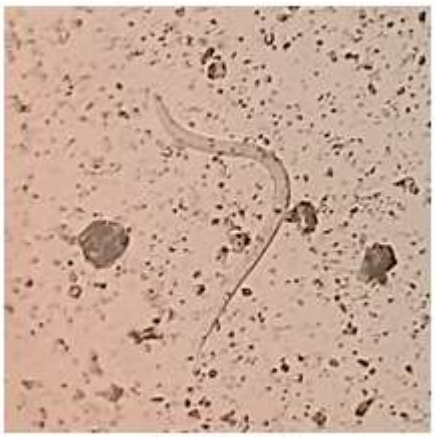
High rainfall

Group/Taxa	Station																	
	A1	**A2**	**A3**	**A4**	**A5**	**A6**	**A7**	**A8**	**A9**	**A10**	**A11**	**A12**	**A13**	**A14**	**A15**	**A16**	**A17**	**R.A. %**
Amoebozoa	0	0	0	1	0	0	0	0	0	7	1	2	0	0	0	1	1	52.99
Arcella sp.	0	0	0	1	0	0	0	0	0	7	1	2	0	0	0	0	0	44.84
Centropyxis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	8.15
Nematoda	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	12.23
Nematode	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	1	12.23
Rotifera	0	0	0	1	0	1	0	0	0	1	1	3	0	0	0	1	0	32.61
Asplanchna sp.	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	12.23
Lecane sp.	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	1	0	20.38
Grand Total	0	0	0	2	2	1	0	0	0	8	2	5	0	0	0	2	2	100.00

NOTE: All values are in individuals/L

Appendix 35. Photographs of recorded zooplanktons at the sampling stations

Nematoda



Nematode

Protozoa

Arcella sp.

Centropyxis sp.

Rotifera

Asplanchna sp.

Lecane sp.

Appendix 36. Abundance and distribution of fishes and macrobenthic fauna at the sampling stations

Low rainfall

Species Name	Station													Total	RA (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13		
Fishes															
Poeciliidae															
Gambusia affinis		3	4	1	5	2	17	11	1	10	1		15	70	57.85
Gobiidae															
Glossogobius giuris	5									1				6	4.96
Glossogobius celebius	4													4	3.31
Cyprinidae															
Barbodes sp.	1													1	0.83
Barbodes binotatus							1			1		1		3	2.48
Cichlidae															
Oreochromis niloticus	36									1				37	30.58
Total	**46**	**3**	**4**	**1**	**5**	**2**	**18**	**11**	**1**	**13**	**1**	**1**	**15**	**121**	**100.00**
Macrobenthic fauna															
Shellfishes															
Thiaridae															
Thiara scabra								3						3	18.18
Melanoides tuberculata								3						3	15.15
Melanoides turriculus			2					1						3	18.18
Lymnaeidae															
Lymnaea perega								1						1	6.06
Lymnaea natalensis								3						3	18.18
Viviparidae															
Vivipara angularis								3						3	18.18
Planorbidae															
Planorbis planorbis								1						1	6.06
Total			**2**					**15**						**17**	**100.00**
Crustaceans															
Paleamonidae															
Macrobrachium rosenbergii	20												25	45	88.24
Gecarcinidae															

Species Name	Station													Total	RA (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13		
Tuerkayana hertipes			5					1						6	11.76
Total	**20**		**5**					**1**					**25**	**51**	**100.00**

High rainfall

Species	STATION																	Total	RA (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17		
Fishes																			
Poeciliidae																			
Gambusia affinis						1								1			1	3	10
Poecilia reticulata			1													4	1	5	16.67
Gobiidae																			
Glossogobius giuris		1													2			3	10
Cyprinidae																			
Barbodes binotatus			1		6	1	1		3						2			14	46.67
Cichlidae																			
Sarotherodon sp.															2		3	5	16.67
Total	**0**	**1**	**2**	**0**	**6**	**2**	**1**		**3**	**0**	**0**	**0**	**0**	**1**	**6**	**4**	**5**	**30**	
Macrobenthic Fauna																			
Shellfishes																			
Thiaridae																			
Melanoides tuberculata			1															1	25
Melanoides turriculus											1		1					2	50
Viviparidae																			
Vivipara punctata													1					1	25
Total	**0**	**0**	**1**	**0**	**0**	**0**	**0**		**0**	**0**	**1**	**0**	**2**	**0**	**0**	**0**	**0**	**4**	
Crustaceans																			
Paleamonidae																			
Macrobrachium rosenbergii	4																19	23	85.19
Gecarcinidae																			
Tuerkayana hertipes												2			2			4	14.81
Total	**4**			**0**	**0**	**0**	**0**		**0**	**0**	**0**	**2**	**0**	**0**	**2**		**19**	**27**	

Appendix 37. Photographs of recorded fishes and macrobenthos across sampling stations

Low rainfall

Family: Cyprinidae

Barbodes binotatus

Family: Cyprinidae

Barbodes sp.

Family: Cichlidae

Oreochromis niloticus

Family: Gobiidae

Glossogobius giuris

Family: Gobiidae

Glossogobius celebius

Family: Poeciliidae

Gambusia affinis

Family: Thiaridae

Family: Thiaridae

Family: Thiaridae

High rainfall

Family: Poeciliidae
Poecilia reticulata

Family: Poeciliidae
Gambusia affinis

Family: Cichlidae
Sarotherodon sp.

Family: Cyprinidae
Barbodes binotatus/

Family: Gobiidae
Glossogobius giuris

Family: Thiaridae
Melanoides turriculus

Family: Thiaridae
Melanoides tuberculata

Family: Viviparidae
Vivipara punctata

Family: Paleamonidae
Macrobrachium rosenbergii

Appendix 38. Diversity, abundance, and distribution of aquatic insects at the sampling stations

Low rainfall

Species Name	Station													Total	Relative abundance (%)
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13		
Ephemeroptera															
Mayfly nymph		2		1			1	1	6			1		12	11.11
Hemiptera															
Common backswimmer (*Enithares sp.*)								1						1	0.92
Riffle Bugs (*Rhagovelia sp.)*			3	4	8		1			5				21	19.45
Water strider (Gerridae)			1	1	2			1				3		8	7.4
Whirligig beetle (*Dineutus sp.*)			1	2										3	2.80
Aphelocheirus sp.			1		1		4	2						8	7.4
Odonata															
Damselfly nymph		9	8	2	1		8	8	1	1		1		39	36.11
Dragonfly nymph			1	2			4	4	1	1				13	12.03
Plecoptera															
Stonefly nymph										2				2	1.86
Trichoptera															
Caddisfly nymph					1									1	0.92
Total	**0**	**11**	**15**	**12**	**13**	**0**	**18**	**17**	**8**	**9**	**0**	**5**	**0**	**108**	

High rainfall

Species Name	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	Grand Total
Coleoptera																		
False water pennies (Psephenidae)													2	1				**3**
Water beetle (Dytiscidae)									1				2		2			**5**
Water beetle (Noteridae)						1						1						**2**
Whirligig beetle (Gyrinidae)					1													**1**
Ephemoptera																		
Mayfly nymph (Baetidae)								3	3	5		2	1	2	3	1		**19**
Mayfly nymph (Ephemerellidae)				1				1	4	3	2	1	3	3	1			**19**
Hemiptera																		
Broad-shouldered Water strider (Veliidae)					1			2					1			4		**8**
Saucer bugs (Naucoridae)					2	3							2					**7**
Water scorpion (Nepidae)		1																**1**
Water strider (Gerridae)					1			1					1		1	4		**8**
Odonata																		
Dragonfly nymph (Aeshnidae)														1				**1**
Dragonfly nymph (Libellulidae)					1							1		1				**3**
Dragonfly nymph (Macromiidae)									1									**1**
Trichoptera																		
Caddisfly nymph (Rhyacophilidae)				2					3	1			2	3	4			**14**
Grand Total	**-**	**1**	**-**	**3**	**6**	**4**	**-**	**7**	**12**	**9**	**2**	**5**	**13**	**10**	**11**	**9**	**-**	**91**

Appendix 39. Photographs of recorded aquatic insects at the sampling stations in low rainfall

Low rainfall

Aphelocheirus sp.

Caddisfly nymph

Caddisfly nymph

Enithares sp.

Damselfly nymph

Dineutus sp.

Dragonfly nymph

Mayfly nymph

Stonefly nymph

Appendix 40. Photographs of recorded aquatic insects at the sampling stations in high rainfall

High rainfall

Coleoptera

False water pennies (Psephenidae)

Water beetle (Dytiscidae)

Water beetle (Noteridae)

Whirligig beetle (Gyrinidae)

Ephemoptera

Mayfly nymph (Baetidae)

Mayfly nymph (Ephemerellidae)

Hemiptera

Broad-shouldered Water strider (Vellidae)

Creeping water bugs (Naucoridae)

Saucer bugs (Naucoridae)

Water scorpion (Nepidae)

Water strider (Gerridae)

Odonata

Dragonfly nymph (Aeshnidae)

Dragonfly nymph (Libellulidae)

Dragonfly nymph (Macromiidae)

Trichoptera

Caddisfly nymph (Rhyacophilidae)

Appendix 41. Photographs of ambient air quality and noise sampling stations along the CMH alignment

Top row, left to right: AQ1 (Zone 2B, Casinglot, Tagoloan), AQ2 (Purok 7, Mambatangan, Manolo Fortich), AQ3 (Zone 4, Alae, Manolo Fortich); *Bottom row, left to right*: AQ4 (Zone 1, Dicklum, Manolo Fortich), AQ5 (Purok 4, San Roque, Sumilao), AQ6 (Poblacion, Impasug-ong)

Top row, left to right: AQ7 (Purok 7, La Fortuna, Impasug-ong), AQ8 (Zone 3, Impalutao, Impasug-ong); *Bottom row, left to right*: AQ9 (Zone 9, Patpat, Malaybalay), AQ10 (Casanova St., Kalasungay, Malaybalay)

Appendix 42. Photographs of the traffics survey stations

Traffic Station 1

Traffic Station 2

Traffic Station 3

Traffic Station 4

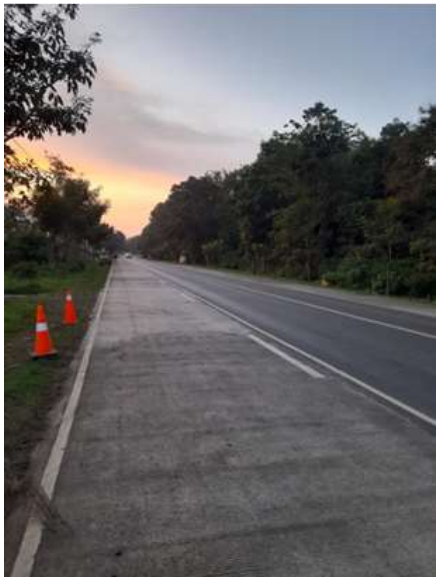
Traffic Station 5

Traffic Station 6

Traffic Station 7

Traffic Station 8

Traffic Station 9

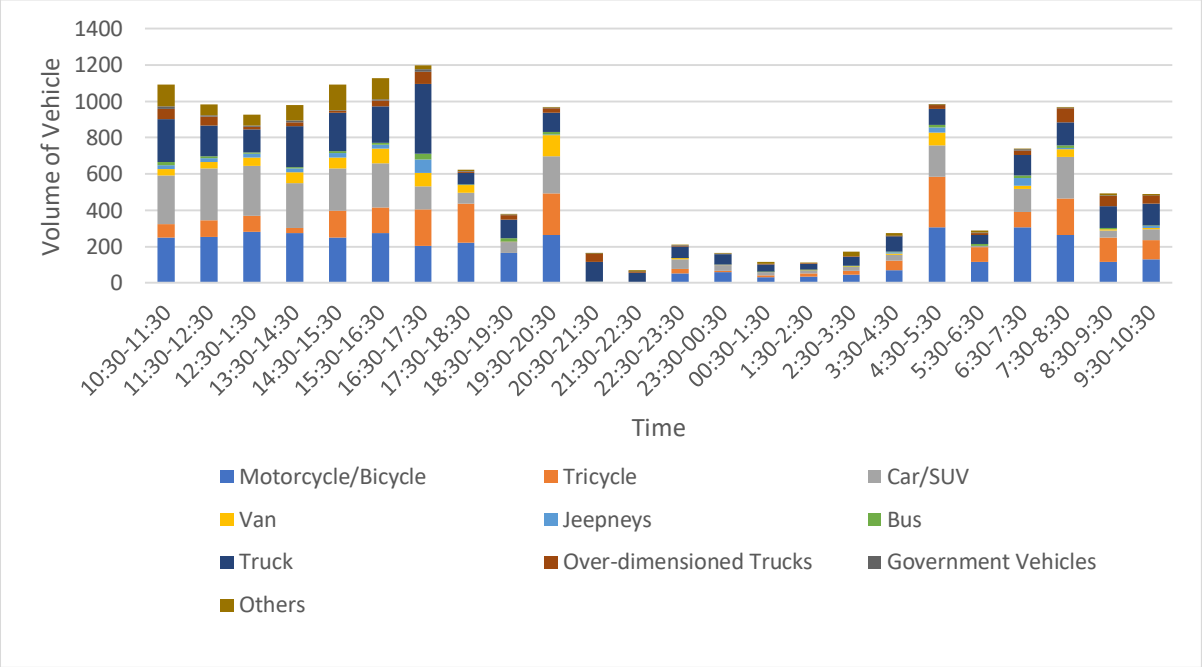


Traffic Station 10

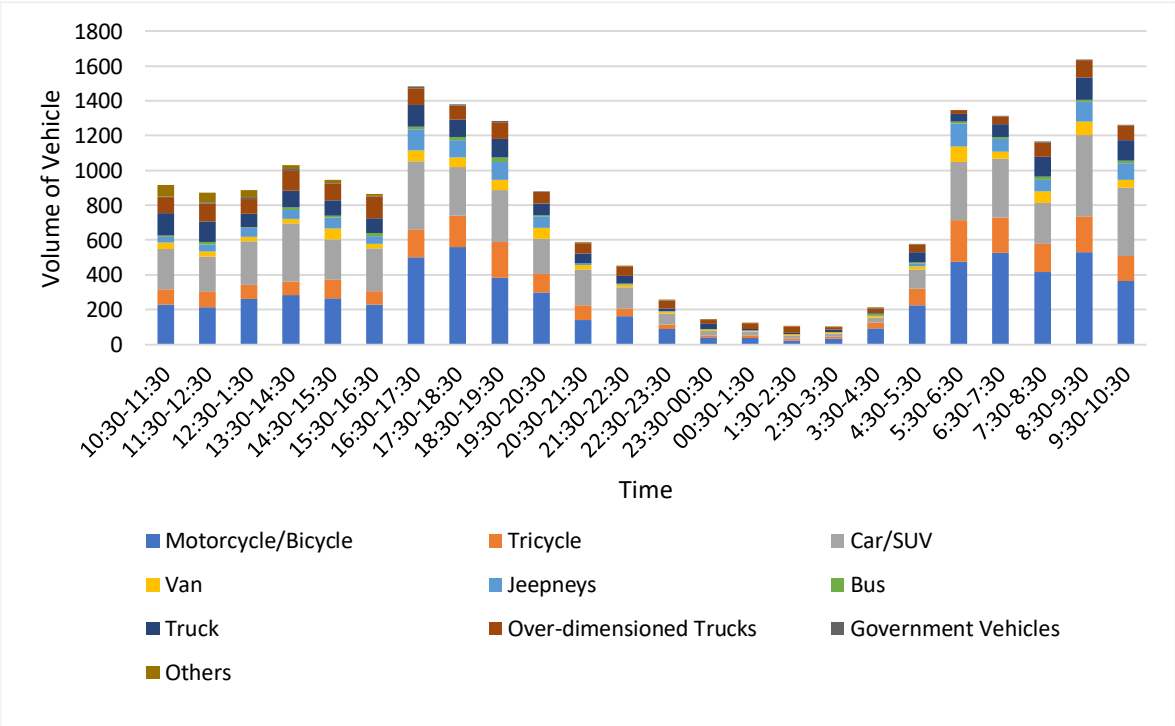
Appendix 43. Baseline traffic and estimation of future traffic section

Baseline Traffic Current Volumes

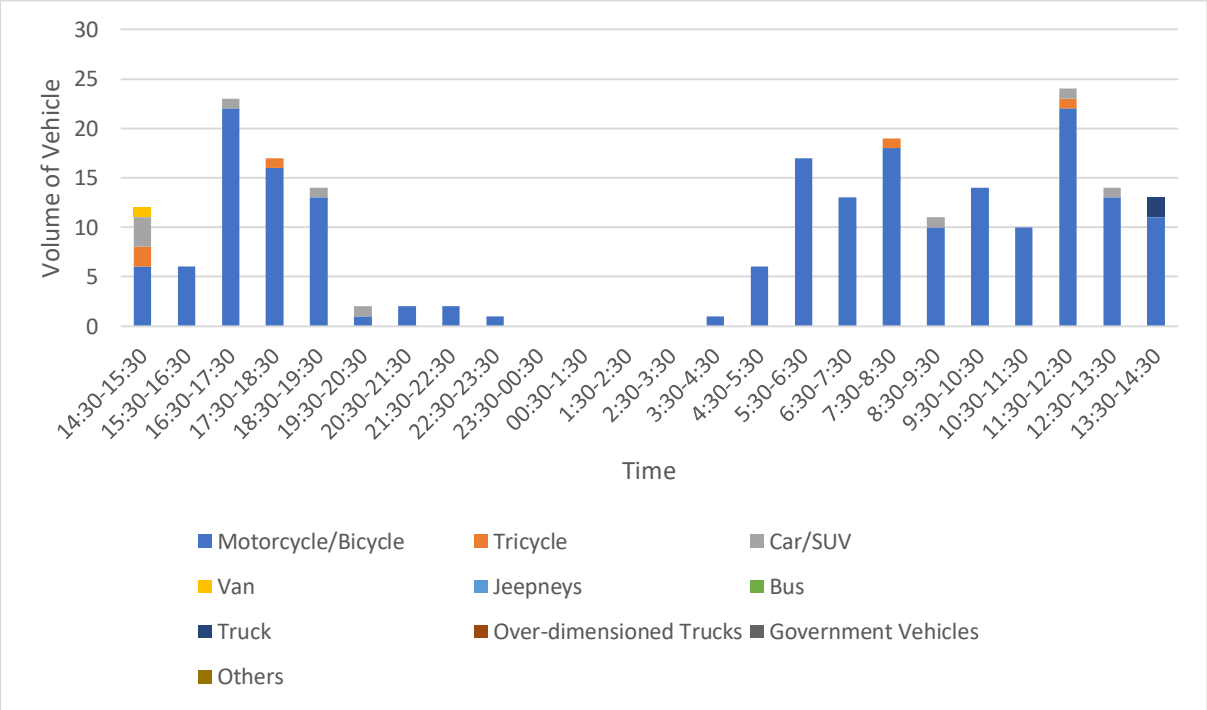
Traffic Count at Station 1 (West bound)



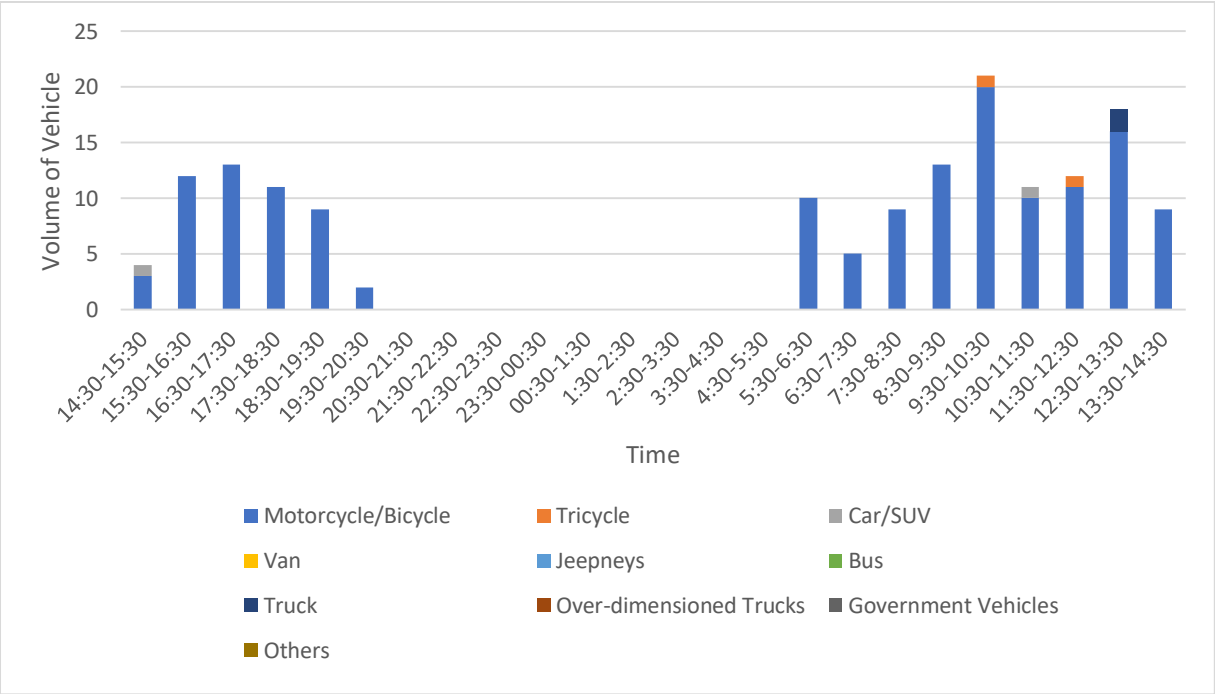
Traffic Count at Station 1 (East bound)



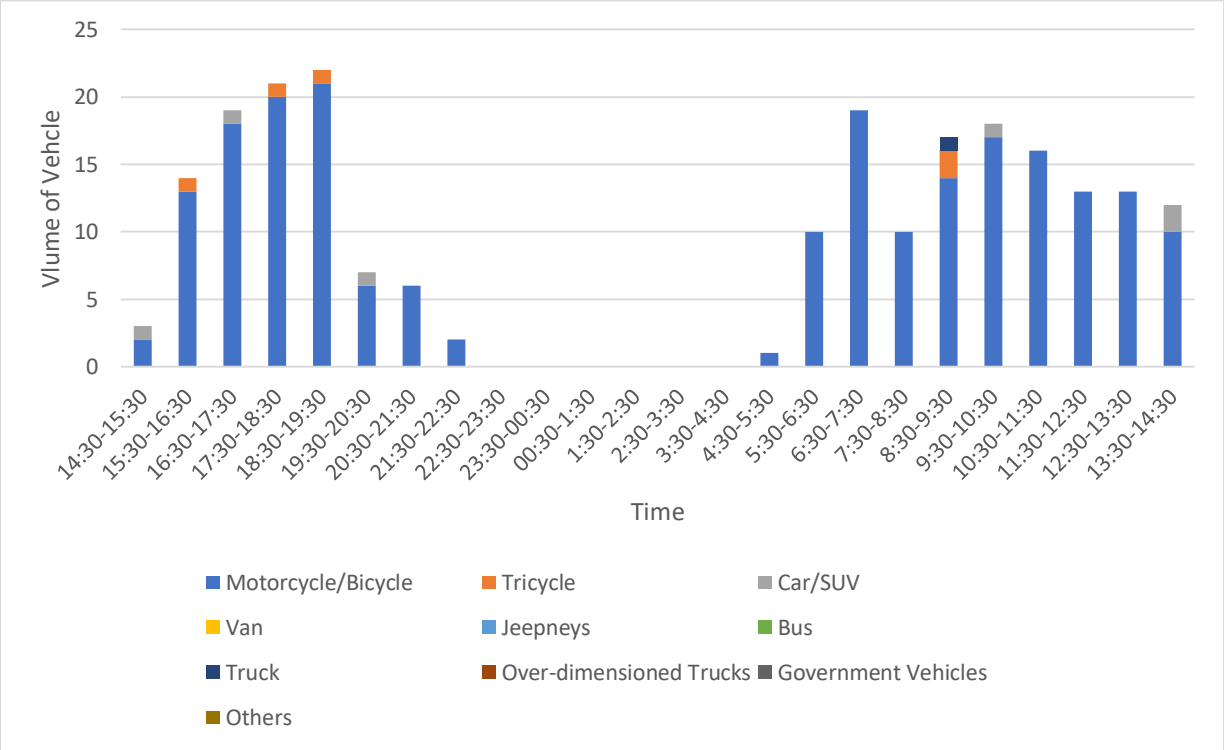
Traffic Count at Station 2 (North bound)



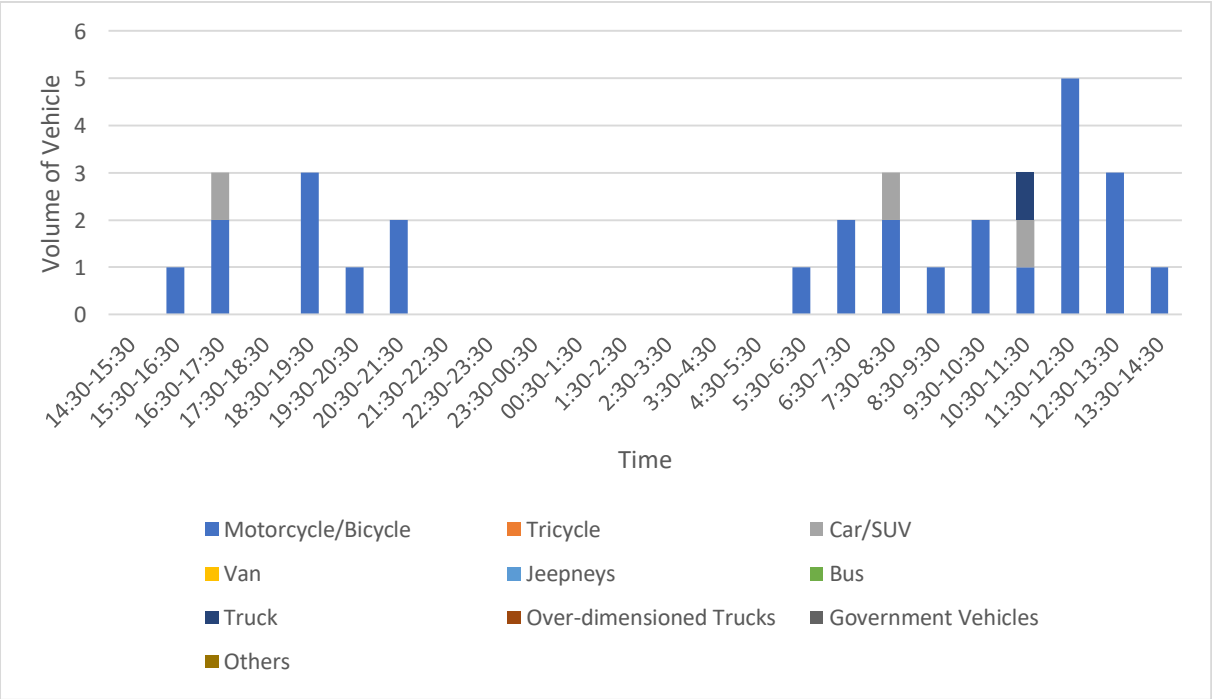
Traffic Count at Station 2 (South bound)



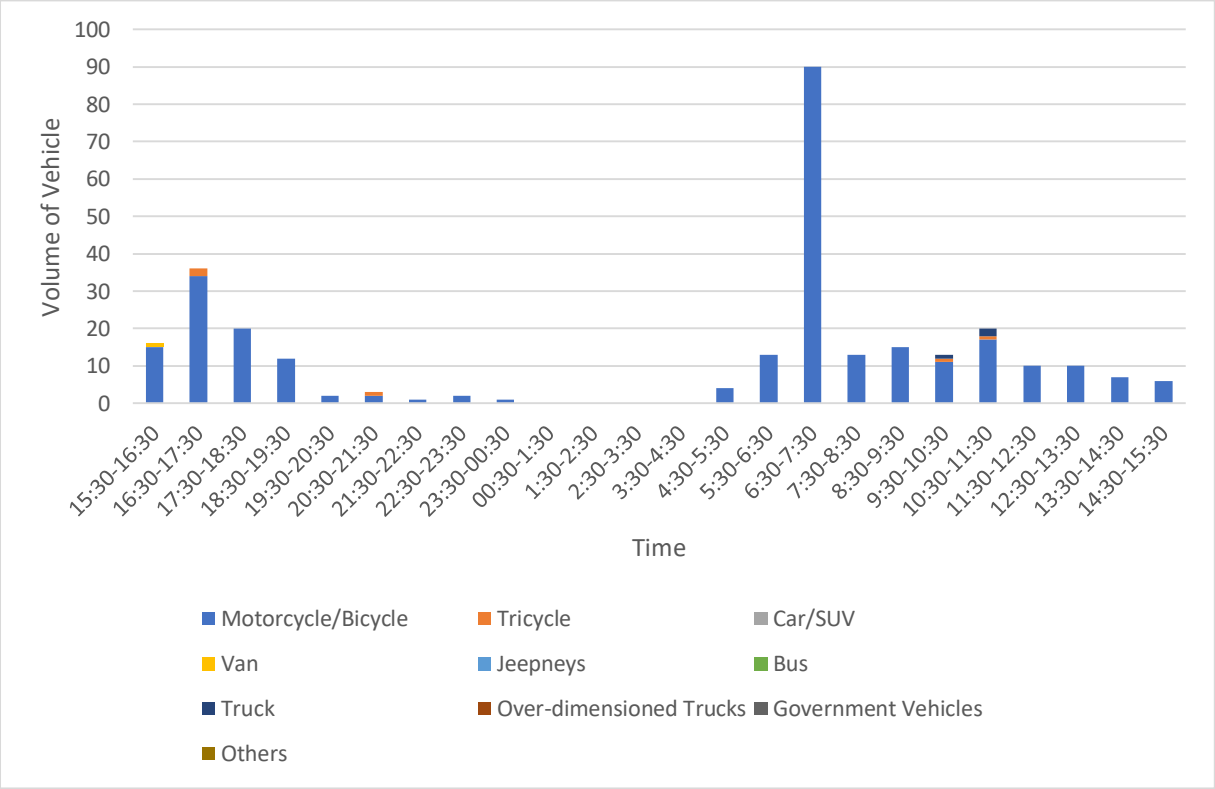
Traffic Count at Station 2 (East bound)



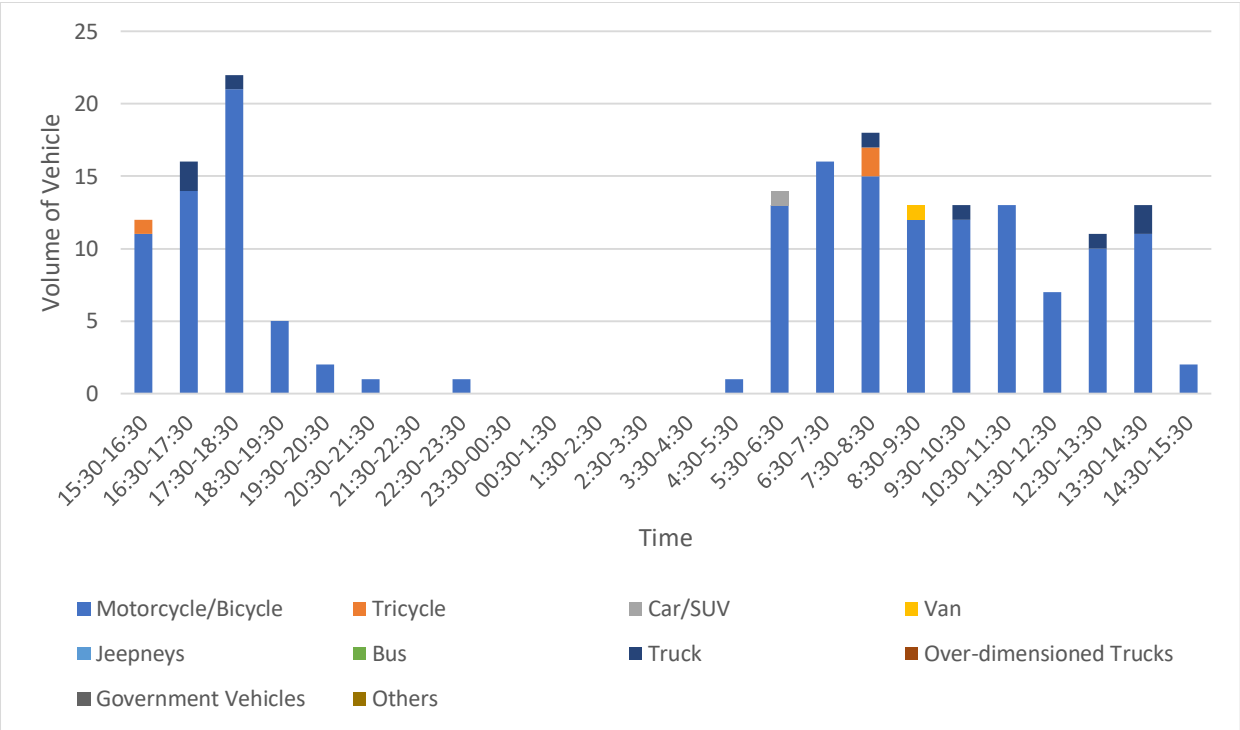
Traffic Count at Station 2 (West bound)



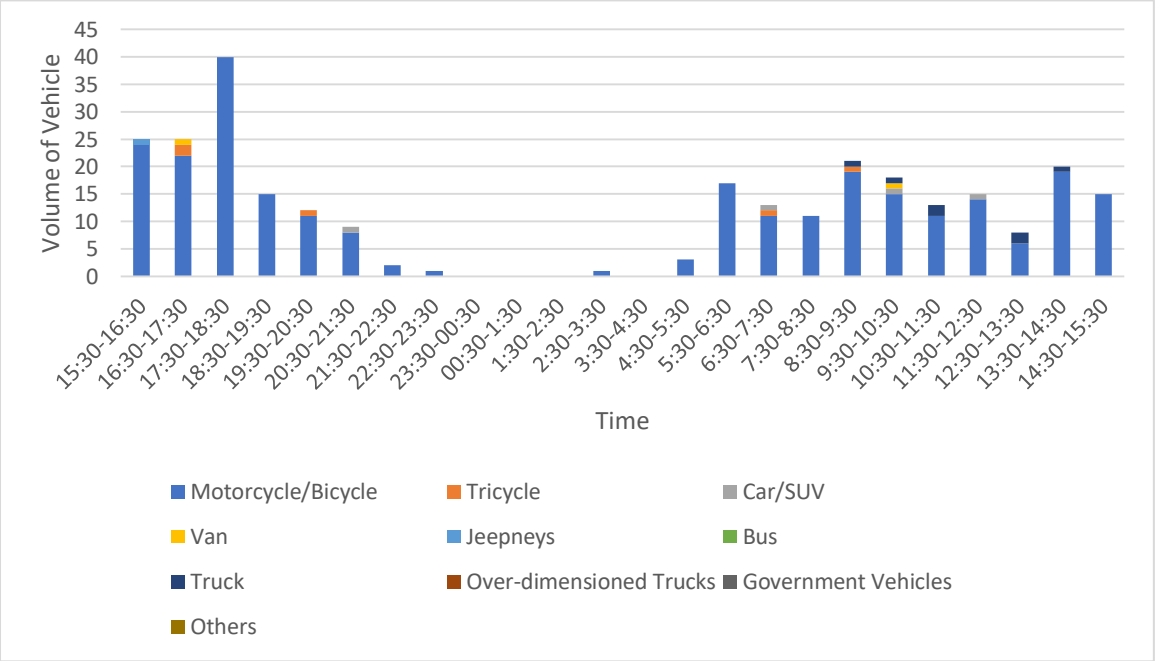
Traffic Count at Station 3 (North bound)



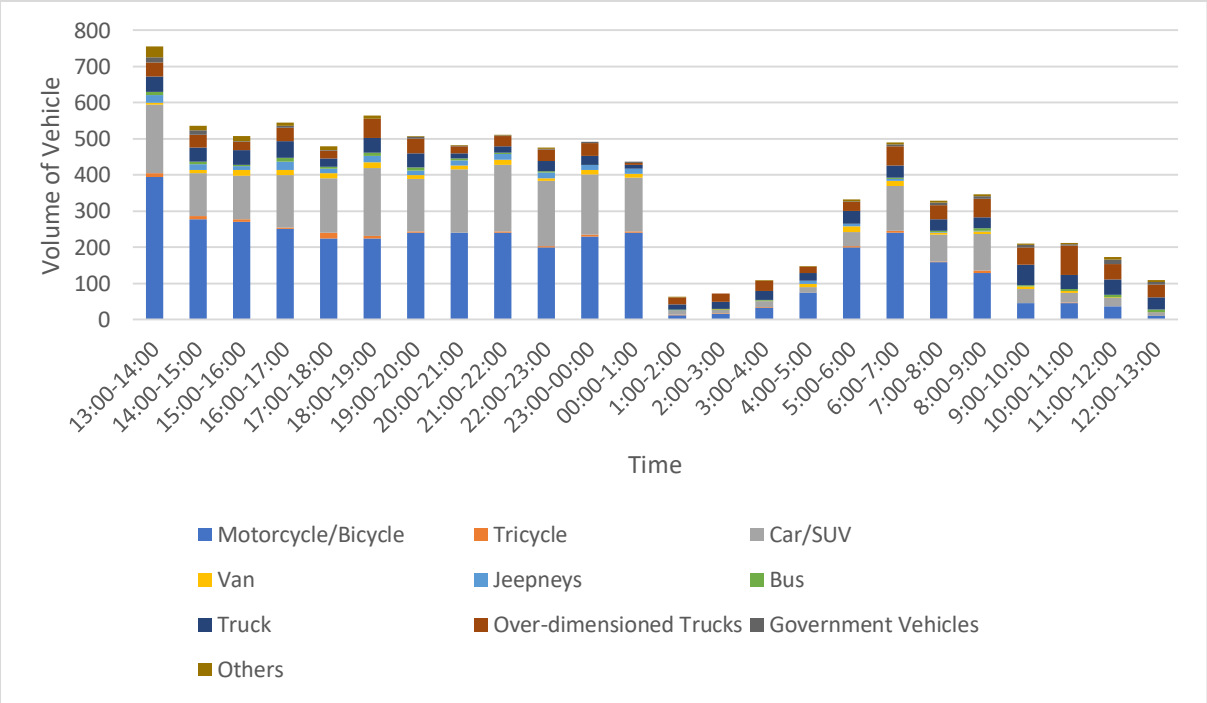
Traffic Count at Station 3 (South bound)



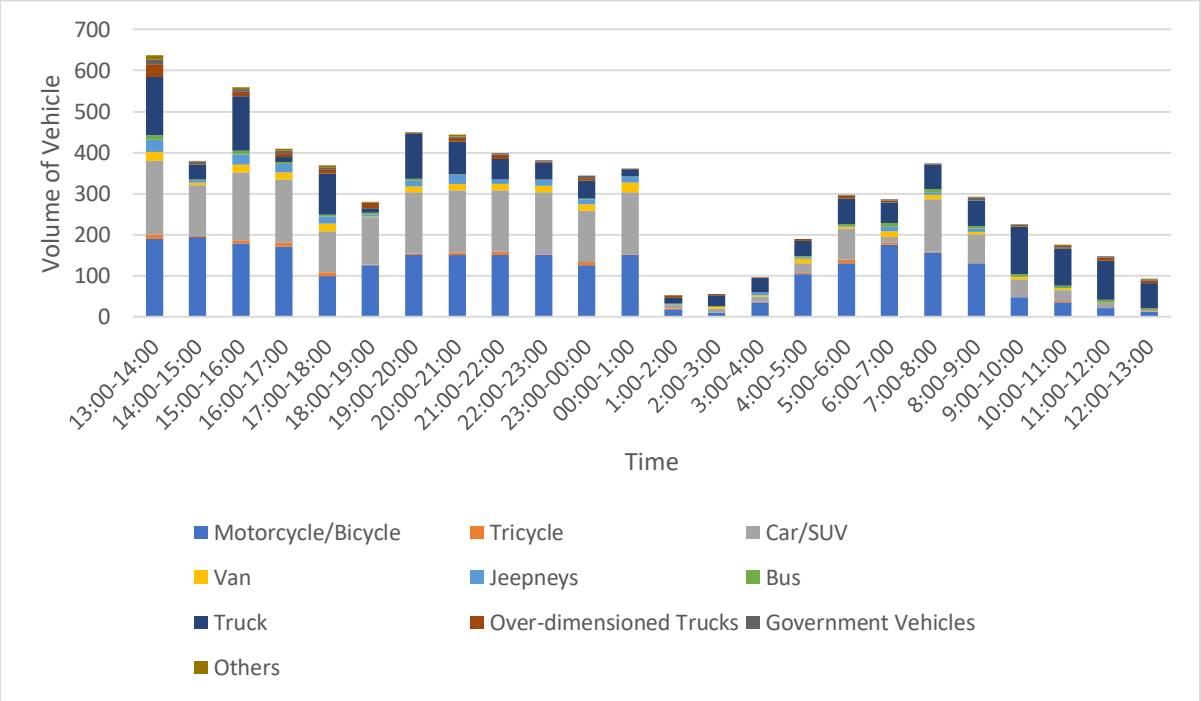
Traffic Count at Station 3 (West bound)



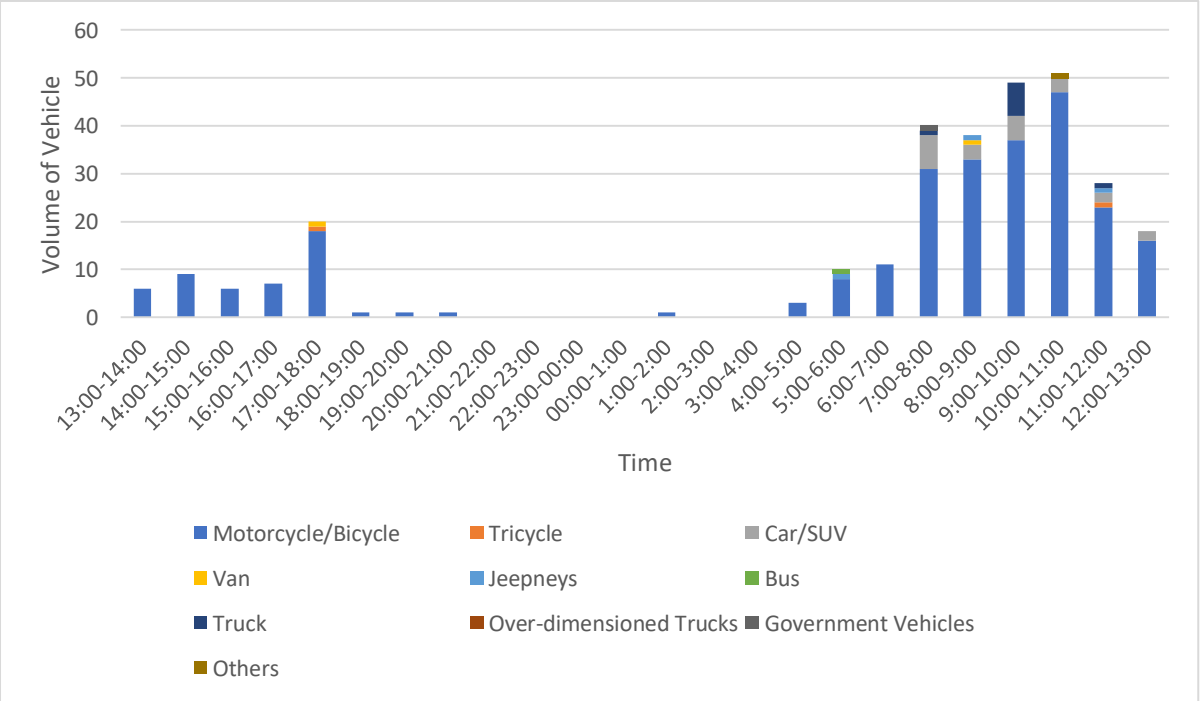
Traffic Count at Station 4 (North bound)



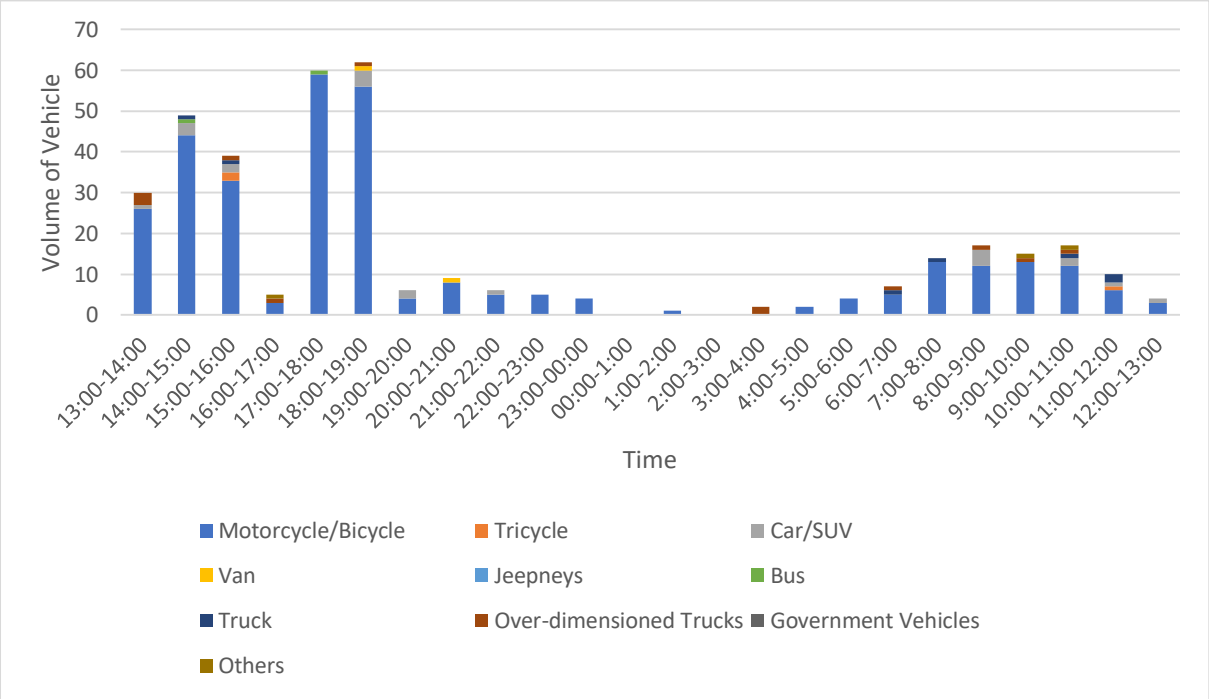
Traffic Count at Station 4 (South bound)



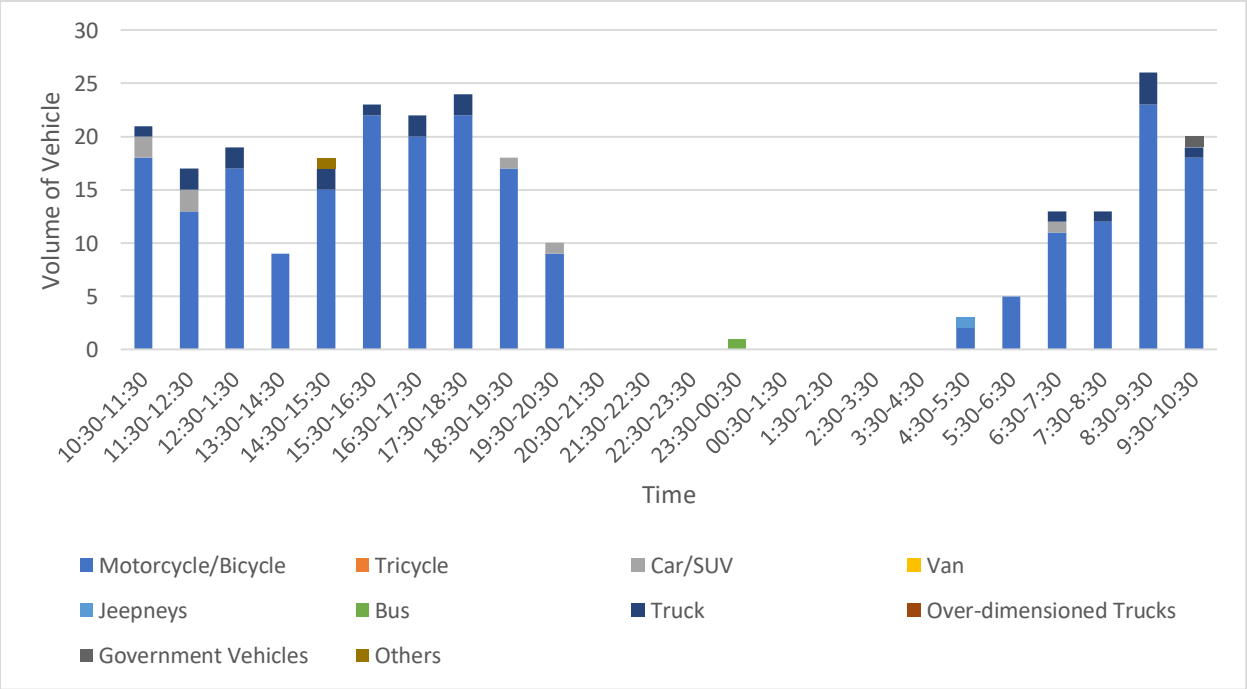
Traffic Count at Station 4 (West bound)



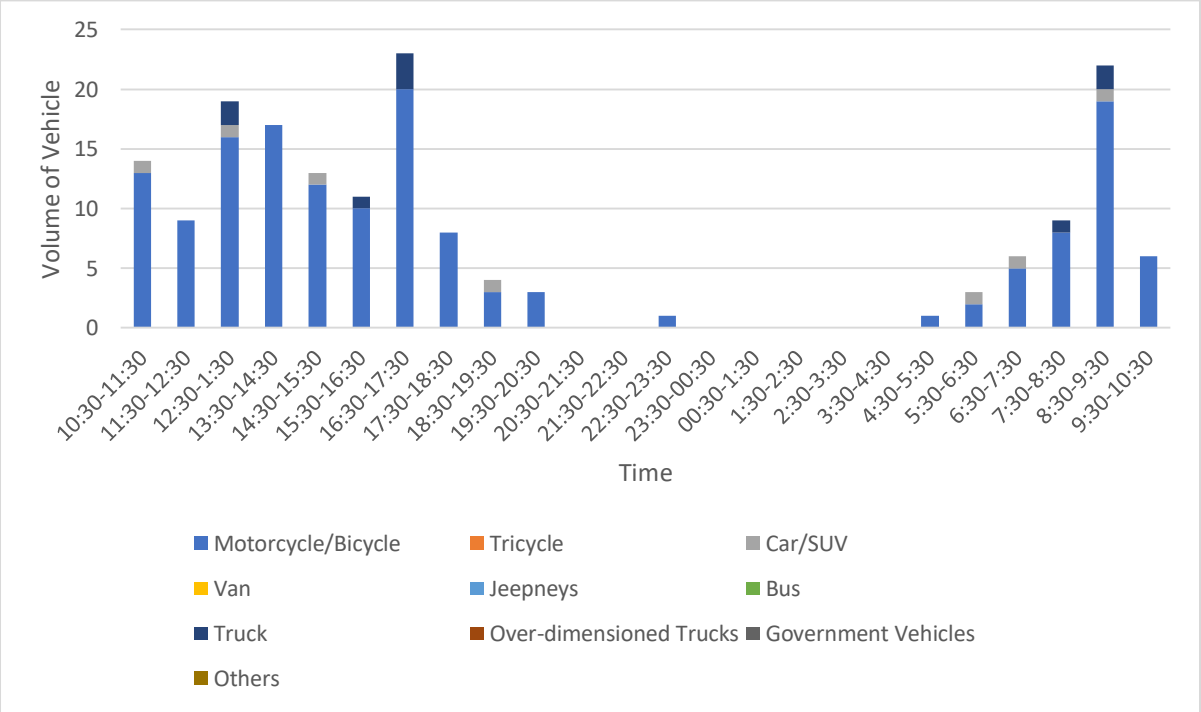
Traffic Count at Station 4 (East bound)



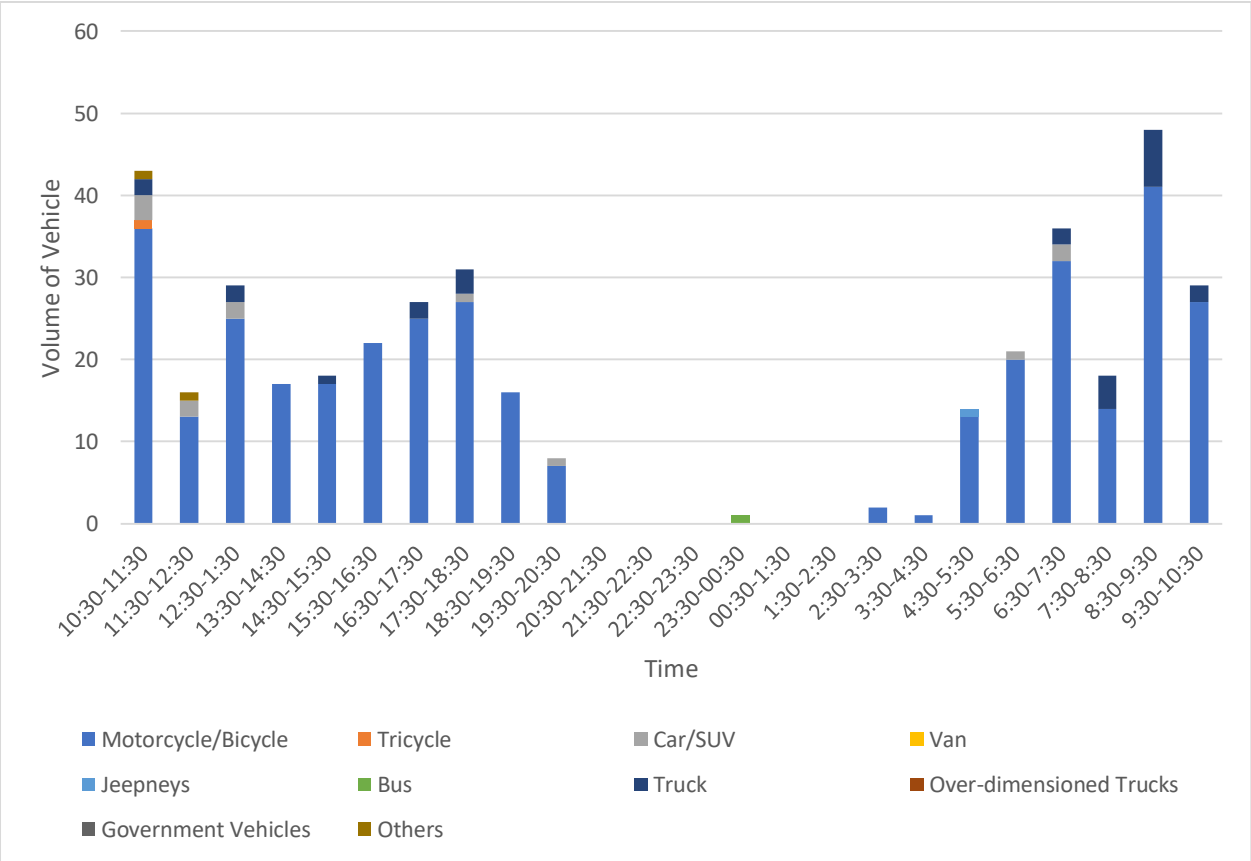
Traffic Count at Station 5 (North bound)



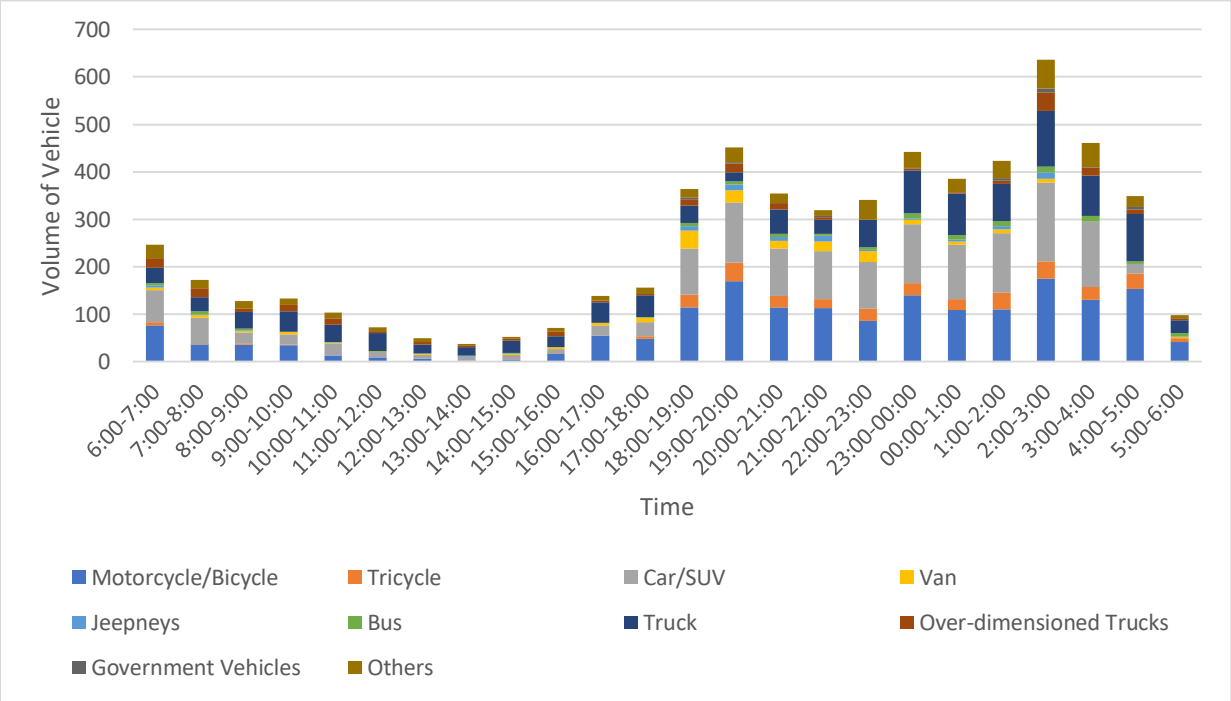
Traffic Count at Station 5 (East bound)



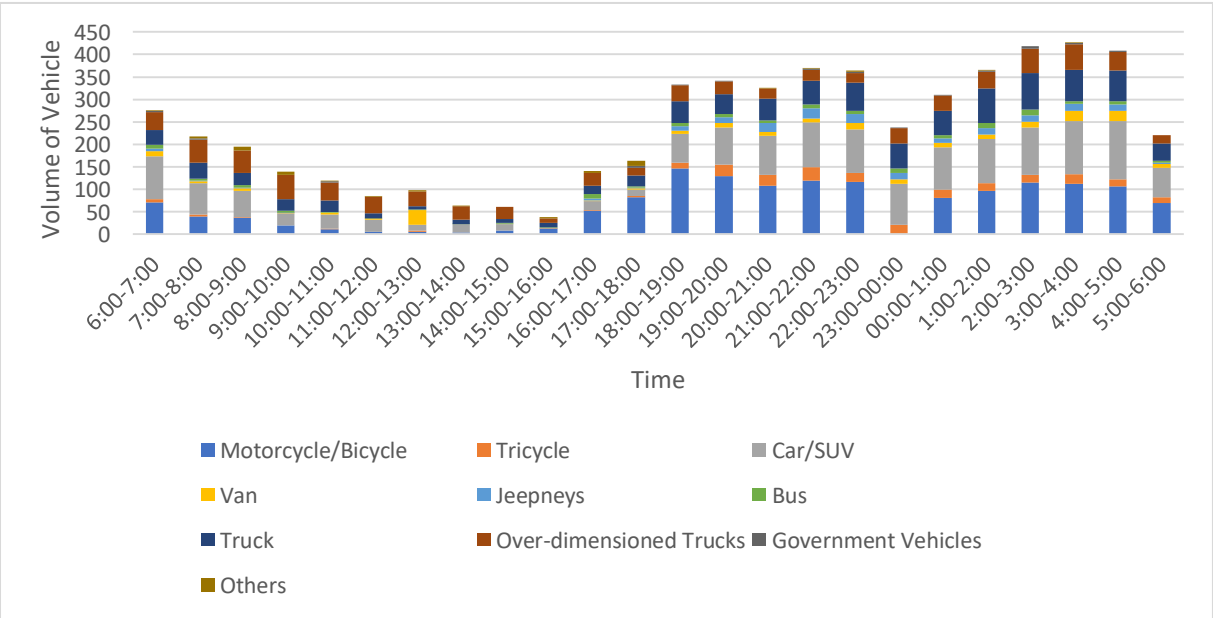
Traffic Count at Station 5 (West bound)



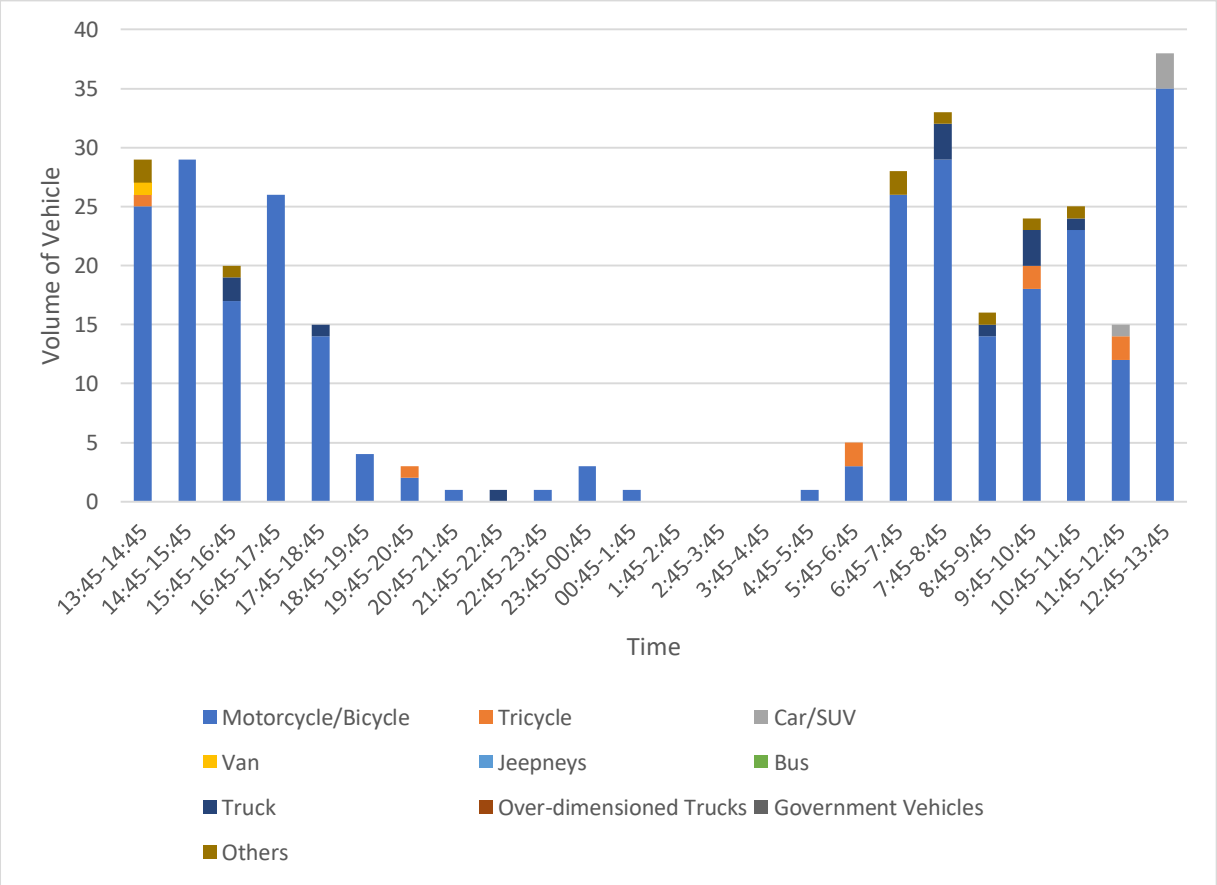
Traffic Count at Station 6 (North bound)



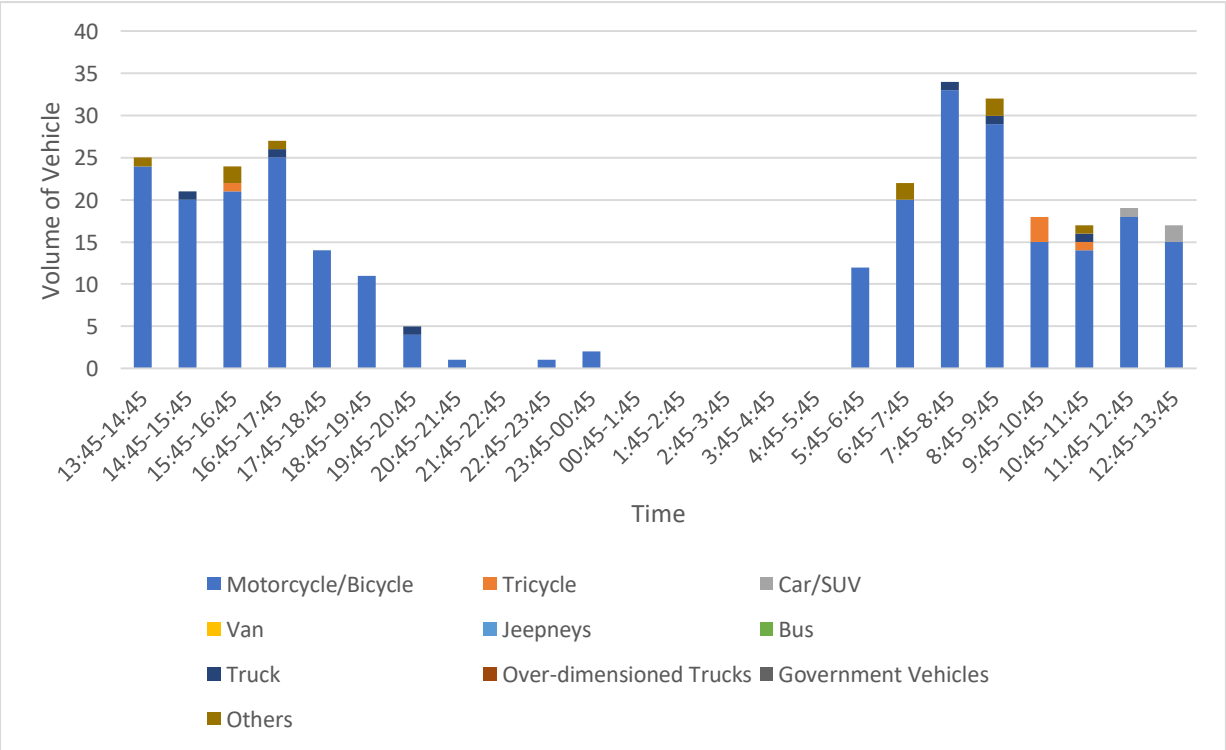
Traffic Count at Station 6 (South bound)



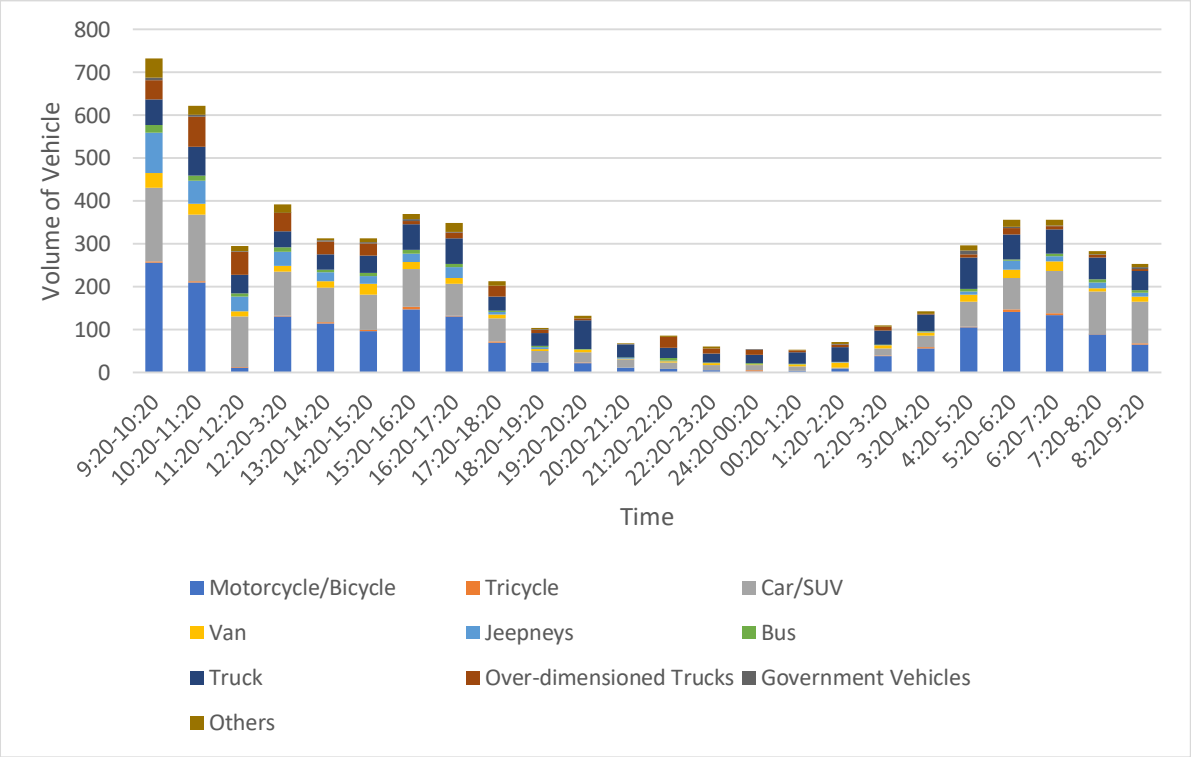
Traffic Count at Station 7 (North bound)



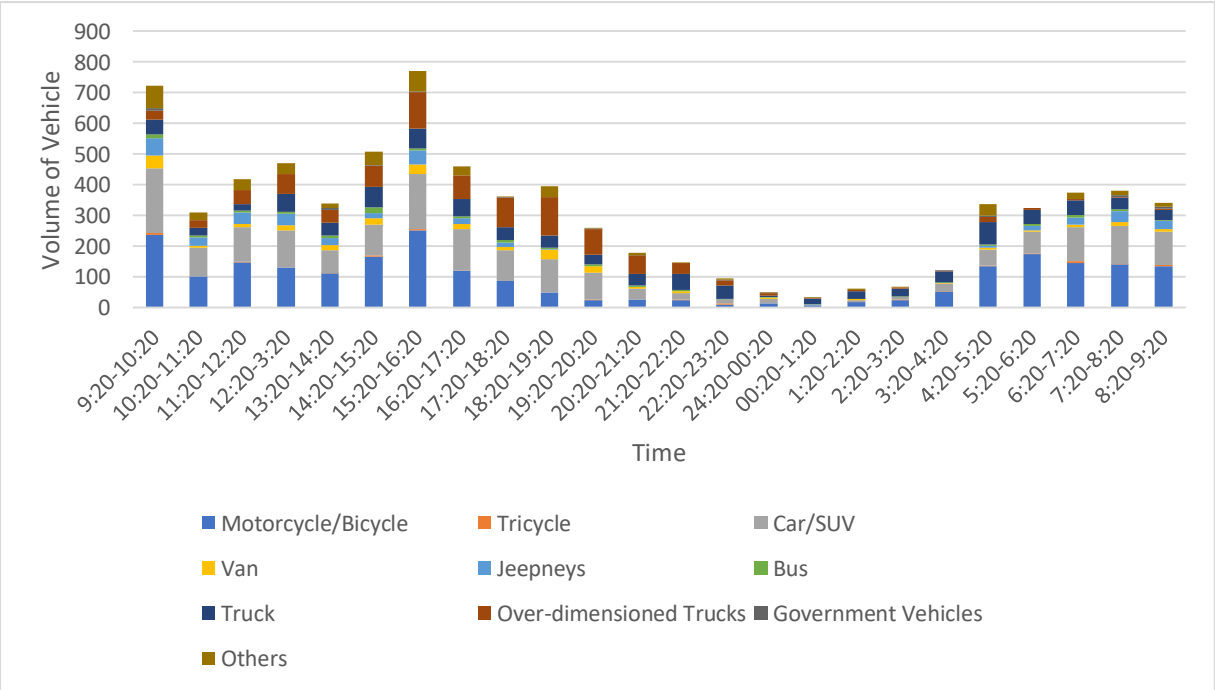
Traffic Count at Station 7 (South bound)



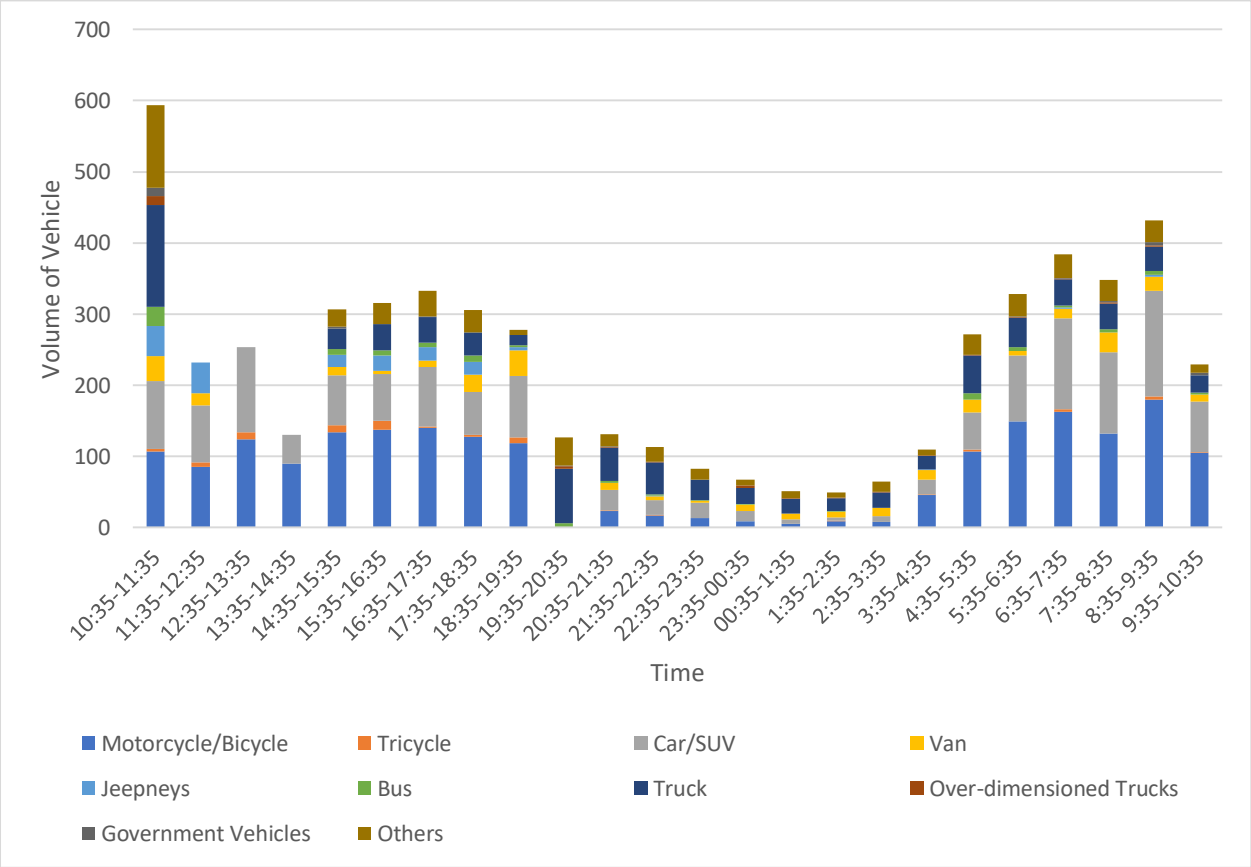
Traffic Count at Station 8 (North bound)



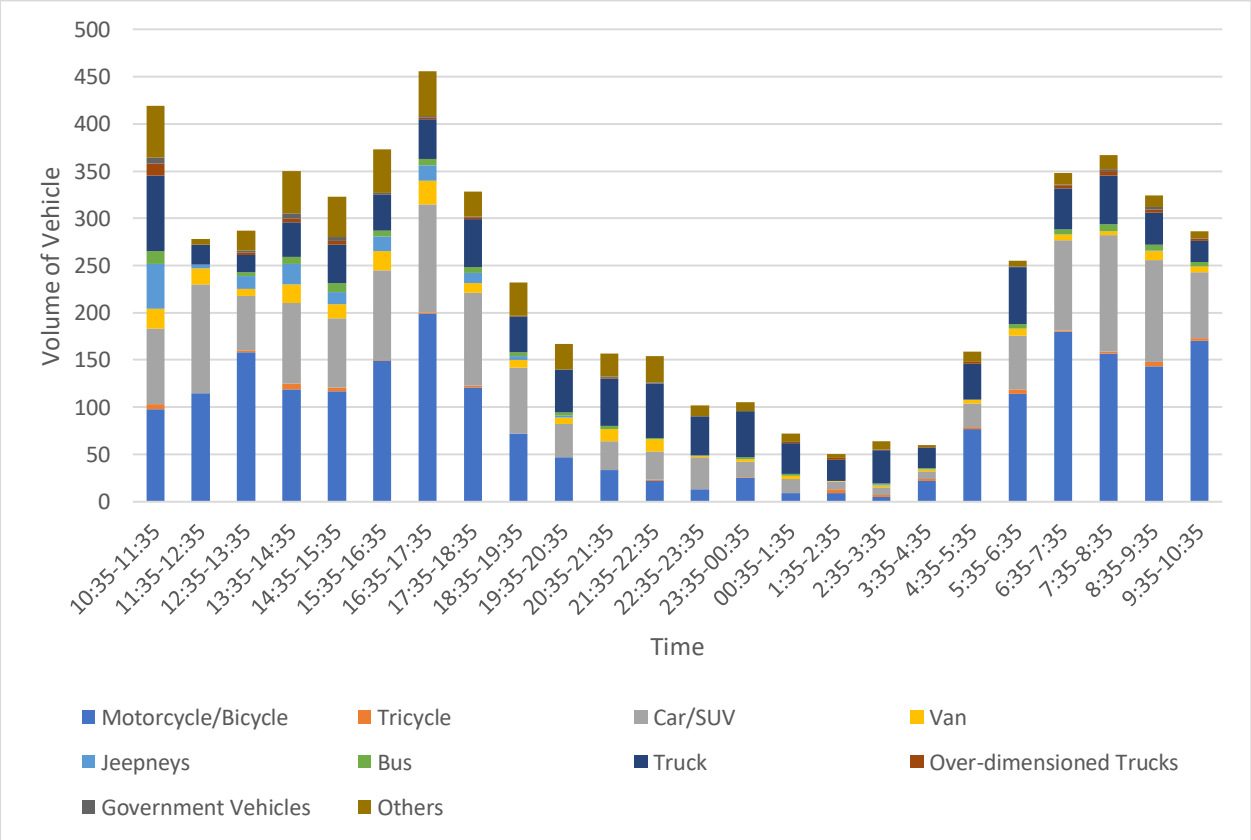
Traffic Count at Station 8 (South bound)



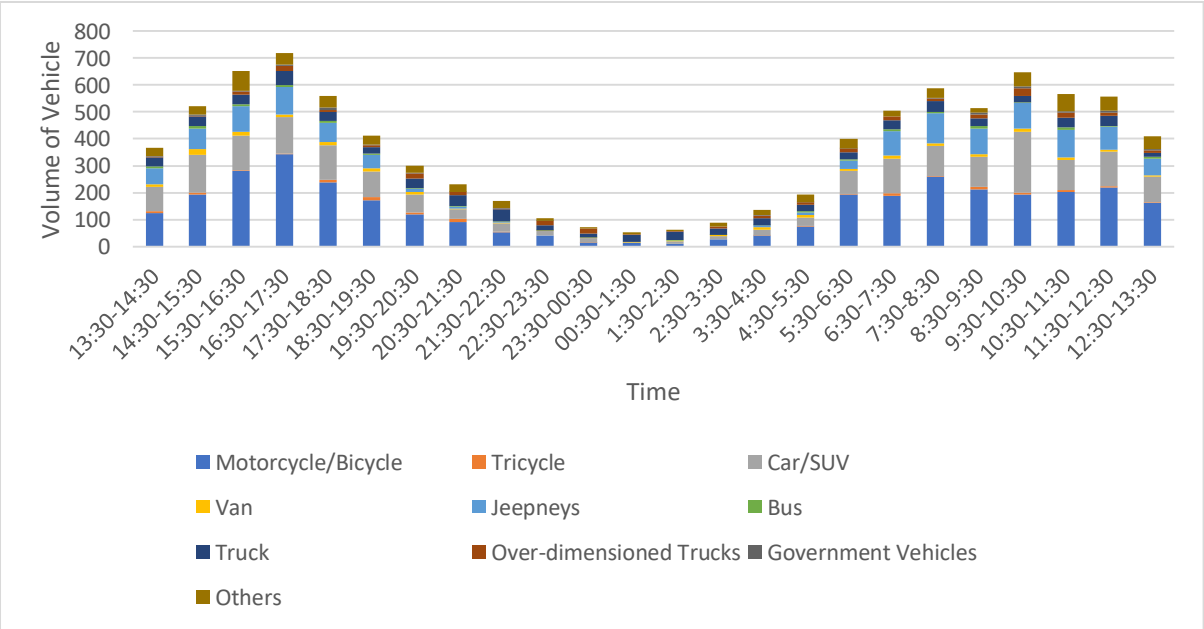
Traffic Count at Station 9 (North bound)



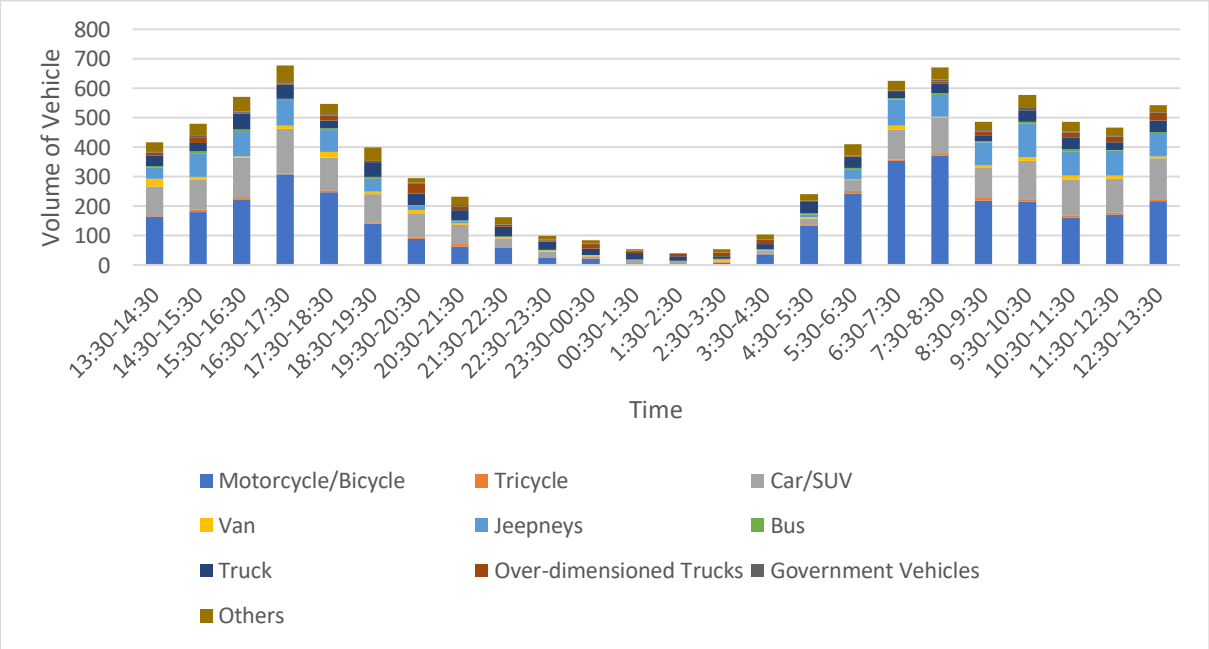
Traffic Count at Station 9 (South bound)



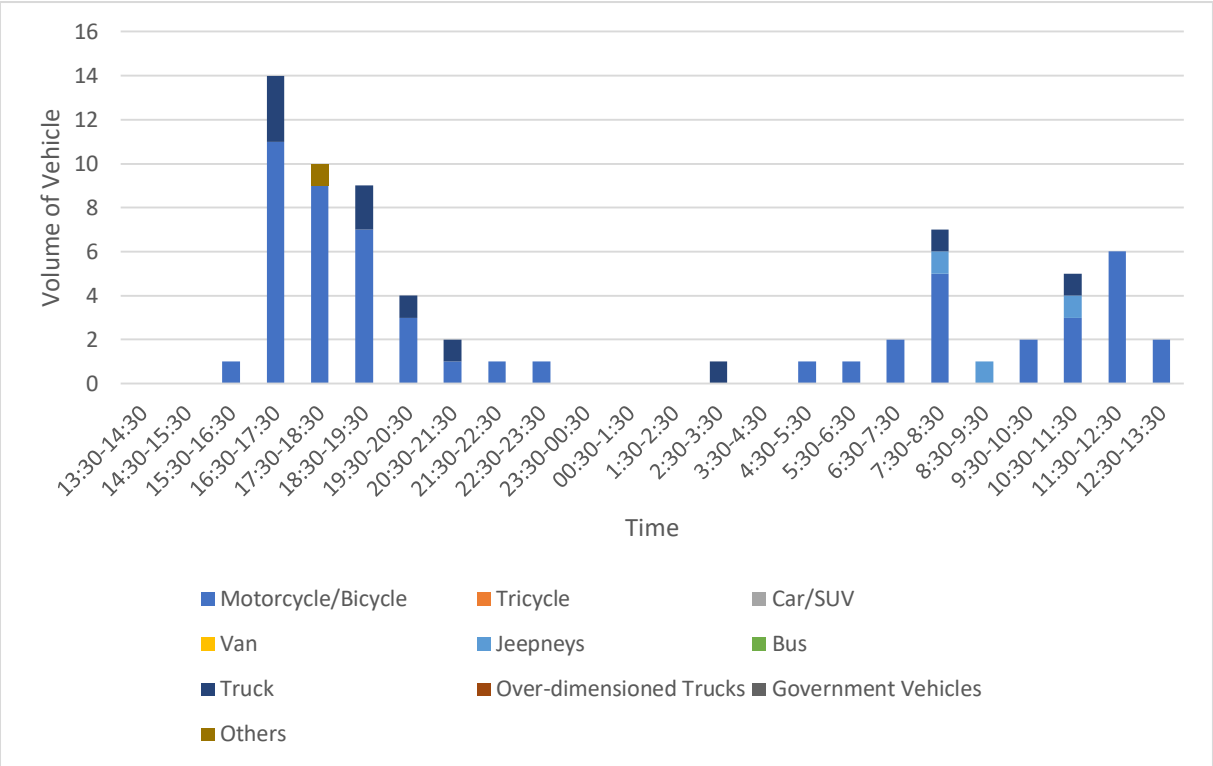
Traffic Count at Station 10 (North bound)



Traffic Count at Station 10 (South bound)

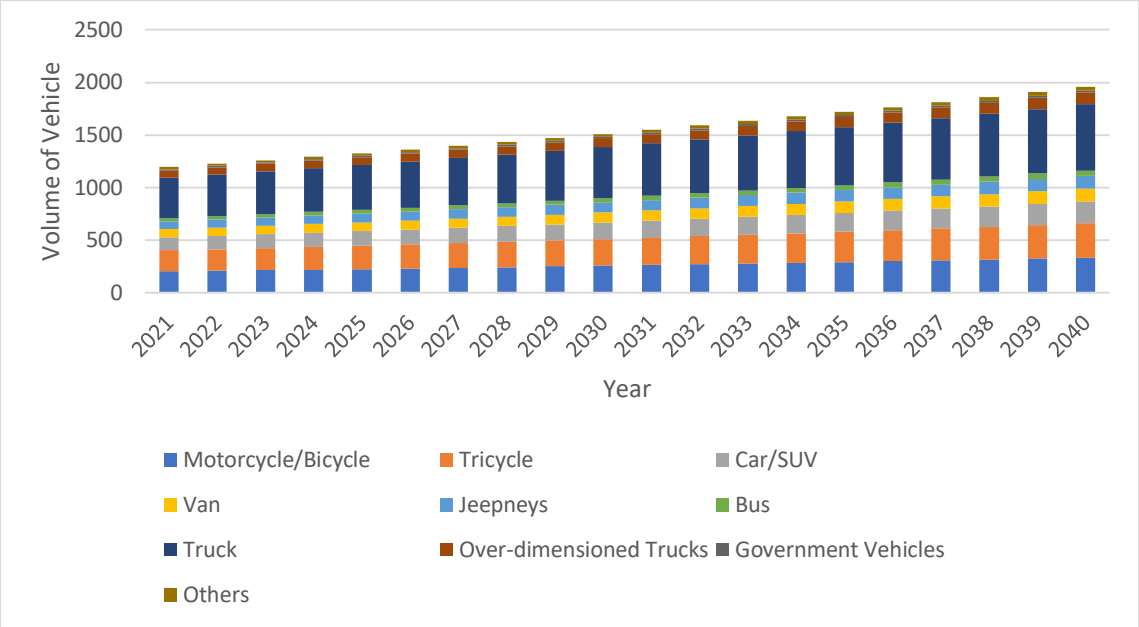


Traffic Count at Station 10 (West bound)

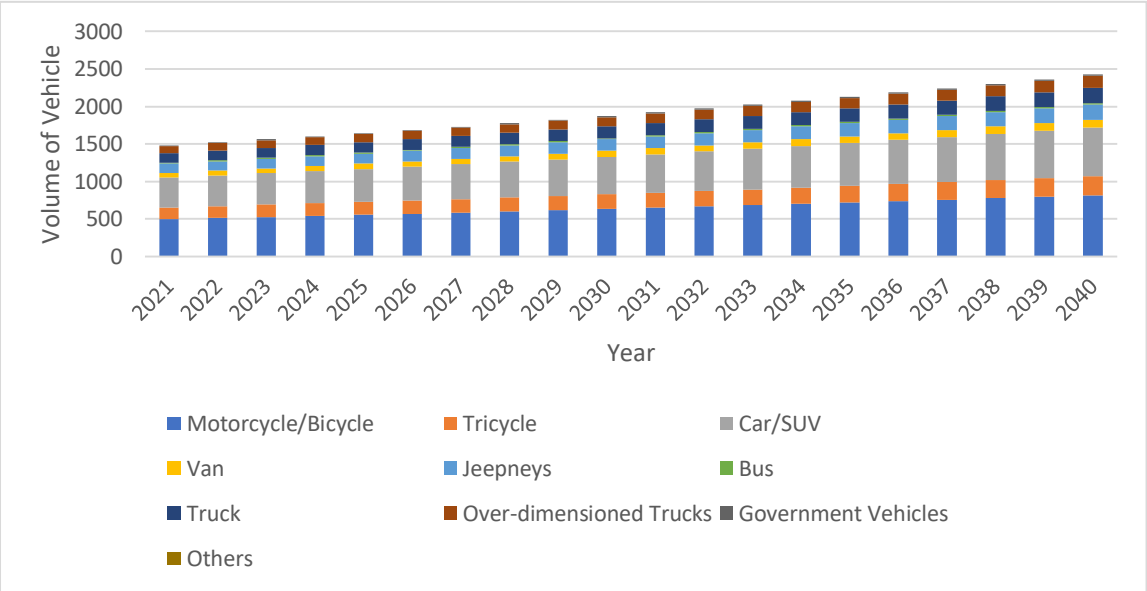


Future Traffic without Development (Existing Sayre)

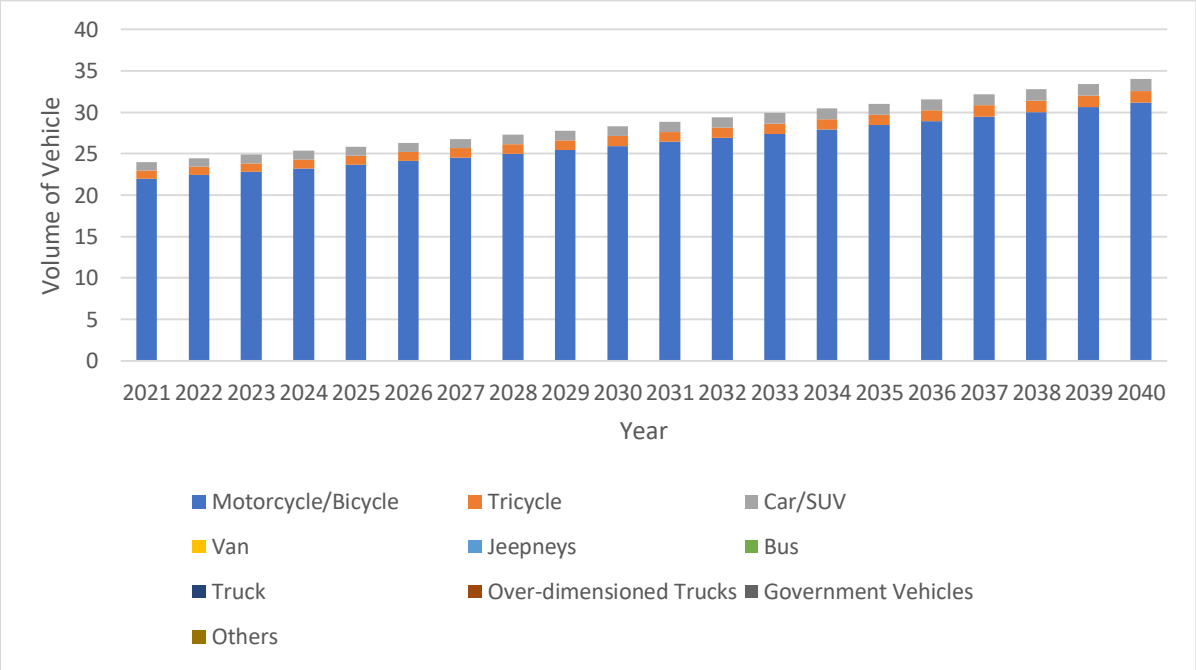
Peak hour traffic volume projection in west bound of Station 1 (without the Project)



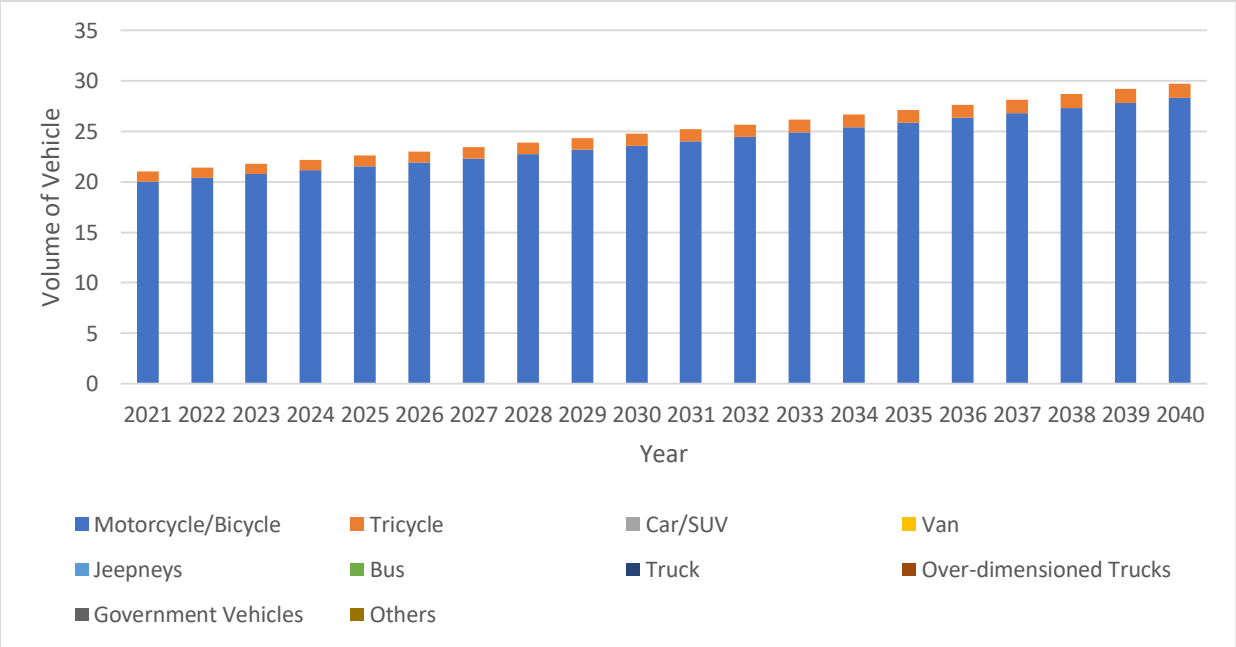
Peak hour traffic volume projection in west bound of Station 1 (without the Project)



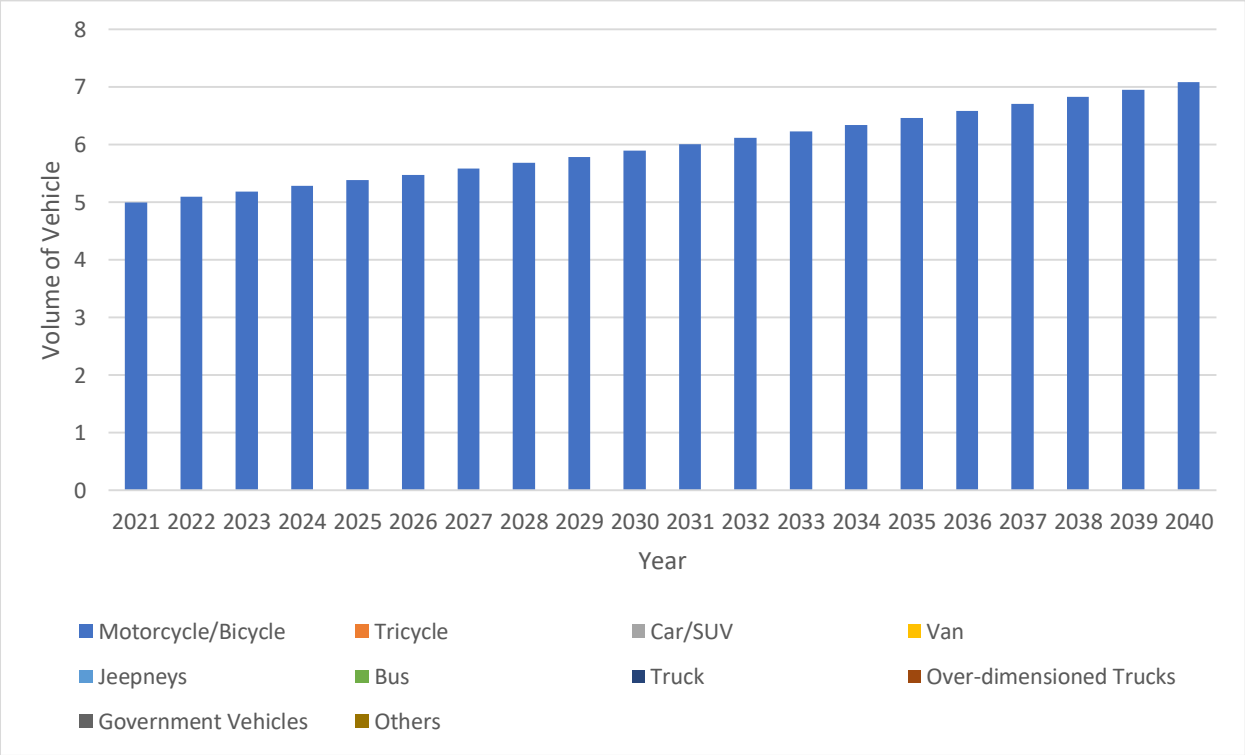
Peak hour traffic volume projection in north bound of Station 2 (without the Project)



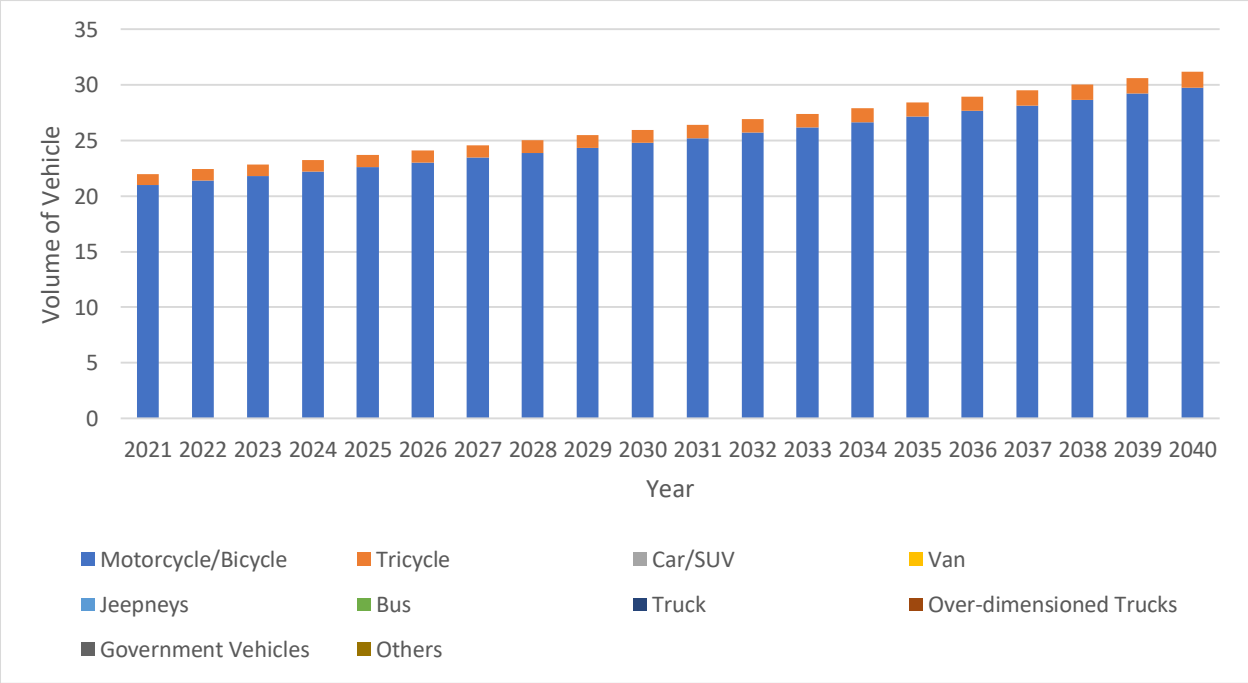
Peak hour traffic volume projection in south bound of Station 2 (without the Project)



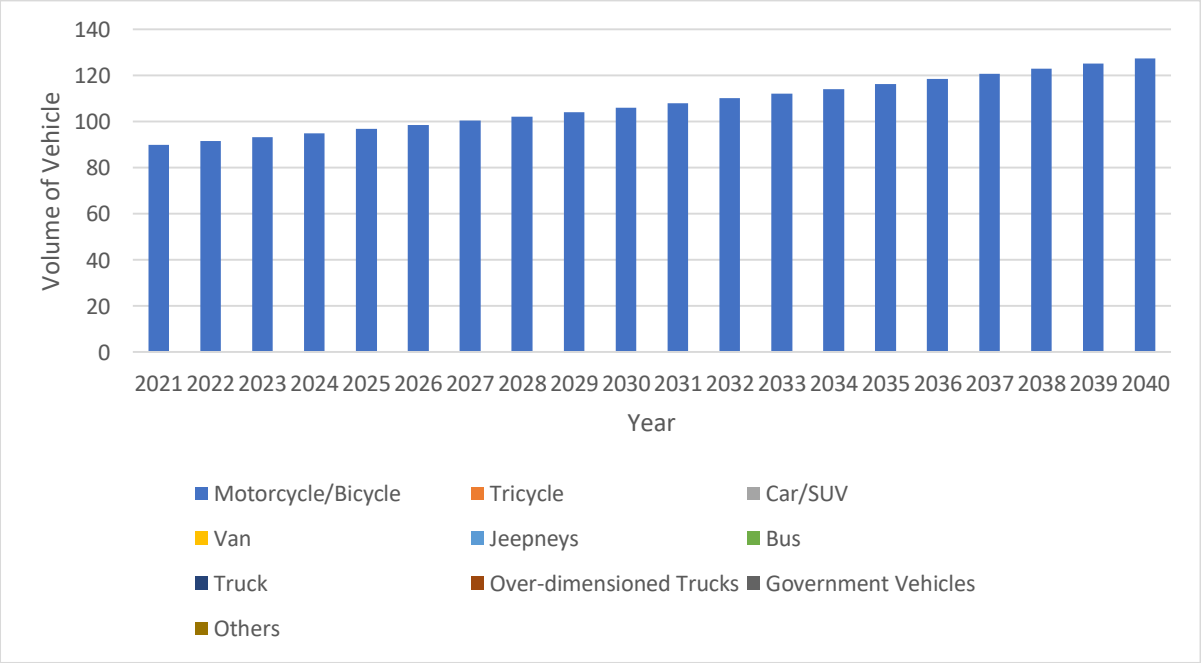
Peak hour traffic volume projection in west bound of Station 2 (without the Project)



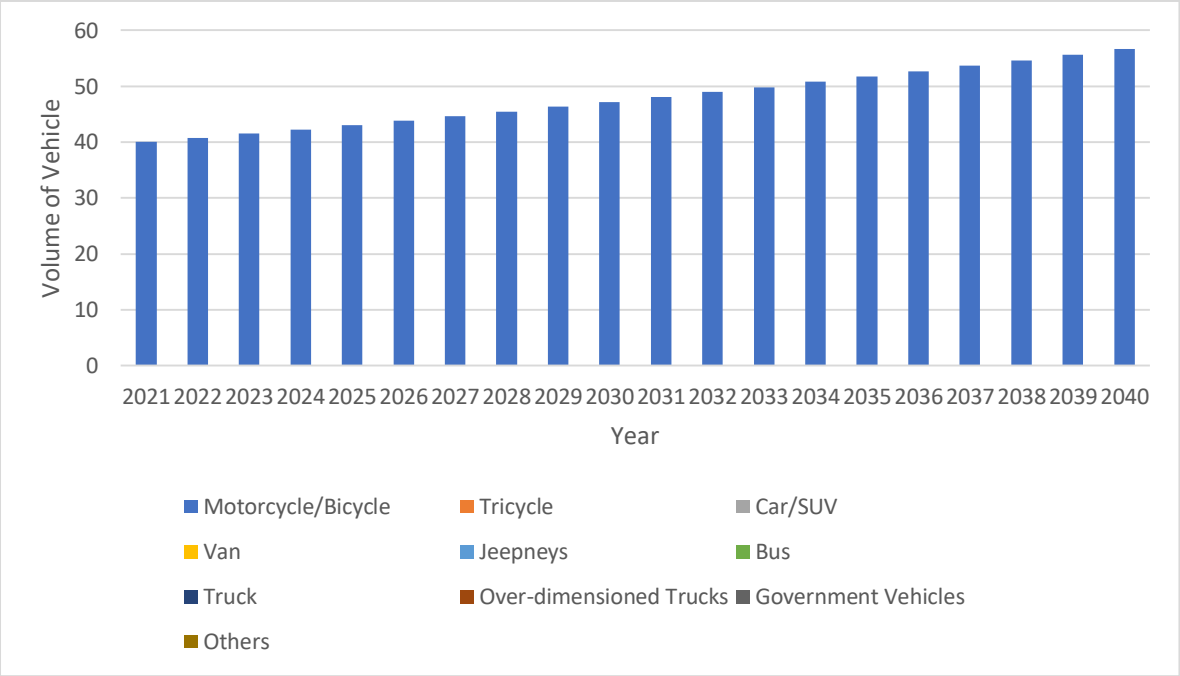
Peak hour traffic volume projection in east bound of Station 2 (without the Project)



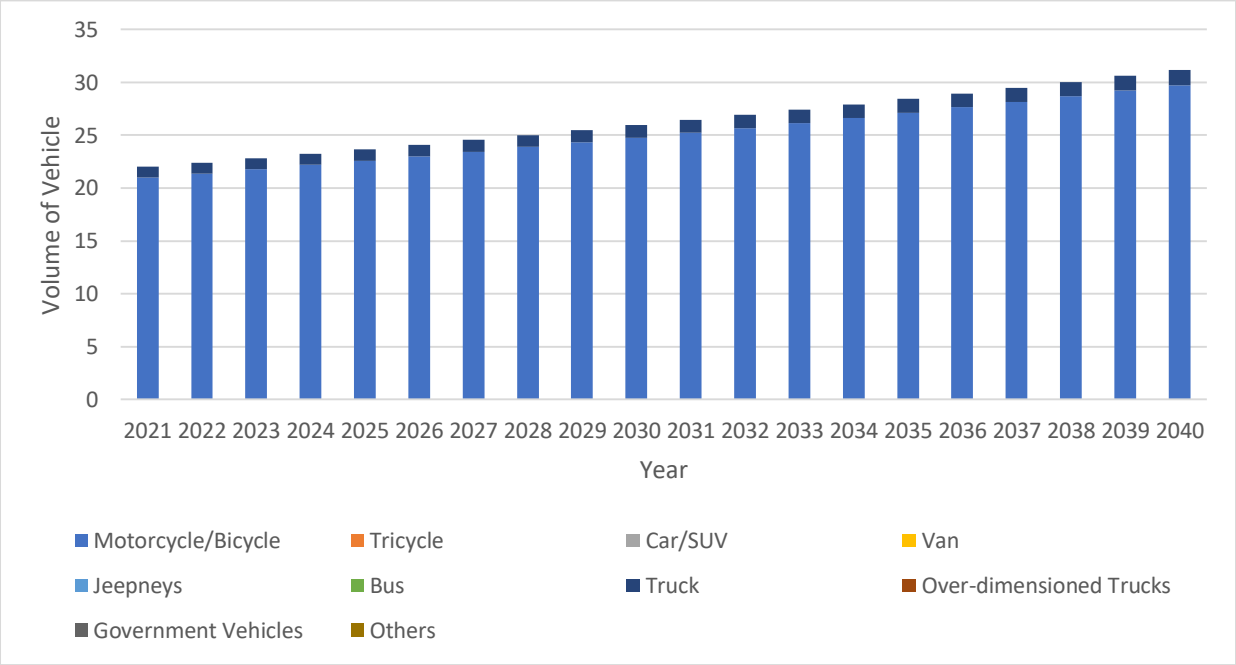
Peak hour traffic volume projection in north bound of Station 3 (without the Project)



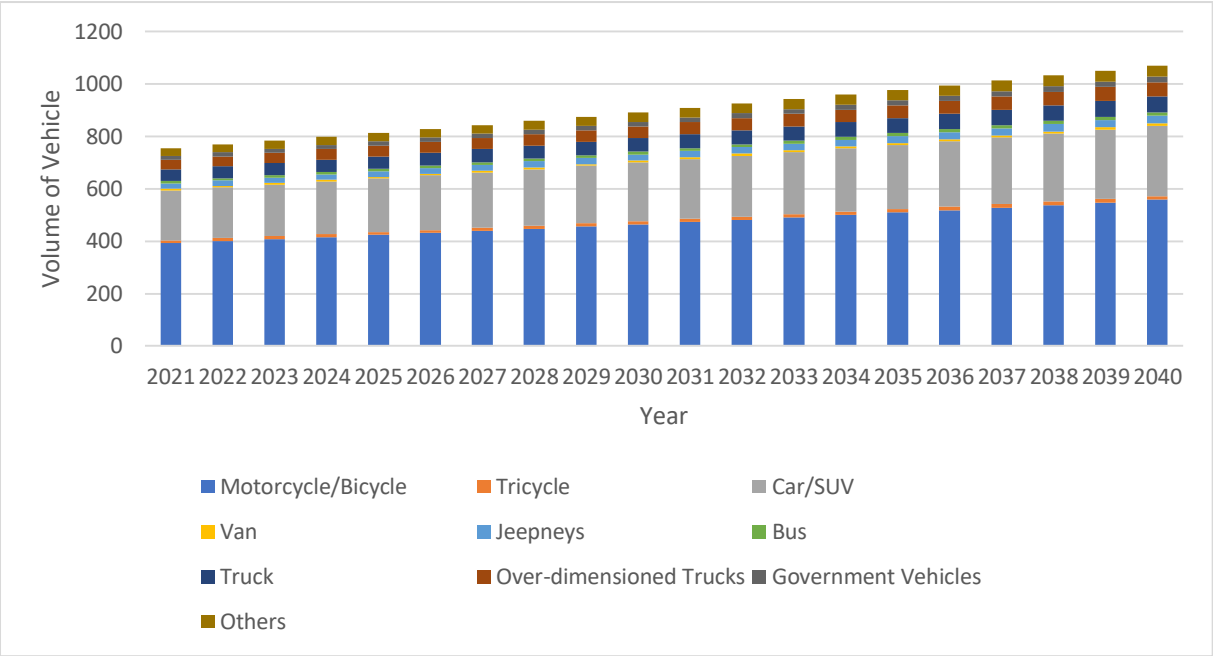
Peak hour traffic volume projection in west bound of Station 3 (without the Project)



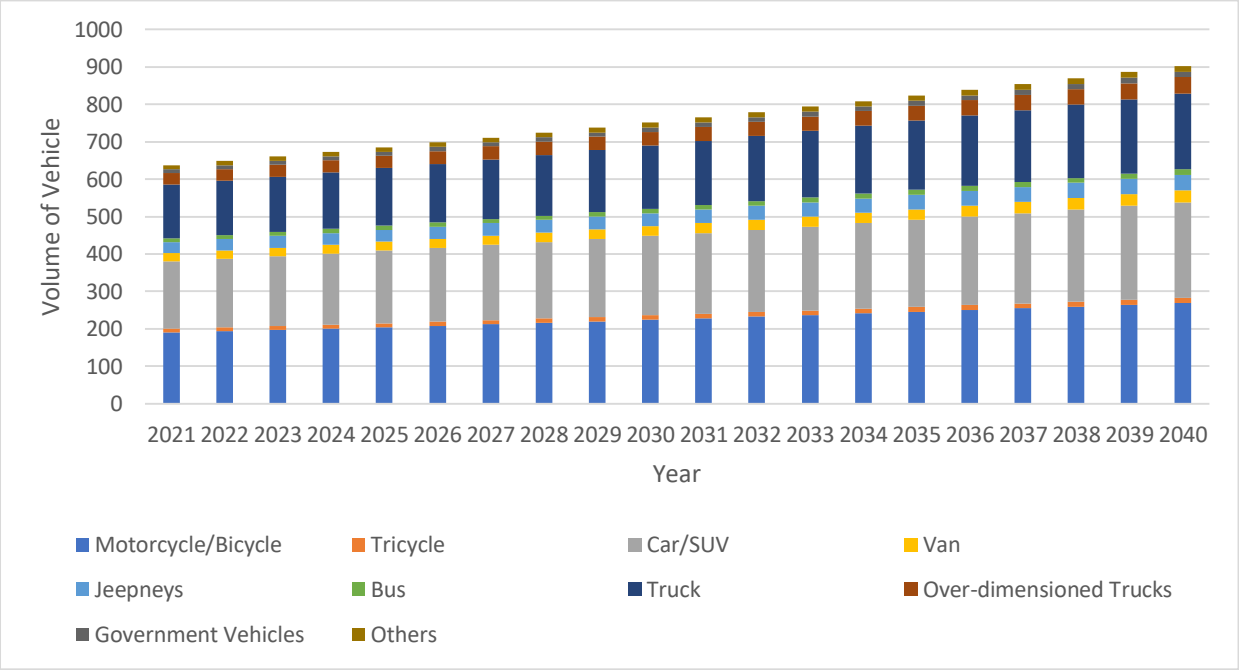
Peak hour traffic volume projection in south bound of Station 3 (without the Project)



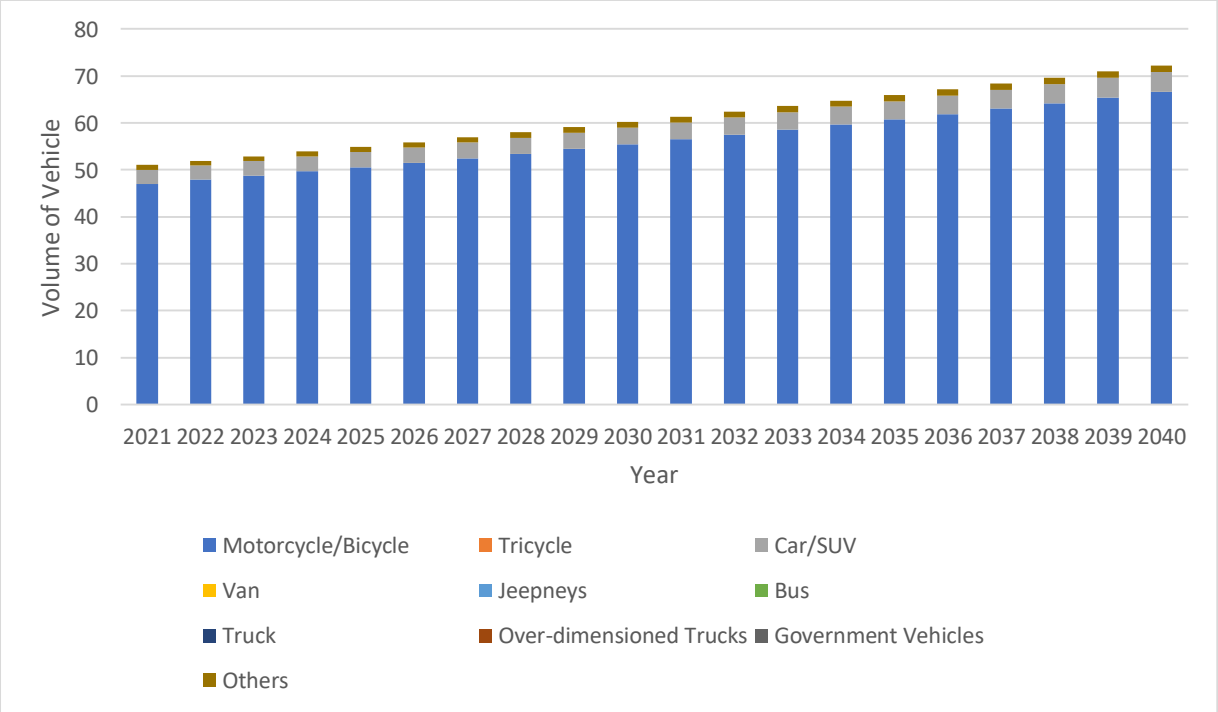
Peak hour traffic volume projection in north bound of Station 4 (without the Project)



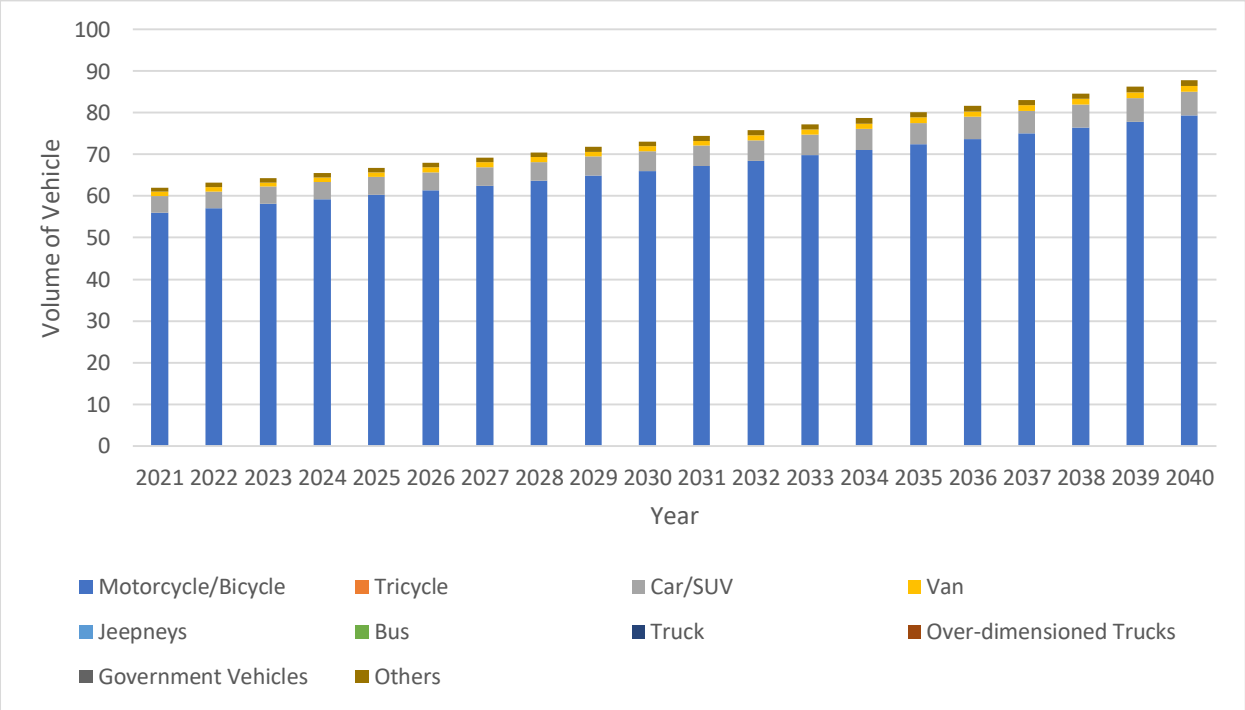
Peak hour traffic volume projection in south bound of Station 4 (without the Project)



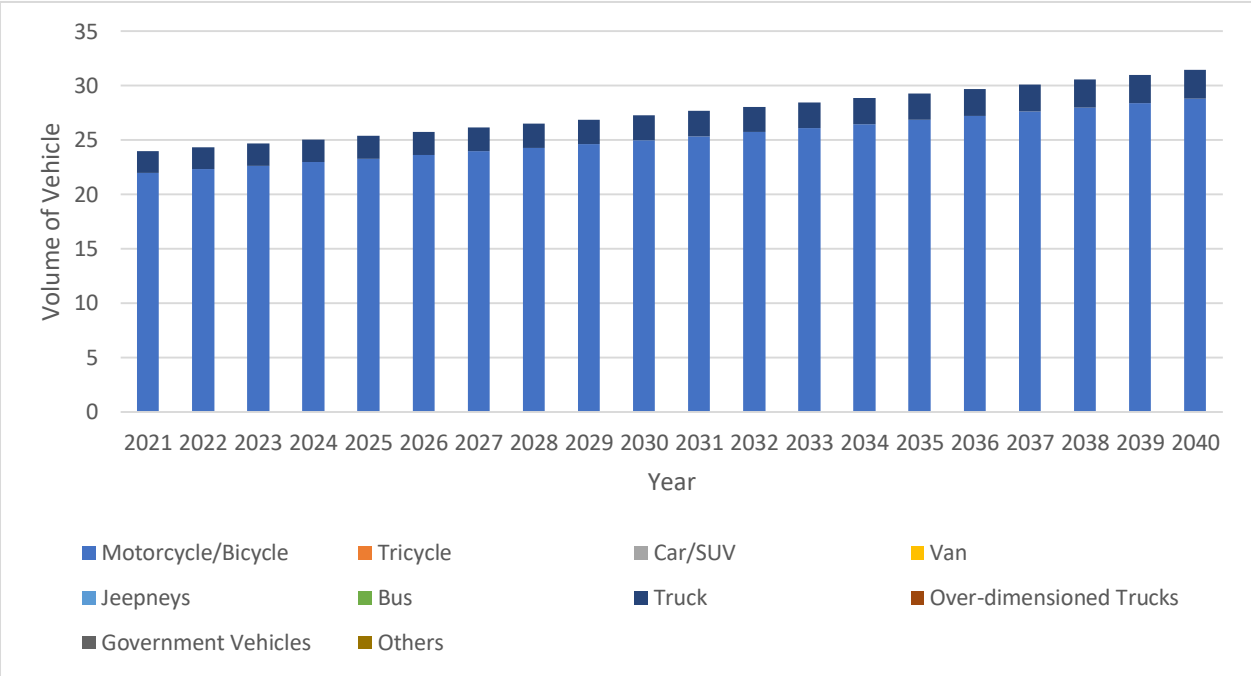
Peak hour traffic volume projection in west bound of Station 4 (without the Project)



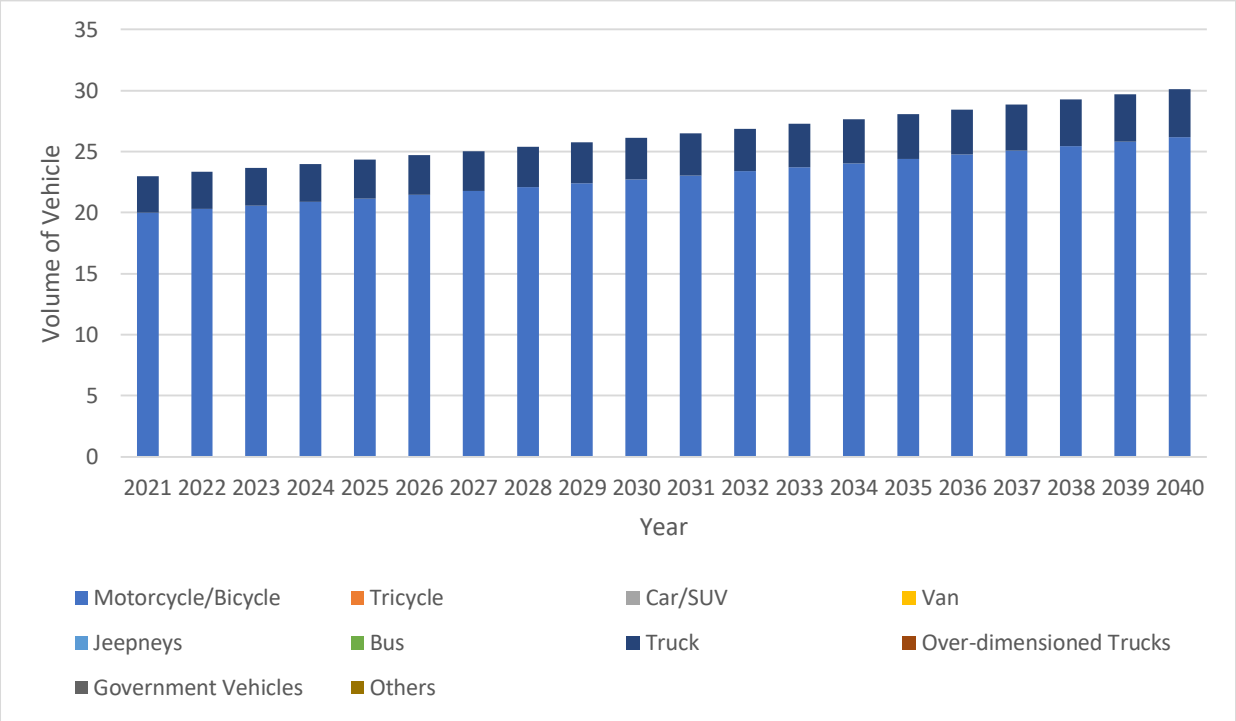
Peak hour traffic volume projection in west bound of Station 4 (without the Project)



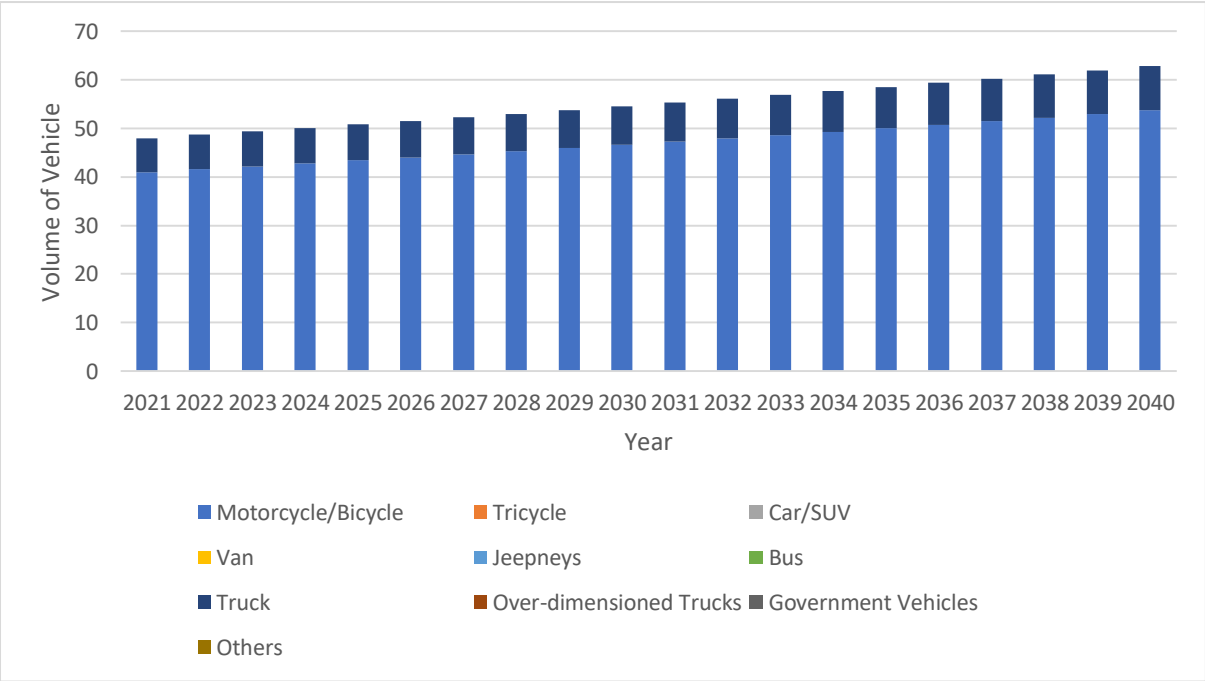
Peak hour traffic volume projection in west bound of Station 5 (without the Project)



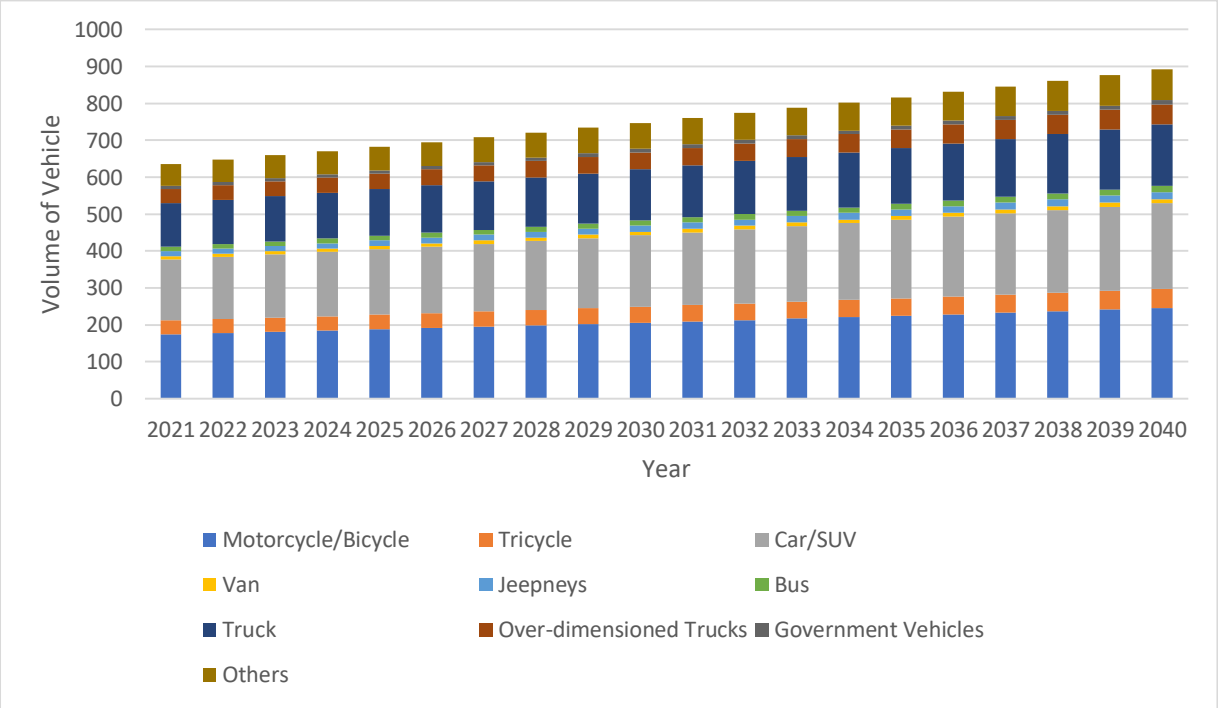
Peak hour traffic volume projection in east bound of Station 5 (without the Project)



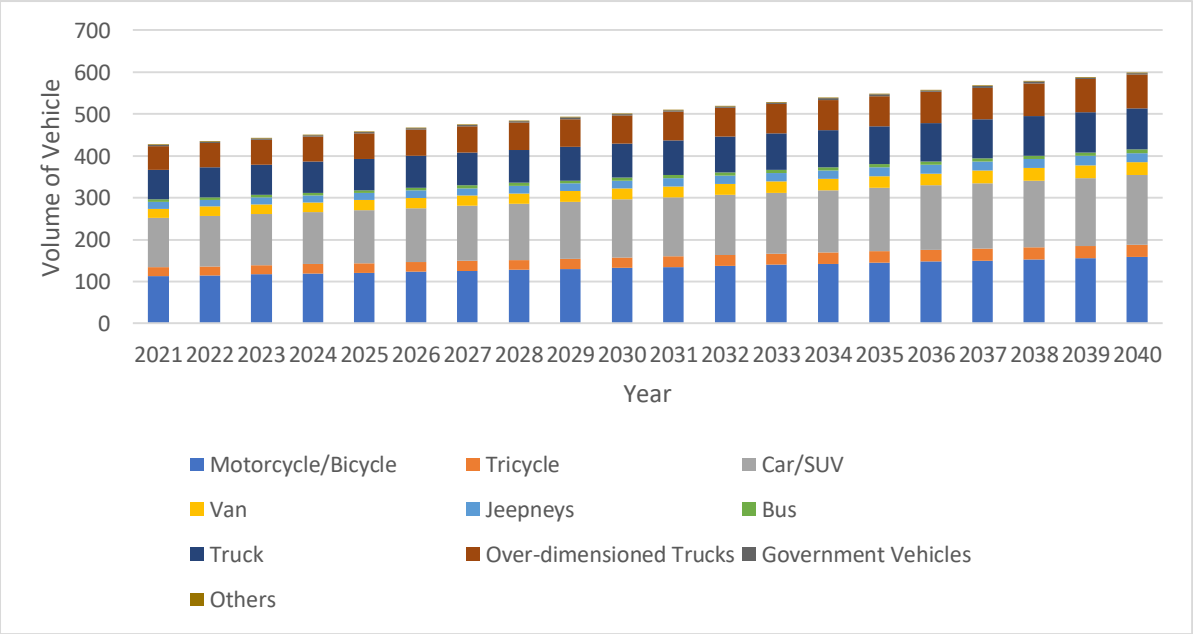
Peak hour traffic volume projection in west bound of Station 5 (without the Project)



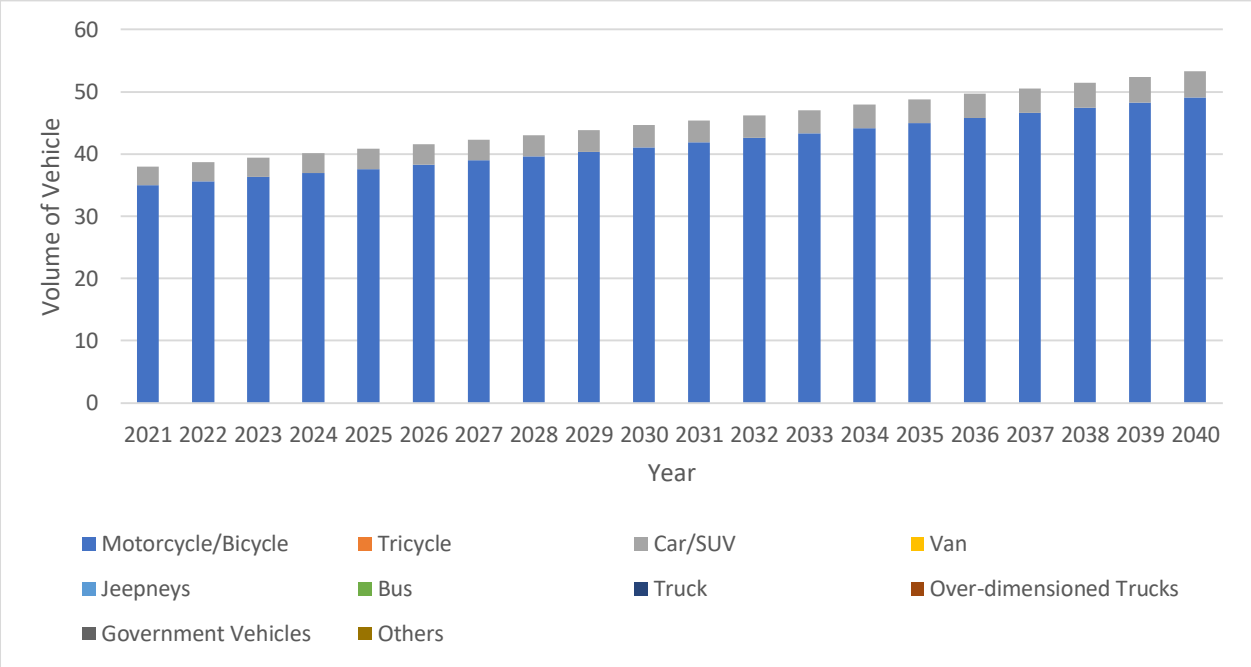
Peak hour traffic volume projection in north bound of Station 6 (without the Project)



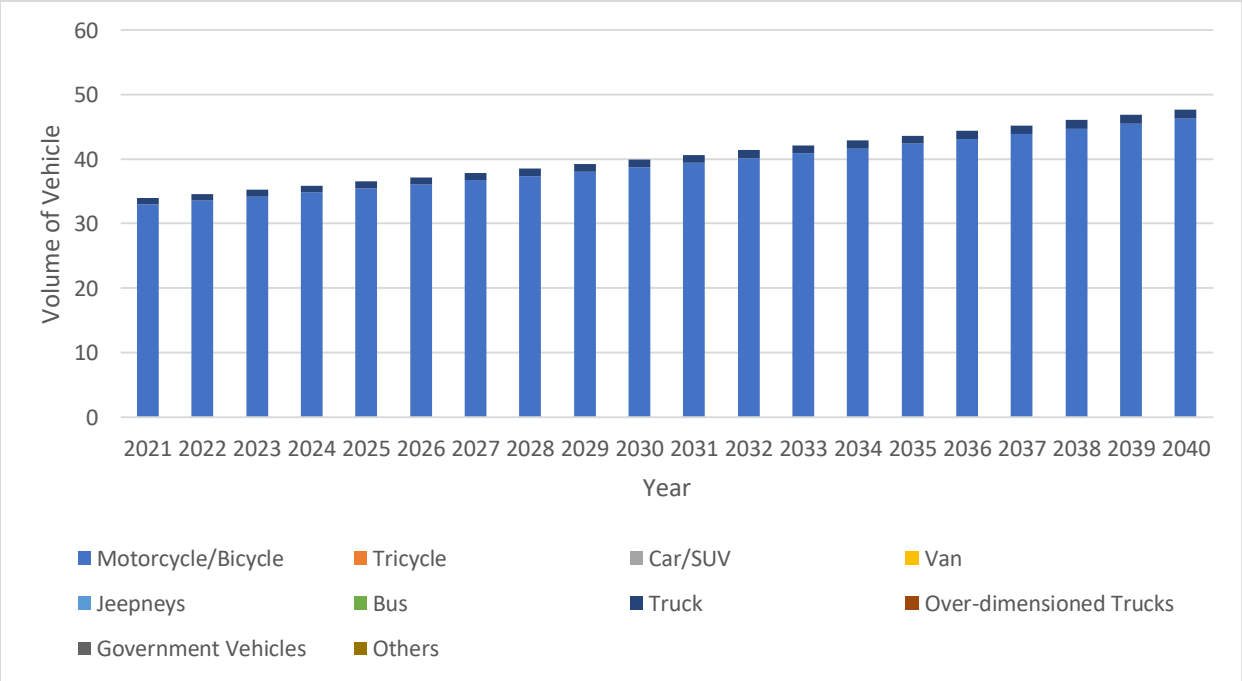
Peak hour traffic volume projection in south bound of Station 6 (without the Project)



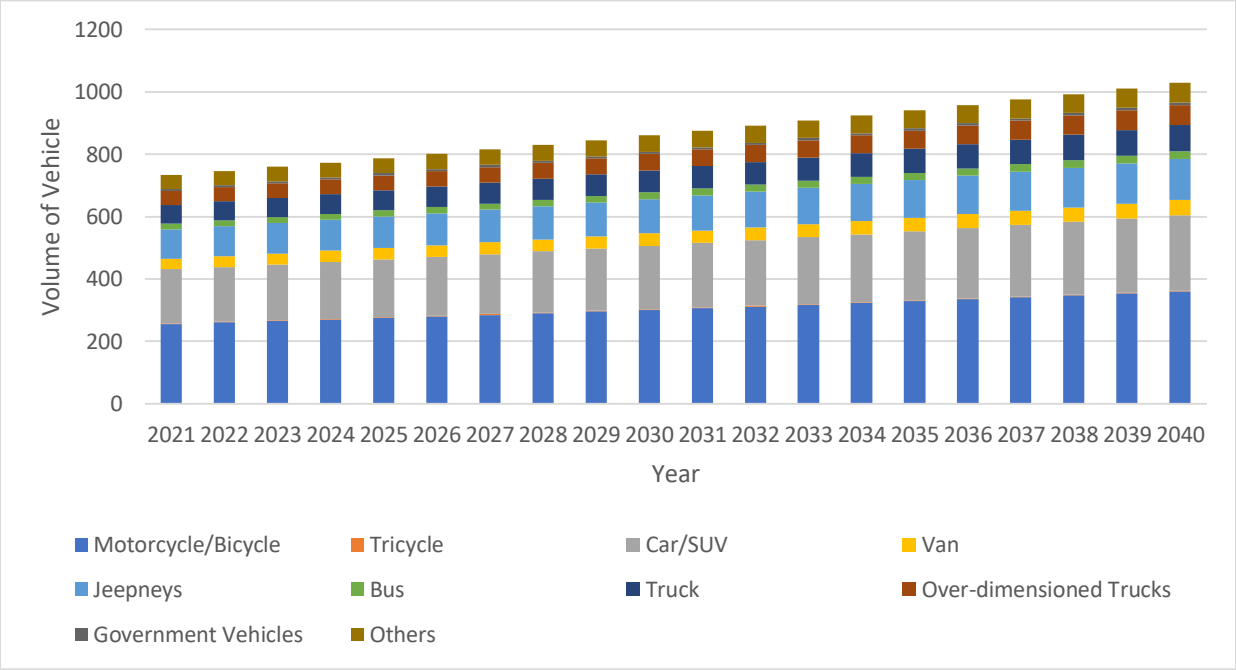
Peak hour traffic volume projection in north bound of Station 7 (without the Project)



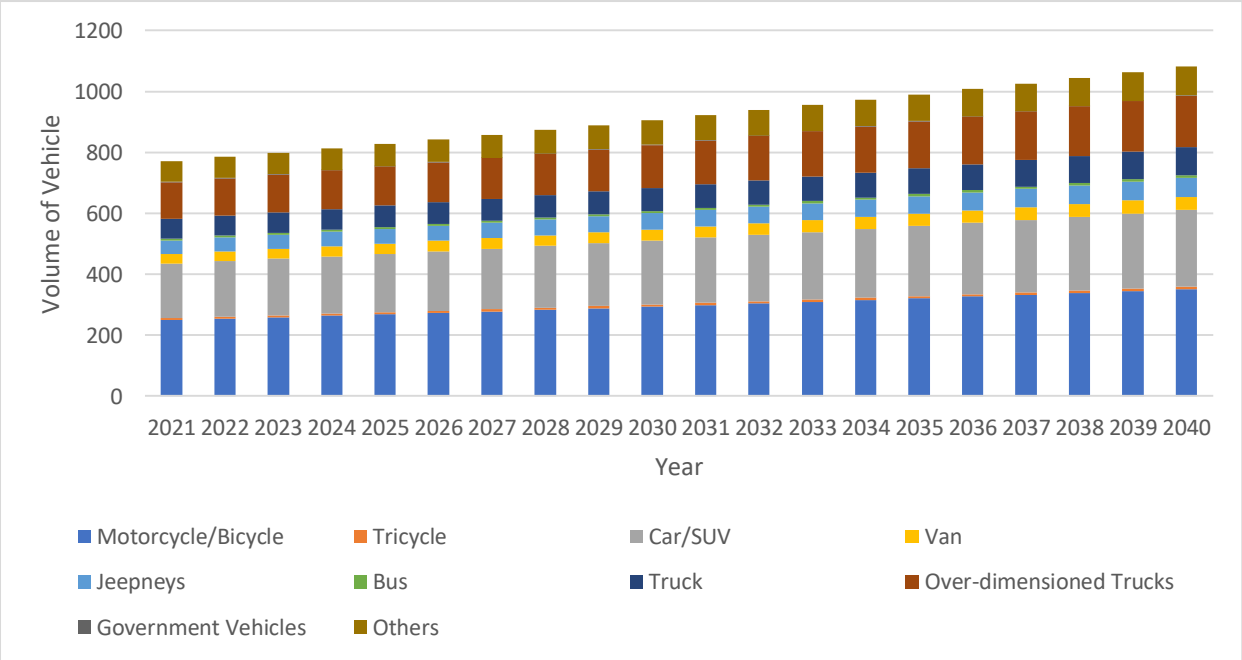
Peak hour traffic volume projection in south bound of Station 7 (without the Project)



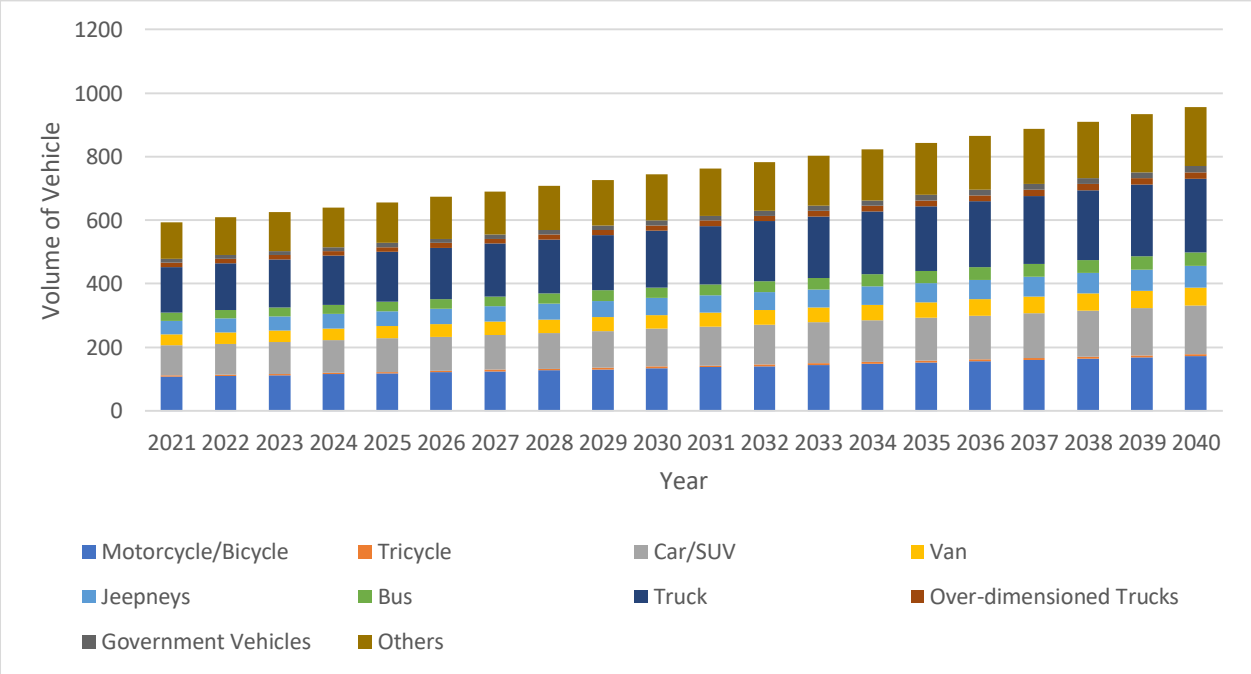
Peak hour traffic volume projection in north bound of Station 8 (without the Project)



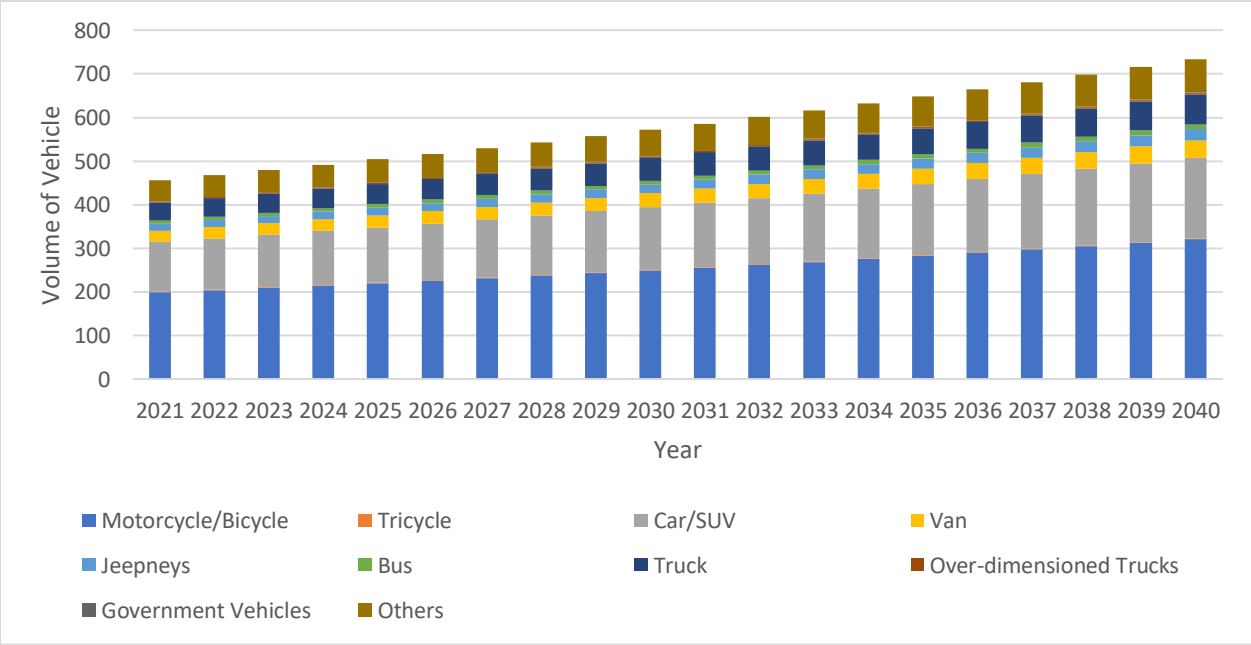
Peak hour traffic volume projection in south bound of Station 8 (without the Project)



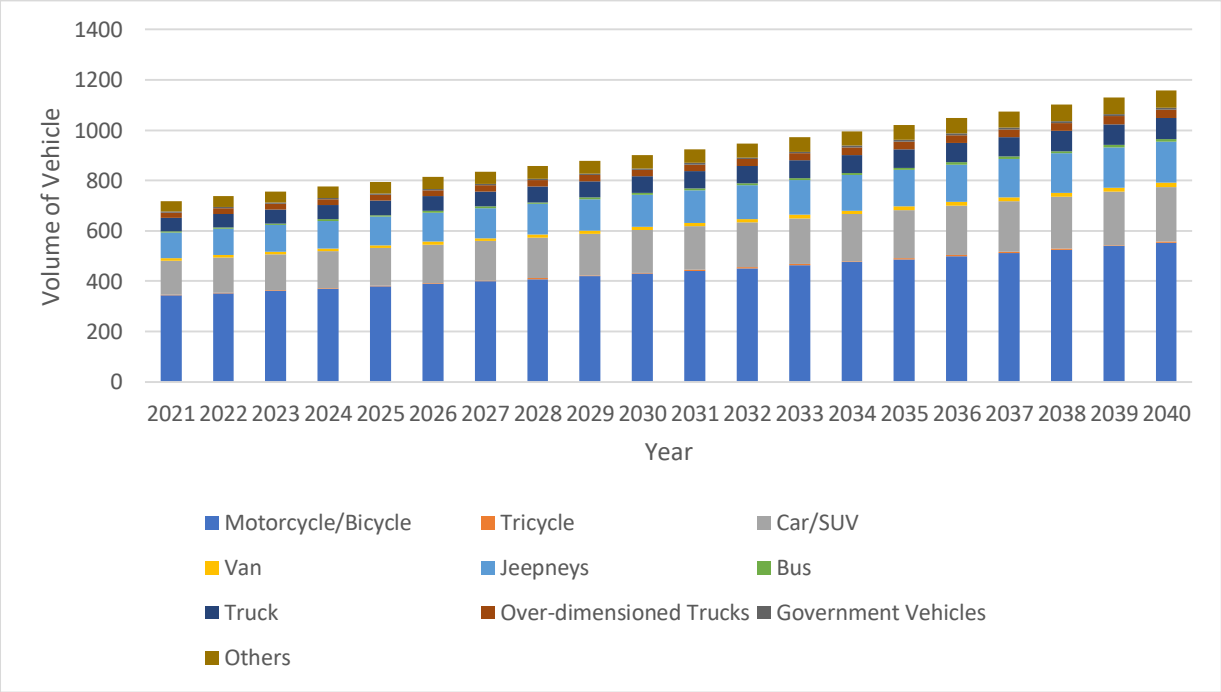
Peak hour traffic volume projection in north bound of Station 9 (without the Project)



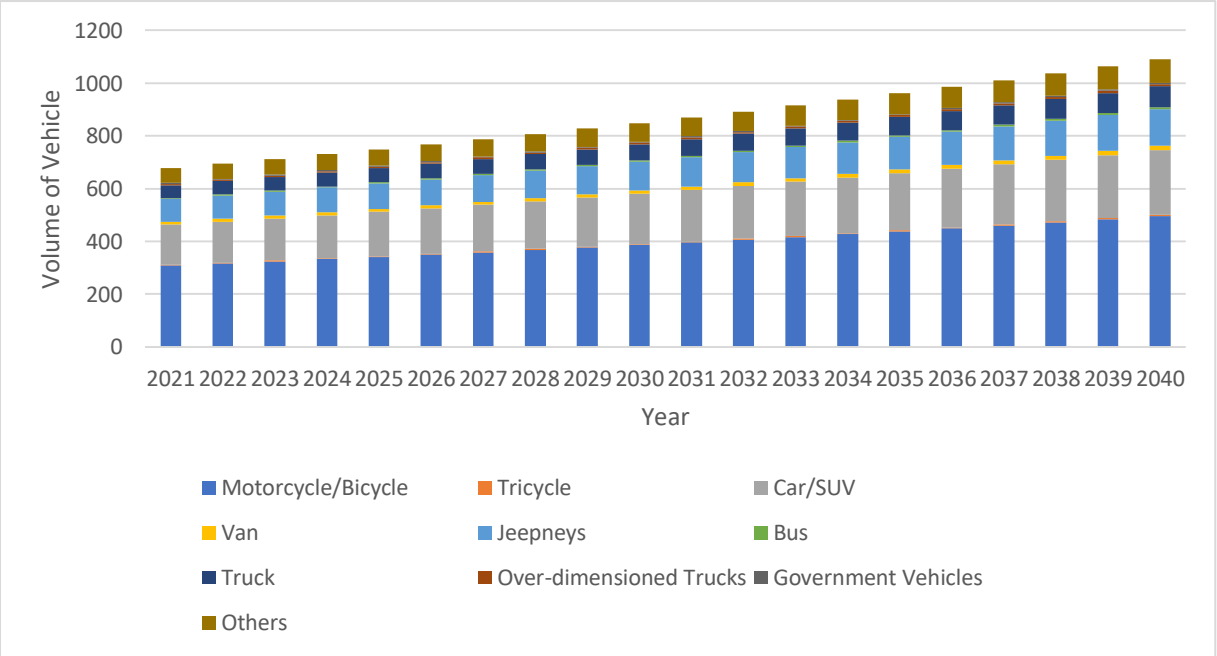
Peak hour traffic volume projection in south bound of Station 9 (without the Project)



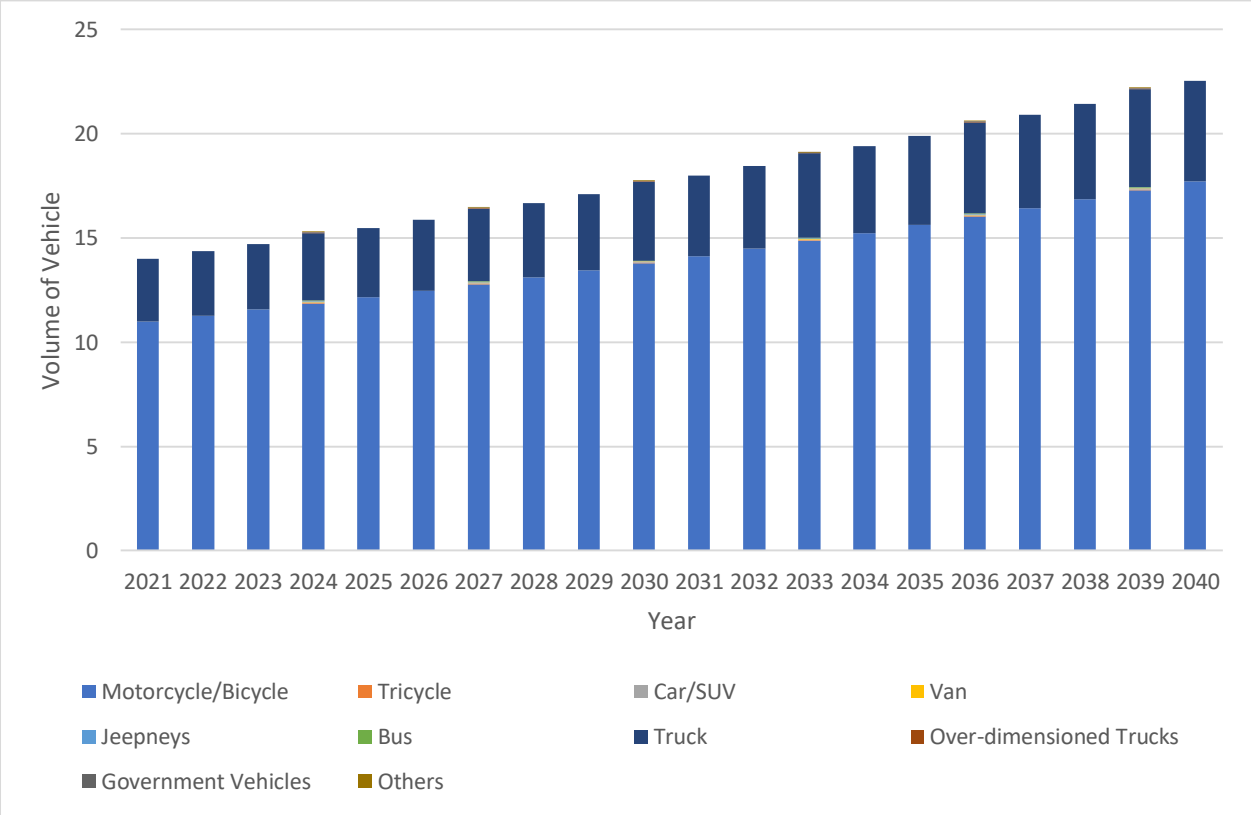
Peak hour traffic volume projection in north bound of Station 10 (without the Project)



Peak hour traffic volume projection in south bound of Station 10 (without the Project)

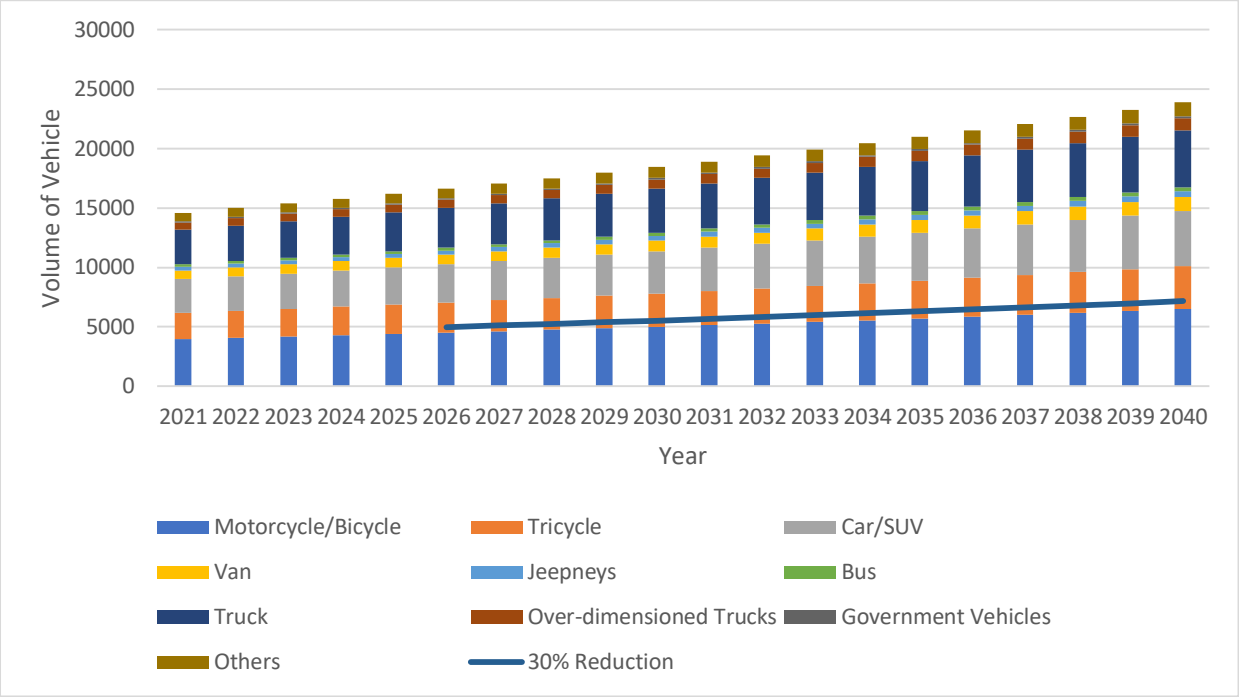


Peak hour traffic volume projection in west bound of Station 10 (without the Project)

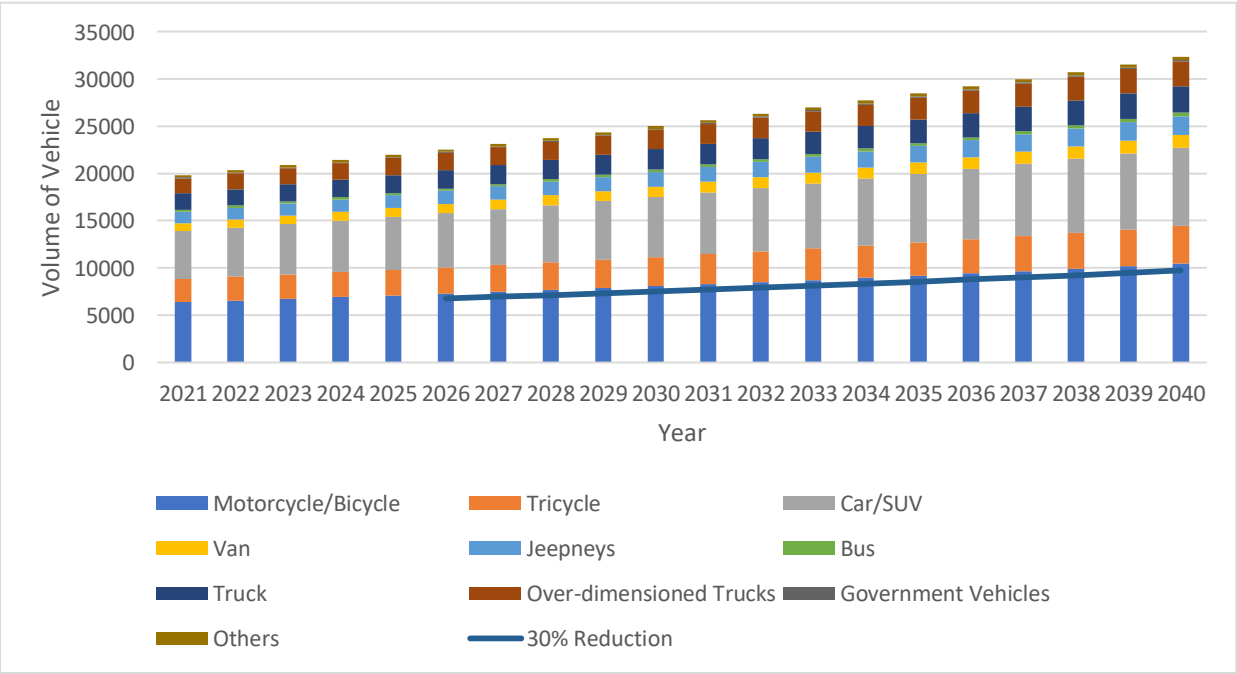


Future Traffic with Development (Central Mindanao High Standard Highway)

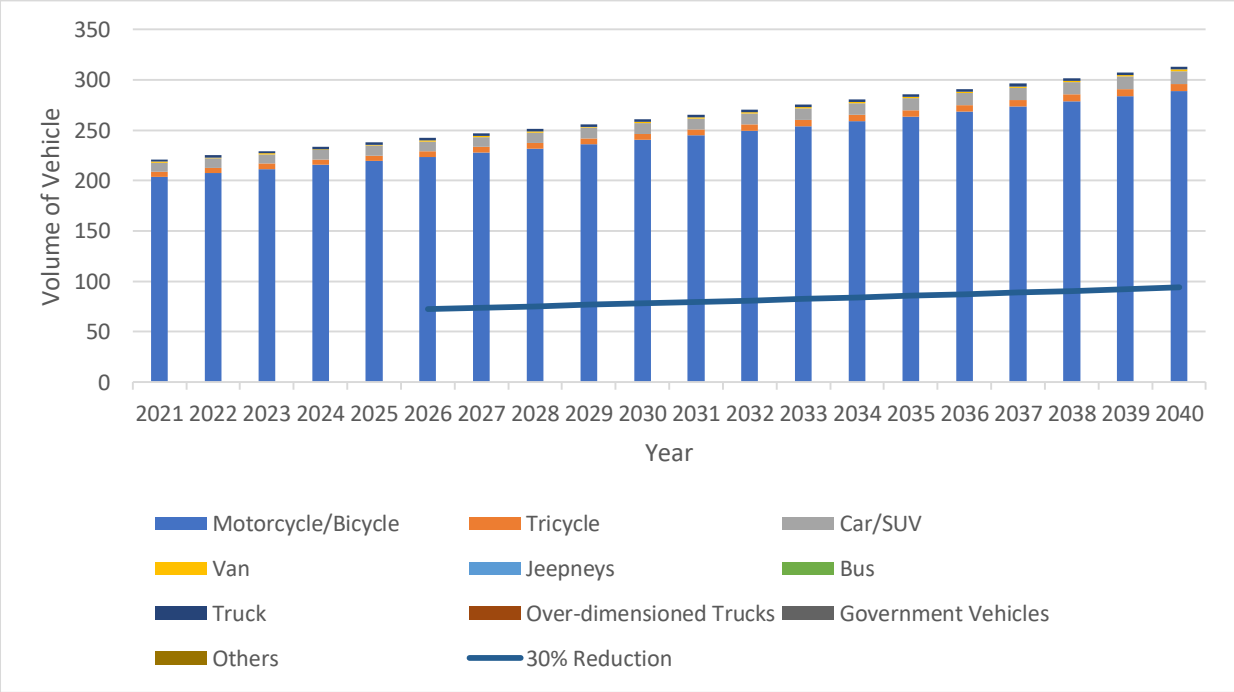
Peak hour traffic volume projection in east bound of Station 1 (with the Project)



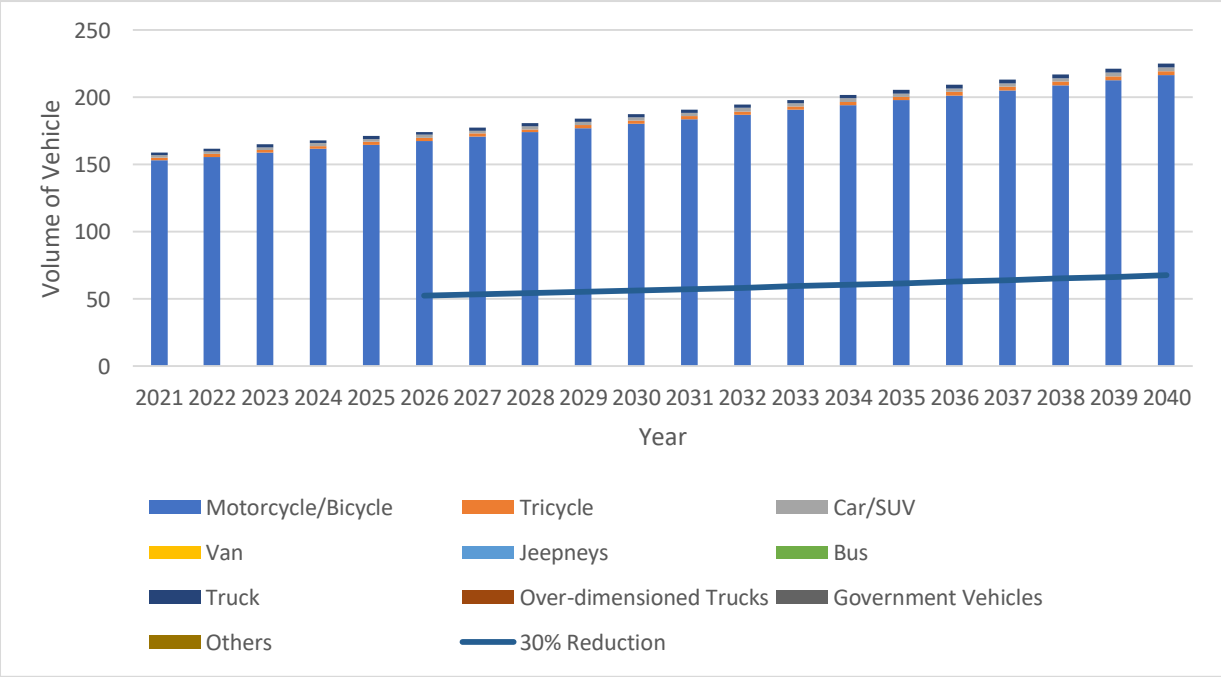
Peak hour traffic volume projection in east bound of Station 1 (with the Project)



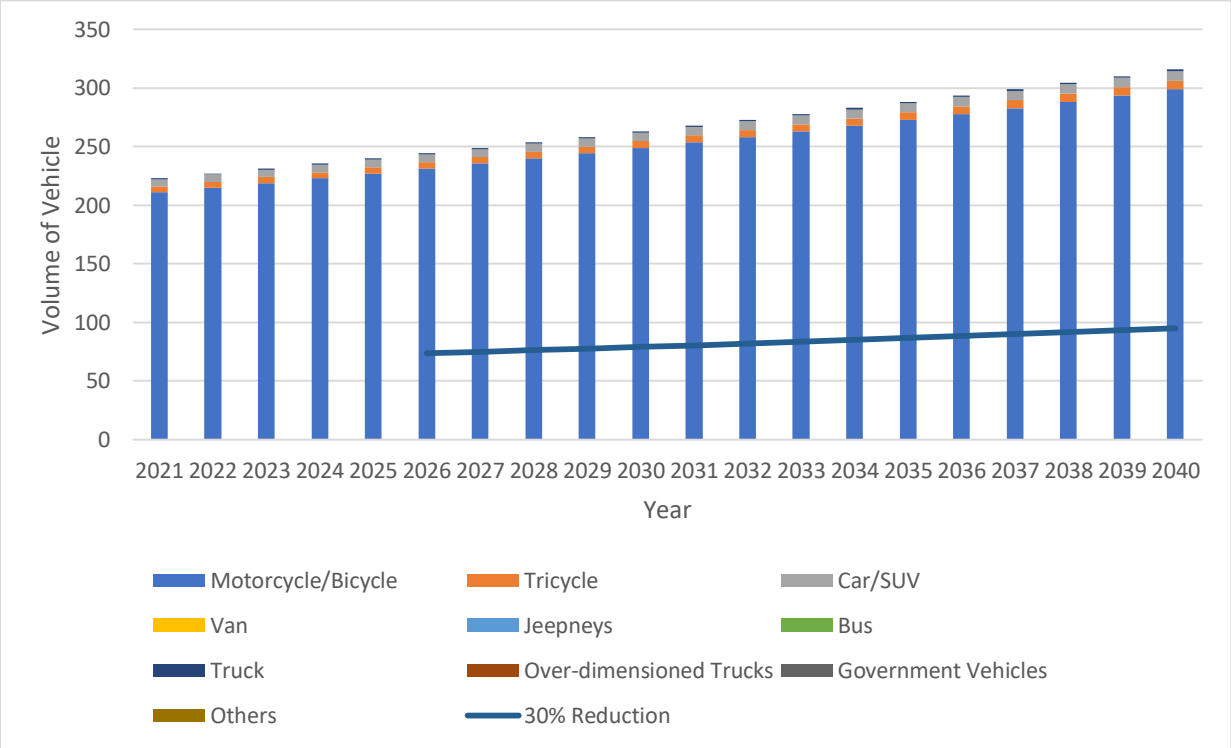
Peak hour traffic volume projection in north bound of Station 2 (with the Project)



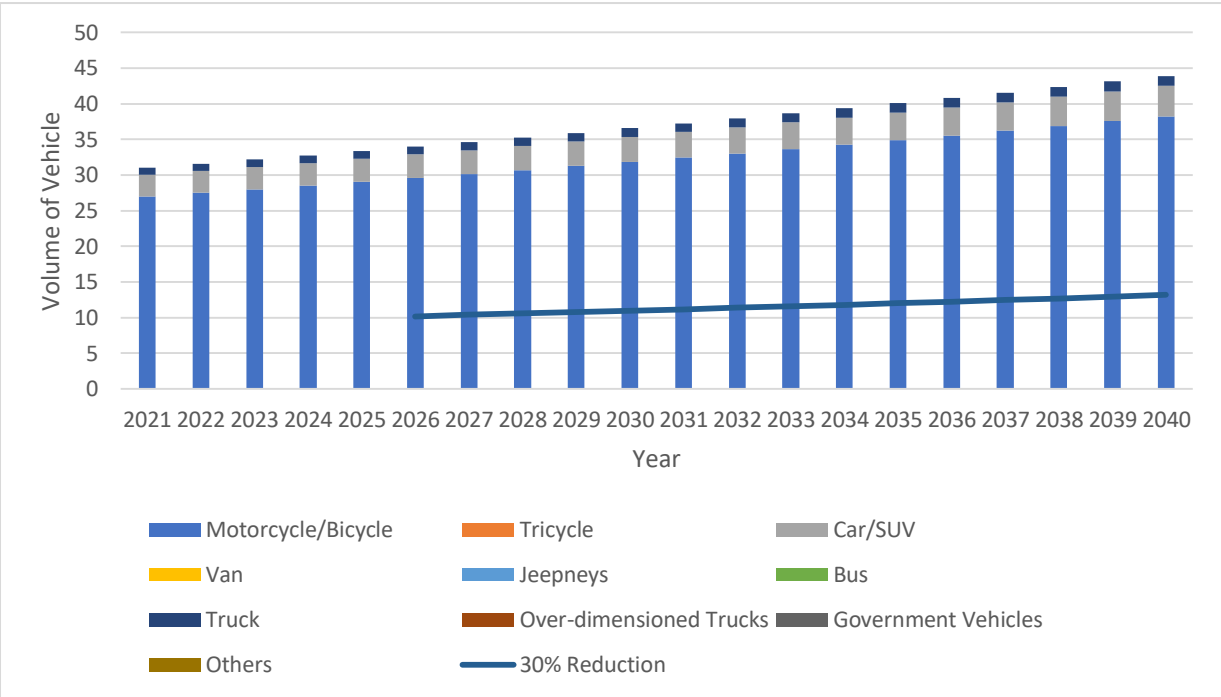
Peak hour traffic volume projection in south bound of Station 2 (with the Project)



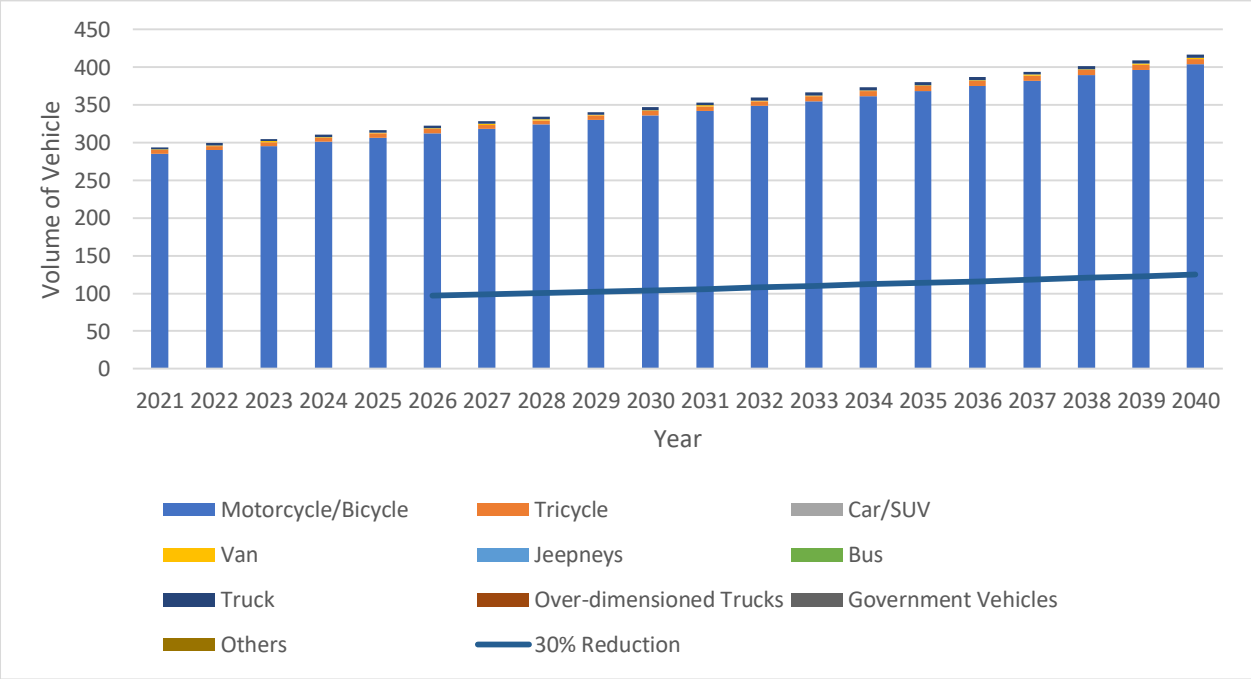
Peak hour traffic volume projection in east bound of Station 2 (with the Project)



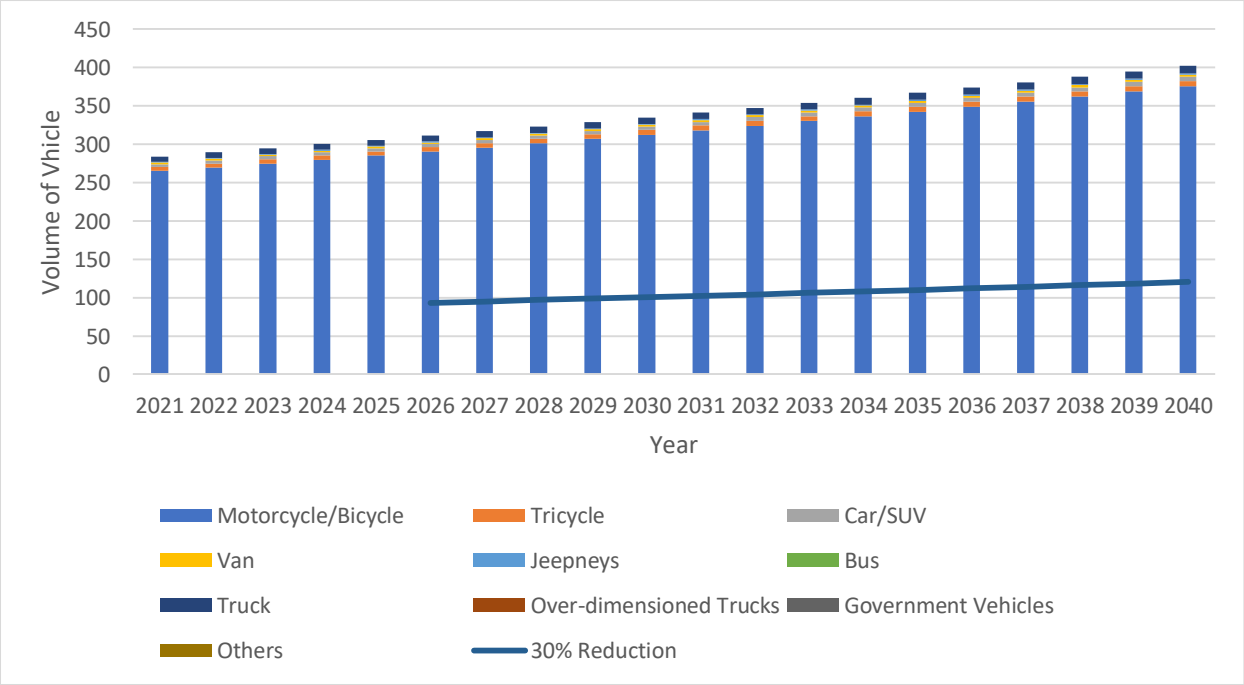
Peak hour traffic volume projection in west bound of Station 2 (with the Project)



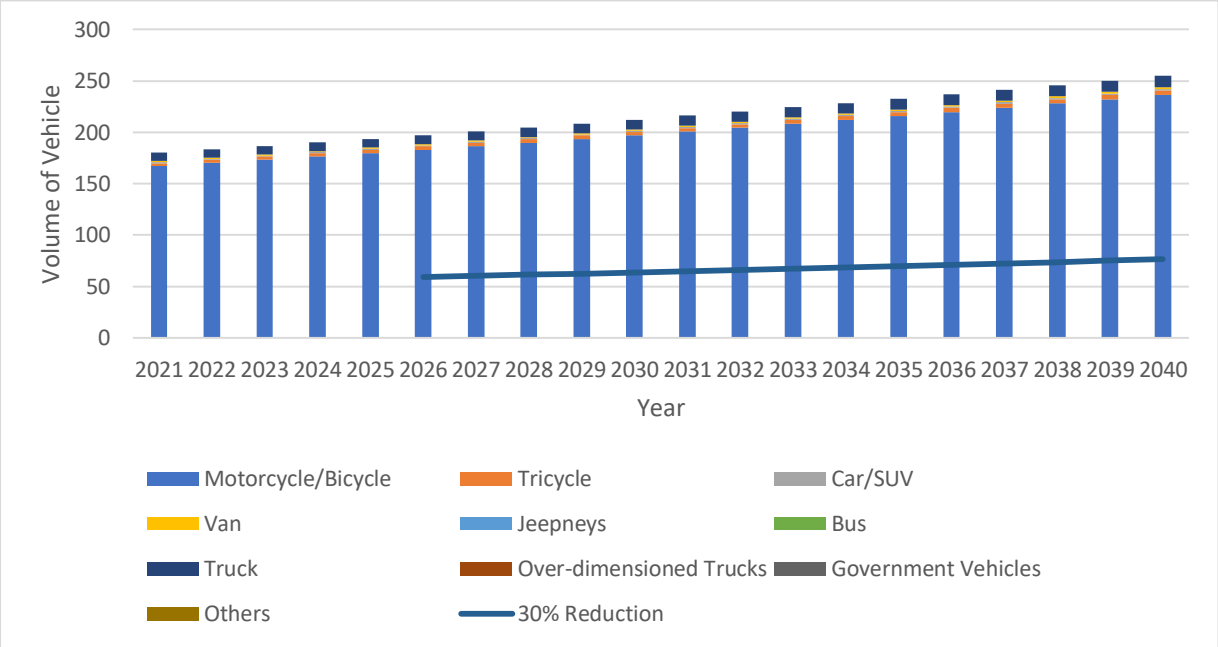
Peak hour traffic volume projection in north bound of Station 3 (with the Project)



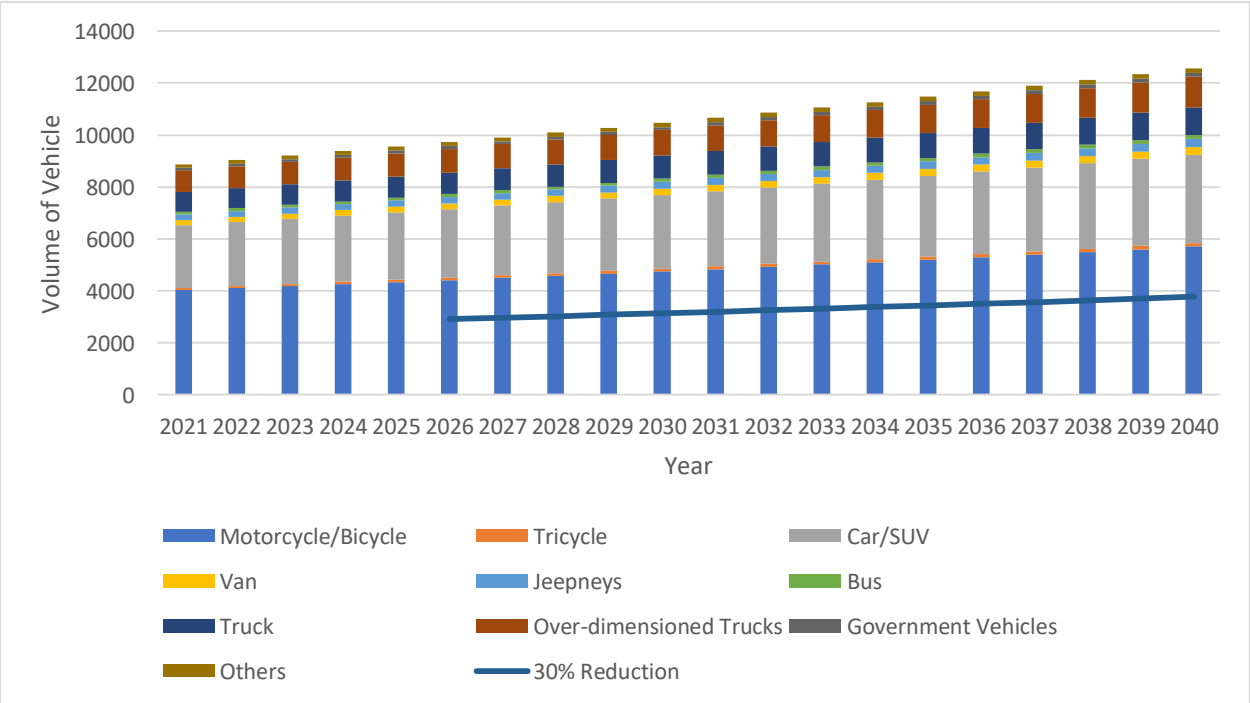
Peak hour traffic volume projection in south bound of Station 3 (with the Project)



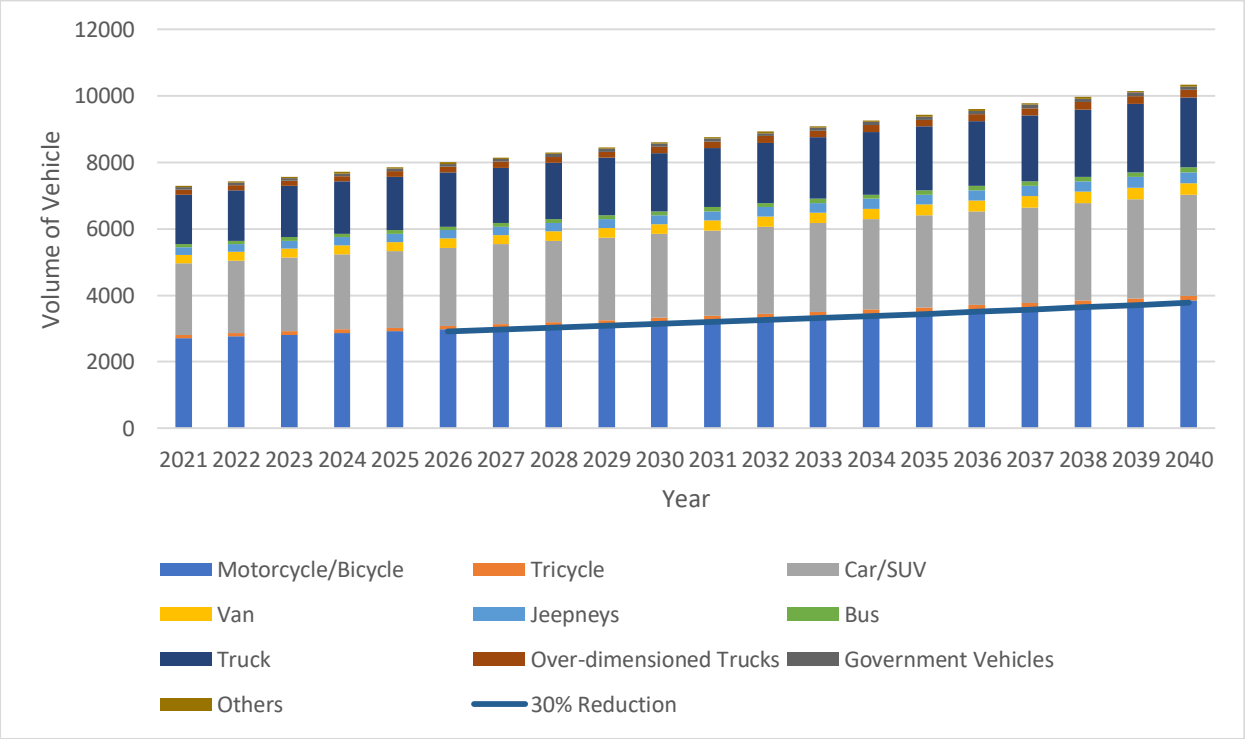
Peak hour traffic volume projection in east bound of Station 3 (with the Project)



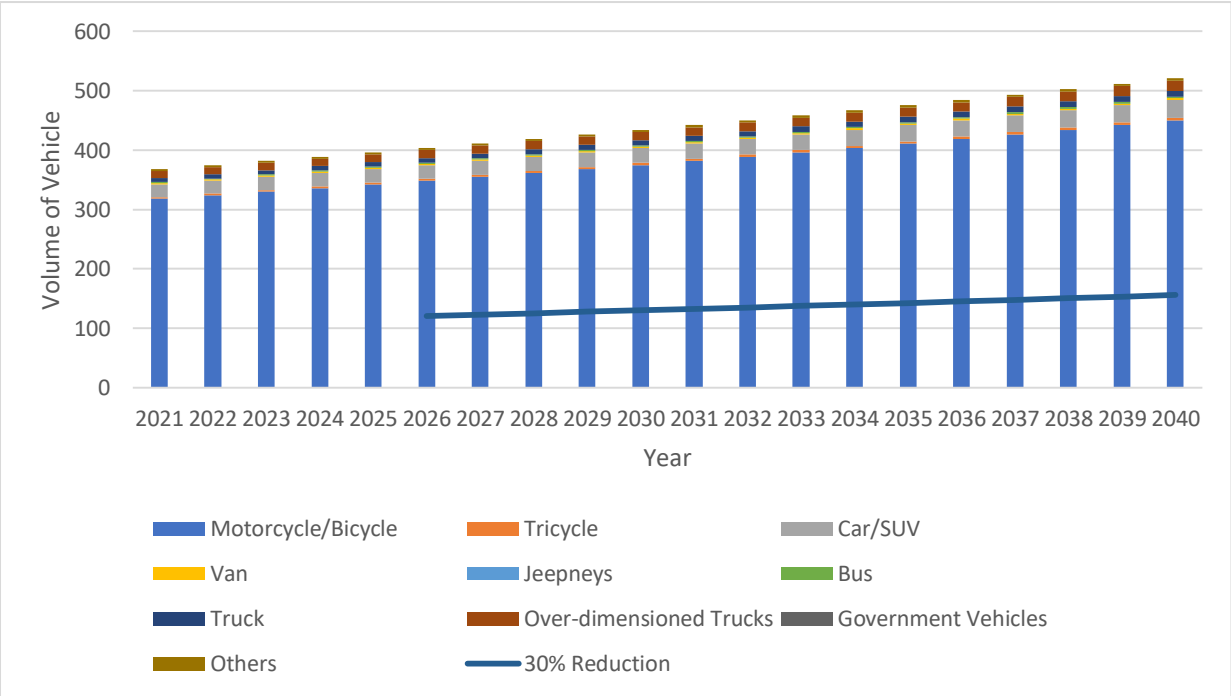
Peak hour traffic volume projection in north bound of Station 4 (with the Project)



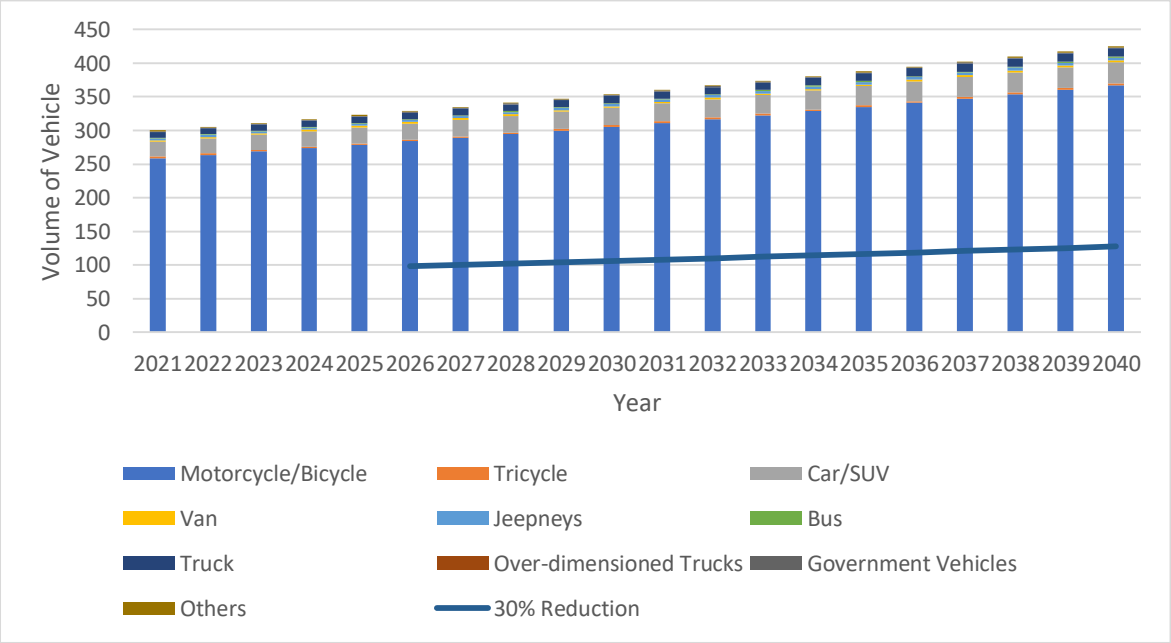
Peak hour traffic volume projection in south bound of Station 4 (with the Project)



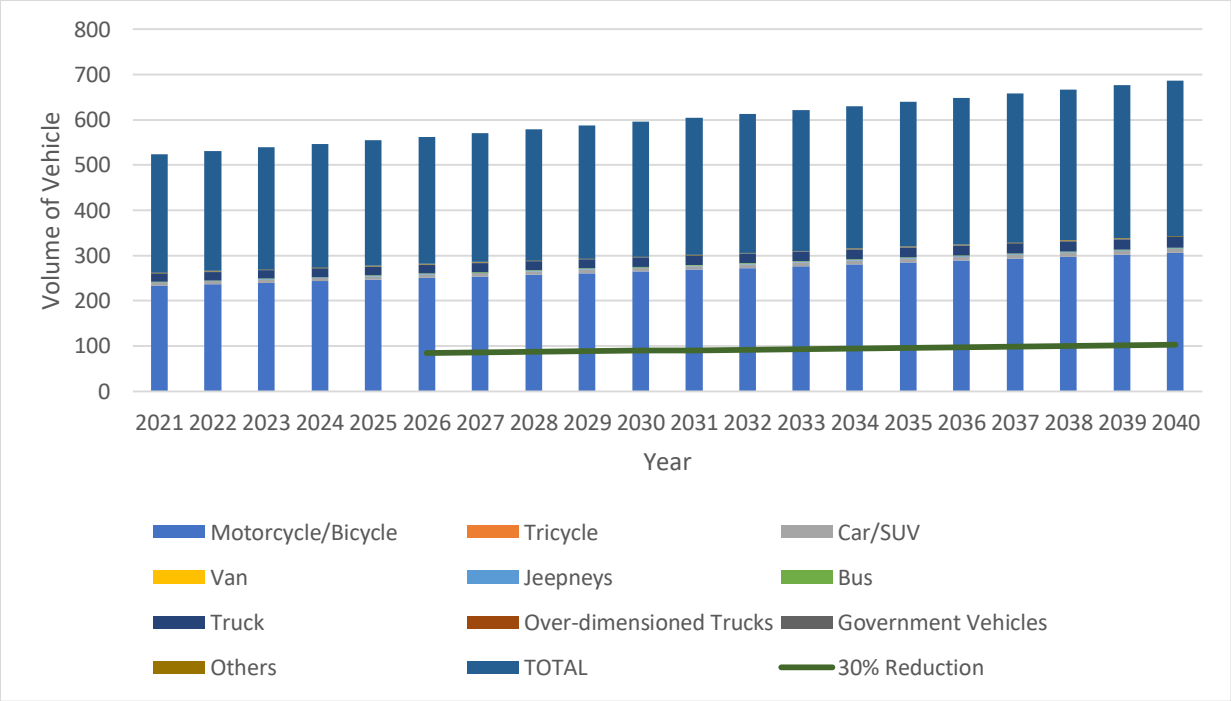
Peak hour traffic volume projection in east bound of Station 4 (with the Project)



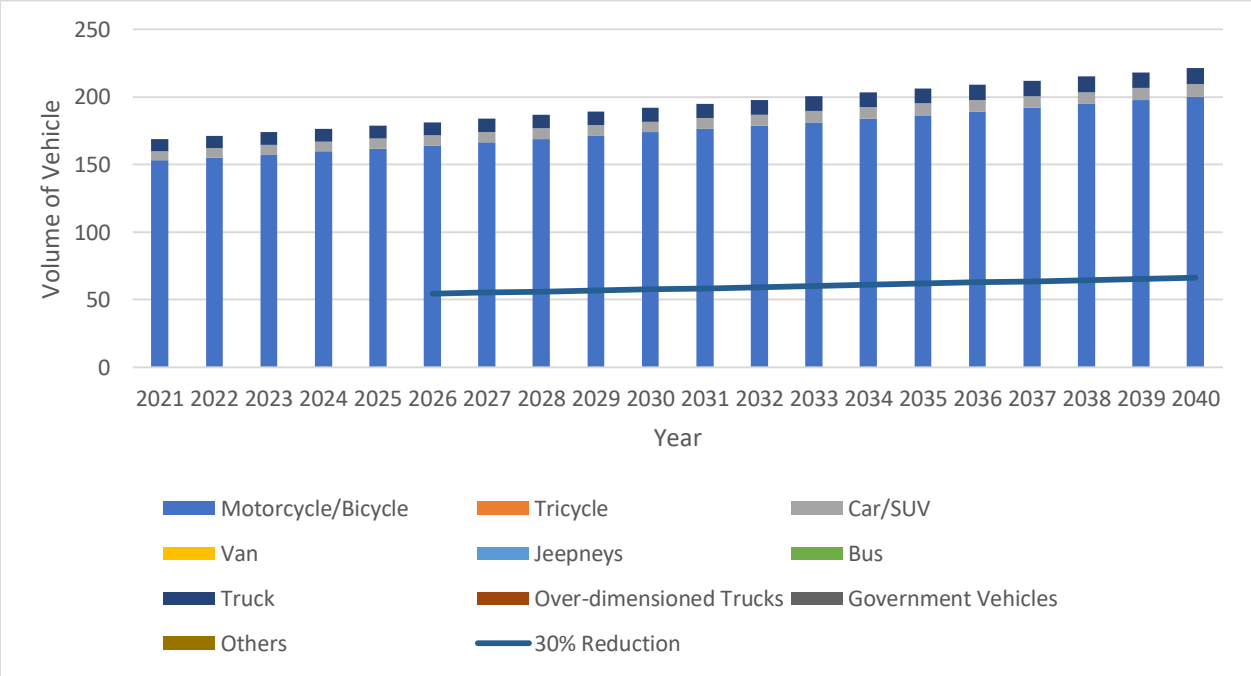
Peak hour traffic volume projection in west bound of Station 4 (with the Project)



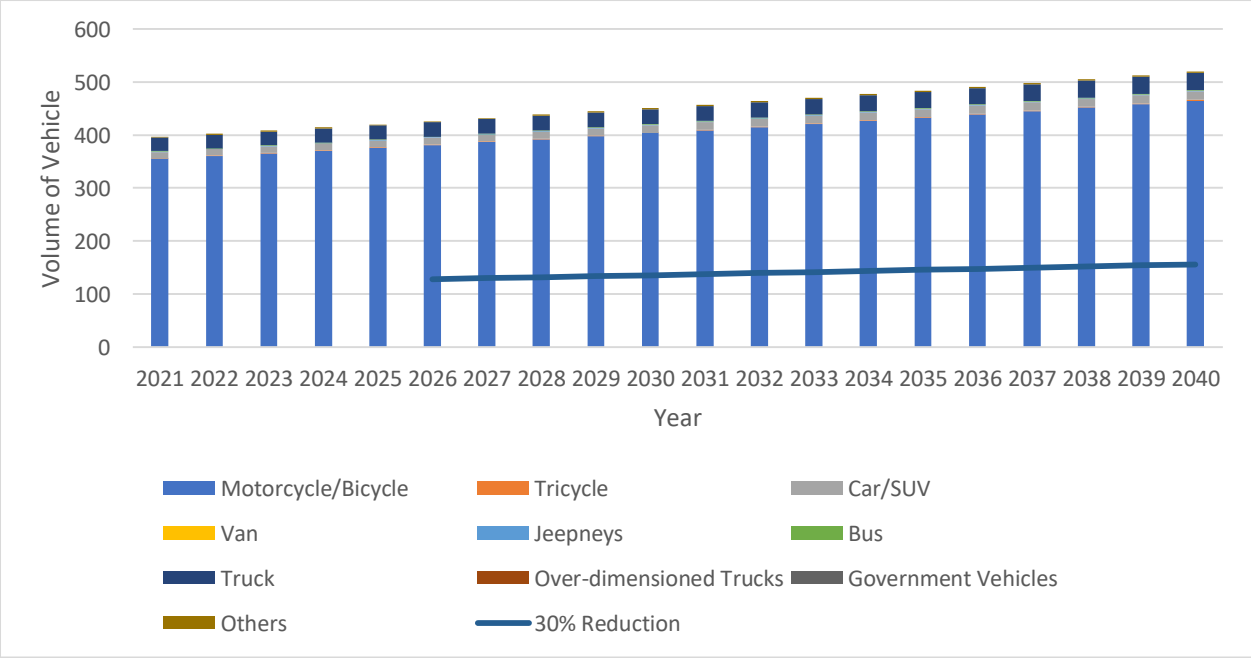
Peak hour traffic volume projection in north bound of Station 5 (with the Project)



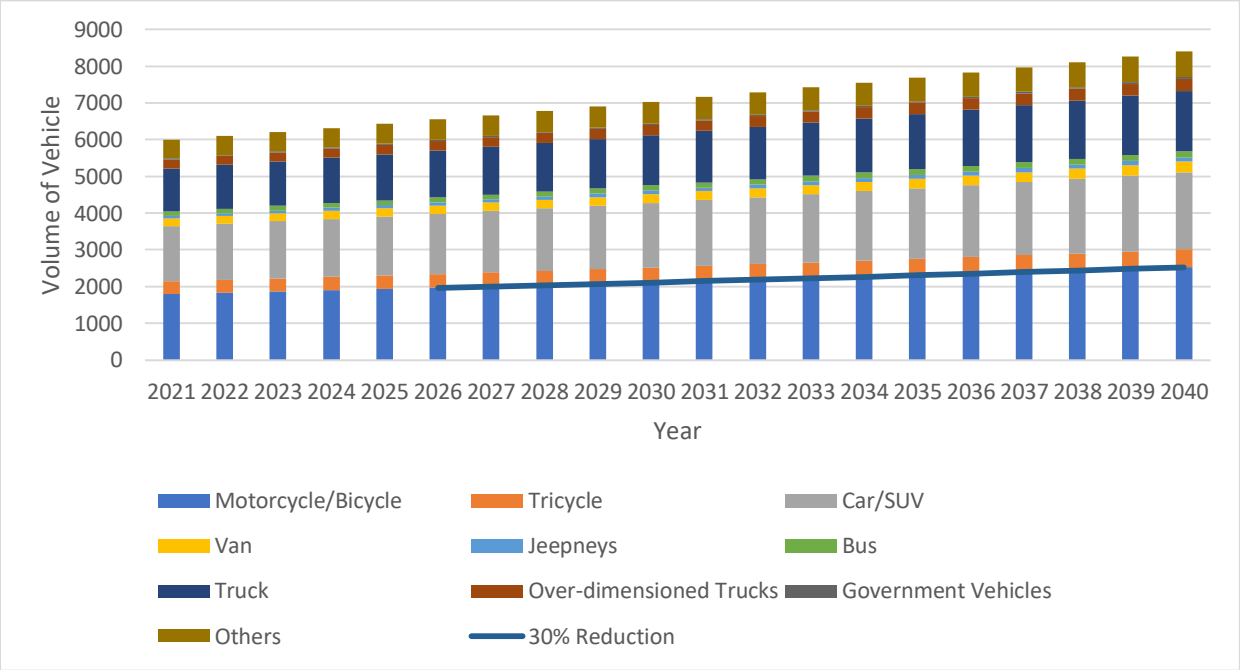
Peak hour traffic volume projection in east bound of Station 5 (with the Project)



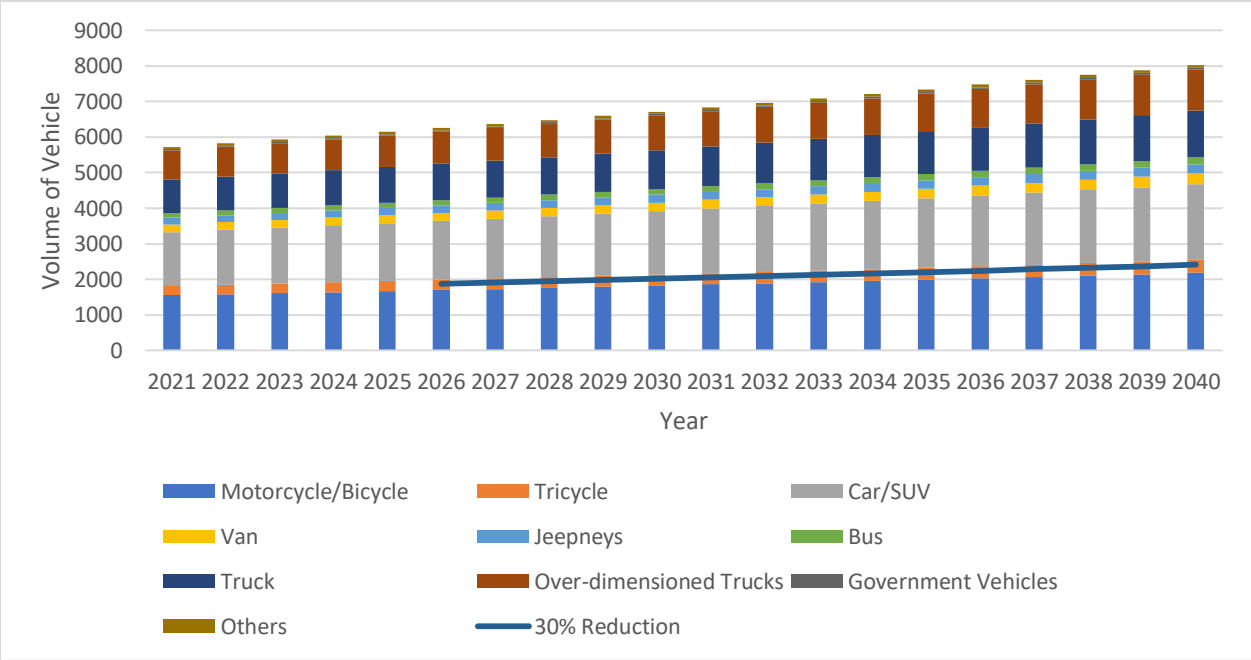
Peak hour traffic volume projection in west bound of Station 5 (with the Project)



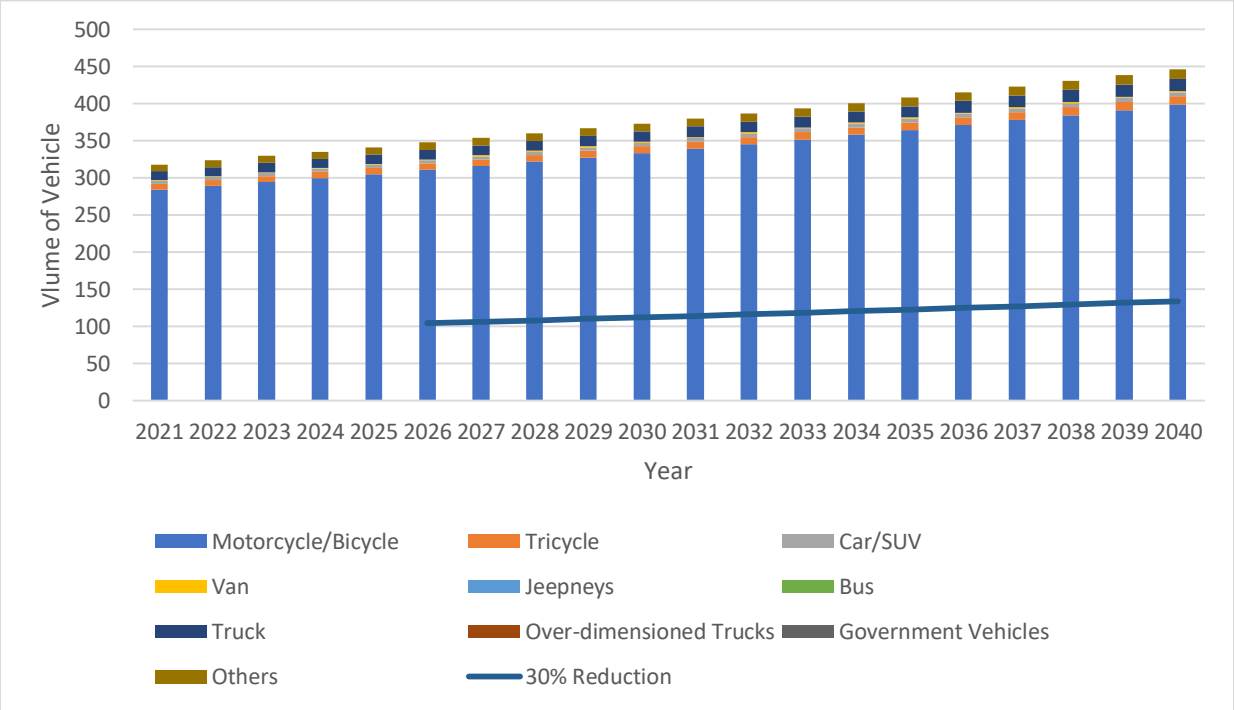
Peak hour traffic volume projection in nortg bound of Station 6 (with the Project)



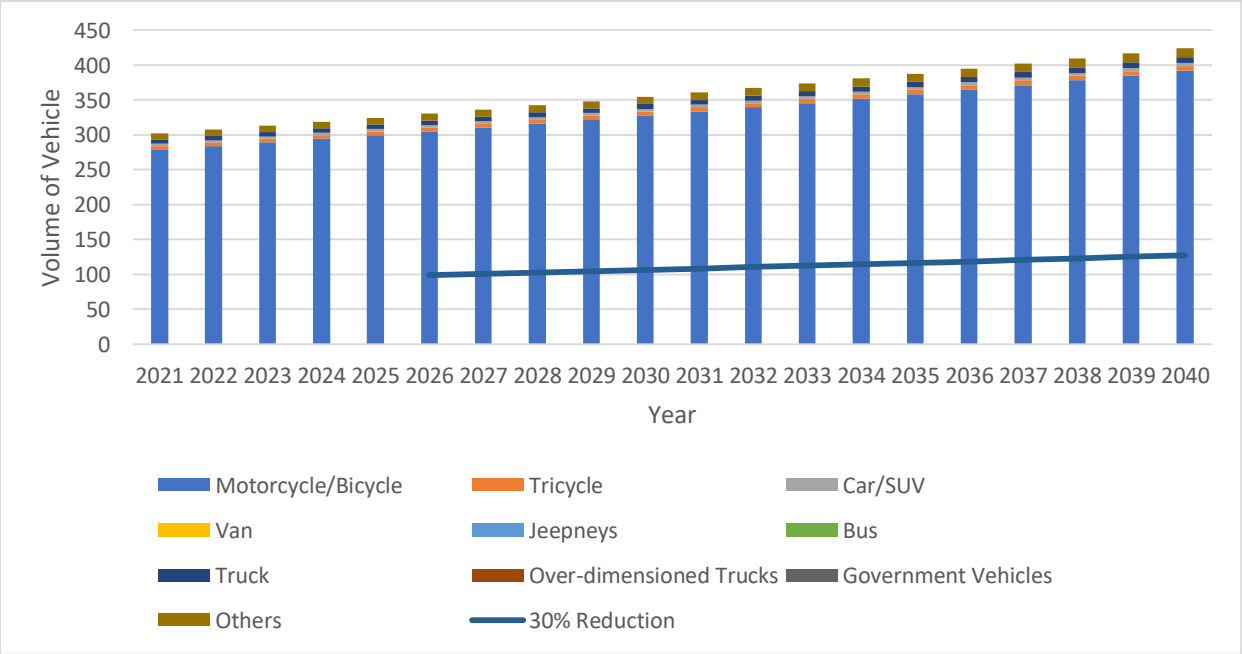
Peak hour traffic volume projection in south bound of Station 6 (with the Project)



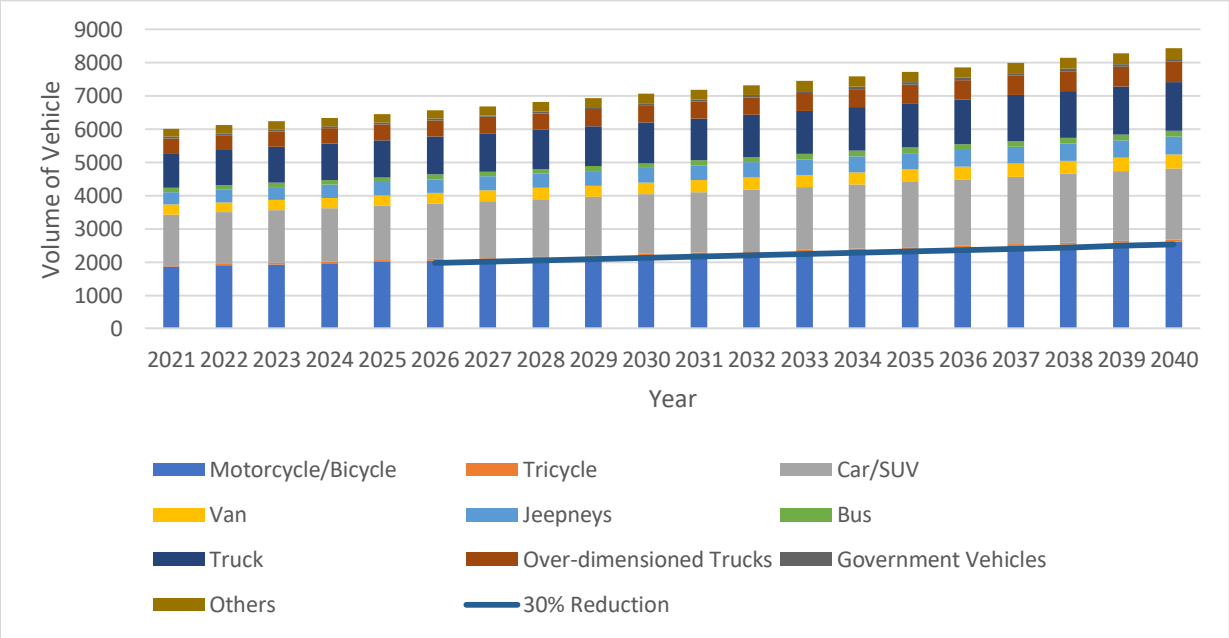
Peak hour traffic volume projection in north bound of Station 7 (with the Project)



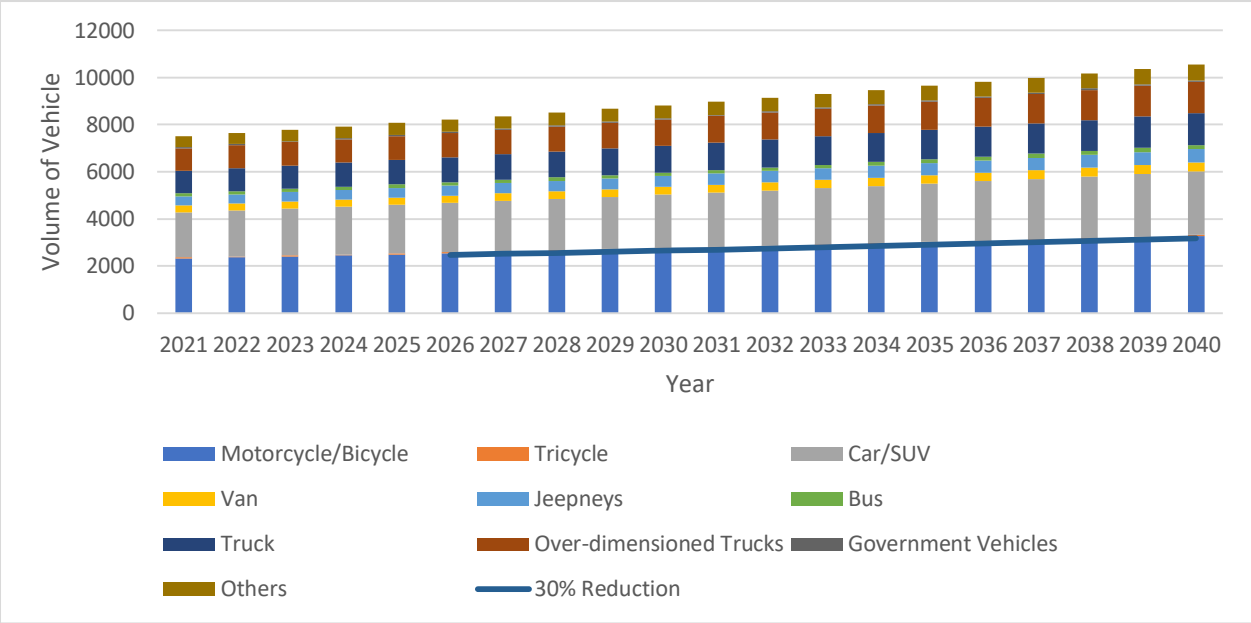
Peak hour traffic volume projection in south bound of Station 7 (with the Project)



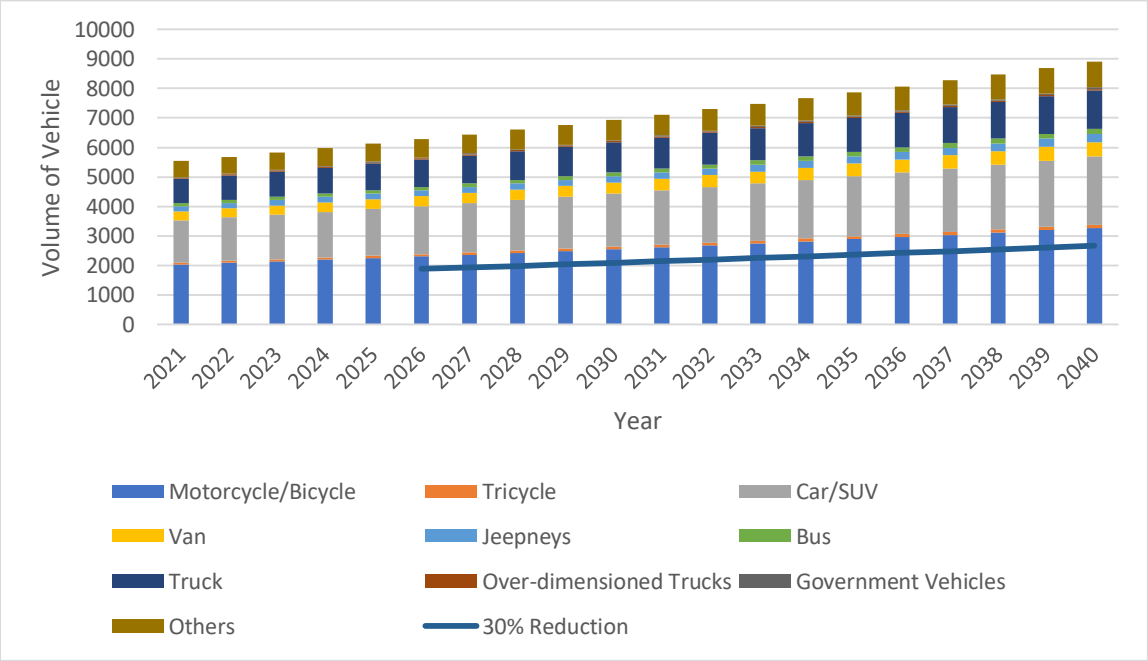
Peak hour traffic volume projection in north bound of Station 8 (with the Project)



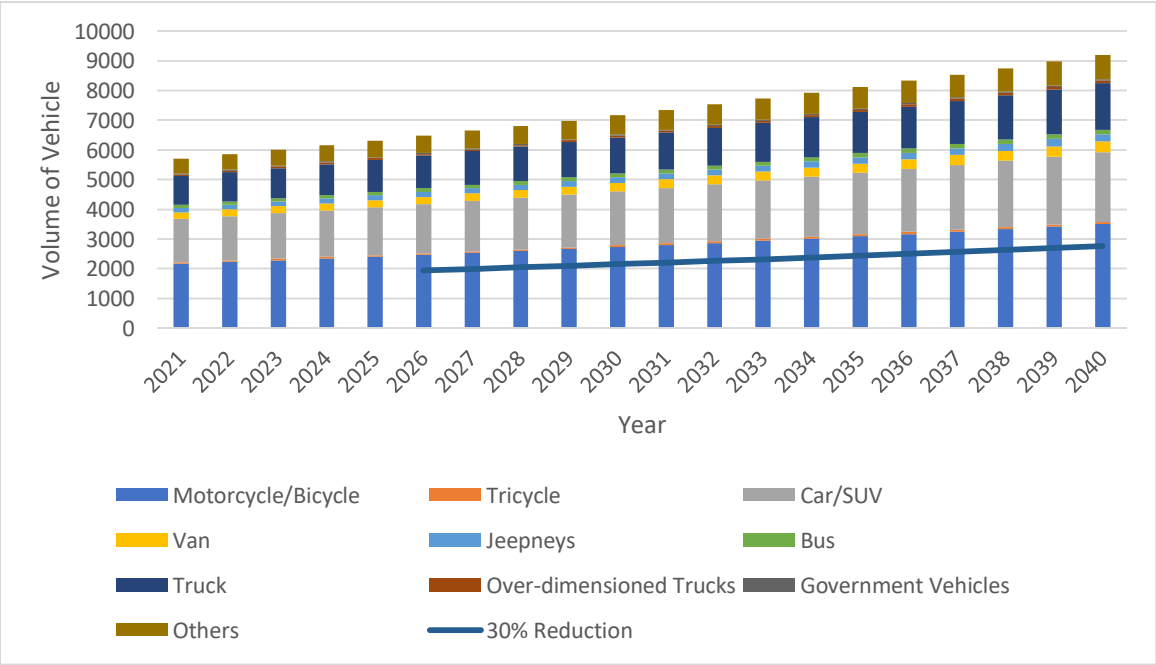
Peak hour traffic volume projection in south bound of Station 8 (with the Project)



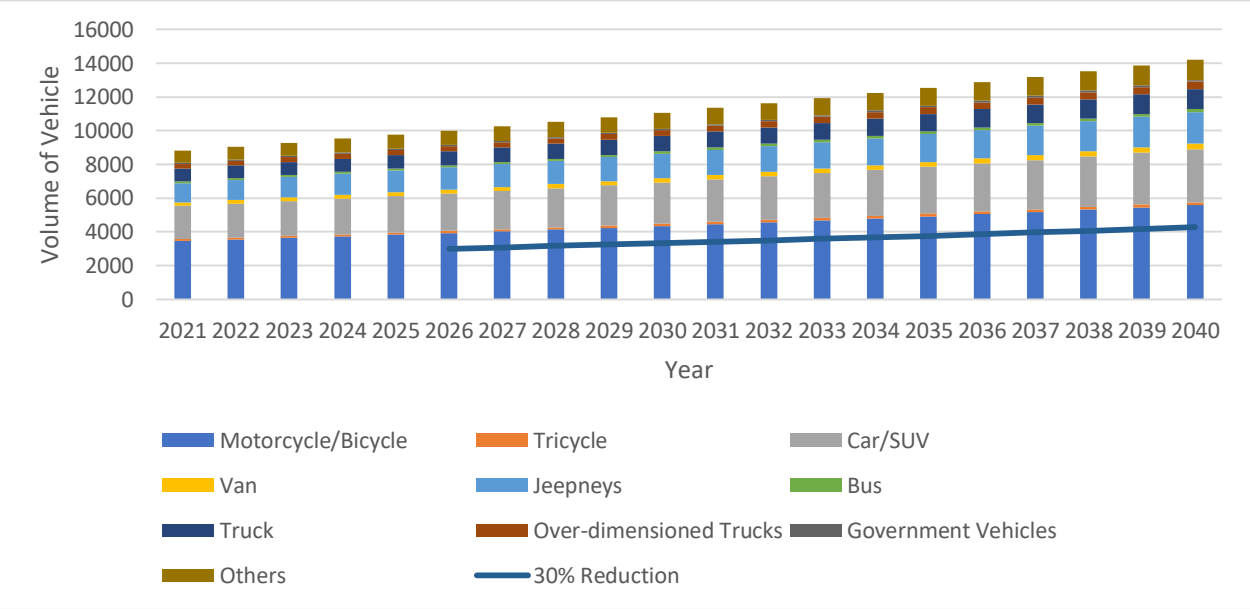
Peak hour traffic volume projection in north bound of Station 9 (with the Project)



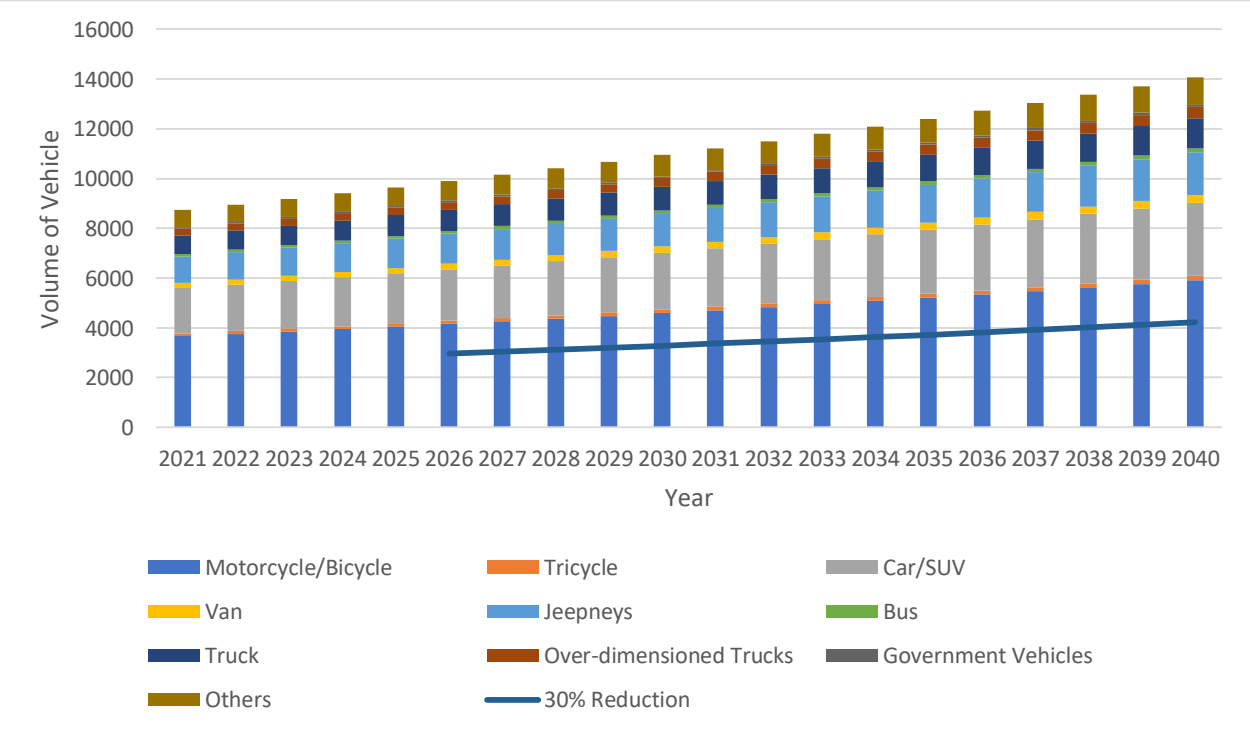
Peak hour traffic volume projection in south bound of Station 9 (with the Project)



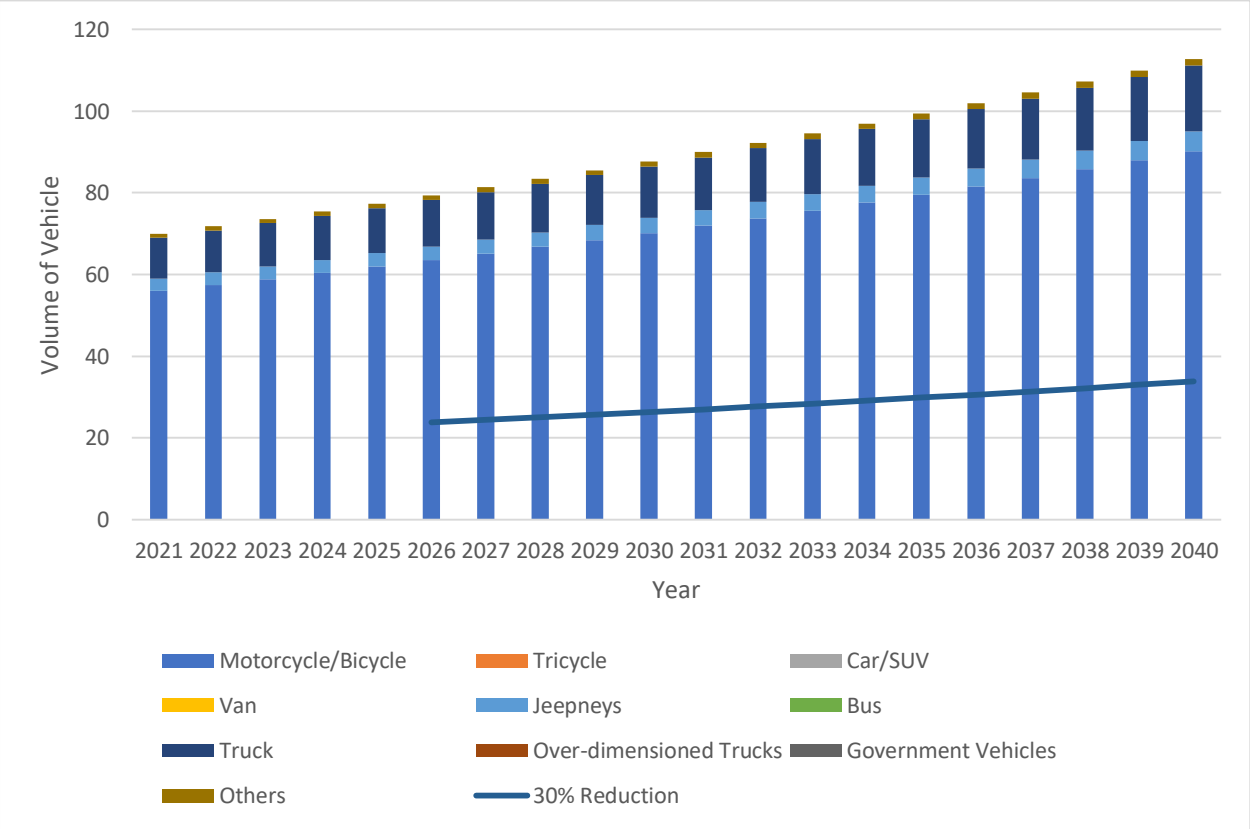
Peak hour traffic volume projection in north bound of Station 10 (with the Project)



Peak hour traffic volume projection in south bound of Station 10 (with the Project)



Peak hour traffic volume projection in west bound of Station 10 (with the Project)



Appendix 44. Level of Service of the peak hour

Level of service of the peak hour in the West Bound of Station 1

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	1197	1800	0.67	C
2022	1228	1800	0.68	C
2023	1260	1800	0.70	C
2024	1293	1800	0.72	D
2025	1326	1800	0.74	D
2026	1361	1800	0.76	D
2027	1396	1800	0.78	D
2028	1433	1800	0.80	D
2029	1470	1800	0.82	D
2030	1508	1800	0.84	D
2031	1547	1800	0.86	E
2032	1588	1800	0.88	E
2033	1629	1800	0.90	E
2034	1671	1800	0.93	E
2035	1715	1800	0.95	E
2036	1759	1800	0.98	E
2037	1805	1800	1.00	F
2038	1852	1800	1.00	F
2039	1900	1800	1.00	F
2040	1949	1800	1.00	F

Level of Service of the peak hour in the East Bound of Station 1.

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	1483	1800	0.82	D
2022	1522	1800	0.85	D
2023	1561	1800	0.87	E
2024	1602	1800	0.89	E
2025	1643	1800	0.91	E
2026	1686	1800	0.94	E
2027	1730	1800	0.96	E
2028	1775	1800	0.99	E
2029	1821	1800	1.00	F
2030	1868	1800	1.00	F
2031	1917	1800	1.00	F
2032	1967	1800	1.00	F
2033	2018	1800	1.00	F
2034	2070	1800	1.00	F
2035	2124	1800	1.00	F
2036	2179	1800	1.00	F
2037	2236	1800	1.00	F
2038	2294	1800	1.00	F
2039	2354	1800	1.00	F
2040	2415	1800	1.00	F

Level of Service of the peak hour in the North Bound of Station 2.

Peak hour (11:30-12:30)	Volume	Capacity	V/C	LOS
2021	24	900	0.03	A
2022	25	900	0.03	A
2023	25	900	0.03	A
2024	26	900	0.03	A
2025	27	900	0.03	A
2026	27	900	0.03	A
2027	28	900	0.03	A
2028	29	900	0.03	A
2029	29	900	0.03	A
2030	30	900	0.03	A
2031	31	900	0.03	A
2032	32	900	0.04	A
2033	33	900	0.04	A
2034	34	900	0.04	A
2035	34	900	0.04	A
2036	35	900	0.04	A
2037	36	900	0.04	A
2038	37	900	0.04	A
2039	38	900	0.04	A
2040	39	900	0.04	A

Level of Service of the peak hour in the South Bound of Station 2

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	21	900	0.02	A
2022	22	900	0.02	A
2023	22	900	0.02	A
2024	23	900	0.03	A
2025	23	900	0.03	A
2026	24	900	0.03	A
2027	24	900	0.03	A
2028	25	900	0.03	A
2029	26	900	0.03	A
2030	26	900	0.03	A
2031	27	900	0.03	A
2032	28	900	0.03	A
2033	29	900	0.03	A
2034	29	900	0.03	A
2035	30	900	0.03	A
2036	31	900	0.03	A
2037	32	900	0.04	A
2038	32	900	0.04	A
2039	33	900	0.04	A
2040	34	900	0.04	A

Level of service of the peak hour in the West Bound of Station 2.

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	5	900	0.01	A
2022	5	900	0.01	A
2023	5	900	0.01	A
2024	5	900	0.01	A
2025	6	900	0.01	A
2026	6	900	0.01	A
2027	6	900	0.01	A
2028	6	900	0.01	A
2029	6	900	0.01	A
2030	6	900	0.01	A
2031	6	900	0.01	A
2032	7	900	0.01	A
2033	7	900	0.01	A
2034	7	900	0.01	A
2035	7	900	0.01	A
2036	7	900	0.01	A
2037	8	900	0.01	A
2038	8	900	0.01	A
2039	8	900	0.01	A
2040	8	900	0.01	A

Level of service of the peak hour in the East Bound of Station 2

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	22	900	0.02	A
2022	23	900	0.03	A
2023	23	900	0.03	A
2024	24	900	0.03	A
2025	24	900	0.03	A
2026	25	900	0.03	A
2027	26	900	0.03	A
2028	26	900	0.03	A
2029	27	900	0.03	A
2030	28	900	0.03	A
2031	28	900	0.03	A
2032	29	900	0.03	A
2033	30	900	0.03	A
2034	31	900	0.03	A
2035	32	900	0.04	A
2036	32	900	0.04	A
2037	33	900	0.04	A
2038	34	900	0.04	A
2039	35	900	0.04	A
2040	36	900	0.04	A

Level of Service of the peak hour in the North Bound of Station 3

Peak hour (6:30-7:30)	Volume	Capacity	V/C	LOS
2021	90	900	0.10	A
2022	92	900	0.10	A
2023	93	900	0.10	A
2024	95	900	0.11	A
2025	97	900	0.11	A
2026	99	900	0.11	A
2027	100	900	0.11	A
2028	102	900	0.11	A
2029	104	900	0.12	A
2030	106	900	0.12	A
2031	108	900	0.12	A
2032	110	900	0.12	A
2033	112	900	0.12	A
2034	114	900	0.13	A
2035	116	900	0.13	A
2036	118	900	0.13	A
2037	121	900	0.13	A
2038	123	900	0.14	A
2039	125	900	0.14	A
2040	127	900	0.14	A

Level of service of the peak hour in the West Bound of Station 3.

Peak hour (17:30-18:30)	Volume	Capacity	V/C	LOS
2021	40	900	0.04	A
2022	41	900	0.05	A
2023	41	900	0.05	A
2024	42	900	0.05	A
2025	43	900	0.05	A
2026	44	900	0.05	A
2027	45	900	0.05	A
2028	45	900	0.05	A
2029	46	900	0.05	A
2030	47	900	0.05	A
2031	48	900	0.05	A
2032	49	900	0.05	A
2033	50	900	0.06	A
2034	51	900	0.06	A
2035	52	900	0.06	A
2036	53	900	0.06	A
2037	54	900	0.06	A
2038	55	900	0.06	A
2039	56	900	0.06	A
2040	57	900	0.06	A

Level of Service of the peak hour in the South Bound of Station 3.

Peak hour (17:30-18:30)	Volume	Capacity	V/C	LOS
2021	22	900	0.02	A
2022	22	900	0.02	A
2023	23	900	0.03	A
2024	23	900	0.03	A
2025	24	900	0.03	A
2026	24	900	0.03	A
2027	25	900	0.03	A
2028	25	900	0.03	A
2029	25	900	0.03	A
2030	26	900	0.03	A
2031	26	900	0.03	A
2032	27	900	0.03	A
2033	27	900	0.03	A
2034	28	900	0.03	A
2035	28	900	0.03	A
2036	29	900	0.03	A
2037	29	900	0.03	A
2038	30	900	0.03	A
2039	31	900	0.03	A
2040	31	900	0.03	A

Level of Service of the peak hour in the North Bound of Station 4.

Peak hour (13:00-14:00)	Volume	Capacity	V/C	LOS
2021	756	900	0.84	D
2022	770	900	0.86	E
2023	784	900	0.87	E
2024	799	900	0.89	E
2025	814	900	0.90	E
2026	829	900	0.92	E
2027	844	900	0.94	E
2028	860	900	0.96	E
2029	875	900	0.97	E
2030	892	900	0.99	E
2031	908	900	1.00	F
2032	925	900	1.00	F
2033	942	900	1.00	F
2034	959	900	1.00	F
2035	977	900	1.00	F
2036	995	900	1.00	F
2037	1014	900	1.00	F
2038	1032	900	1.00	F
2039	1052	900	1.00	F
2040	1071	900	1.00	F

Level of Service of the peak hour in the South Bound of Station 4

Peak hour (13:00-14:00)	Volume	Capacity	V/C	LOS
2021	637	900	0.71	D
2022	649	900	0.72	D
2023	661	900	0.73	D
2024	673	900	0.75	D
2025	685	900	0.76	D
2026	698	900	0.78	D
2027	711	900	0.79	D
2028	724	900	0.80	D
2029	738	900	0.82	D
2030	751	900	0.83	D
2031	765	900	0.85	D
2032	779	900	0.87	E
2033	794	900	0.88	E
2034	808	900	0.90	E
2035	823	900	0.91	E
2036	839	900	0.93	E
2037	854	900	0.95	E
2038	870	900	0.97	E
2039	886	900	0.98	E
2040	902	900	1.00	E

Level of Service of the peak hour in the West Bound of Station 4

Peak hour (6:30-7:30)	Volume	Capacity	V/C	LOS
2021	51	900	0.06	A
2022	52	900	0.06	A
2023	53	900	0.06	A
2024	54	900	0.06	A
2025	55	900	0.06	A
2026	56	900	0.06	A
2027	57	900	0.06	A
2028	58	900	0.06	A
2029	59	900	0.07	A
2030	60	900	0.07	A
2031	61	900	0.07	A
2032	62	900	0.07	A
2033	64	900	0.07	A
2034	65	900	0.07	A
2035	66	900	0.07	A
2036	67	900	0.07	A
2037	68	900	0.08	A
2038	70	900	0.08	A
2039	71	900	0.08	A
2040	72	900	0.08	A

Level of Service of the peak hour in the East Bound of Station 4.

Peak hour (6:30-7:30)	Volume	Capacity	V/C	LOS
2021	62	900	0.07	A
2022	63	900	0.07	A
2023	64	900	0.07	A
2024	66	900	0.07	A
2025	67	900	0.07	A
2026	68	900	0.08	A
2027	69	900	0.08	A
2028	70	900	0.08	A
2029	72	900	0.08	A
2030	73	900	0.08	A
2031	74	900	0.08	A
2032	76	900	0.08	A
2033	77	900	0.09	A
2034	79	900	0.09	A
2035	80	900	0.09	A
2036	82	900	0.09	A
2037	83	900	0.09	A
2038	85	900	0.09	A
2039	86	900	0.10	A
2040	88	900	0.10	A

Level of Service of the peak hour in the North Bound of Station 5

Peak hour (17:30-18:30)	Volume	Capacity	V/C	LOS
2021	24	900	0.03	A
2022	24	900	0.03	A
2023	25	900	0.03	A
2024	25	900	0.03	A
2025	25	900	0.03	A
2026	26	900	0.03	A
2027	26	900	0.03	A
2028	27	900	0.03	A
2029	27	900	0.03	A
2030	27	900	0.03	A
2031	28	900	0.03	A
2032	28	900	0.03	A
2033	28	900	0.03	A
2034	29	900	0.03	A
2035	29	900	0.03	A
2036	30	900	0.03	A
2037	30	900	0.03	A
2038	31	900	0.03	A
2039	31	900	0.03	A
2040	31	900	0.03	A

Level of Service of the peak hour in the East Bound of Station 5

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	23	900	0.03	A

2022	23	900	0.03	A
2023	24	900	0.03	A
2024	24	900	0.03	A
2025	24	900	0.03	A
2026	25	900	0.03	A
2027	25	900	0.03	A
2028	25	900	0.03	A
2029	26	900	0.03	A
2030	26	900	0.03	A
2031	27	900	0.03	A
2032	27	900	0.03	A
2033	27	900	0.03	A
2034	28	900	0.03	A
2035	28	900	0.03	A
2036	28	900	0.03	A
2037	29	900	0.03	A
2038	29	900	0.03	A
2039	30	900	0.03	A
2040	30	900	0.03	A

Level of Service of the peak hour in the West Bound of Station 5

Peak hour (8:30-9:30)	Volume	Capacity	V/C	LOS
2021	48	900	0.05	A
2022	49	900	0.05	A
2023	49	900	0.05	A
2024	50	900	0.06	A
2025	51	900	0.06	A
2026	52	900	0.06	A
2027	52	900	0.06	A
2028	53	900	0.06	A
2029	54	900	0.06	A
2030	55	900	0.06	A
2031	55	900	0.06	A
2032	56	900	0.06	A
2033	57	900	0.06	A
2034	58	900	0.06	A
2035	59	900	0.07	A
2036	59	900	0.07	A
2037	60	900	0.07	A
2038	61	900	0.07	A
2039	62	900	0.07	A
2040	63	900	0.07	A

Level of Service of the peak hour in the North Bound of Station 6

Peak hour (17:30-18:30)	Volume	Capacity	V/C	LOS
2021	636	1800	0.35	B
2022	647	1800	0.36	B
2023	659	1800	0.37	B

2024	671	1800	0.37	B
2025	683	1800	0.38	B
2026	695	1800	0.39	B
2027	708	1800	0.39	B
2028	721	1800	0.40	B
2029	734	1800	0.41	B
2030	747	1800	0.41	B
2031	760	1800	0.42	B
2032	774	1800	0.43	B
2033	788	1800	0.44	B
2034	802	1800	0.45	B
2035	816	1800	0.45	B
2036	831	1800	0.46	B
2037	846	1800	0.47	B
2038	861	1800	0.48	B
2039	877	1800	0.49	B
2040	893	1800	0.50	B

Level of Service of the peak hour in the South Bound of Station 6.

Peak hour (16:30-17:30)	Volume	Capacity	V/C	LOS
2021	427	1800	0.24	B
2022	435	1800	0.24	B
2023	443	1800	0.25	B
2024	450	1800	0.25	B
2025	459	1800	0.25	B
2026	467	1800	0.26	B
2027	475	1800	0.26	B
2028	484	1800	0.27	B
2029	493	1800	0.27	B
2030	501	1800	0.28	B
2031	510	1800	0.28	B
2032	520	1800	0.29	B
2033	529	1800	0.29	B
2034	538	1800	0.30	B
2035	548	1800	0.30	B
2036	558	1800	0.31	B
2037	568	1800	0.32	B
2038	578	1800	0.32	B
2039	589	1800	0.33	B
2040	599	1800	0.33	B

Level of Service of the peak hour in the North Bound of Station 7

Peak hour (12:45-13:45)	Volume	Capacity	V/C	LOS
2021	38	1800	0.02	A
2022	39	1800	0.02	A
2023	39	1800	0.02	A

2024	40	1800	0.02	A
2025	41	1800	0.02	A
2026	42	1800	0.02	A
2027	42	1800	0.02	A
2028	43	1800	0.02	A
2029	44	1800	0.02	A
2030	45	1800	0.02	A
2031	45	1800	0.03	A
2032	46	1800	0.03	A
2033	47	1800	0.03	A
2034	48	1800	0.03	A
2035	49	1800	0.03	A
2036	50	1800	0.03	A
2037	51	1800	0.03	A
2038	51	1800	0.03	A
2039	52	1800	0.03	A
2040	53	1800	0.03	A

Level of Service of the peak hour in the South Bound of Station 7.

Peak hour (7:45-8:45)	Volume	Capacity	V/C	LOS
2021	34	1800	0.02	A
2022	35	1800	0.02	A
2023	35	1800	0.02	A
2024	36	1800	0.02	A
2025	37	1800	0.02	A
2026	37	1800	0.02	A
2027	38	1800	0.02	A
2028	39	1800	0.02	A
2029	39	1800	0.02	A
2030	40	1800	0.02	A
2031	41	1800	0.02	A
2032	41	1800	0.02	A
2033	42	1800	0.02	A
2034	43	1800	0.02	A
2035	44	1800	0.02	A
2036	44	1800	0.02	A
2037	45	1800	0.03	A
2038	46	1800	0.03	A
2039	47	1800	0.03	A
2040	48	1800	0.03	A

Level of Service of the peak hour in the North Bound of Station 8

Peak hour (12:45-13:45)	Volume	Capacity	V/C	LOS
2021	733	1800	0.41	B
2022	746	1800	0.41	B
2023	760	1800	0.42	B
2024	773	1800	0.43	B
2025	787	1800	0.44	B

2026	801	1800	0.45	B
2027	816	1800	0.45	B
2028	830	1800	0.46	B
2029	845	1800	0.47	B
2030	861	1800	0.48	B
2031	876	1800	0.49	B
2032	892	1800	0.50	B
2033	908	1800	0.50	B
2034	924	1800	0.51	C
2035	941	1800	0.52	C
2036	958	1800	0.53	C
2037	975	1800	0.54	C
2038	993	1800	0.55	C
2039	1011	1800	0.56	C
2040	1029	1800	0.57	C

Level of Service of the peak hour in the South Bound of Station 8.

Peak hour (7:45-8:45)	Volume	Capacity	V/C	LOS
2021	771	1800	0.43	B
2022	785	1800	0.44	B
2023	799	1800	0.44	B
2024	813	1800	0.45	B
2025	828	1800	0.46	B
2026	843	1800	0.47	B
2027	858	1800	0.48	B
2028	874	1800	0.49	B
2029	889	1800	0.49	B
2030	905	1800	0.50	B
2031	922	1800	0.51	C
2032	938	1800	0.52	C
2033	955	1800	0.53	C
2034	972	1800	0.54	C
2035	990	1800	0.55	C
2036	1008	1800	0.56	C
2037	1026	1800	0.57	C
2038	1044	1800	0.58	C
2039	1063	1800	0.59	C
2040	1082	1800	0.60	C

Level of Service of the peak hour in the North Bound of Station 9

Peak hour (10:35-11:35)	Volume	Capacity	V/C	LOS
2021	594	1800	0.33	B
2022	609	1800	0.34	B
2023	625	1800	0.35	B
2024	640	1800	0.36	B
2025	657	1800	0.36	B
2026	673	1800	0.37	B

2027	690	1800	0.38	B
2028	708	1800	0.39	B
2029	726	1800	0.40	B
2030	744	1800	0.41	B
2031	763	1800	0.42	B
2032	783	1800	0.43	B
2033	803	1800	0.45	B
2034	823	1800	0.46	B
2035	844	1800	0.47	B
2036	865	1800	0.48	B
2037	887	1800	0.49	B
2038	910	1800	0.51	C
2039	933	1800	0.52	C
2040	957	1800	0.53	C

Level of Service of the peak hour in the South Bound of Station 9

Peak hour (16:35-17:35)	Volume	Capacity	V/C	LOS
2021	456	1800	0.25	B
2022	468	1800	0.26	B
2023	479	1800	0.27	B
2024	492	1800	0.27	B
2025	504	1800	0.28	B
2026	517	1800	0.29	B
2027	530	1800	0.29	B
2028	544	1800	0.30	B
2029	557	1800	0.31	B
2030	571	1800	0.32	B
2031	586	1800	0.33	B
2032	601	1800	0.33	B
2033	616	1800	0.34	B
2034	632	1800	0.35	B
2035	648	1800	0.36	B
2036	664	1800	0.37	B
2037	681	1800	0.38	B
2038	698	1800	0.39	B
2039	716	1800	0.40	B
2040	734	1800	0.41	B

Level of Service of the peak hour in the South Bound of Station 10.

Peak hour (10:35-11:35)	Volume	Capacity	V/C	LOS
2021	677	1800	0.38	B
2022	694	1800	0.39	B
2023	712	1800	0.40	B
2024	730	1800	0.41	B
2025	748	1800	0.42	B
2026	767	1800	0.43	B

2027	787	1800	0.44	B
2028	807	1800	0.45	B
2029	827	1800	0.46	B
2030	848	1800	0.47	B
2031	870	1800	0.48	B
2032	892	1800	0.50	B
2033	915	1800	0.51	C
2034	938	1800	0.52	C
2035	962	1800	0.53	C
2036	986	1800	0.55	C
2037	1011	1800	0.56	C
2038	1037	1800	0.58	C
2039	1063	1800	0.59	C
2040	1090	1800	0.61	C

Level of Service of the peak hour in the North Bound of Station 10

Peak hour (16:35-17:35)	Volume	Capacity	V/C	LOS
2021	719	1800	0.40	B
2022	737	1800	0.41	B
2023	756	1800	0.42	B
2024	775	1800	0.43	B
2025	795	1800	0.44	B
2026	815	1800	0.45	B
2027	836	1800	0.46	B
2028	857	1800	0.48	B
2029	879	1800	0.49	B
2030	901	1800	0.50	B
2031	924	1800	0.51	C
2032	947	1800	0.53	C
2033	972	1800	0.54	C
2034	996	1800	0.55	C
2035	1021	1800	0.57	C
2036	1047	1800	0.58	C
2037	1074	1800	0.60	C
2038	1101	1800	0.61	C
2039	1129	1800	0.63	C
2040	1158	1800	0.64	C

Level of Service of the peak hour in the West Bound of Station 10

Peak hour (16:35-17:35)	Volume	Capacity	V/C	LOS
2021	14	1800	0.01	A
2022	14	1800	0.01	A
2023	15	1800	0.01	A
2024	15	1800	0.01	A
2025	15	1800	0.01	A
2026	16	1800	0.01	A
2027	16	1800	0.01	A
2028	17	1800	0.01	A

2029	17	1800	0.01	A
2030	18	1800	0.01	A
2031	18	1800	0.01	A
2032	18	1800	0.01	A
2033	19	1800	0.01	A
2034	19	1800	0.01	A
2035	20	1800	0.01	A
2036	20	1800	0.01	A
2037	21	1800	0.01	A
2038	21	1800	0.01	A
2039	22	1800	0.01	A
2040	23	1800	0.01	A

Appendix 45. Certificate of No Overlap and Work Order for FPIC

Republic of the Philippines
OFFICE OF THE PRESIDENT
NATIONAL COMMISSION ON INDIGENOUS PEOPLES
3RD & 4TH Floor Halasan Building, Corner Tiano and Del Pilar Streets
Region10, Cagayan de Oro City
Tel. Nos. 721500 & 710728

Control No. CNO-R10-2022-002

CERTIFICATE OF NON-OVERLAP

TO WHOM IT MAY CONCERN:

THIS IS TO CERTIFY that the applied area for the proposed Preparatory Survey for Central Mindanao High Standard Construction Project of Japan International Cooperation Agency (JICA) and Department of Public Works and Highways (DPWH) located in Barangays Naburnolan & Casinglot, Tagoloan and Barangays Bugo, Puerto & Balulal, Cagayan de Oro City all of Misamis Oriental covering a total land area of 96.1582 Hectares or 961,582 sq. m. **DOES NOT OVERLAP** any Ancestral Domain/Land of Indigenous Cultural Communities/ Indigenous Peoples based on the (assessment of secondary data/field based investigation conducted) in accordance with National Commission on Indigenous Peoples Administrative Order No. 3, Series of 2012.

THIS IS TO CERTIFY FURTHER that the proponent is required to undergo Free and Prior Informed Consent (FPIC) process in accordance with the Affidavit of Undertaking, in the event it is determined that there is, in fact, an overlap, in whole or in part, with any ancestral domain/land.

This office, however, reserves whatever action needed to be undertaken to protect the rights and interest of the Indigenous Cultural Communities/Indigenous Peoples concerned, including the cancellation/revocation of the certification, as the case maybe.

Issued in compliance with section 59 of Republic Act. No. 8371, otherwise known as the Indigenous Peoples Rights Act (IPRA) of 1997.

Issued on March 28, 2022 at National Commission on Indigenous Peoples Region – 10

Certified:

JAN N. BURGOS
Regional Director

Concurred:

ATTY. PINKY GRACE P. PAREJA
Commissioner

cc:
1. ADO
2. DPWH-X
3. Office of the Ethnographic Commissioner
4. Misamis Oriental Provincial Office
5. File

Republic of the Philippines
OFFICE OF THE PRESIDENT
NATIONAL COMMISSION ON INDIGENOUS PEOPLES
3RD & 4TH Floor Halasan Building, Corner Tiano and Del Pilar Streets
Region10, Cagayan de Oro City
Tel. Nos. 721500 & 710728

Control No. CNO-R10-2022-001

CERTIFICATE OF NON-OVERLAP

TO WHOM IT MAY CONCERN:

THIS IS TO CERTIFY that the applied areas for the proposed Preparatory Survey for Central Mindanao High Standard Construction Project of Japan International Cooperation Agency (JICA) and Department of Public Works and Highways (DPWH) located in Barangays of Alae, Damilag, Diclum, Mambatangan, San Miguel, Sankanan, and Tankulan, all in the Municipality of Manolo Fortich; Barangays of Poblacion, Cawayan, Capitan Bayong, Impalutao, and La Fortuna, all in the Municipality of Impasug-ong, Barangays Kalasungay, Patpat all in the Municipality of Malaybalay, Province of Bukidnon covering a total land area of 239,7600 Hectares or 2,397,600 sq.m. **DOES NOT OVERLAP** any Ancestral Domain/Land of Indigenous Cultural Communities/Indigenous Peoples based on the (assessment of secondary data/field based investigation conducted) in accordance with National Commission on Indigenous Peoples Administrative Order No. 3, Series of 2012.

THIS IS TO CERTIFY FURTHER that the proponent is required to undergo Free and Prior Informed Consent (FPIC) process in accordance with the Affidavit of Undertaking, in the event it is determined that there is, in fact, an overlap, in whole or in part, with any ancestral domain/land.

This office, however, reserves whatever action needed to be undertaken to protect the rights and interest of the Indigenous Cultural Communities/Indigenous Peoples concerned, including the cancellation/revocation of this certification, as the case maybe.

Issued in compliance with section 59 of Republic Act. No. 8371, otherwise known as the Indigenous Peoples Rights Act (IPRA) of 1997.

Issued on June 20, 2022 at National Commission on Indigenous Peoples Region – 10.

Certified:

ANA N. BURGOS
Regional Director

Concurred:

ATTY. PINKY GRACE R. PAREJA
Commissioner

cc:
1. ADO
2. DPWH-X
3. Office of the Ethnographic Commissioner
4. Bukidnon Provincial Office/Manolo CSC
5. File

Republic of the Philippines
OFFICE OF THE PRESIDENT
NATIONAL COMMISSION ON INDIGENOUS PEOPLES
3RD & 4TH Floor Halasan Building, Corner Tiano and Del Pilar Streets
Region10, Cagayan de Oro City
Tel. Nos. 721500 & 710728

Control No. CNO-R10-2022-001

CERTIFICATE OF NON-OVERLAP

TO WHOM IT MAY CONCERN:

THIS IS TO CERTIFY that the applied areas for the proposed Preparatory Survey for Central Mindanao High Standard Construction Project of Japan International Cooperation Agency (JICA) and Department of Public Works and Highways (DPWH) located in Barangays of Alae, Damilag, Diclum, Mambatangan, San Miguel, Sankanan, and Tankulan, all in the Municipality of Manolo Fortich; Barangays of Poblacion, Cawayan, Capitan Bayong, Impalutao, and La Fortuna, all in the Municipality of Impasug-ong, Barangays Kalasungay, Patpat all in the Municipality of Malaybalay, Province of Bukidnon covering a total land area of 239.7600 Hectares or 2,397,600 sq.m. **DOES NOT OVERLAP** any Ancestral Domain/Land of Indigenous Cultural Communities/Indigenous Peoples based on the (assessment of secondary data/field based investigation conducted) in accordance with National Commission on Indigenous Peoples Administrative Order No. 3, Series of 2012.

THIS IS TO CERTIFY FURTHER that the proponent is required to undergo Free and Prior Informed Consent (FPIC) process in accordance with the Affidavit of Undertaking, in the event it is determined that there is, in fact, an overlap, in whole or in part, with any ancestral domain/land.

This office, however, reserves whatever action needed to be undertaken to protect the rights and interest of the Indigenous Cultural Communities/Indigenous Peoples concerned, including the cancellation/revocation of this certification, as the case maybe.

Issued in compliance with section 59 of Republic Act. No. 8371, otherwise known as the Indigenous Peoples Rights Act (IPRA) of 1997.

Issued on June 20, 2022 at National Commission on Indigenous Peoples Region – 10.

Certified:

ANA N. BURGOS
Regional Director

Concurred:

ATTY. PINKY GRACE P. PAREJA
Commissioner

cc:
1. ADO
2. DPWH-X
3. Office of the Ethnographic Commissioner
4. Bukidnon Provincial Office/Manolo CSC
5. File

Republic of the Philippines
OFFICE OF THE PRESIDENT
NATIONAL COMMISSION ON INDIGENOUS PEOPLES
3RD & 4TH Floor Halasan Building, Corner Tiano and Del Pilar Streets
Region10, Cagayan de Oro City
Tel. Nos. 721500 & 710728

WORK ORDER NO. 199 A
Series of 2022

TO : **MA. SHIRLENE D. SARIO- DMO V,** *Team Leader*
_____ – ***PLO IV,*** *Member*
_____ – *ENGR.II, Member*
MELINDA B. TULBA – *OIC CDO III, Member*
REVELYN D. PIALAN – *TAA I, Member*
SAMIAHAN L. ESLAO – *CAO I, Member*
_____ – *IP Representative*
_____ – *IP Representative*

FROM : **OFFICE OF THE REGIONAL DIRECTOR**

SUBJECT : **CONDUCT OF FREE AND PRIOR INFORMED CONSENT (FPIC) PROCESS RELATIVE TO THE APPLICATION OF JICA AND DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH) FOR PREPARATORY SURVEY FOR CENTRAL MINDANAO HIGH STANDARD CONSTRUCTION PROJECT LOCATED PORTIONS OF BARANGAY TICALA OF THE MUNICIPALITY OF MANOLO FORTICH; BARANGAYS CULASI, POBLACION, PUNTIAN, VISTA VILLA, SAN ROQUE ALL WITHIN THE UNIFIED CLAIM OF IMPUMATRICS; BARANGAY DALWANGAN OF MALAYBALAY CITY WITHIN CADT NO.R10-MLY-0609-106 OF THE BUKIDNON ICC's ALL IN THE PROVINCE OF BUKIDNON.**

DATE : **JUNE 16, 2022**

In accordance with Section 59 of RA 8371 and in relation to existing guidelines particularly Section 19, NCIP AO 3, S- 2012, you are hereby constituted to conduct the Free and Prior Informed Consent (FPIC) process on the above-mentioned application of the herein proponent.

Further, please be reminded to strictly observe the prescribed period within which to inform your task from the date when the budgeted amount for the Free and Prior Informed Consent (FPIC) process shall have been deposited in the Trust Account in the Regional Office. In this light, please coordinate with the Chief, Administrative and Finance, and Cashier of this Office, for the proper observation of this particular provision.

For compliance.

6-20-22

ANA N. BURGOS
Regional Director

Appendix 46. CMH Certification as Masterplan of High Standard Highway Development Project Phase 2

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
CENTRAL OFFICE
Manila

CERTIFICATION

This is to certify that the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan De Oro – Malaybalay Section)** is a priority project of the present government as reflected in the Masterplan of High Standard Highway Network Development Project, Phase 2. The proposed project is expected to accelerate the economic development of Mindanao through infrastructure development by connecting Cagayan de Oro City and Davao City with a high standard highway. The proposed project location have undergone substantive studies, reviews and consultations with stakeholders. Necessary expropriation and remuneration to affected families will be taken care of by the DPWH.

This certification is being issued as a requirement by the DENR in the processing of corresponding environmental clearances as required for the implementation of the above mentioned high standard highway project.

Issued this ___ day of December 2022 at the DPWH, Manila.

12/16/22

CONSTANTE A. LLANES, Jr., CESO III
Assistant Secretary for Planning Service

Appendix 47. Perception survey form sample

CONSENT FORM FOR RESEARCH PARTICIPANTS

Title of Study: SOCIAL IMPACT ASSESSMENT FOR THE CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)
Duration/Period:
Place:_____
(Barangay/ Municipality/ City/ Province/ Region)
Name of Researcher/Investigator: Dr. Nimfa L. Bracamonte
Contact Number of Researcher: 09171351584

Part I: Information Sheet: Introduction

Maayong Adlaw!

Ako si _____usa ka representante/researcher nga kasamtangan nagapahigayon ug usa ka pag-tuon nga giulohan ug "Social Impact Assessment For The Central Mindanao High Standard Highway Construction Project (Cagayan De Oro – Malaybalay Section)". Tungod niini, ako mangayo sa imong pagtugot nga unta moapilka niining among pagtu-on.

Katuyuan sa Pag-tuon: Ang pinakatuyuan sa maong pagtu-on mao ang pagtuki kung unsa ang kahibalo ug opinyon sa mga lumolupyo mahitungod sa highway project nga buhaton sa DPWH.

Boluntaryong Partisipaasyon: Boluntaryong partisipasyon lamang ang makaapil sa maong pagtu-on, boot pasabot, aduna kay katungod kung moapil ka ba o dili.

Benispiyo ug Risgo: Walay kaayuhan nga diritso mahatag kanimo sa imong pag-apil niini nga pagtu-on, apan ang resulta niini magamit nga basehan sa paghimo ug mga pamaagi aron makapagaan sa unsa mang problema nga makita.

Privacy and Confidentiality: Among bug-os na ipasalig ngaang tanang impormasyon nga among makuha niani nga pagtu-on walay laing makahibalo gawas lamang sa mga tawo nga nagdumala nianing pagtu-on .Ang imong ngalan dili namu ipakita o ipa-ilaila sa among ipagawas na pagtuki ani nga pagtu-on. Alyas o numero lamang ang among gamiton sa pagpresenta namu sa mga datos.

Part II: Certificate of Consent: Written Consent Form for Research Participants/Informants
Pagapirmahan sa pagsugod sa interview
Direktiba: Palihog basaha pag-ayo ang mga nakasulat sa ubos ug butangi ug tsek (/) ang kahon kung ikaw mouyon niani:

- ☐ Akong nasabtan pag ayo ang katuyuan niining maong pagtu-on
- ☐ Akong gihatag ang akong boluntaryo nga pagtugot sa pag- apil niining maong pagtu-on.
- ☐ Akong gihatag ang akong pagtugot sa tigpanuki-duki sa pag record sa mga aktibidades nga adunay kalambigitan sa pagtu-on.
- ☐ Akong gihatag ang akong pagtugot sa tigpanuki-duki sa pagkuha ug hulagway o video .
- ☐ Ako pwede moundang sa pagtubag sa mga pngutana sa binsan onsang oras ug sa binsan unsang hinungdan.
- ☐ Kung ako adunay mga pangutana mahitungod sa pagtu-on o sa akong papel niining maong pagtu-on. Gawasnon akong makapangutana sa tigpanuki-duki kabahin sa akong partisipasyon niini.

_____ _____
Ngalan sa partisipante/respondent Petsa (Adlaw/Bulan/Tuig)

Oral Consent:
Kung ang porma/sinulat nga pagtugot dili haum sa kultura/politikanhon nga panglantaw hinungdan o kung ang partisipante dili makabasa/makasulat, ang mga tigpanuki-duki magpasabot sa tumong sa pagtu-on ug hangyu-on ang partisipante nga nga itamla o pagmarka sa iyang kumagko ang iyang toong kumagko diha sa papel isip pagmatuod sa iyang boluntaryong pagtugot inubanan sa pirma sa iyang testigo.

_____
Ngalan sa Testigo

_____
Petsa(Adlaw/Bulan/Tuig)

Right Thumb
of Participant
☐

Central Mindanao High Standard Highway Construction Project
(Cagayan de Oro-Malaybalay Section)

PERCEPTION SURVEY FORM

SOCIAL IMPACT ASSESSMENT FOR THE CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

(Palihug tubaga ang mosunud pinaagi sa pagsulat niini sa blangko nga gihatag ug palibutan ang numero nga imong nauyonan. Palihug tubaga ang TANANG pangutana na sumala sa inyong panginabuhian).

(Please answer the following items by writing on the space provided and encircling the number that corresponds to your answer. Please answer ALL times applicable to your household).

Ang mo tubag sa mga pangutana mao ang principal nga ulo sa balay o ang asawa. (The correspondent should be the household head or his spouse).

RESPONDENT'S IDENTIFICATION BLOCK

1. Name of Respondent: _____ _____ _____
   (Pangalan) (First Name) (Middle Name) (Last Name)

2. Address: _____ _____ _____
   (Puloy-anan) (Zone) (Street/Sitio/Purok) (Barangay) (City/ Municipality)

DEMOGRAPHIC INFORMATION OF RESPONDENT

1. Lugar na natawhan: _____ _____
   (Municipality/City) (Province)

2. *Kung wala ka gipanganak niining lugara, ngano nga ikaw ug imong pamilya mibalhin aning lugara:*
   (If not born in the place of survey, indicate why you/your family moved into your present address)
   _____

3. Pila ka tuig ka nagpuyo diring lugar (Years of stay in present address): _____

4. Gidaghanon sa mga nagpuyo sa panimalay:(Number of Household Members) _____
   Include non-relative who are staying in the house (Palihog ko ug iapil ang inyong paryente nga nagpuyo niining balaya).

5. Kinaiya sa matag miyembro sa panimalay

Household member	Relation to Respondent	Age	Sex *	Civil Status**	Highest Educational Attainment ***	Occupation/ Employment
1.	Respondent		M F	S M W	G/H/C/V = 1234567	
2.			M F	S M W	G/H/C/V = 1234567	
3.			M F	S M W	G/H/C/V = 1234567	
4.			M F	S M W	G/H/C/V = 1234567	
5.			M F	S M W	G/H/C/V = 1234567	
6.			M F	S M W	G/H/C/V = 1234567	
7.			M F	S M W	G/H/C/V = 1234567	
8.			M F	S M W	G/H/C/V = 1234567	
9.			M F	S M W	G/H/C/V = 1234567	
10.			M F	S M W	G/H/C/V = 1234567	

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11.			M F	S M W	G/H/C/V = 1234567	
12.			M F	S M W	G/H/C/V = 1234567	

* *Sex: M = Male, F = Female (encircle)*
** *Civil Status: S for Single, M for Married, W for Widowler (encircle)*
*** *Educational Attainment: G for Grade, H for High School, C for College, V for Vocational, 1234567 for year level (encircle) Also indicate if studying in School of Living Traditions*

6. Relihiyon:_____

7. Gigikanan sa kita (Primary source of income): _____

8. Ikaduha nga gigikanan sa kita (Secondary Source of Income)_____

9. Household monthly income (Combined)(check) (Total nga binulan na kita sa panimalay)

	Below P/5,000		P/14,001 – P/17,000
	P/5,001 – P/8,000		P/17,001 – P/20,000
	P/8,001 – P/11,000		Above P/20,000
	P/11,001 – P/14,000		

I. HOUSING INFORMATION

1. Klase sa balay (Kind of dwelling unit)(encircle)

   1 = Single (bungalow) 3 = Apartment 5 = Others, specify:_____

   2 = Duplex 4 = Two-storey

2. Klase ng materyales sa balay (Description of house materials)(encircle)

   1 = Pawid/kawayan (cogon/bamboo) 3 = Konkreto (concrete)

   2 = Kahoy (wood) 4 = Kahoy at konkreto (wood and concrete)

3. Nagpanag-iya sa balay (Residence ownership)(encircle)

   1 = Tag-iya sa balay ug lote (Owns both the house and lot) 3 = Ga-abang (renting)

   2 = Tag-iya sa balay (Owns the house only) 4 = Iba pa (others):_____

4. Gamit sa pagluto (Fuel for cooking)(encircle)

   1 = Kahoy/uling (firewood/charcoal) 3 = Kalang de kuryente (electric stove) 5 = Iba pa (others):_____

   2 = Liquefied Petroleum Gas (LPG) 4 = Gaas (kerosene)

5. Gamit na suga (Lighting facility)(encircle)

   1 = Kandila (candle) 3 = Petrolyo (kerosene/gas)

   2 = Electricity (kuryente) 4 = Uban pa (others): _____

6. Gigikanan sa tubig sa balay (Source of domestic water)(encircle)

   1 = Water district (municipality/city waterworks system) 5 = Bukal(spring water)

   2 = Balon (deep/dug well) 6 = Ilog (river)

   3 = Poso (pitcher pump) 7 = Tubig-ulan (rainwater)

   4 = Private pump 8 = Uban pa (others): _____

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7. Pamaagi sa paglabay sa basura (Method of garbage disposal)(encircle)

   1 = Sunog (burning) — 3 = Kinokolekta ng gobyerno ng Bayan(municipality/city collection)

   2 = Ginalubong (burying) — 4 = Ginalabay, isulti ang lugar nga ginalabayan (dumping, specify dumpsite location):_____

8. Kasilyas (Toilet facility)(encircle)

   1 = Water sealed — 4 = Public toilet

   2 = Flush type — 5 = Others, specify:_____

   3 = Antipolo type

9. Unsang mga sakit ang kasagaran nga makaapekto sa mga kauban sa panimalay sa niaging 6 bulan? (What illnesses commonly affect your household members in the last 6 months ?): _____

II. PERCEPTIONS AND ATTITUDES TOWARDS THE PROJECT

(Annotated EMB Guidelines for the conduct of the Perception Survey)

Part I. Awareness of the Proposed Project

1. *Nakahibalo ka ba sa ginasugyot nga proyekto Cagayan de Oro – Malaybalay Highway Project sa inyong lugar?* (Are you aware of the proposed Proposed Cagayan de Oro – Malaybalay Highway Project that will be constructed in your community?)

   1 = Oo (Yes) — **[proceed to number 2]**
   2 = Dili (No) — [Interviewer should give short description of the proposed project. Focus shall be on the structures to be constructed, the project inputs and outputs environmental impacts/proposed mitigating measures. **Proceed to number 3**]

2. *Asa man kini ninyo nahibal-an kining ginasugyot na proyekto?* (From whom did you know of the proposed development project?)

   1 = Radio
   2 = Television
   3 = Parish Priest
   4 = Family Member
   5 = Neighbor
   6 = Barangay/Municipal Officials
   7 = DPWH Project employees
   8 = Others, specify _____

Part II. Environment Change

3. *Unsa man ang imong mga naobserbaran nga kabag-ohan sa inyong palibot sa miaging lima ka tuig?* (What changes have you observed in your environment (community) during the past five years? Please refer to the list presented below).

   Palibutan ang numero nga uyon sa gihisgutan nga pagbag-o ug ang direksyon sa pagbag-o. Palibutan ang "M" kung mas daghan karon pagbag-o ug palibutan ang "L" kung gamay lamang karon pagbag-o). (Encircle the number corresponding to the mentioned change and the direction of change; encircle "M" if there is more at present and encircle "L" if there is less at present).

Items (encircle no.)	Degree of Change (encircle letter)	
	More	Less
1 = Pabrika/planta/industriya (factories/power plants/industries		
2 = Lupang ginagawang subdivision (lands converted into subdivision)	M	L
3 = Ani sa bukid (farm harvest)	M	L
4 = Pagbabaha (flooding in low lands)	M	L
5 = Kagubatan (forest cover)	M	L
6 = Populasyon (population/migration)	M	L

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7 = Polusyon sa tubig (water pollution)	M	L
8 = Polusyon sa hangirvingay (air/noise pollution)	M	L
9 = Pagsikip ng mga kalsada dahil sa mga sasakyan (traffic congestion)	M	L
10 = Kalat o basura (solid wastes)	M	L
11. Uban pa, ibatbat _____	M	L

4. *Para sa mga naobserbarang pagbag-o: Hain sa mga pagbag-o ang imong gikonsiderar nga adunay labing dakong epekto sa komunidad ug sa imong adlaw-adlaw nga kinabuhi?*

(For those who observed a change: Which of these changes would you consider as having the most effect on the community and on your daily life? Indicate the corresponding item number from the above list) _____

_____

Part III. Perceptions towards the Project

5. *Unsa man ang imong reaksyon o gihunahuna sa una nimo pagka-dungog bahin sa proyekto?* (What was/were your initial reaction/s or thought/s when you first heard about the project?)

0= Wala
1= *Daghan kaayuhan mahatag sa mga residente ug komunidad*
2= *Daghan problema mahatag sa mga residente ug komunidad*
3= Uban pa (others, specify): _____

6. *Sa imong opinyon, unsa imong hunahuna kibahin sa epekto sa ginasugyot na proyekto sa inyong komunidad, lungsod, o probinsiya? Palibutan ang na uyonan nga mag numero* (In your opinion, what do you think will be the effects of the proposed project to your community/town/province?) (Encircle the corresponding numbers).

Positive (Beneficial) Effects/Impacts
(Positibo o Maayong Epekto)

0 = Wala (none)
1 = Panginabuhi sa mga residente (Employment for some local residents)
2 = Industrialisasyon sa komunidad) (Industrialization of the community)
3 = Kita/kita sa barangay/munisipyo/probinsiya pinaagi sa buwis) (Income/revenue to the barangay/municipality/city/province)
4 = Tabang sa mga proyekto sa komunidad ug kalamboan sa komunidad (Assisting community projects/development)
5 = Panaghi-usa sa komunidad (Community solidarity)
6 = Uban pa (others, specify): _____

Negative (Adverse) Effects/Impacts
(Negatibo o Dili Maayong Epekto)

0 = Wala (none)
1 = Pagminus sa ani sa umahan) (Decrease in farm harvest)
2 = Pagbabaha (Flooding)
3 = Pagminus sa kuhaanan sa tubig sa yuta (Decrease in ground water resources)
4 = Peligro sa panglawas (Health hazard)
5 = Problema sa kalinaw ug kahusay) (Peace and order hazard)
6 = Polusyon sa tubig (Water pollution)
7 = Polusyon sa hangin (Air pollution)
8 = Kasaba sa palibot (Noise pollution)
9 = Kahuot sa dalan (Traffic congestion)
10 = Uban pa (others, specify): _____

7. *Sa imong opinyon, ang ginasugyot nga proyekto kay…* (In your opinion, the proposed project…..)

1 = Makatabang ug dako sa komunidad ug sa mga lumulupyo niini. (Will help a lot the community and local residents)
2 = Makatabang ug gamay. (Will be able to help but not much)
3 = Walay maitabang para sa komunidad. (Will not help the community at all)
4 = Makahatag ug kadaot sa komunidad. (Will be detrimental to the community)

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Part IV. Aspiration

8. *Kung hatagan ug higayon nga makatrabaho sa proyekto, mogamit ka ba sa oportunidad o tugotan ba nimo imong bana/asawa/anak nga mo trabaho sa proyekto?* (If given the chance to work for the project, would you take the opportunity or would you permit your husband/wife/son/daughter to work for the project?)

   1 = Oo (Yes) 2 = Dili (No) 3 = Dili sigurado (Not sure)

   Ngano? (Why?): _____

Part V. Attitude Towards the Project

9. *Human nimo pagtubag sa mga pangutana, mo-uyon ba ka sa pagtukod sa proyekto?* (Having responded to above questions, would you approve the establishment of the project?)

   1 = Oo (Yes) 2 = Dili (No) 3 = Dili sigurado (Not sure)

   Ngano? (Why?) _____

10. *Kung malikayan o makontrol ang mga dili maayong epekto sa proyekto, kung naa man, motugot ka ba sa pagtukod sa ginasugyot na proyekto?* (Upon abatement or control of perceived adverse effect, if needed there are, will you approve the establishment of the project?)

    1 = Oo (Yes) 2 = Dili (No) 3 = Dili sigurado (Not Sure)

    Ngano? (Why?) _____

11. *Sa imong panglantaw, dapat ba nga mokonsulta ang komunidad mahitungod sa buhaton nga proyekto aron maampingong hunahunaon kung unsa ang labing angay nga buhaton?*

    1 = Oo (Yes) 2 = Dili (No) 3 = Dili sigurado (Not Sure)

    Ngano? (Why?) _____

12. *Uyon ka ba o boluntaryong motambong sa mga miting o pagkonsulta bahin niining proyekto?*

    1 = Oo (Yes) 2 = Dili (No) 3 = Dili sigurado (Not Sure)

    Ngano? (Why?) _____

OTHER MATTER:
13. Unsa inyong huna-huna bahin sa COVID-19? _____

_____

14. Kung adunay libre nga vaccine gikan sa gobyerno, magpa vaccine/injection ba ka? Kung dili, ngano man?
_____

_____

_____ _____
Petsa(Adlaw/Bulan/Tuig) Pirma sa Respondent

END OF QUESTIONNAIRE
THANK YOU VERY MUCH
(Maraming salamat po)

Appendix 48. Key informant interview guide questions

KI Code_____

PROFILE OF KEY INFORMANTS IN
CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT 2021
Place of Interview:_____

Name : _____
(Last Name) (First Name) (Middle)

1. Sex: _____Male _____ Female

2. Age : _____

3. Civil Status: ____Single _____Married _____Widowed ____Separated

4. Occupation: _____

5. Highest Level of Education: _____

6. Sector Represented by the Key Informant: _____

7. Position in the Organization Community: _____

8. Presence of Local Ordinances Pertaining to Traffic Safety and Protection of Citizens:

_____

9. Usual/Common Problems in the Community and Reasons: (Probe on issues re ancestral domain e.g. IP, Sex Trafficking, Transportation Problem, and Covid19 related issues, among others)

_____

_____

_____

_____

_____

10. Skills of Residents in the Community:_____

_____

11. Community Development Projects
What do you think are the projects that will enhance or provide "alternative livelihood"?

Both Men and Women	Men Only	Women Only

12. What are your suggested projects for the youth?

Both Boys and Girls	Boys Only	Girls Only

Social Acceptability of the Highway Project

13. Attitude towards the Highway Project:

Attitude Towards The Project	Reasons
Favorable	
Unfavorable	
Uncertain	

14. Issues/Concerns related to the High Standard Highway Construction Project at the **Household level**	15. Issues/Concerns related to High Standard Highway Construction Project at the **Community level**

16. Dreams/Aspirations for the Community

_____

_____

17. Other Suggestions/Comments

_____

_____

Date of Interview _____

Interviewer _____

Appendix 49. EIA Technical Screening and Scoping Checklist

GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Date Submitted for Screening: _____
Form of Submission: ___ Hard ___ Digital
Project Title: Central Mindanao High Standard Highway (Cagayan de Oro-Malaybalay Section) Project
Project Location: Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay, Bukidnon
Project Proponent: Department of Public Works and Highways Central Office
Authorized Representative: Engr. Constante A. Llanes, Jr.
Address: Bonifacio Drive Port Area, 652 Zone 068, Manila
Contact No: _____ Fax No: _____ Contact Person: _____
EIS Consultant: Amet-Asia Inc.
Address: Unit 303 One Corporate Centre, J. Vargas Avene cor Meralco Avenue, Ortigas, Pasig City
Contact No: _____ Fax No: _____ Contact Person: _____
Project Category & Type *(based on Annex A of MC 2014-005 Guidelines)*: _____
Project Size *(use parameter in Annex A of MC 2014-005 Guidelines)*: _____

Project Status *(Please Check)*:
/ New Project
__Existing Year of Establishment: _____

With Previous ECC? *(Please check)* __Yes / No

If with Previous ECC, Date/s of Issuance and Reference Code/s: *(List in chronological order)*

Date/s of Issuance	Reference Code/s
_____	_____
_____	_____

Date of Technical Scoping: 01 July 2021
Venue of Technical Scoping: Via Microsoft Teams

Table 1. Checklist of Documentary Requirements
Boxes and blanks in the first column are to be filled-up during scoping and the rest, upon submission of EIS for screening

	Acceptable?		Screening Officers' Remarks
	Yes	No	
Check required EIA Report[1] ☐ Environmental Impact Statement (EIS) ✓ Executive Summary ✓ Project Description ✓ Assessment of Environmental Impacts (including baseline) ✓ Environmental Management Plan ✓ Environmental Risk Assessment (ERA) & Emergency Response Policy and Guidelines ✓ Social Development Plan/Framework (SDP) and IEC Framework ✓ Environmental Compliance Monitoring ✓ Decommissioning / Abandonment /Rehabilitation Policy ✓ Institutional Plan for EMP Implementation including EMF and EGF Commitments *(Include photographs or plates of project site, impact/affected areas and communities and land-use plan showing compatibility of the proposed project)*			
Proof of Authority over the Project Site ☐ TCT ☐ Lease Agreement ☐ Others: Status of RAP			
Accountability Statements of Preparers & Proponent (see Annexes 2-21 & 2-22 of Revised Procedural Manual for DAO 2003-30)			

[1] *Please refer to attached checklist of EIS/EPRMP Contents*

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Duly Accomplished Project Environmental Monitoring & Audit Prioritization Scheme (PEMAPS) Questionnaire (see Annex 2-7d of Revised Procedural Manual for DAO 2003-30)			
For EPRMP, Copy of previous ECC			N/A
For EPRMP, Proof of compliance in the submission of monitoring reports			N/A

ACTION TAKEN: (Please check to indicate corresponding action taken)

☐ Document accepted; please submit __ copies
☐ Document not accepted

NOTED BY:

_____
Screening Officer
Division

_____
Section/Division Chief

EMB Office
Screening Office

Date: _____

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Table 2. EIS/EPRMP Annotated Outline

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
Executive Summary (maximum of 10 pages)				
Project Fact Sheet	Summary of Project Description *(For EPRMP, Include comparative matrix of the existing project components vis-à-vis the proposed changes)*			
Process Documentation	Documentation of the process undertaken in the conduct of EIA *(EIA Team, EIA Study Schedule & Area, description of key EIA Methodologies including sampling and measurement plan, Scoping and Public Participation)* **Expertise needed for the EIA Team:** **1. Geologist** **2. Geotechnical Engineer** **3. Flora and Fauna Expert** **4. Water Quality Expert/Hydrologist (if groundwater will be used, Hydrogeologist)** **5. Air Quality Expert** **6. Social Scientist** **At least 60% of the EIA Team should have attended the training on DRR/CCA technical guidelines pursuant to EMB MC 2011-005**			
EIA Summary	• Summary of alternatives considered in terms of siting, technology selection/operation processes and design • Concise integrated summary of the main impacts and residual effects after applying mitigation Project Activity | Impacts | Mitigating Measures | Target Efficiency • Risks and uncertainties relating to the findings and implications for decision making			
1. Project Description Include as an introduction, basic information about the project and project proponent				
1.1 Project Location and Area *For EPRMP, discussions should be in the context of the proposed modification/changes*	a) Map showing sitio, barangay, municipality, province, region boundaries, vicinity, proposed buffers surrounding the area and Primary & secondary impact areas Please use A3 sizes for maps. Show other infrastructures in the area (e.g. airports, railways, etc.)			
	b) Geographic coordinates (shape file data) of project area (use WGS 84 datum - GPS setting)			
	c. Describe the vicinity and the accessibility of the project site/area			
1.2. Project Rationale *For EPRMP, discussions should be in the context of the proposed modification/changes*	• Cite and focus on the need for the project based on national and regional/local economic development in terms of contribution to sustainable development agenda or current development thrusts. • Describe the justification for the Project with particular reference made to the economic and social benefits, including employment and associate economic development, which the project may provide. The status of the project should be discussed in a regional and national context.			

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
I.3. Project Alternatives *For EPRMP, discussions should be in the context of the proposed modification/ changes*	a) Cite criteria used in determining options for facility siting, development design, process/technology selection, resource utilization and discuss how the decisions on the preferred options were made. Siting: Alternative project locations including factors significant to the selection such as severity of impacts, perception of affected communities with regards to project, ancestral domain issues, land classification, etc. Discuss other options on the siting of major components of the project within the project area. Technology Selection/Operation Processes and design Selection for storage: Alternative technologies, operation processes, and measures to minimize wastes, prevent adverse impacts such as air and water pollution, groundwater and land contamination, and for the prevention/control of emergency events (eg. fire, explosion, leaks, spills) including factors significant to the selection. Resources: Alternative sources of power, water, raw materials and other resources needed including factors significant to the selection such as supply sustainability and climate change projections *Likewise contextualize the determination of preliminary options in terms of project site factors significant to the selection such as supply sustainability and susceptibility to:* • *Liquefaction, Ground Shaking, Ground Rupture, Earthquake induced Landslides Volcanic eruptions, tsunami (PHIVOLCS.)* • *Rain-induced landslide and flooding (MGB)* • *Storm surge, and flooding as well as extreme climatologic conditions (PAGASA)*			
	b) Summarize and discuss comparison of environmental impacts of each alternative for facility siting, development design, process/technology selection, resource utilization			
	d) Discuss the consequences of not proceeding with the project or no project option			
1.4 Project Components *For EPRMP, discussions should be in the context of the proposed modification/changes; boundaries of current project area should be delineated from the proposed expansion area, if any*	a) General layout of facilities;			
	b) Maps showing in particular, the location and boundaries of project area, location and footprint of main facilities, storage and support facilities, and proposed buffers. Include possible areas for facilities such as camp sites, casting yards, stock yards, etc., taking into consideration the DPWH guidelines and other government requirements.			
	c) Identification and general description of major components such as materials, capacity, number, safety features , etc.			
	d) Identification and description of support facilities and infrastructure requirements such as energy/power generating facility (if any) or energy source, water supply/storage, storm water drainage, sewerage,			

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
	telecommunications, safety devices/emergency facilities, accommodation and similar facilities Include wastewater and solid waste management system during construction phase – Dr. Maestrecampo			
	e)Identification and description of pollution control devices and waste management system for the waste materials: wastewater, air emissions, domestic wastes, sewage and septage, toxic and hazardous wastes, non toxic and non hazardous wastes, etc.			
I.5. Process/ Technology *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) ~~Description of the Processing/Manufacturing technology~~ ~~o process flow sheet showing material, and water (and energy, if applicable) balance including inputs and similar data on products, recycling and waste streams~~ ~~o materials/product handling and transport including storage protocols~~			
	c) ~~Description of the pollution control devices and waste management system~~			
	d) Description of the operations and maintenance of facility			
I.6. Project Size *For EPRMP, include discussion/comparison of existing and proposed modifications or expansion*	a) ~~Total capacity / stock population/dimension (whichever is applicable based on screening parameter in the Guidelines for Coverage Screening per MC 2014-005)~~			
	b)Total Project Length in km.			
I.7. Development Plan, Description of Project Phases and Corresponding Timeframes For EPRMP, *discussions should be in the context of the proposed modification/changes*	Phases to be described in terms identifying specific activities (w/ special attention on those with significant environmental impacts as well as DRR/climate change adaptation options relevant to the project and project activities) and corresponding projected implementation timeframes: • ***Pre-construction*** (e.g. planning, acquisition of rights to use land, etc.) • ***Construction*** (e.g. land/site clearing, temporary housing, transport of materials, health and other services for the workforce, discussion of temporary facilities including the progress of works/milestones and the number workers required per milestones) • ***Operation*** (projected period of start-up/commissioning/full operation of various project components) include discussion on the operation of various components (as identified above) in terms of raw materials, fuel requirements, waste management and infrastructure requirements • ***Decommissioning/Abandonment/Rehabilitation*** - projected life of the project and alternatives for the future use of the project area which should be consistent with long term zoning and land use development plan of the municipality; - Abandonment Plan (general) to include management plan for the projected cumulative/long term project impacts such as remediation of contaminated soil and water resources, land restoration, proper dismantling/abandonment of facilities/ equipment and other necessary activities			

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Sections / Subsections	Content	Page #	Acceptable?	REMARKS
I.8. Manpower	Tabulate the following per project phase (pre-construction, construction, operation and maintenance): • manpower requirements; • expertise/skills needed; • nature & estimated number of jobs available for men, women, and indigenous peoples (if in IP ancestral land); • scheme for sourcing locally from host and neighboring LGUs			
I.9. Project Cost	Indicative Project Investment Cost (Philippine Peso)			
2. Assessment of Environmental Impacts See Table 3 for the list of key environmental impacts which shall be subjected to assessment. The assessment shall done using the prescribed approach/method and in relation to the corresponding baseline characterization in the primary and secondary impact areas (*as determined using the Guidelines in Annex 2-2 of the Revised Procedural Manual (RPM) for DAO 2003-30 or succeeding issuances*). The sampling and measurement plan used shall be discussed. Likewise, the assessment should be done for the various phases of development (i.e. pre-construction, construction and operation) and should consider climate change projections and disaster risks based on existing natural hazard information. For all maps, include overlays of project area footprint, show sensitive/critical receptors and sampling points for baseline data (indicate geographical coordinates). In conclusion, the residual and cumulative impacts shall be assessed. For EPRMP, the result of the proponent's monitoring shall be used as baseline. The assessment of environmental impacts of proposed modification shall be discussed in relation to the actual impacts of existing project operations which shall be presented from a summary of the results of compliance monitoring (in matrix and graphical form) as described in 6.1.			
3. Environmental Management Plan Appropriate mitigation/management measures should be specified for each of the identified key impacts (Table 3). Appropriate climate change adaptation and disaster risk reduction measures/options shall likewise be thoroughly discussed. The impact management plan should be summarized using at the minimum, the format in Annex 2-17 of RPM for DAO 2003-30 For EPRMP, the proposed impact management plan to be discussed shall consider review of performance of existing project based on the Environmental Quality Performance Levels (EQPLs) set. Also include change in adaptation measures / options and remediation of contaminated soil and water resources, land restoration proper dismantling, if any. During construction phase: • Include all aspects of air pollution sources particularly dust control or mitigation. Consider road watering plan and water sprinkling on wheels of transport vehicles to avoid spreading of dust particles on the community roads. • Provide mitigating measures on the inducement of flooding and the change in drainage morphology. • Provide mitigating measures of the impact of sedimentation in surface water (if applicable) especially during inclement weather or typhoon. • Include landslide prevention or risk reduction strategies – Dr. Maestrecampo			

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GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

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Sections / Subsections	Content	Page #	Acceptable?	REMARKS
4. Environmental Risk Assessment (ERA) & Emergency Response Policy and Guidelines The level of coverage and type of document required shall first be determined based on Annex 2-7e of RPM for DAO 2003-30. For EPRMP, discuss status of implementation of the safety policies/guidelines and any proposed changes. Include last three (3) years of safety statistics. Also include incidence such as spills, near spills and similar incidents such as accidents and emergency. Discuss actions taken. See Table 4 for details				
5. Social Development Plan/Framework (SDP) and IEC Framework For EPRMP, discussion should focus on the status of implementation of SDP and IEC commitments. Discuss adjustments that should be undertaken.				
5.1 Social Development Program (SDP)	Community development or livelihood programs/activities, projected beneficiaries, partner institutions, timeframe of implementation as well as source and amount allotted per activity/component (See Annex 2-18 of RPM for DAO 2003-30)			
5.2.Information and Education Campaign (IEC)	Target sector, key messages, scheme/strategy/methods, Information medium, timelines and frequency, cost (See Annex 2-19 of RPM for DAO 2003-30)			
6. Environmental Compliance Monitoring				
6.1 Environmental Performance (for EPRMP only)	• Results of compliance monitoring in matrix and graphical form showing and explaining the trend in environmental conditions • Analyze performance based on the Environmental Quality Performance Levels (EQPLs) set • Discuss compliance to ECC conditions and performance against the originally approved Environmental Management and Monitoring Plan, MMT requirements/commitments, third party audits (if any) • Discuss implementation of appropriate and effective environmental impact remedial actions in case of exceedances • Discuss operationalization of complaints management system			
6.2.Self-Monitoring Plan	The monitoring plan shall be summarized using Annex 2-20 of RPM for DAO 2003-30 or succeeding issuances as template. For EPRMP, the original and proposed additional/changes in sampling sites/stations shall be discussed and shown in map/s. Proposed reduction in or additional parameters especially for air and water shall likewise be identified. The proposed changes in parameters and/or sampling stations which shall be based on the results of the impact assessment reported in Chapter 2 shall be discussed in this section.			
6.3.Multi-Sectoral Monitoring Framework	Discussion on the necessity of creating a Multi-Partite Monitoring Team (MMT). If deemed necessary, describe the proposed scope of MMT responsibilities and activities and tabulate the list of proposed stakeholder-members of the MMT, basis of selection and proposed role. (See Annex 3-4 of the RPM for DAO 2003-30).			

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Sections / Subsections	Content	Page #	Acceptable?	REMARKS
	Please consider in the selection of the MMT member the DAO 2017-15 and DAO 2018-18			
6.4 Environmental Guarantee and Monitoring Fund Commitments	• Discussion on the necessity of putting up an EGF. If deemed necessary, present a proposed amount of EGF indicating the basis for the estimate (per guidelines in annex 3-6 of RPM for DAO 2003-30) • If MMT is deemed necessary, present a proposed amount of EMF (based on a draft AWFP in following the format in Annex 3-4 and consistent with guidelines in Annex 3-5 of RPM for DAO 2003-30);			
7.Decommissioning / Abandonment /Rehabilitation Policy Statement on Proponent's policies to implement the abandonment plan described in Item 1.7 and to formulate and submit procedures for Rehabilitation/ Decommissioning/Abandonment within a timeframe specified in the ECC. For EPRMP, present approved plan/program, if any, and proposed changes.				
8. Institutional Plan for EMP Implementation Present the organizational scheme of the proponent including line of command and reporting procedures as well as manpower complement and relationships with other operating departments. For EPRMP, discuss status of implementation and any proposed changes in the plan to cover modification/expansion if any.				

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Table 3. Key Environmental Impacts to be included in the Assessment and Formulation of Management and Monitoring Plan to be reflected in the EIS/EPRMP

During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
I. Land											
1.1. Land Use and Classification											
1.1.1 Impact in terms of compatibility with existing land use	Description & Map showing the project area in relation to existing land use.	Assessment of the compatibility of the proposed project vis-a-vis actual land use and the approved comprehensive land use plan/zoning classification, ECA Classification and/or the coastal resource management plan of the LGU if any.									
1.1.2 Impact on compatibility with classification as an Environmentally Critical Area (ECA)	Identify ECA where the project is located or near the project area. Identify areas vulnerable/susceptible to natural hazards where the project is located or near the project area (include map/s).										
1.1.3 Impact in existing land tenure issue/s	Determine if the project area is under CARP or with CADC / CADT / CALC/ CALT, with IFMA/CBFMA, within COC, within MPSA or other tenurial instruments (issued by the DENR) and identify corresponding existing tenure issues including presence of informal settlers.	Identify and assess impact in terms of land tenure issues in relation to project implementation									
1.1.4 Impairment of visual aesthetics	Visually significant landforms/ landscape/structures	Identify and assess impact of the project on these visually significant landforms/landscape/structures									
1.1.5 Devaluation of land value as a result of improper solid waste management and other related impacts	Existing solid waste management and related land management scheme in the area	Identify and assess impacts of the estimated generation of solid wastes in terms of - amount and - characteristics (hazardous or domestic) and other related issues on the existing management scheme									

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During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP								
List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
1.2 Geology/Geomorphology											
1.2.1 Change in surface landform/geomorphology/ topography/ terrain/slope	Slope and Elevation/Topographic Map;	Identify and assess project impact in terms of the changes in surface landform/topography/terrain/slope including existing hazard as maybe aggravated by climate change as projected by PAGASA									
1.2.2 Change in sub-surface geology/underground conditions	Regional/General Geological Map Natural Hazard Map (sub surface)	Identify and assess project impact in terms of the changes in sub-surface geology and inducement of subsidence, liquefaction, landslides, mud/debris flow to the environment including the possibility of aggravating existing natural hazards Discuss and assess the impacts of geologic hazards and planned earthworks on the project facilities (e.g., landslides, mudflows, subsidence, ground shaking from earthquake, liquefaction, flooding, etc.). Note in the discussion how climate change can aggravate the hazards and impacts. The geologic hazards map must consider the hazards/exposure/vulnerability/ risk maps of Section 1.1.2. Consider new faults (PHIVOLCS)									
1.2.3 Inducement of subsidence, liquefaction, landslides, mud / debris flow, etc.	Geological Map as needed.; hazard maps (NAMRIA, NDRRMC, MGB, PHIVOLCS, PAGASA) DWPH initial liquefaction screening										
1.3 Pedology											
1.3.1 Soil erosion / Loss of topsoil/overburden	• Summary of Soil Investigation Report on soil type and quality • Soil map showing soil types, sampling stations, topography,	Describe capability of the land to accommodate the proposed development with minimal or without soil erosion/loss of topsoil/overburden									

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During scoping: Unless otherwise specified as agreed during scoping, all items listed are required. Write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*								
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			Page	✓	Page	✓	Page	✓	Page	✓	
	streams, built-up areas, and planned project features • Water and wind erodibility potential • Sediment sources, and • Riverbank stability	Describe the physical properties and erodibility potential of the soil, ongoing erosion processes and assess the erosional impacts of the project. The Universal Soil Loss Equation (USLE) and its variants may be used in the modeling.									
1.3.2 Change in soil quality/fertility	Laboratory results on soil sample analysis for N, P, K, pH, organic matter, micronutrients	Assess the impact of the project activities including the possibility of spills on soil quality and fertility									
1.4 Terrestrial Ecology											
1.4.1 Vegetation removal and loss of habitat	• Map showing land cover; sampling sites; location of observed important, endangered, and keystone species; ecologically sensitive sites; planned land development works • Flora and fauna species inventory or survey report to cover species listing, abundance, richness, dominance, diversity, evenness, ecological status, and uses; • Historical occurrences of pest infestation, forest/grass fire and/or similar incidences	To establish baseline, - Use quadrat sampling for flora to cover all land cover types - Use transect walk – mist nets, traps, for fauna - show survey locations in a map Identify and assess specific impacts of the project activities guided by the following: 1. Habitat loss or degradation – Land clearing, river damming, etc. will result in the loss of habitat. Some activities may lead to the alteration of habitat composition, structure or function. Some habitats, e.g., wetlands, are critical to ecological processes or endangered species. 2. Habitat fragmentation – This is the break-up of the natural landscape into small patches isolated from one another. It affects the number of									
1.4.2 Threat to existence and/or loss of important local species	Summary of endemicity / conservation status										
1.4.3 Threat to abundance, frequency and distribution of important species	• Summary of abundance, frequency and distribution • Economic importance and uses of significant flora and fauna										

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List of Key Impacts	**Baseline Data Parameter Requirements**	**Required Assessment Methodology/Approach**	**Baseline Conditions**		**Impact Analysis**		**Mgmt. Plan**		**Monitoring Plan**		**Remarks**
			Page	✓	Page	✓	Page	✓	Page	✓	
1.4.4 Hindrance to wildlife access	Survey map in relation to the project site	species present, movement of species, and transfer of materials among habitats. 3. Loss of species – Of special interest are the keystone, endangered, and endemic species. 4. Pollution effects on species – The stressors include dust, noise,chemical/ petrochemical spills, eroded sediment, increased temperature, etc. Relate discussions to estimated GHG emissions and possible carbon sequestration programs.									
2. THE WATER											
2.1 Hydrology/Hydrogeology											
2.1.1 Change in drainage morphology / inducement of flooding/ Reduction in stream volumetric flow	Drainage map (also showing local drainage system/infrastructures); Historical flooding/drought occurrences, stream flow measurements/estimates; Delineation of watershed /sub-watersheds/ floodplain; and identification of aquifers if any Include a map of the affected river system overlaying the project components – Dr. Maestrecampo	Identify and assess project impact on the change in drainage morphology/local drainage system and resulting effects of flooding pattern in the project area and surrounding. Include climate projections effects on flooding. Relate discussions to item 3.1.1									
2.1.2 Change in stream, lake water depth	Regional hydrogeological map	Identify and assess project impact in terms of change in stream, lake water depth									

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List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		Remarks
			Page	✓	Page	✓	Page	✓	Page	✓	
2.1.3 Depletion of water resources / competition in water use	Current / projected water use (groundwater/surface water) in the area and adjacent areas Inventory of water supply source including springs and wells(indicate depth of water table) and show location in a map of appropriate scale	Identify and assess project impact on the existing water resources and the resulting competition in the water use using analysis/estimation of water availability. Include discussions taking into consideration the PAGASA medium to long term projections Quantify the amount of water that will be extracted during construction. Identify the potential impacts of water extraction to the affected community. Conduct water balance to show that water extraction from sources will not exceed the source's threshold. Include strategies on water conservation to address the possible impact of water resource depletion or water resource competition – Dr. Maestrecampo									
2.2 Oceanography *(applicable to projects with jetty/port and/or subsea structures that will change the bathymetry in the area)* N/A											
2.2.1 Change/disruption in water circulation pattern, littoral current, and coastal erosion and deposition	• Bathymetric survey and map • Measurement of water currents • Analysis of available proximate tides data • Hydrodynamic modeling • Particle dispersion modeling and map • Storm surge hazard, exposure, vulnerability, risk maps	Identify and assess project impact on the degree of change/disruption of circulation pattern and the potential for coastal erosion Build a hydrodynamic model based on the measured bathymetry and currents and tidal analysis and then validate the model. A public domain software like the United States Environmental Protection Agency Environmental Fluid Dynamics Code (EFDC) may be used. Through the									

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			Page	✓	Page	✓	Page	✓	Page	✓	
		validated hydrodynamic model, assess the impacts of the project on water circulation, littoral current, and coastal erosion and deposition. Use the modeling results of Sec. 1.3.1 and 2.1.1. Discuss how the impacts may be affected by climate change especially sea level rise.									
2.2.2 Change in bathymetry	Bathymetric map.	USLE / similar modeling when applicable Use the hydrodynamic model to assess the impacts of the bathymetric changes. Discuss how the impacts may be affected by climate change. Compare projected new bathymetry as a result of the project with the existing									
2.3 Water Quality											
2.3.1 degradation of groundwater quality	Physico-Chemical characterization of water: ☐ pH ☐ BOD5 ☐ COD ☐ DO ☐ Oil and grease ☐ TSS ☐ Heavy Metals: _____ ☐ fecal / total coliform	Identify and assess project impact in terms of degradation of groundwater, coastal surface water and coastal/marine water quality. Use DENR standard methods and procedures for sampling and analysis. Assess impact on siltation of surface and coastal/marine waters. Circulation / plume modeling for regular discharges, leaks/spills, worst case scenario of failure of WTF and other emergency/ accident scenarios for facilities with structures in water bodies									
2.3.2 degradation of surface water quality											
2.3.3 degradation of coastal/marine water quality (n/a)											

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Noted By:	Signature		Signature
Review Committee Members		EMB Representatives	
1. Mr. Edmundo Vargas		1. Engr. Joel Polinian	
2. For Raul Briz		2.Engr. George Silvederio	
3.Engr. Dodjie Maestracampo			
4. Ms. Esperanza Lee		Project Proponent:	
		1. Ms.Michiko Quiachon	
		2.Engr. Maria Victoria Lofamia	
Resource Person		Project Preparer/Consultant:	
1.Ms.Winnievir Ballia		1. Ms.Jan Heidel Bautista	
		2. Mr. Jethro Alden C. Hipe	

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			Page	✓	Page	✓	Page	✓	Page	✓	
	☐ others: _____ ☑ sampling site map Include parameters from DAO 2016-08	Link discussion of spills with Section 1.3 especially if spills affect soil and groundwater. Aquifer (Groundwater) vulnerability Assessment (i.e. discussions on groundwater contamination due to project operation). Show in a map, sampling sites for monitoring purposes based on the above assessment.									
2.4 Freshwater Ecology											
2.4.1 Threat to existence and/or loss species of important local and habitat	• Summary of endemicity / conservation status • Abundance of ecologically and economically important species (fishes, benthos, planktons); • Presence of pollution indicator species; • sampling site map	Identify and assess project impact in terms of threats to existence/and or loss of species, abundance frequency and distribution species and include discussions on overall impact to freshwater ecology.									
2.4.2 Threat to abundance, frequency and distribution of species		Relate discussions to air and water. Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.									
2.5 Marine Ecology *(applicable if project involves activities, discharges and structure in marine waters) N/A*											
2.5.1 Threat to existence and/or loss of important local species and habitat	• Abundance/densities/distribution of ecologically and economically important species (mangroves, fishes, benthos, planktons, coral reefs, algae, seaweeds, sea grasses); • Presence of pollution indicator species; • Historical occurrences of red-tide, fish kill or any related event • marine resource map	Quadrat, transect, line intercept, spot dive, manta tow, marine resource characterization (e.g. municipal and commercial fisheries data) for baseline gathering.									
2.5.2 Threat to abundance, frequency and distribution		Identify and assess project impact in terms of threats to existence, loss of important local species, threat to abundance, frequency and									

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List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		Remarks
			Page	✓	Page	✓	Page	✓	Page	✓	
	• sampling site map	distribution and include discussions on overall impact to marine ecology. Relate discussions to air, water and oceanography Show in a map, sampling sites for monitoring purposes based on the most significant threats identified.									
3.0 THE AIR											
3.1 Meteorology/Climatology											
3.1.1 Change in the local micro-climate e.g. local temperature	Monthly average rainfall and temperature of the area; Climatological normals/extremes; Wind rose diagrams; Frequency of Tropical cyclones	Identify and assess project impact in terms of change in the local micro-climate change. Also discuss effects of climate change using PAGASA medium to long term projections									
3.1.2 Contribution in terms of greenhouse gas emissions (or GHG mitigation potential) Note: applicable only for projects with significant GHG emissions	Data on Greenhouse gasses (i.e. carbon dioxide, nitrous oxide);	Estimate projected greenhouse gases (GHG) (i.e. carbon dioxide, nitrous oxide) using IPCC guidelines, include mitigation and/or sequestration for both construction and operation phases.									
3.2 Air Quality (& Noise)											
3.2.1 Degradation of air quality	Characterization of ambient air quality: ✓ TSP ✓ PM10 ✓ SOx ✓ NOx Trace Metals: _____ others: _____ (for sampling methods refer to Clean Air Act) ☑ sampling site map	Use DENR standard methods and procedures for sampling and analysis. Relate selection of sampling locations using data collected in 3.1.1 Identification and assessment of impact of the project to the identified parameters including VOCs and odor through air dispersion modeling (as may be applicable)									

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List of Key Impacts	Baseline Data Parameter Requirements	Required Assessment Methodology/Approach	Baseline Conditions		Impact Analysis		Mgmt. Plan		Monitoring Plan		Remarks
			Page	✓	Page	✓	Page	✓	Page	✓	
	Conduct 24-hrs Ambient Air Quality Monitoring based Standard Criteria Parameters: TSP, PM10, SO2, NO2 as per NAAQGV and NAAQSSSAP under DAO 2000-81	Show in a map, sampling sites for monitoring purposes based on the above assessment. *Compare changes in air quality over time using statistical tools e.g. across sampling sites over time, and test for significant changes*									
3.2.2 Increase in ambient noise level	Characterization of ambient noise level sampling site map Please include the map of the Ambient Air Quality Monitoring Stations.	Use DENR standard methods and procedures for sampling and measurement. Identification and assessment of impact to ambient noise level using noise attenuation modeling and comparing it with relevant standards. (applicable if estimated total noise level will exceed noise standard). Please include discussion on the basis selection for stations of 24hrs and on 1hr sampling.									
4.0 THE PEOPLE											
4.1 Displacement of settlers Displacement / disturbance of properties Change/conflict in land ownership Change/conflict Right of way Impact on Public Access	Demographic data of impact area (barangay level): - Number of households and household size - Land area, - Population, - Population density /growth - gender and age profile,	Identify and assess project impacts on demography of affected communities. Use assessment in the formulation of SDP/REC The SDP/REC should take into consideration the issues raised during public scoping									

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			Page	✓	Page	✓	Page	✓	Page	✓	
	- literacy rate, profile of educational attainment - settlements map Census of population / property that will be displaced / disturbed Housing ownership profile / availability of housing/ number of informal settlers	Assess availability of alternative public access and housing options for displaced settlers For project with displacement/ disturbance of properties/settlers, change/conflict in land ownership and change/conflict right of way, formulate resettlement framework plan or RAP									
4.2 In-migration proliferation of informal settlers		Identify and assess project impact due to in-migration patterns including proliferation of informal settlers									
4.3 Cultural/Lifestyle change	Existing Culture/Lifestyle that may be significantly affected	Identify and assess project impact in terms of Culture/Lifestyle that may be affected and/or introduced									
4.4 Impacts on physical cultural resources	Inventory and description of physical cultural resources and landscapes that have archaeologic, paleontologic, historical, religious, aesthetic, or cultural significance; Movable or immovable objects, below ground or under water, sites, structures, groups of structures, and natural features Classify cultural interest value/ importance into local, provincial, national, or international level *Sources of information: UNESCO, National Museum (NM), National Historical Commission of the Philippines (NHCP), National Commission for Culture and Arts (NCAA) and the Local Government Units (LGUs) in the project area and other LIN or National Publications*	Identify all potential project impacts in an integrated manner considering the type, significance, and value/importance of the physical cultural resource/s Identify risks in terms of capacity and commitment in managing the impacts *(protocols in handling chance finds shall be implemented)*									

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			Page	✓	Page	✓	Page	✓	Page	✓	
4.5 Threat to delivery of basic services /resource competition	Availability of public services in terms of • Water supply • Power supply • Communications /transportation • peace and order / crime • education facilities • recreational facilities / sports facilities statistical data / information related to public services: • literacy rate, profile of educational attainment • Crime rate • Food security	Identify and assess project impact in terms of threats to delivery of basic services including potential for resource competition in the area including effects of in-migration									
4.6 Threat to public health and safety	Availability of public services in terms of health resources (Government and Private) Statistical data / information related to public services • Morbidity and mortality rates (infants and adults - 5-year trend) • Common diseases in the area including endemic diseases; Environmental Health and Sanitation Profile	Identify and assess specific threats to public health and safety due to project impacts. Relate discussions to land, air and water (Item 1 to 3) Analysis of the impact of project implementation on existing disease profile including weather sensitive diseases and impact aggravation as a result of climate change as projected by PAGASA									
4.7 Generation of Local Benefits from the project Enhancement of employment and livelihood opportunities	Socioeconomic data: • Main sources of income • Employment rate/ profile • Poverty incidence • sources of livelihood	Identify and assess local benefits of the project in terms of enhancement of employment and livelihood opportunities, increased business opportunities and associated economic activities and increased revenue of LGU									

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			Page	✓	Page	✓	Page	✓	Page	✓	
Increased business opportunities and associated economic activities Increased revenue of LGUs	• commercial establishments and activities • banking and financial institutions Data regarding the possible project contribution to the local economy like gross domestic product and domestic per capita income										
4.8 Traffic congestion	Road network/ systems Existing Transportation/traffic situation	Identify and assess project impact on the traffic situation in the area including congestion based on existing capacity of road system									

Table 4. Environmental Risk Assessment to be included in EIS/EPRMP

During scoping: Check (•) required/applicable items; items with ✓ are automatically required; write specific instructions (if any) on the blanks/spaces provided			✓ *For completeness during procedural screening; page numbers should be provided upon submission of the EIS/EPRMP*						
Level of Coverage & Type of Risks	**CONTENTS OF ERA AS PART OF EIS/EPRMP For the identified safety risks in column 1**	Remarks/ Specific Scoping Instruction/s	ERA		ERP		Monitoring Plan		REMARKS
			Page	✓	Page	✓	Page	✓	
Level of Coverage: Refer to Annex 2-7e of the RPM for DAO 2003-30 ☐ Level 2 (QRA Required) ☐ Level1 (Emergency Plan based on hazard analysis) ☑ Risk Screening Level	For EPRMP, include HAZOP or QRA for existing facilities and compare with that for the expansion. Also include discussions on safety incidents/records/history (in relation to environmental risks) classified into first aid, medical attention cases, days away from work cases, fatalities (including contractors), record of drills (fire, spills, explosion, among others) and any experience in implementing the ERP For EIS, check type of report to be submitted prior to Operation: ☐ Quantitative Risk Assessment(QRA) ☐ HAZOP ☐ Others : _____								

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☐ 1st ☐2nd ☐3rd ___th Screening

Safety Risks Type: ☑ Fire ☑ Explosion ☑ Release of toxic substances	☑ Description of conditions, events and circumstances which could be significant in bringing about identified safety risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards, both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the release of toxic substance, as applicable ☑ The safety policy and emergency preparedness guidelines consistent with the regulatory requirements. Emergency Preparedness should also consider natural hazards to the infrastructures and facilities. For EPRMP, present actual Emergency Response Policy,record of drills and recorded events.									
☑ Physical Risks (Failure of Structure w/c could endanger life, property and/or the environment)	☑ Description of conditions, events and "trigger" which could be significant in bringing about identified physical risks ☑ Description & assessment of the possible accident scenarios posing risk to the environment ☑ Description of the hazards both immediate (acute effects) and delayed (chronic effects) for man and the environment posed by the failure of structure, as applicable									

GENERIC EIS/EPRMPSCOPING AND SCREENING FORM

☐ 1st ☐2nd ☐3rd ___th Screening

Noted By:	Signature		Signature
Review Committee Members		EMB Representatives	
1. Mr. Edmundo Vargas		1. Engr. Joel Polinian	
2. For Raul Briz		2.Engr. George Silvederio	
3.Engr. Dodjie Maestracampo			
4. Ms. Esperanza Lee		Project Proponent:	
		1. Ms.Michiko Quiachon	
		2.Engr. Maria Victoria Lofarnia	
Resource Person		Project Preparer/Consultant:	
1.Ms.Winnievir Ballia		1. Ms.Jan Heidel Bautista	
		2. Mr. Jethro Alden C. Hipe	

Page 22 of 22

This report documents the environmental impact assessment (EIA) and public participation activities conducted for the ECC application of the proposed road project of Department of Public Works. The Project is a 65.6 km high standard highway with a 60 m road-right of way that will traverse 2 cities and 4 municipalities of Misamis Oriental and

ENVIRONMENTAL IMPACT STATEMENT (Annex) May 2024

CENTRAL MINDANAO HIGH STANDARD HIGHWAY

Misamis Oriental and Bukidnon, Region X

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS – CENTRAL OFFICE

Bonifacio Drive Port Area, 652 Zone 068, Manila

Preparer

Amet-Asia, Inc.

Unit 303, One Corporate Center, Meralco Ave. corner Julia Vargas Avenue, Ortigas Center, San Antonio, Pasig City 1605

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Annex 1. Laboratory report of soil analysis

Low rainfall

HiAdvance Philippines Incorporated
(formerly HCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

14 May 2021 W/O# M21D418

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Soil Analysis

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-21 11:30.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager- Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly NCALABS Philippines, Inc.)

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inotel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 12:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S1	M21D418-01	Soil	26-Apr-21 08:41	28-Apr-21 11:30

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

Page 1 of 7

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 12:04

CHAIN-OF-CUSTODY / Analytical Request Document

SAMPLE ID

HiAdvance Project No / Lab ID

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

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Annexes

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 12:04

HiAdvance Philippines

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet - Asia Inc.
Project Name: Soil Analysis
Work Order: [illegible]
Date Received: 28 Apr 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: ___	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded: 8.8 °C	T	
7	COC is present. COC #: 52[illegible]	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

3

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

Page 3 of 7

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: Soil Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 14-May-21 12:04

HiAdvance Philippines

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	F	Out of hold for pH
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	T NA	
25	Multiphase samples are not present or < 10% mixture of solids/liquids/oil.	F NA	
26	Sample appearance is noted.	F NA	
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	F NA	
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for the specific site.	NA	

Client Confirmation M210418

2

MP-SPL-007-F01
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizon D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

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Annexes

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pernida	**Reported:** 14-May-21 12:04

S1
M21D418-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Conventional Chemistry Parameters by EPA Methods									
pH	**8.30**	1.00	pH Units	1	21D0279	28-Apr-21	28-Apr-21	EPA 9045D	1-05, 1-06, T-02

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

Page 5 of 7

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Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 14-May-21 12:04

Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21D0279 - pH APHA 4500-H										
LCS (21D0279-BS1)				Prepared & Analyzed: 28-Apr-21						
pH	7.21	1.00	pH Units	7.20		100	97-104			T-02
LCS Dup (21D0279-BSD1)				Prepared & Analyzed: 28-Apr-21						
pH	7.21	1.00	pH Units	7.20		100	97-104	0.00	10	T-02
Duplicate (21D0279-DUP1)		Source: M21D418-01		Prepared & Analyzed: 28-Apr-21						
pH	8.31	1.00	pH Units		8.30			0.120	1	T-02a

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bingoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

Page 6 of 7

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: (none) Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 12:04

Notes and Definitions

Report Specific Notes

T-02a	The reported temperature is 22.8°C.
T-02	The reported temperature is 22.7°C.
I-06	This sample was analyzed outside EPA/APHA recommended holding time.
I-05	This sample was received outside EPA/APHA recommended holding time. The laboratory proceeded with the analysis as per client request

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,
Limit	analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date
Note 1	Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT **********

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001138	Princess S. Gaviez, Laboratory Manager Chemist PRC# 9207

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philippines@hiadvance.com

22 May 2021 WO# M21D418

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Soil Analysis

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-21 11:30. If you have any questions concerning this report, please feel free to contact me.

Note : HiAdvance Philippines Incorporated is former NCALABS Phils. Inc.

Sincerely,

for Annabelle Bangoy
Project Manager

HiAdvance

HiAdvance Philippines

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St.
Paseo de Magallanes, 1232
Makati City, PHILIPPINES
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Fax No : +632.854.8385
philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 22-May-21 07:33

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S1	M21D418-01	Soil	26-Apr-21 08:41	28-Apr-21 11:30

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Annabelle Bongoy, Project Manager

Page 1 of 4

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philippines@hiadvance.com

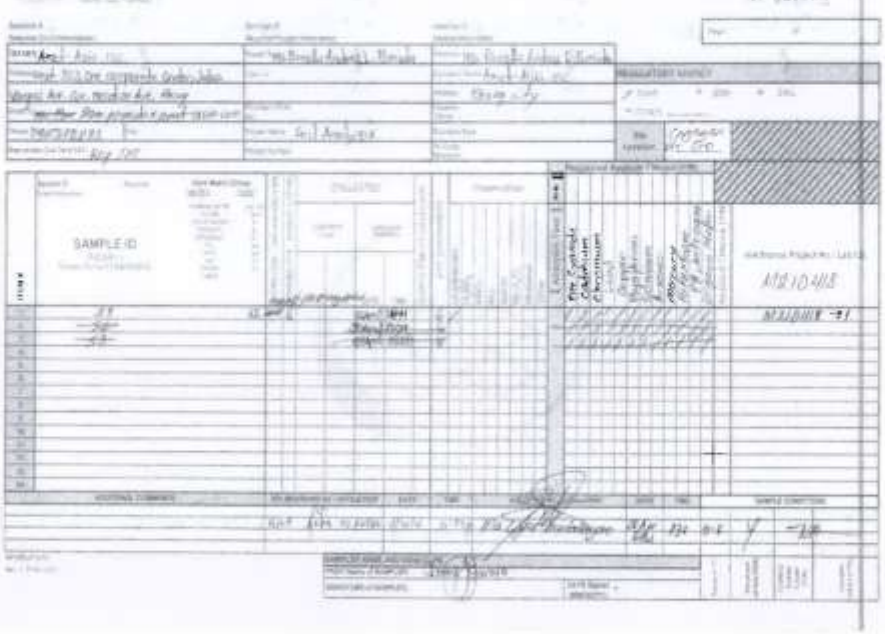
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Soil Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
22-May-21 07:33

CHAIN-OF-CUSTODY / Analytical Request Document

SAMPLE ID



HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Annabelle Bailloy, Project Manager

Page 2 of 4

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Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 22-May-21 07:33

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet - Asia Inc.
Project Name: Soil Analysis
Work Order: [illegible]
Date Received: 28 Apr 2021
Creator: JAM

Item #	Question	Y / N	Remarks
1	[illegible]	[illegible]	
2	The cooler's custody seal, if present, is [illegible]	[illegible]	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. Temperature should be < 0 °C	T	
6	Cooler temperature is recorded 5.8 °C	T	
7	COC is present. COC = 32 PCS	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Hold Sample is name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample container is provided by the lab.	T	

1

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

for

Annabelle Bangoy, Project Manager

Page 3 of 4

Annexes

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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Soil Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pornida

Reported:
22-May-21 07:33

HiAdvance Philippines

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample ID(s) on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	T	Out of hold for pH
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	T NA	
25	Multiphase samples are not present or > 10% mixture of solids/liquids/oil.	~~T~~ NA	
26	Sample appearance is noted.	~~T~~ NA	
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria ≤ 2)	~~T~~ NA	
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific site.	NA	

Client Confirmation

M210418

2

MP-SPL-002-F01
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

for

Annabelle Bangoy, Project Manager

Page 4 of 4

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6951
Email : customer.service@ostrealabs.com.ph

PAB ACCREDITED TESTING LABORATORY PNS ISO/IEC 17025:2017 LA-1867-017F

DENR Recognized Laboratory with C.R No. 011/2018

Original Issue ✔
Duplicate issue by request ■
Revision Copy ■

CERTIFICATE OF ANALYSIS

Customer : HIADVANCE PHILIPPINES INCORPORATED

Address : 3F Maga Center Bldg. Paseo de Magallanes, Makati City

Attention : MS. ANNABELLE BANGOY

Contact Information : (02) 854-8365

CAN : **C21-05-438**
Date of Issue : 5/21/2021
RAN : R21-04-725
INVOICE # : -
Date Received: 4/30/2021
Date Sampled: -
Date Analyzed: 4/30-5/18/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods
Soil Sample				
M21D418-01	Total Nitrogen (N)	0.05	%	Kjeldahl
4/26/2021	Total Phosphorus (P)	0.031	%	Titrimetric
0841H	Total Potassium (K) *	0.045	%	Direct Air-Acetylene Flame
	Organic Matter	1.189	%	Walkley - Black
	* Total Selenium (Se) *	<0.002	mg/kg	Manual Hydride Generation AAS
	Total Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Total Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	* Free Cyanide (CN^-)	<1.0	mg/kg	Cyanide - Selective Electrode (w/o distillation)
	Total Copper (Cu) *	39.90	mg/kg	Direct Air-Acetylene Flame
	Total Chromium (Cr) *	37.44	mg/kg	Direct Air-Acetylene Flame
	Total Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
	Total Arsenic (As) *	<0.01	mg/kg	Manual Hydride Generation AAS

Note : Metals are on dry weight basis.
* Parameter(s) which is/are outside the laboratory's PNS ISO/IEC 17025:2017 scope of accreditation.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 1 **Total Analysis** : 12
Sample Submission : Submitted by the Customer
Reference : [a]USEPA Method 3050B.; [b]USEPA Method 245.5.
Remarks : Results relate only to the items tested and received by the laboratory.

Certified Correct by:
MA. CRISTINA F. BEFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:
ALVIN P. BASCO, RCh
PRC No. 0011786
Head of Operations

Not valid without OMLI dry seal

Page 1 of 1

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Uninterrupted Total Quality Service Since 1976

HiAdvance Philippines Incorporated
(formerly NCALABS Philippines, Inc.)

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Website: www.hiadvance.com.ph

14 May 2021 WO# M21E004

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Soil Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager- Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly BCALABS Phils., Inc.)
www.hiadvance.com.ph

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S2	M21E004-01	Soil	30-Apr-21 12:09	03-May-21 08:00
S3	M21E004-02	Soil	29-Apr-21 08:08	03-May-21 08:00

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizel D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

Page 1 of 8

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 321908

SAMPLE ID

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

Page 2 of 8

Annexes

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Website: www.hiadvance.com.ph

Amrt Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

HiAdvance Philippines

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amrt Asia Inc.
Project Name: Soil Analysis
Work Order: 1121E004
Date Received: 03 May 2021
Creator: MMB

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: ____	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded 6 -8 °C	T	
7	COC is present. COC # 52P118	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

1

MP-SPL-007-001
Rev. 01, 10 Nov 2014

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 5207

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Annexes

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor.
Pasig PHILIPPINES.

Project: **Soil Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
14-May-21 10:11

HiAdvance Philippines

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	T	Out of hold for pH
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	T	
25	Multiphase samples are not present or < 10% mixture of solids/liquids/oil.	NA	
26	Sample appearance is noted.	NA	
27	Samples did not require splitting or composting.	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	NA	
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific site.	NA	

MAIE004

Client Confirmation

1

MP-SPL-007-F01
Rev. 01, 12 Nov 2018

HiAdvance Philippines Incorporated

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Report Prepared By :
Annabelle Bangoy, Project Manager

Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 8297

Page 4 of 8

HiAdvance Philippines Incorporated
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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

S2
M21E004-01 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Conventional Chemistry Parameters by EPA Methods									
pH	**8.20**	1.00	pH Units	1	21E0106	03-May-21	03-May-21	EPA 9045D	

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0091128	Princess S. Galvez, Laboratory Manager Chemist PRC# 0207

Page 5 of 8

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

S3
M21E004-02 (Soil)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Conventional Chemistry Parameters by EPA Methods									
pH	**8.11**	1.00	pH Units	1	21E0106	03-May-21	03-May-21	EPA 9045D[illegible]	

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# [illegible]

Page 6 of 8

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Amet Asia, Inc.	Project: **Soil Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 10:11

Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0106 - pH APHA 4500-H										
LCS (21E0106-BS1)				Prepared & Analyzed: 03-May-21						
pH	7.18	1.00	pH Units	7.20		99.7	97-104			T-02
LCS Dup (21E0106-BSD1)				Prepared & Analyzed: 03-May-21						
pH	7.19	1.00	pH Units	7.20		99.9	97-104	0.139	10	T-02a
Duplicate (21E0106-DUP1)		**Source: M21E004-01**		Prepared & Analyzed: 03-May-21						
pH	8.19	1.00	pH Units		8.20			0.122	1	I-05, I-06,

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Dungoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001120	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

Page 7 of 8

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Website: www.hiadvance.com.ph

Amrt Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 14-May-21 10:11

Notes and Definitions

Report Specific Notes

T-02d	The reported temperature is 23.0°C.
T-02c	The reported temperature is 22.8°C.
T-02b	The reported temperature is 22.5°C.
T-02a	The reported temperature is 21.1°C.
T-02	The reported temperature is 20.9°C.
I-06	This sample was analyzed outside EPA/APHA recommended holding time.
I-05	This sample was received outside EPA/APHA recommended holding time. The laboratory proceeded with the analysis as per client request

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable Prepared Date indicated is the same as Extraction Date
Note 1	Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT**********

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9301

Page 8 of 8

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HiAdvance Philippines

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22 May 2021

WO# M21E004

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Soil Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21

08:00. If you have any questions concerning this report, please feel free to contact me.

Note : HiAdvance Philippines Incorporated is former NCALABS Phils. Inc.

Sincerely,

FOR
Annabelle Bangoy
Project Manager

HiAdvance

HiAdvance Philippines

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3F Mega Center, San Antonio St.
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Makati City, PHILIPPINES
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philippines@hiadvance.com

Amet Asia, Inc.	Project: Soil Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 22-May-21 07:46

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S2	M21E004-01	Soil	30-Apr-21 12:09	03-May-21 08:00
S3	M21E004-02	Soil	29-Apr-21 08:08	03-May-21 08:00

HiAdvance Philippines Incorporated

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for

Annabelle Bangay, Project Manager

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HiAdvance Philippines

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philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Soil Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 22-May-21 07:46

CHAIN-OF-CUSTODY / Analytical Request Document

№ 321905

REGULATORY AGENCY

SAMPLE ID

HiAdvance Philippines Incorporated

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For
Annabelle Bangoy, Project Manager

Page 2 of 4

Annexes

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philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project: **Soil Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 22-May-21 07:46

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia Inc.
Project Name: Soil Analysis
Work Order: [illegible]
Date Received: [illegible]
Creator: [illegible]

Item #	Question	Y / N / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background	N/A	
2	The cooler's custody seal, if present, is intact. Cooler No.: ____	N/A	
3	The cooler or samples did not appear to have been compromised or tampered	Y	
4	Samples are received on ice. If applicable:	Y	
5	Cooler temperature is acceptable. Temperature should be (-6 °C)	Y	
6	Cooler temperature is recorded [illegible] °C	Y	
7	COC is present. COC # 52798	Y	
8	COC is filled out in ink and is legible.	Y	
9	COC is filled out with all pertinent information	Y	
10	Is the field sampler's name present on COC?	Y	
11	Number of containers received match with COC.	Y	
12	Sample containers have legible labels.	Y	
13	Sample containers provided by the lab.	Y	

1

[illegible]
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

For [illegible]
Annibelle Bangoy, Project Manager

Page 3 of 4

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
Barangay Road, Bo. Mamplasan, Biñan, Laguna, Philippines 4024
Telefax : (02) 889-9058; (049) 539-0102; (02) 848-6861
Email : customer.service@ostrealabs.com.ph

PAB ACCREDITED TESTING LABORATORY PNS ISO/IEC 17025:2017 LA-1997-017P

DENR Recognized Laboratory with C.R No. 011/2018

Original Issue ✔
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Revision Copy ■

CERTIFICATE OF ANALYSIS

Customer : HIADVANCE PHILIPPINES INCORPORATED

Address : 3F Maga Center Bldg. Paseo de Magallanes, Makati City

Attention : MS. ANNABELLE BANGOY

Contact Information : (02) 854-8365

CAN : **C21-05-357**
Date of Issue : 5/19/2021
RAN : R21-05-02
INVOICE # : -
Date Received: 5/3/2021
Date Sampled: -
Date Analyzed: 5/3-18/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods
Soil Samples				
M21E004-01	Total Nitrogen (N)	0.3	%	Kjeldahl
4/30/2021	Total Phosphorus (P)	0.013	%	Titrimetric
1209H	Total Potassium (K) *	0.072	%	Direct Air-Acetylene Flame
	Organic Matter	9.448	%	Walkley - Black (Colorimetric)
	* Total Selenium (Se) *	0.057	mg/kg	Manual Hydride Generation AAS
	Total Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Total Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	* Free Cyanide (CN^-)	<0.1	mg/kg	Cyanide - Selective Electrode (w/o distillation)
	Total Copper (Cu) *	72.94	mg/kg	Direct Air-Acetylene Flame
	Total Chromium (Cr) *	36.75	mg/kg	Direct Air-Acetylene Flame
	Total Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
	Total Arsenic (As) *	2.75	mg/kg	Manual Hydride Generation AAS
M21E004-02	Total Nitrogen (N)	0.3	%	Kjeldahl
4/29/2021	Total Phosphorus (P)	0.052	%	Titrimetric
0808H	Total Potassium (K) *	0.079	%	Direct Air-Acetylene Flame
	Organic Matter	3.675	%	Walkley - Black (Colorimetric)
	* Total Selenium (Se) *	0.176	mg/kg	Manual Hydride Generation AAS
	Total Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Total Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	* Free Cyanide (CN^-)	<0.1	mg/kg	Cyanide - Selective Electrode (w/o distillation)

Not valid without OMLI dry seal Page 1 of 2 C21-05-357

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Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Methods
	Total Copper (Cu) *	65.03	mg/kg	Direct Air-Acetylene Flame
	Total Chromium (Cr) *	44.43	mg/kg	Direct Air-Acetylene Flame
	Total Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
	Total Arsenic (As) *	2.36	mg/kg	Manual Hydride Generation AAS

Note : Metals are on dry weight basis.
* Parameter(s) which is/are outside the laboratory's PNS ISO/IEC 17025:2017 scope of accreditation.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 2 **Total Analysis** : 24
Sample Submission : Submitted by the Customer
Reference : [a]USEPA Method 3050B.; [b]USEPA Method 245.5.
Remarks : Results relate only to the items tested and received by the laboratory.

Certified Correct by:
MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:
ALVIN P. BAGOO, RCh
PRC No. 0010786
Head of Operations

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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Soil Analysis**
Project Number: [none]
Project Manager: Ms. Pamelle Andrea L. Pumida

Reported:
15-Sep-21 15:25

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
S1	M21H229-01	Soil	26-Jul-21 11:40	16-Aug-21 8:00
S3	M21H229-02	Soil	27-Jul-21 08:20	16-Aug-21 8:00
S2	M21H229-03	Soil	29-Jul-21 13:30	16-Aug-21 8:00

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Annabelle Bangoy, Project Manager

Page 1 of 4

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Assaying and Environmental Testing Specialist
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Email : customer.service@ostrealabs.com.ph

PAB ACCREDITED TESTING LABORATORY PNS ISO/IEC 17025:2017 LA-1997-017F

DENR Recognized Laboratory with C.R No. 011/2018

Original Issue ■
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CERTIFICATE OF ANALYSIS

Customer : HIADVANCE PHILIPPINES INCORPORATED

Address : Unit 5 & 6 Maga Centre, Paseo de Magallanes, Makati City

Attention : MS. ANNABELLE BANGOY

Contact Information : (02) 854-8365

CAN : **C21-09-305A**
Date of Issue : 9/15/2021
RAN : R21-08-523
INVOICE # : -
Date Received: 8/17/2021
Date Sampled: -
Date Analyzed: 8/17-9/6/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods
Soil Samples				
M21H229-01	Iron (Fe) *	4.49	%	Direct Air-Acetylene Flame
1140H	Manganese (Mn) *	833.07	mg/kg	Direct Air-Acetylene Flame
7/26/2021	* Molybdenum (Mo) *	<0.20	mg/kg	Direct Nitrous Oxide-Acetylene Flam
	Nickel (Ni) *	150.73	mg/kg	Direct Air-Acetylene Flame
	Zinc (Zn) *	78.34	mg/kg	Direct Air-Acetylene Flame
	Boron (B)	0.41	%	Titrimetric
	* Chloride (Cl^-)	13.051	ppm	Titrimetric
M21H229-02	Iron (Fe) *	7.25	%	Direct Air-Acetylene Flame
0820H	Manganese (Mn) *	737.67	mg/kg	Direct Air-Acetylene Flame
7/27/2021	* Molybdenum (Mo) *	<0.20	mg/kg	Direct Nitrous Oxide-Acetylene Flam
	Nickel (Ni) *	37.71	mg/kg	Direct Air-Acetylene Flame
	Zinc (Zn) *	112.40	mg/kg	Direct Air-Acetylene Flame
	Boron (B)	0.41	%	Titrimetric
	* Chloride (Cl^-)	1.684	ppm	Titrimetric

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Sample Descriptions	Parameters	Results	Units	Methods
M21H229-03	Iron (Fe) *	4.53	%	Direct Air-Acetylene Flame
1330H	Manganese (Mn) *	1438.57	mg/kg	Direct Air-Acetylene Flame
7/29/2021	* Molybdenum (Mo) *	<0.20	mg/kg	Direct Nitrous Oxide-Acetylene Flam
	Nickel (Ni) *	461.17	mg/kg	Direct Air-Acetylene Flame
	Zinc (Zn) *	76.22	mg/kg	Direct Air-Acetylene Flame
	Boron (B)	0.30	%	Titrimetric
	* Chloride (Cl^-)	0.842	ppm	Titrimetric

Note : Cancels and supersedes C21-09-107 dated September 8, 2021.
Metals are on dry weight basis.
* Parameter(s) which is/are outside the laboratory's PNS ISO/IEC 17025:2017 scope of accreditation.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 3 **Total Analysis :** 21
Sample Submission : Submitted by the Customer
Reference : *USEPA Method 3050B.
Remarks : Results relate only to the items tested and received by the laboratory.

Certified Correct by:
MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:
ALVIN P. BASCO, RCh
PRC No. 0011786
Head of Operations

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Annex 2. Laboratory report of bottom sediment

HiAdvance

HiAdvance Philippines

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St.
Paseo de Magallanes, 1232
Makati City, PHILIPPINES
Office : +632.729.4327
Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: Soil Analysis (Sediments) Project Number: [none] Project Manager: Ms. Pamelle Andrea L. Pomida	Reported: 15-Sep-21 15:18

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
AF-1 (Tagaloan River) Natumolan	M21H228-01	Soil	26-Jul-21 10:55	16-Aug-21 08:00
AF-2 (Diclum River) Diclum	M21H228-02	Soil	26-Jul-21 14:10	16-Aug-21 08:00
AF-10 (Sawaga River) Kalasungay	M21H228-03	Soil	27-Jul-21 08:35	16-Aug-21 08:00
AF-9 (Sawaga River) Patpat	M21H228-04	Soil	27-Jul-21 10:15	16-Aug-21 08:00
AF-8 (Komotal/Kubatan River) La Fortuna	M21H228-05	Soil	27-Jul-21 11:45	16-Aug-21 08:00
AF-3 (Ticala River)	M21H228-06	Soil	30-Jul-21 11:59	16-Aug-21 08:00
AF-4 (Puntian)	M21H228-07	Soil	29-Jul-21 11:47	16-Aug-21 08:00
AF-5 (Poblacion/Kisolon)	M21H228-08	Soil	29-Jul-21 11:10	16-Aug-21 08:00
AF-6 (Vista Villa/Culasi)	M21H228-09	Soil	29-Jul-21 09:27	16-Aug-21 08:00
AF-7 (Impalutao River)	M21H228-10	Soil	29-Jul-21 07:55	16-Aug-21 08:00

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Annabelle Bangoy, Project Manager

Page 1 of 4

OSTREA MINERAL LABORATORIES, INC.
Assaying and Environmental Testing Specialist
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PAB ACCREDITED TESTING LABORATORY PNS ISO/IEC 17025:2017 LA-1997-017F

DENR Recognized Laboratory with C.R No. 011/2018

CERTIFICATE OF ANALYSIS

Original Issue ■
Duplicate issue by request ■
Revision Copy ✓

Customer : HIADVANCE PHILIPPINES INCORPORATED

Address : Unit 5 & 6 Maga Centre, Paseo de Magallanes, Makati City

Attention : MS. ANNABELLE BANGOY

Contact Information : (02) 854-8365

CAN : **C21-09-305**
Date of Issue : 9/15/2021
RAN : R21-08-523
INVOICE # : -
Date Received: 8/17/2021
Date Sampled: -
Date Analyzed: 8/17-9/6/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods
Soil Samples				
M21H228-01	Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
1055H	Chromium (Cr) *	64.48	mg/kg	Direct Air-Acetylene Flame
7/26/2021	Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) *	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-02	Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
1410H	Chromium (Cr) *	59.10	mg/kg	Direct Air-Acetylene Flame
7/26/2021	Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) *	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-03	Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
0835H	Chromium (Cr) *	45.08	mg/kg	Direct Air-Acetylene Flame
7/27/2021	Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) *	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-04	Cadmium (Cd) *	<0.03	mg/kg	Direct Air-Acetylene Flame
1015H	Chromium (Cr) *	14.35	mg/kg	Direct Air-Acetylene Flame
7/27/2021	Mercury (Hg) *	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) *	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) *	<0.01	mg/kg	Manual Hydride Generation AAS

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Sample Descriptions	Parameters	Results	Units	Methods
M21H228-05	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
1145H	Chromium (Cr) [a]	14.95	mg/kg	Direct Air-Acetylene Flame
7/27/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-06	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
1159H	Chromium (Cr) [a]	19.97	mg/kg	Direct Air-Acetylene Flame
7/30/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-07	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
1147H	Chromium (Cr) [a]	22.04	mg/kg	Direct Air-Acetylene Flame
7/29/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-08	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
1110H	Chromium (Cr) [a]	8.57	mg/kg	Direct Air-Acetylene Flame
7/29/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-09	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
0927H	Chromium (Cr) [a]	<0.20	mg/kg	Direct Air-Acetylene Flame
7/29/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS
M21H228-10	Cadmium (Cd) [a]	<0.03	mg/kg	Direct Air-Acetylene Flame
0755H	Chromium (Cr) [a]	23.11	mg/kg	Direct Air-Acetylene Flame
7/29/2021	Mercury (Hg) [b]	<0.08	mg/kg	Cold Vapor AAS
	Lead (Pb) [a]	<0.10	mg/kg	Direct Air-Acetylene Flame
	Arsenic (As) [a]	<0.01	mg/kg	Manual Hydride Generation AAS

Note : Cancels and supersedes C21-09-107 dated September 8, 2021.
Metals are on dry weight basis.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 10 **Total Analysis** : 50
Sample Submission : Submitted by the Customer
Reference : [a]USEPA Method 3050B.; [b]USEPA Method 245.5.
Remarks : Results relate only to the items tested and received by the laboratory.

Certified Correct by:
MA. CRISTINA F. REFERENTE, RCh
PRC No. 0007398
Laboratory Head

Approved by:
ALVIN P. BASCO, RCh
PRC No. 0011786
Head of Operations

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Annex 3. Key Informant Interview on Biodiversity Experts

Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)

Key Informant Interviews (KIIs) on Regional Ecology and Biodiversity along the Proposed Road Alignment

Final Report

AMET Asia, Inc.

March 2021

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Executive Summary

Key Informant Interviews (KIIs) with regional experts on the ecology and biodiversity of the proposed bypass road spanning Cagayan de Oro, Misamis Oriental and Malaybalay, Bukidnon held on February 27, 2021 and March 8, 2021 suggest that impacts on movement and nesting behavior of Philippine Eagles are considered unlikely as the location of the nesting sites in Mts. Tago and Kitanglad, and elsewhere in the mountain ecosystems of Bukidnon Province is too distant from the proposed road alignment. Remnant forest patches in deep ravines and along riparian zones provide dispersing areas for immature Philippine eagles in search of territories to colonize. Impacts on stream biota are also considered insignificant as erosion arising from road construction is temporary and freshwater stream biota is generally of Least Concern under the IUCN Red List criteria. Regional experts agree on two sampling periods to cover rainfall distribution in the area: during the 1st quarter of the year or March-April for low rainfall season and 3rd quarter, particularly July-August, for high rainfall season. Aquatic sampling may also be carried out only once, but sampling must be duplicated upstream and downstream of the proposed bridge location or where the stream intersects with the proposed road. Plant surveys can also be conducted once, but ideally during summer when trees are flowering, and plant reproductive parts can be collected for taxonomic identification.

1. Introduction

Amet-Asia, Inc. spearheaded by the Ecology Consultant Dr. Jaime Namocatcat conducted Key Informant Interviews (KIIs) on regional ecology and biodiversity along the proposed Cagayan de Oro – Malaybalay Section road construction project with regional experts, namely:

- Dr. Jason Ibañez on Philippine Eagle and nesting sites in the mountain ecosystems of Bukidnon Province on February 27, 2021
- Dr. Fulgent Coritico on plant community structure of Mt. Tago and Mt. Kitanglad, and along proposed road alignment on March 8, 2021
- Dr. Sonnie Vedra on freshwater ecology and Philippine gobies on March 8, 2021

2. Key Informant Interviews

2.1 Philippine Eagle and nesting sites in the mountain ecosystems of Bukidnon Province

2.1.1 Institutional and Research Profile

Name:	Dr. Jason Ibañez
Institution:	Director, Research and Conservation Philippine Eagle Foundation Davao City Senior Lecturer, UP Mindanao
Academic Background:	Ph.D. Natural Resource Management Charles Darwin University, Australia
Research Interest:	Wildlife Conservation, Biodiversity

2.1.2 Transcript of Interview

Dr. Jaime Namocatcat:	First and foremost, thank you for your time this afternoon Dr. Jayson, I understand that you are a very busy person, so thank you very much. We called for this meeting/interview because this relates to the proposed project of constructing a bypass road from Cagayan De Oro (CDO) to Malaybalay, Bukidnon. The bypass road project sort of cuts across the three IBAs; from CDO, both sides of the proposed road, we have the Mt. Kitanglad to your left and Mt. Tago to your right, and somewhere out there is the Mt. Kaluayan-Kinabalian complex, but basically its more of the Mt. Kitanglad and Mt. Tago. Is it correct to assume that in all areas in the Philippines, is Bukidnon, Mindanao a major eagle habitat?
Dr. Jayson Ibañez:	Right, True, the mountain ranges you mentioned, these are essentially the nesting territories of the Philippine Eagles.
Dr. Jaime Namocatcat:	Currently, what are the current initiatives of the Philippine Eagle Foundation on the area?

Dr. Jayson Ibañez:	Well, if you talk about the Mt. Kitanglad Range Natural Park, [there is] very minimal intervention we have there. It's more of monitoring of the breeding success of [our] known pairs. We have at least two (2) active testing pairs, one in the municipality of Lantapan, and then another in Malaybalay, Bukidnon. These are old nesting sites and we've been monitoring them across the years and fortunately, [they are] consistent, the pair is breeding every two years. And then there are also sightings of pairs and young birds in two more areas, one in the Municipality of Baungon and another in Lantapan so practically, about four pairs in Mt. Kitanglad. It also become an experimental site in Mt. Kitanglad in the past. On Mt. Tago, we have an existing partnership with the Municipality of Manolo Fortich to manage a 16,000 ha Philippine Eagle sanctuary for two Philippine Eagle pairs and what Manolo Fortich LGU did was to declare the Philippine Eagle as their flagship species, so they do have a resolution, they celebrate an annual Tabanog festival in honor of their resident Eagle pairs so that's an undergoing project. We're helping a community take care of two Philippine domestic [inaudible]. We're also monitoring Philippine Eagle pair in the municipality of Impasug-ong, we have two pairs there and also in Malaybalay in Mt. Tago site and these sites are more of monitoring of breeding pair. In Mt. Kinabalian complex, is it the mountain range near the municipality of Claveria or Tinguog, correct?
Dr. Jaime Namocatcat:	I think, the Mt. Kinabalian is next to Mt. Tago.
Dr. Jayson Ibañez:	Ah. Okay. Right so again, [there's] monitoring only [in that area]. We found a pair in Hagpa, still part of Impasug-ong, I think [still] connecting the Pantaron Range and Mt. Kinabalian complex. So, we worked with an IP group there monitoring this Philippine Eagle. It's basically working with the indigenous communities organizing, training and then, engaging forest guards; monitoring the breeding success. I think those are [our] major activities in those mountain ranges.
Dr. Jaime Namocatcat:	So, it looks like most of the Eagle habitats that we come to know of late, almost all are found in Bukidnon, right?
Dr. Jayson Ibañez:	True, they have the highest number of wild pairs as of our latest count. Eleven plus the one discovered confiscated eaglet so 12 Philippine Eagle nesting pairs in the province and that's the greatest number of wild pairs in the Philippines per province basis.
Dr. Jaime Namocatcat:	Is that good news, in terms of Philippine Eagle conservation?
Dr. Jayson Ibañez:	Well, I guess so because we still have this large area and they are also finding out that they have very critical role of these large natural areas as source population of smaller mountains because based on our telemetry studies, we are attaching GPS tracker in Philippine Eagles and they are actively moving between mountains which is really very interesting, for example, we have a juvenile eagle trapped and tagged in Mt. Apo last 2014 and this bird migrated from Mt. Apo to Bukidnon. The bird is now in San Fernando and she used smaller forest patches as dispersal pathways or stepping stones. We have evidences that it is moving around without our knowledge and are using forest patches and this bigger mountain ranges are becoming the sources of surplus birds that apparently replace the dying individuals in the other mountains.
Dr. Jaime Namocatcat:	In the case of Mt. Kitanglad having the biggest area, how many individual eagles can it accommodate given that its individual is highly territorial?

Dr. Jayson Ibañez:	Yes, we think the maximum maybe would be five (5) Philippine Eagle pairs, if I'm not mistaken around 60-70,000 [m^3] are its forest cover area but apart from the territorial pairs, we also have floaters or suppressed birds that are hanging around waiting for the territories to be vacant. During one of our releases, we released a captive- bred there, we saw three surplus birds in one particular area. We know that they're non-territorial because they are still immature based on its feathers, so we think that especially the protected areas, they're becoming sanctuaries of these surplus birds and those are their staging point before they go to other places so it's possible, they were born and raised there or they are also new arrivals from other mountains.
Dr. Jaime Namocatcat:	So, it looks like Eagles from Mt. Kitanglad are likely to move around the area going to [Mt.] Tago.
Dr. Jayson Ibañez:	Yes.
Dr. Jaime Namocatcat:	Like to say, from January to December, what are the usual months when the eagles breed?
Dr. Jayson Ibañez:	Well, the nesting season in Mindanao, it starts as early as September and then they can still breed until January. So, they begin their courtship] as early as July and nest build until August and then starting an egg in September, this is the earliest. So, for example, the one eaglet we rescued was already three (3) months old so most probably it was laid in November. So that's their typical nesting season, September to January.
Dr. Jaime Namocatcat:	So, let us say between February to August, they just particularly move around in like feeding trips.
Dr. Jayson Ibañez:	Yes, so its breeding cycle is two (2) years. If they lay an egg in September, the egg would hatch November for the two (2) months' incubation then after that they care for their young for the next six (6) months on the nest; after that, the eaglet flies off the nest and take care of it for one year until it becomes independent. So once in every two (2) years. So, you would find the parents in a particular year either preparing to breed, early breeding stage or already rearing an eaglet [inaudible] of the nest. So, I think that's their pattern. However, there are also cases where they missed breeding attempt so you have a year that they will not breed for unknown reasons. Perhaps the lack of prey or weather changes but normally they will breed once every two years.
Dr. Jaime Namocatcat:	If you are on a mission to observe eagles, how rare is it to observe a flying Philippine Eagle?
Dr. Jayson Ibañez:	Very challenging, it takes a lot of observation and cohorts. If you're lucky, if you're observing within a nesting site, means a nest would be within say 500-m radius or one (1)-km radius, there is a high chance that you can observe them but if you're observing outside the nesting site, you have very limited detection rate. So just imagine 7,000 ha territory so it's very challenging however, through the years, we refined our protocols. We zoomed in on places where there are reliable reports, historical records of nesting, any secondary data and then often, the average you spend for example you observed during nesting season, you're lucky if within a month you can observe the bird. So the detection rate's very challenging. I think that is also the challenge in modelling made by our colleagues. They're relying on the presence-absence data, transect walks and you can't detect it. You have to occupy one observation post and you have to stay there for several weeks.

	So, very challenging. But once you find an active nest, because they are very loyal to the places where they breed, as long as it's intact, you can go back to the same place then find the birds when they're nesting. Their nest sites occur in a same general place like within 500 ha, their alternate nests are present. One pair can have alternate nests. In Mt. Apo, we have 11 nesting trees for a pair confined in a five (5) ha nesting site and they use it repeatedly across the years, even their ancestors as it's an ancient nesting site.
Dr. Jaime Namocatcat:	So is it the same pair of birds that will mate?
Dr. Jayson Ibañez:	It depends, of course, as long as they're alive but if the mate dies, they can be replaced by the surviving mate. Pairs can die and then they can be replaced by another individual or another pair. In Mt. Apo, we've been monitoring it since 1970s, in the early part of the conservation program they discovered it during Dr. Bob Kennedy time and amazingly until now, it [nesting site] is still used by one pair. So very loyal. I think in terms of the conservation measures or environmental impacts, I think it's really very important that we mapped out these ancient nesting sites and avoid habitat losses, and destruction of the ancient nesting sites.
Dr. Jaime Namocatcat:	Dr. Jayson, back to our road alignment, we tried to plot the road alignment vis-a-vis the location of the two IBAs. I think for Mt. Kitanglad, the very edge of its forests is about six (6)-eight (8) km away.
Dr. Jayson Ibañez:	Oh, it's far.
Dr. Jaime Namocatcat:	It's far, right. Although the impression of Bukidnon is that it is highly forested, looking at the detailed snapshots, it's a mosaic of plantation, rice fields. Looking at these detailed snapshots, it's already deforested on the proposed road alignment, will it somehow impact the movement or breeding of nesting eagles in Mt. Tago and Mt. Kitanglad?
Dr. Jayson Ibañez:	I think it depends on the actual location of the road. If you're saying that the proposed road is, say, seven (7) km from the forest edge. For example, the Mt. Kitanglad with its conspicuous boundaries, I don't think you can make a road across the PA. It's already chunked so if the road is seven (7)- eight (8) km [away], definitely [has] less impact in the Philippine Eagles but I think it would be very challenging and have a huge impact is if your road is traversing a Philippine Eagle habitat specially if it's a no nesting territory or nest site. So, for example, the Philippine Eagle in Manolo Fortich, the actual nest tree we know two (2) nest trees by a single pair. If the location of your road, like are you familiar with the Manolo Fortich-Kalabugaw concrete road. That road is 300 km of the actual nesting tree and it's the road is newly constructed. But the bird is still breeding so you can say that in this sense, the Philippine Eagle was able to in a way adopted to the existence of the road. The only danger it has is if it will be an avenue for more deforestation. I think that is really the challenge but in this particular case, where relatively strong ownership of the IP in the area, I think, my personal opinion, the presence of the road will be a very important infrastructure and economy of the IP. As long as the deforestation is prevented, the Philippine Eagle will thrive, and we have evidences that they can really adjust to the change of environment.
Nina Arra Rivera	Dr. Jaime Namocatcat, can I share your power point for [reference] only.
Dr. Jaime Namocatcat:	Jayson, this is our plotted [map]. These are the boundaries of Kitanglad and Tago. This is based on Birdlife data. We still have to validate the exact boundary for the Mt. Tago because CENRO Manolo Fortich is actually preparing the documentation for application as a natural park.

	So looking at the boundary of the Mt. Tago and the white line as the proposed bypass road, we have areas of intersection near Impasugong and Malaybalay City. You mentioned a nesting site, is it near the green area?
Dr. Jayson Ibañez:	In Mt. Kitanglad Mountain range. The nesting site in Malaybalay City is in the Mt Kitanglad range. And also in Mt. Tago, the red line as boundary right? In the area of Bulunay. In Malaybalay, you have a diagonal pointing to the green patch, that's the area of Bulunay nesting site.
Dr. Jaime Namocatcat:	So, it's one nesting site?
Dr. Jayson Ibañez:	Yes. Within the ancestral domain of the Buhita. Bukidnon-Hiligaynon Tribal Association.
Dr. Jaime Namocatcat:	So, we have one here, and the other nesting pair in the area of Impasugong.
Dr. Jayson Ibañez:	Yes, there. So, I think its location would be the dark green polygon.
Dr. Jaime Namocatcat:	These are the remaining primary forest cover in Mt. Tago.
Dr. Jayson Ibañez:	Right, and then your Manolo Fortich is in the primary forest too in the northwestern side within Manolo Fortich. There are two (2) nesting sites with two nesting pairs.
Dr. Jaime Namocatcat:	Which is outside of the Mt. Tago?
Dr. Jayson Ibañez:	Still within Mt. Tago range, approximately above the 9.3 km label and near the diagonal line, above it, there are two (2) nesting pairs.
Dr. Jaime Namocatcat:	So, there are two and another one below. Interesting, looks like there is a rise of individuals observed or there is an improved sighting activity of our Philippine Eagle.
Dr. Jayson Ibañez:	Yes, I think, there are more reports maybe due to the increase awareness. When we think of social media too because of the exposure of the IP communities through the use of social media also enhances the reporting frequency making rise.
Dr. Jaime Namocatcat:	Dr. Jayson, these location of nesting sites in Mt. Tago, is it reflected in your publications?
Dr. Jayson Ibañez:	We still haven't published. Well, because we really don't publish the exact location of the Philippine Eagles. In my thesis, I think it only included in Lantapan which is in Mt. Kitanglad mountain range, but we did not publish any actual location as we tried to make it confidential. But again, for the purpose of planning, protected area establishment, and like this, of course to minimize the impacts, we are very open in sharing the locations.
Dr. Jaime Namocatcat:	Doc Jayson, every time there is a flying event of the Philippine Eagle, how high can it fly in terms of vertical height?
Dr. Jayson Ibañez:	Very high, beyond the clouds, I don't know the exact altitude, but they can do that, they can disappear among the clouds specially the adults and from there, they can glide straight to the other mountain range. We've seen that several times so for example in Mt. Kitanglad, we were observing an adult bird, he started flying in spirals, right thermals, and then up to the clouds and then we followed it on our field scopes, and it glides going to Kalatungan, the other protected area. So, we also saw a Philippine Eagle from Mt. Apo doing that flying to a forest in North Cotabato so they can practically do that. But for the juveniles, or immatures like two (2)-four (4) years old, we think that they don't do that or seldom do that, often they fly low and then transfer from one forest to the other. So that's how they disperse like from one forest patch like 500 m to one (1) km and then perched again in another forest area and stay there for a few days.
Dr. Jaime Namocatcat:	Next slide please, so this is a clearer view on the locations of Mt. Tago and Mt. Kitanglad and farther side: Mt. Kaluayan-Mt Kinabalian complex.

	The sections near Malaybalay city and Impasugong, can we have the next slide please just to illustrate. This is the one near Manolo Fortich, as you can see, there is still some forest cover here then the white line is the proposed road alignment, so looking at it, it really has poultry farms.
Dr. Jayson Ibañez:	Yes, it's already an open area.
Dr. Jaime Namocatcat:	Open areas, combination of farm, plantations. Next slide please. Also, this is the intersections, but we still have to validate the boundaries of Mangtarok because we have an intersection here, but looking at the profile of this figure, it's the same, containing forest patch, you have your structures here and houses. Next, just the same, these is the proposed road alignment. It cuts across farmlands, and then houses. Next slide, so that's it.
Dr. Jaime Namocatcat:	Doc Jayson, these locations in Mt. Tago, is it okay to ask for their coordinates or even locations near to the actual [sites]?
Dr. Jayson Ibañez:	I can provide a general location and I'll put coordinates, definitely not the exact coordinates of the nesting sites but at least close to that area.
Dr. Jaime Namocatcat:	So. Which means that if you traverse the area between the Kitanglad and Tago, in the proposed [road] alignment, it really is rare or difficult to observe one flying Philippine Eagle.
Dr. Jayson Ibañez:	Yes, I agree, the chances that you can observe Philippine Eagle there is only dispersing or immatures because I was looking at the proposed road between Manolo Fortich and Impasugong, it traverses in the Kulaman river. There are large river systems that because its deep and steep, there are still remnants riparian forests. We've seen Philippine Eagle used this riparian forest as their dispersal areas. But I assume there will be a constructed bridge. So, if you can observe a Philippine Eagle purposely like you're going to survey, perhaps that site will be the area that you may observe [Philippine Eagle]. It is also far from their primary habitats.
Dr. Jaime Namocatcat:	Okay, I think I have no more questions for Doctor Jayson. Maybe you have [questions] Nina?
Nina Arra Rivera	Dr. Jayson, I only have one question, Sir, based on the regional ecosystems of the Philippine Eagle as well as the climate in Northern Mindanao, in terms of survey sampling, can we conduct a one season sampling or two season sampling? Wet and dry?
Dr. Jayson Ibañez:	Maybe two (2) seasons sampling, would be appropriate, but I think in Bukidnon, it's climate is all rains across the year, but you can do sampling during period during lowest rain and then period during highest rain. So, if it's Philippine Eagle sampling with distinct climate, I would recommend doing it as first quarter and then 3rd quarter of the year just to make sure you could cover the distribution of rains.
Dr. Jaime Namocatcat:	Basically, Bukidnon is Type IV, so more or less even rainfall distribution. Maybe we will try this 1st quarter and 3rd quarter sampling but this area near the river is the most probable location where we can spot. Hopefully and maybe if our luck is on our side, we can observe Philippine Eagles or maybe other raptors.
Dr. Jayson Ibañez:	Right, there are other raptors like for example the Hawk Eagle, Pinsker's hawk eagle, IUCN endangered, most probably, you can also spot it in the same habitat. But I agree, in general, the road looking at the mosaic of the land cover types, mostly are pineapple plantations, exotic plantation of species, farms. Looking at it, the woodlands that are natural are in the ravines, riparian forests. There are many deep ravines present in Bukidnon, which is suitable for other wildlife like owls but for Philippine Eagle, it could be a dispersing area but not a nesting site.
Dr. Jaime Namocatcat:	Okay, I think you have answered our questions particularly Dr. Jayson. Thank you very much.

Dr. Jayson Ibañez:	You're welcome.
Dr. Jaime Namocatcat:	If we still need additional info, we hope that we can have your time.
Dr. Jayson Ibañez:	Sure, Thank you too. Thanks for the opportunity to share [inaudible]
Dr. Jaime Namocatcat:	Finally, we've met today. I hope we can meet in person if ever I can come to Davao city.
Dr. Jayson Ibañez:	Please, do drop by. I'm also happy because we cited your paper on our new bird paper for Mt. Busa. You wrote a paper on birds on Mt. Busa.
Dr. Jaime Namocatcat:	A long time ago. Yes. Thank you very much Dr. Jayson
Dr. Jayson Ibañez:	Welcome, Stay safe, Bye.
Dr. Jaime Namocatcat:	See you soon.

2.1.3 Photodocumentation

2.2 Plant community structure of Mt. Tago and Mt. Kitanglad

2.2.1 Institutional and Research Profile

Name:	Dr. Fulgent Coritico
Institution:	Central Mindanao University Valencia, Bukidnon
Academic Background:	Ph.D. Biology Central Mindanao University
Research Interest:	Plant Ecology

2.2.2. Transcript of Interview

Dr. Jaime Namocatcat	*Referring to Mt. Tago vegetation surveys:* Were your survey points, were they closer to the breeding sites of the Philippine Eagle? Or were they too far from the nesting site?
Dr. Fulgent Cortico:	Actually, the Philippine Eagle is somewhere in the northern part of Mt. Tago.
Dr. Fulgent Cortico:	Our study is more on the Southern part of Mt. Tago, here in Malabalay, Manalog, and Gibalabad areas.
Dr. Jaime Namocatcat:	So, in terms of land architecture how is Mt. Tago different from Mount Kitanglad?
Dr. Fulgent Cortico:	Actually, if compare the vegetation, most likely they are about the same. Mt. Tago is just like Mt. Kitanglad where the lower part is devoid of original vegetation. As you approach the barangay, that's the start of the lower montane forest. We categorize it as lower montane forest since the original typical lowland vegetation is long gone, although, there are some remnants of trees like Lawaan in the montane forest but it is not that dominant unlike in the lowland forest where majority are Lawaan trees.
Dr. Jaime Namocatcat:	In your survey along an elevational gradient, what is the dominant vegetation from top to bottom?
Dr. Fulgent Cortico:	It is really montane vegetation. At the higher elevation, upper and lower montane vegetation is the more dominant vegetation type. Upper part is mossy. Mt. Tago is unique compared to Mt. Kitanglad. Although, Mt. Kitanglad is good, but only in Mt. Tago where I saw at the peak, in the topmost part *bonsai* or ultramafic vegetation just like in Mt. Hamiguitan, but it is just a few hectares minute as it is in the upper elevation, unlike in Mt. Hamiguitan where you can see thousands of hectares. It is unique because the top most part is pygmy vegetation, and the plants similar to Mt. Hamiguitan, with several pitcher plants. But it is just the northern part. We were not able to penetrate the main peak of Mt. Tago at the southern part.

Dr. Jaime Namocatcat:	So basically Mt. Tago is, much of what remains in Mt. Tago is the crown in montane forest. At the lowland or the base, it is basically a secondary forest.
Dr. Fulgent Cortico:	Yes.
Dr. Jaime Namocatcat:	When you did you your sampling, was it a one-shot sampling or you considered a two (2)-season sampling, like a wet and dry, something like that.
Dr. Fulgent Cortico:	During our sampling, my dissertation research is really Mt. Tago, and it was enhanced because we have an ongoing project funded by the Department of Science and Technology (DOST). I did my sampling every week, carried out gradually, first at the lower montane, then upper montane, and mossy forest. I kept coming back to the site for almost two (2) months because I established eight (8) units of 20x20 m plots per vegetation type and was enhanced by the project by adding additional plots across several types of vegetation. That is our frequency when we do a sampling in the area. And for transects, we had several; we kept coming back from the foot of the barangay to the peak of Mt. Timbawon, part of Mt. Tago range.
Dr. Jaime Namocatcat:	I understand that Bukidnon is basically Type IV climate. So, when we say Type IV, more or less, it means rainfall is evenly distributed throughout the year. In the case of plants surveys, I think it makes sense that we only conduct surveys once in a year, something like that… there is no need for, in the context of Bukidnon, there is no need for the wet and dry season.
Dr. Fulgent Cortico:	Yes, that is allowed. Actually, the difference is that for animals it is both wet and dry season sampling, but for plants, in my opinion one season sampling is fine, although we need to consider the summer season since plants flower during this period, especially trees. Last time, I was just lucky that I was able to conduct my sampling during summer and in January. I was able to collect fertile reproductive part of plants, as this is the most important part for identification. That is why some of my collections were not yet identified down to species level because there were no flowers.
Dr. Jaime Namocatcat:	Ideally, we have to conduct our plant survey during summer so that we can survey plants that are in flowering stage to aid us in, more or less, on-site or off-site taxonomic identification. Dr. Fulgent, I will show you a map.
Dr. Jaime Namocatcat:	Pointing to the map, this is our Mt. Tago Range and this is our Mt. Kitanglad. The proposed bypass road will transect between two IBAs. I think the distance from the proposed bypass road to the edge of Mt. Kitanglad is I think about 10 km, a minimum of 10 km. So, along this course are there any unique vegetation types or critical habitats that you can find in the area? I think this is all dominated by *bBuyo-buyo* (*Piper aduncum*), the open spaces, unless there are plantations in the area.
Dr. Fulgent Cortico:	You mean this normal road?
Dr. Jaime Namocatcat:	Yes, the normal road, because if we take detailed snapshots you will see more or less plantations and households. No original vegetation remains here.
Dr. Fulgent Cortico:	Actually, along the road, that is already disturbed with plantations, although there is a little remnant vegetation in Manolo, but I have never been to this part of Manolo. According to some students (research students), there is still remnant vegetation, but these are already disturbed areas along the road.

Dr. Jaime Namocatcat:	Disturbed…and when you travel from Davao to Bukidnon, the vast open spaces are typically invaded by *buyo-buyo* (*Piper aduncum*). It is hard to rehabilitate or reforest these areas. *Buyo-buyo* (*Piper aduncum*) is all over the place. *Buyo-buyo* (*Piper aduncum*) originated in Malaysia and was used as reforestation species. It has tiny flowers and seeds are dispersed by the wind. We observed a small nectar-feeding bird feeding on *Buyo-buyo* (*Piper aduncum*). This species of bird is found in Malaysia and Philippines and aids in seed dispersal, and the area is now vastly covered with *Buyo-buyo* (*Piper aduncum*). What is your ongoing botanical work in Bukidnon?
Dr. Fulgent Cortico:	We have a recently completed project in Marilog, Bukidnon-Davao. We have comprehensive data along Marilog. There are remaining forest patches, we also established plots. Our results suggest there are still unique species remaining in the area, but *Buyo-buyo* has already invaded the area, becoming a problem for the local villagers. We interviewed the local and they had contrasting views on *Buyo-buyo*, whether they are of use or not. *Buyo-buyo* has already invaded Marilog but not inside the forest patch. They are found in the periphery, but they dominate the open areas.
Dr. Jaime Namocatcat:	Same thing with Mt. Busa here in South Cotabato, I mean Sarangani Province-South Cotabato border. If there is an open space in the forest or the canopy has open areas, that becomes the entry point for *Buyo-buyo*. That's how invasive *Buyo-buyo* is. Along the proposed road, there will be impacts as far as road construction is concerned. Ideally what can we do in this area to improve vegetation cover. Should we replant Philippine endemic species?
Dr. Fulgent Cortico:	Actually, along the road I also notice that they planted invasive or alien species. Just like in Musuan, we are happy about the road widening because Mahogany trees are being felled down. We wonder why mahogany trees were planted on both sides of the road. I hope whoever is involved in planning will plant indigenous trees, as Mahogany, being exotic is not ideal for reforestation.
Dr. Fulgent Cortico:	Thank you, Dr. Fulgent for your time. Next time I visit Bukidnon, I may drop by at CMU. I am friends with Dr. Amoroso, Dr. Leaño, and most importantly, Dr. Reggie Dela Cruz as we are colleagues at PSBMB Mindanao.
Dr. Fulgent Cortico:	Actually, if you need data, we also have data that you may want to see, although some data have been published.
Dr. Jaime Namocatcat:	Yes, preferably the published data. Our major concern is along the road, what are the remaining critical habitats, taking into account that Kitanglad Mt. Tago Range and Mt Kitanglad are KBAs and IBAs. With your statements, over time, this area has been degraded to the point there is no forest cover except patches. The area is basically plantation, agirucltural areas, plantation.
Dr. Fulgent Cortico:	Actually, the forest is now at higher elevation since the lower areas have been converted into agricultural areas. The lowland forest has been decimated.
Dr. Jaime Namocatcat:	At what elevation you begin to observe forest cover.
Dr. Fulgent Cortico:	For Mt. Tago, Malaybalay part, it starts around 1,000+ m, 1,100 m. It varies, some forest cover starts at 1,200 or 1,300 m, but basically the lower part along the Barangay has been converted into plantation.
Dr. Jaime Namocatcat:	These are lands owned by the IPs. Is it CADT or CADC?
Dr. Fulgent Cortico:	If you are familiar with the Buhita, they control Mt. Tago. It's their claim. That is their ancestral domain.
Dr. Jaime Namocatcat:	In Mt. Kitanglad, who has the CADT?

Dr. Fulgent Cortico:	It's Datu Vic Saway and several others. Honestly, in Mt. Kitanglad, we had a previous encounter with the locals. That is why, for now, we take a respite from doing field work in Mt. Kitanglad. There was a conflict among Datus and we were caught in between. DENR is slowly working out to get us back to do Biodiversity assessment for Mt. Kitanglad. Right now, we have no ongoing assessment at Mt. Kitanglad. We focus more on Mt. Tago and Pantaron. These are our current study sites.
Dr. Jaime Namocatcat:	You also have a publication on sundews. Where is it collected.
Dr. Fulgent Cortico:	Yes sir, at the lower part, also in Mt. Tago. It's the first record of sundews for the Philippines.
Dr. Jaime Namocatcat:	Is it the same sundew species found abroad?
Dr. Fulgent Cortico:	Yes, in Japan, Korea, and northern hemisphere ang distribution. But then, it was found in Mindanao, but in that specific locality, a very small area at the peak. at the pack. It grows with the sphagnum moss
	-The interview ended with pleasantries -

2.2.3 Photodocumentation

2.3 Freshwater ecology and Philippine gobies

2.3.1 Institutional and Research Profile

Name:	Dr. Sonnie A. Vedra
Institution:	Mindanao State University – Naawan Misamis Oriental NGO: Balay Kalinaw
Academic Background:	Ph.D. Environmental Science University of the Philippines-Los Baños
Research Interest:	Aquatic Ecology, Philippine Gobies

2.3.2 Transcript of Interview

Dr. Jaime Namocatcat:	Dr. Vedra, thank you for your time today. Thank you for accommodating us. I will introduce my members or our colleagues for this interview. I have Patricia Lim from AMET and then we also have…I think Kath is joining us, and yes Nina, since this morning we had Kath.
Dr. Jaime Namocatcat:	We call for this interview to ask for your expertise as there is a project that will connect Cagayan de Oro City and Malaybalay, Bukidnon through a bypass road. The considerations are the potential ecological impacts on the area, in particular on aquatic ecology.
Dr. Sonnie Vedra:	Let's proceed on whatever idea I can share with you regarding aquatic ecology.
Dr. Jaime Namocatcat:	One of our concerns with the Road Project why we ask for this interview, of course your expertise on aquatic ecology, is with regards to potential impacts, as the bypass road will traverse some streams or maybe some segments of the river. Basically, it is just a road construction project, but do you see any aquatic ecology concern like impact on guppies, small fishes.
Dr. Sonnie Vedra:	Yes. I can see that there are really no significant impacts, as long as the stream is not blocked. Besides, our freshwater fishes in Northern Mindanao are generally Least Concern under the IUCN Red List. So, it is allowable to construct a road, as it is only a road. There are no impacts really. Also, in the case of *Pigok* (*Mesopristes cancellatus*), this is not really a common fish. If we take a look, for example, a resident freshwater fish in Luzon, it is very expensive, but here in Mindanao there are really no cause for concern.
Dr. Jaime Namocatcat:	In the context of ecological sampling, is it really necessary to conduct wet and dry season sampling?
Dr. Sonnie Vedra:	Well, yes, absolutely. For some species, since I'm an expert on gobies, it is in their life history that during flooding (wet season), the gobies go with the flow. The pregnant gobies will hatch their eggs in the sea. After that, the *pispis* or post-larvae will migrate back to their stream or river of origin.

	If we will just build a road, there are really no impacts, in all honesty. It is just turbidity but that is not really detrimental.
Dr. Jaime Namocatcat:	So, it is not really necessary to conduct wet and dry season sampling for the aquatic biota
Dr. Sonnie Vedra:	Yes. But if budget allows, it can be conducted only once, both wet and dry. So far, that's what I did. There is really no significant difference between wet and dry seasons. For diversity and abundance, there is none. There is no significant difference.
Dr. Jaime Namocatcat:	What is your background on regional ecology of Northern Mindanao, particularly Bukidnon area as far as aquatic ecology is concerned?
Dr. Sonnie Vedra:	Well, so far, well I am not based in Bukidnon but I have a friend there (Dr. Imbang) who was with me in Surigao and she was also involved in the study of fishes. So far, the fish composition, gobies, guppies, trichogaster are practically the same. If we check the IUCN Red IList, they are also of least concern. If a bypass road happens to run through a stream or river, that is still alright.
Dr. Jaime Namocatcat:	So, there are no remarkable aquatic species that will be potentially impacted by the road project?
Dr. Sonnie Vedra:	Yes. In a road project, it is usually the terrestrial ecology that is affected because of tree-cutting; the birds and other wildlife are affected. But if we talk about rivers, it is just soil erosion, especially during construction, but that is short-lived and won't take long, since we are not really building large bridges here. Then, usually in our streams, the water level is low during dry season, so building road is fairly alright.
Dr. Jaime Namocatcat:	In terms of Bukidnon climate, in your experience, when is it ideal to conduct wet and dry season sampling. When do we start wet and dry season sampling.sampling?
Dr. Sonnie Vedra:	Well, the peak of gobies, is more on, meaning they will spawn during summer, I mean they will go with the flood, September-October, and the eggs are hatched during summer, January-February, and then return to their stream or river of origin. So most probably, dry season sampling could be March-April, and July-August for wet season sampling.
Dr. Jaime Namocatcat:	So, it is not possible during September as the gobies are already pregnant by that time.
Dr. Sonnie Vedra:	Yes, pregnant. And when the flood season comes October-November, the gobies go with flow.
Dr. Jaime Namocatcat:	So, gobies have varying life histories in particular.
Dr. Sonnie Vedra:	Yes, they have varying life histories.
Dr. Jaime Namocatcat:	So, is there a higher chance of capturing eels in stream, during dry season?
Dr. Sonnie Vedra:	Yes. Well, during spawning, the eels also migrate downstream, along with gravid freshwater shrimps, crabs. But usually, there are really no eels in Bukidnon, I don't know, eels are not easily captured.
Dr. Jaime Namocatcat:	So we also cannot claim that is not a migration area for eels?

Dr. Sonnie Vedra:	In my experience with Mandulog River in Iligan City, we really did not capture eels when I did my sampling for one year. So eels were not really captured during this season.
Dr. Jaime Namocatcat:	Which means, there are particular rivers in the Philipines where we could capture eels but not that commonplace and it is not a guarantee that if there are streams or rivers, there are eels. So I think it depends on which rivers or streams the eels are imprinted.
Dr. Sonnie Vedra:	That is why they will migrate back to their place of origin. Since dams will not be built, that is also allowable; they will just install posts, so that is fairly alright.
Dr. Jaime Namocatcat	Nina may have questions
Nina Arra Rivera:	About the sampling, I would just like to confirm if it is alright to do it one season.
Dr. Sonnie Vedra:	Usually, there is wet and dry but Bukidnon climate… It is very important to have wet and dry sampling to account for the total species number and what species are involved during dry and wet season. Gobies, in particular have varying life histories. But usUally in Bukidnon, it is common freshwater species, like *dalag* (*Ophicephalus striatus*), *hito* (catfish), gobies, local, I mean indigenous species of carps, *Pontius binotatus* (*paitan*). Based on IUCN Red Llist, they are of Least Concern. Regarding the sampling, it is better to have wet and dry seasons. But if the budget is off, one season sampling is alright. But the sampling area has to be duplicated from upstream and downstream. This is the bridge; there is sampling above the bridge and below the bridge. Something like that.
Patricia Lim:	If the area is Type IV, can we say one season sampling is allowable?
Dr. Sonnie Vedra:	Rains distributed throughout the year…yes. But there are portions of Bukidnon that have distinct dry and wet season.
Dr. Sonnie Vedra:	That is why during our Lake Mainit sampling, we preferred to do it for one year to comply or picture out the total number of species that we could capture, since they have varying life histories. Some go with the flow during flooding and some migrate back, those larval species spawned and hatched in the sea to their river of origin.
Patricia Lim:	Sir, you said if it is not possible, sampling could be done one season but it has to be duplicated. What are the most ideal months if that is the recommendation?
Dr. Sonnie Vedra:	Well, it could be done any month to make it cost-effective, especially if the team is already in the area. They could sample any time to be cost-effective according to the availability of the project team members
Dr. Jaime Namocatcat:	Basically, the approach is multi-station sampling, at least ten (10) stations throughout the curvature of the river or stream. But usually small streams, unless the project cuts across a major river system.
Dr. Sonnie Vedra:	Yes
Dr. Jaime Namocatcat:	Anything else, Pat.
Patricia Lim:	If rivers and streams are cut across, especially if bridges will be built, will that have impacts on species?
Dr. Sonnie Vedra:	Not really, since it is just a bridge. Usually the impacts are soil erosion, which for Bukidnon is fairly normal since it is an agricultural area and sedimentation and silt deposition are usual in river systems.
Dr. Sonnie Vedra:	Which means, erosion is only enhanced if there is road construction, but the potential impacts are not really detrimental to aquatic species.

Dr. Jaime Namocatcat:	What is your current project with MSU Naawan?
Dr. Sonnie Vedra:	There is none so far but I have a Feasibility Study proposal. I just completed my study on Lake mainit gobies.
Dr. Jaime Namocatcat:	Actually, for one project, what we did for lake mainit is revisit the fish migration phenomenon but the data could not be disclosed since those are project data.
Dr. Sonnie Vedra:	Since Nina has no more questions, Dr. Sonnie thank you for your time, thank you for accommodating us. At the very least, we heard your expert opinion on whether we do whether we have to do wet and dry season sampling, or one sampling so long as it is a multi-station sampling, and what months of the year to cover the dry and wet season sampling. Thank you very much and see you soon.
Nina Arra Rivera:	Thank you, Dr. Sonnie
Dr. Sonnie	Alright, then.

2.3.3 Photodocumentation

3. Summary of Key Points

3.1 Philippine Eagle and Nesting Sites

- Nesting season for Philippine Eagles in Mindanao starts as early as September until January; breeding cycle is two years
- Chances of observing Philippine Eagle on site are very rare and challenging. Dispersing immatures of Philippine Eagles may be observed in remnant forest of deep ravines and riparian rivers, particularly Kulaman River as these are used as dispersal areas of immature Philippine Eagles
- Two-season sampling, would be appropriate: 1st quarter and then 3rd quarter to cover rainfall distribution

- The proposed road construction will not impact eagle movement or nesting activities as nesting habitats are too distant from the proposed road alignment

3.2 Vegetation of Mt. Tago and Mt. Kitanglad

- One-season sampling is allowed for plants, preferably in the summer during the flowering stage to collect fertile reproductive part of plants to aid in taxonomic identification
- Actual forest is now located at higher elevation, around 1,000 m+ (asl) since the lower areas have been converted into agricultural areas; lowland forest has been decimated.
- Areas along the proposed road alignment are plantation areas, farm lots, households, or colonized with the invasive *buyo-buyo* (*Piper aduncum*)

3.3 Freshwater Ecology, Philippine Gobies

- Low rainfall season sampling is March-April, and July-August for high rainfall season sampling.
- One-season sampling could be done since fish diversity and abundance do not really vary, so long as sampling is duplicated upstream or downstream, or multi-station sampling is employed
- There are really no significant impacts of road construction to streams, as long as the stream is not blocked. Freshwater fishes in Northern Mindanao are generally of Least Concern under the IUCN Red List. Erosion is also temporary during construction and is not viewed detrimental to aquatic biota

Annex 4. Laboratory report of surface water quality analysis

Low rainfall

HiAdvance Philippines Incorporated
(formerly MCALABS Phils., Inc.)

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12 May 2021 WO# M21D417

Ms. Pamelia Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-21 11:30.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager-Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabella Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)
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SUMMARY OF RESULTS

REPORT NO. *M21D417Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 26, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21D417-01 WQ1	pH on-site	pH Units	7.97	-
	Dissolved Oxygen on-site	mg/L	5.85	-
	COD	mg/L	45.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	*J-01b*
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	33.5	-
M21D417-02 WQ2	pH on-site	pH Units	5.60	-
	Dissolved Oxygen on-site	mg/L	5.60	-
	COD	mg/L	41.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	*J-01a*
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	30.7	-
M21D417-03 WQ3	pH on-site	pH Units	6.26	-
	Dissolved Oxygen on-site	mg/L	6.26	-
	COD	mg/L	44.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	*J-01*
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	28.9	-

References:
Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode" Rev. 0, 1996

Definition of Terms:
Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (HCN) and the cyanide ion (CN-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.
Temperature - The degree of hotness or coldness of a body or environment.

Notes:
J-01 0.0198 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-01a 0.0170 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-01b 0.0565 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-06 This sample was analyzed outside EPA/APHA recommended holding time

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21D417Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 26, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21D417-01 WQ1	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	134	*I-06*
M21D417-02 WQ2	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	92.0	*I-06*
M21D417-03 WQ3	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	95.0	*I-06*

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Salinity - is the saltiness or dissolved salt content of a body of water.

Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.

Note:

I-06 This sample was analyzed outside EPA/APHA recommended holding time.

Note: M21D471 Water Analysis Rev01: *This report was revised to separate the Total Dissolved Solids and Salinity results as per customer's request. This final report replaces the one generated on 12 May 2021 at 11:45H. All other data results are not affected; data results remain unchanged.*

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Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 12-May-21 11:45

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ1	M21D417-01	Water	26-Apr-21 10:10	28-Apr-21 11:30
WQ2	M21D417-02	Water	26-Apr-21 12:53	28-Apr-21 11:30
WQ3	M21D417-03	Water	26-Apr-21 16:21	28-Apr-21 11:30

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

CHAIN-OF-CUSTODY / Analytical Request Document

N° 321903

Amet Asia, Inc.	Ms. Pamella Andrea L. Pomida
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig	Amet Asia, Inc.
Pam.Pomida@amet-asia.com	Pasig City
09153701175	Water Analysis
Reg. DWT	

SAMPLE ID					HiAdvance Project No. / Lab ID
					M21D417
DO WQ1 PH			6		M21D417-01
PH-5.32@26.0 DO-7.97@29.5					
DWP-5.28@24.1 DWP-7.94@25.1					
WQ2					
PH-7.49@30.7 DO-5.60@25.9			6		-02
DWP-7.68@30.9 DWP-5.58@25.9					
WQ3					
PH-7.96@28.9 DO-6.26@25.6			6		-03
DWP-7.94@28.5 DWP-6.23@25.6					
WQ4					
PH-7.67@25.6 DO-5.54@24.0					
DWP-7.65@25.7 DWP-5.52@24.0					

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

FIELD DATA SHEET

Date: 22 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampler's Name: [illegible]
Project Manager / Sales Personnel in Charge: [illegible]
Work order: M210417
Water Type: ☑ Waste water ☐ Potable
Sampling Method Used: ☑ Grab ☐ Composite

Sample ID:	Appearance	Parameters	Sampling Location	Weather	Sampling Point Observation
WA1	☐ Clear ☑ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.96 Temp: 31.1 D.O: 8.15 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
WA2	☐ Clear ☑ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.94 Temp: 31.1 D.O: 8.62 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
WA3	☐ Clear ☑ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.96 Temp: 31.9 D.O: 8.26 Cond: Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:

1 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :
Annabelle Bangoy, Project Manager

Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inonel	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	12-May-21 11:45

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	M-PHM-04			Reading	/ TEMP	/ (element ID)
Buffer Soln /	Reading	/ TEMP	/ Element ID	pH (LCS)	7.08	27.5 [illegible]
pH 4	3.99	28.0	M201666	pH (LCSD)	7.08	27.1
pH 7	6.98	28.9	M201667	Sample Duplicate:		
pH 10	10.01	27.1	M201668	Workorder	Reading	
Verification pH 10	10.01	27.2				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID:		Sample Duplicate (Reading per)	DO, mg/L
	DO, mg/L	[illegible]	9.79
Air verification		[illegible]	9.88
		[illegible]	9.23

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
0	[illegible]	0

Checked by: [illegible] 20 May 2021
(To be checked by SRO)

2 of 2

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

HiAdvance Philippines

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia Inc
Project Name: Water Analysis
Work Order: R21D417
Date Received: 28 Apr 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: ____	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded 5.7 °C	T	
7	COC is present. COC # 32195	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample container/s provided by the lab.	T	

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MP-SPL-007-R01
Rev. 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inone1	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	12-May-21 11:45

HiAdvance Philippines

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample ids on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	F	Out of hold for TAS
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is ≤ 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	NA	
25	Multiphase samples are not present or < 10% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	pale yellow slight turbid
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	T	pH adjusted ≤ 2.0 for O&G
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific size.	NA	

Client Confirmation

M210417

2

MP-SPL-007-F02
Rev. 01, 12 Nov 2014

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

WQ1
M21D417-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	7.97		pH Units	1	21E0019	26-Apr-21	26-Apr-21	APHA 4500-H	T-04b
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	134	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	I-06
Temperature on-site	33.5		°C	"	21E0055	26-Apr-21	26-Apr-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	5.85	0.200	mg/L	1	21E0017	"	26-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	45.0	4.61	mg/L	1	21E0013	03-May-21	03-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0009	03-May-21	03-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	I-01b
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0114	26-Apr-21	28-Apr-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21D0470	30-Apr-21	30-Apr-21	APHA 3500-Cr B	

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Ionel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

WQ2
M21D417-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**5.6**		pH Units	1	21E0019	26-Apr-21	26-Apr-21	APHA 4500-H	T-04a
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**92.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	I-06
Temperature on-site	**30.7**		°C	"	21E0055	26-Apr-21	26-Apr-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**5.60**	0.200	mg/L	1	21E0017	"	26-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**41.0**	4.61	mg/L	1	21E0013	03-May-21	03-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0009	03-May-21	03-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	I-01a
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0114	26-Apr-21	28-Apr-21	DPD Chlorine Test Kit	
Metals by APHA/AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21D0470	30-Apr-21	30-Apr-21	APHA 3500-Cr B	

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Report Prepared By :	Reviewed By :	Certified Correct By :
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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

WQ3
M21D417-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	6.26		pH Units	1	21E0019	26-Apr-21	26-Apr-21	APHA 4500-H	T-04
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	95.0	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	I-06
Temperature on-site	28.9		°C	"	21E0055	26-Apr-21	26-Apr-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	6.26	0.200	mg/L	1	21E0017	"	26-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	44.0	4.61	mg/L	1	21E0013	03-May-21	03-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0009	03-May-21	03-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	I-01
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0114	26-Apr-21	28-Apr-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21D0470	30-Apr-21	30-Apr-21	APHA 3500-Cr B	

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Physical Parameters by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0104 - TDS APHA 2540-C										
Blank (21E0104-BLK1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	ND	7.41	mg/L							
LCS (21E0104-BS1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	47.0	7.41	mg/L	50.0		94.0	80-120			
LCS Dup (21E0104-BSD1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	44.0	7.41	mg/L	50.0		88.0	80-120	6.59	10	
Duplicate (21E0104-DUP1)		Source: M21E003-01		Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	85.0	7.41	mg/L		85.0			0.00	10	
Batch 21E0110 - Residual Chlorine										
Blank (21E0110-BLK1)				Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units							
LCS (21E0110-BS1)				Prepared & Analyzed: 07-May-21						
Salinity	35.8	0.212	Salinity units	35.0		102	80-120			
LCS Dup (21E0110-BSD1)				Prepared & Analyzed: 07-May-21						
Salinity	35.4	0.212	Salinity units	35.0		101	80-120	1.12	20	
Duplicate (21E0110-DUP1)		Source: M21D417-01		Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units		ND				10	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Ionel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0009 - O&G APHA 5520B										
Blank (21E0009-BLK1)				Prepared & Analyzed: 03-May-21						
Oil & Grease	ND	2.00	mg/L							
LCS (21E0009-BS1)				Prepared & Analyzed: 03-May-21						
Oil & Grease	109	2.00	mg/L	112		97.0	80-120			
LCS Dup (21E0009-BSD1)				Prepared & Analyzed: 03-May-21						
Oil & Grease	108	2.00	mg/L	113		96.0	80-120	0.922	10	
Duplicate (21E0009-DUP1)		Source: M21D416-01		Prepared & Analyzed: 03-May-21						
Oil & Grease	ND	2.00	mg/L		ND				10	
Matrix Spike (21E0009-MS1)		Source: M21D416-01		Prepared & Analyzed: 03-May-21						
Oil & Grease	144	2.00	mg/L	150	ND	96.3	80-120			
Batch 21E0013 - COD - Closed Reflux APHA 5220D										
Blank (21E0013-BLK1)				Prepared & Analyzed: 03-May-21						
Chemical Oxygen Demand	ND	4.61	mg/L							
LCS (21E0013-BS1)				Prepared & Analyzed: 03-May-21						
Chemical Oxygen Demand	49.0	4.61	mg/L	50.0		98.0	80-120			
LCS Dup (21E0013-BSD1)				Prepared & Analyzed: 03-May-21						
Chemical Oxygen Demand	49.0	4.61	mg/L	50.0		98.0	80-120	0.00	20	
Duplicate (21E0013-DUP1)		Source: M21D407-01		Prepared & Analyzed: 03-May-21						
Chemical Oxygen Demand	20.0	4.61	mg/L		20.0			0.00	20	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen O. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0013 - COD - Closed Reflux APHA 5220D										
Matrix Spike (21E0013-MS1)		**Source: M21D407-01**		Prepared & Analyzed: 03-May-21						
Chemical Oxygen Demand	69.0	4.61	mg/L	50.0	20.0	98.0	80-120			

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor *Chem. Tech PRC# 0001128*	Princess S. Galvez, Laboratory Manager *Chemist PRC# 9207*

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0014 - General Preparation										
Blank (21E0014-BLK1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	ND	0.0635	mg/L							
LCS (21E0014-BS1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.99	0.0635	mg/L	2.00		99.5	80-120			
LCS Dup (21E0014-BSD1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.96	0.0635	mg/L	2.00		98.0	80-120	1.52	200	
Duplicate (21E0014-DUP1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	0.0565	0.0635	mg/L		0.0565			0.00	20	J-01b
Matrix Spike (21E0014-MS1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	2.06	0.0635	mg/L	2.00	0.0565	100	75-125			

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Report Prepared By :
Annabelle Baegoy, Project Manager

Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 8207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21D0470 - Cr+6 APHA 3500-CrB										
Blank (21D0470-BLK1)				Prepared & Analyzed: 30-Apr-21						
Hexavalent Chromium	ND	0.00500	mg/L							
LCS (21D0470-BS1)				Prepared & Analyzed: 30-Apr-21						
Hexavalent Chromium	0.149	0.00500	mg/L	0.150		99.3	80-121			
LCS Dup (21D0470-BSD1)				Prepared & Analyzed: 30-Apr-21						
Hexavalent Chromium	0.150	0.00500	mg/L	0.150		100	80-121	0.669	20	
Duplicate (21D0470-DUP1)		Source: M21D417-01		Prepared & Analyzed: 30-Apr-21						
Hexavalent Chromium	ND	0.00500	mg/L		ND				20	
Matrix Spike (21D0470-MS1)		Source: M21D417-01		Prepared & Analyzed: 30-Apr-21						
Hexavalent Chromium	0.152	0.00500	mg/L	0.150	ND	101	68.6-117			

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Report Prepared By :
Annabelle Sangoy, Project Manager

Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

Notes and Definitions

Report Specific Notes

T-04b	33.5°C is the temperature taken in the field at the time of sampling.
T-04a	25.9°C is the temperature taken in the field at the time of sampling.
T-04	25.6°C is the temperature taken in the field at the time of sampling.
J-01b	0.0565 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-01a	0.0370 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-01	0.0190 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
I-06	This sample was analyzed outside EPA/APHA recommended holding time.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,
Limit	analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date
Note 1	Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT**********

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 11:45

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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12 May 2021

WO# M21D417

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-21 11:30.

If you have any questions concerning this report, please feel free to contact the undersigned or our Laboratory Manager- Ms. Princess Galvez or our Quality Assurance Manager.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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SUMMARY OF RESULTS

REPORT NO. *M21D417*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 26, 2021

Sample ID	*Analysis*	*Unit*	*Results, as received*	*Remarks*
M21D417-01 WQ1	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21D417-02 WQ2	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21D417-03 WQ3	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-

References:

U.S. EPA, 1996. "Method 6010B – Inductively Coupled Plasma Atomic Emission Spectroscopy" from "Test Methods for the Evaluation of Waste", SW-846. Rev 846, Revision 2

Definition of Term:

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form.
Cadmium exerts toxic effects on the kidney, the skeletal and the respiratory systems, and is classified as a human carcinogen. It is generally present in the environment at low levels. However, human activity has greatly increased those levels.
Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world.

Note:

A-02 ***<0.000727*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02a ***<0.00416*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02b ***<0.00517*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: (none) Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ1	M21D417-01	Water	26-Apr-21 10:10	28-Apr-21 11:30
WQ2	M21D417-02	Water	26-Apr-21 12:53	28-Apr-21 11:30
WQ3	M21D417-03	Water	26-Apr-21 16:21	28-Apr-21 11:30

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

CHAIN-OF-CUSTODY / Analytical Request Document

REGULATORY AGENCY

SAMPLE ID

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

HiAdvance Philippines

FIELD DATA SHEET

Date: 26 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet - Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida

Sampler's Name: Jerwin Garcia
Project Manager / Sales Personnel in Charge: LLL
to be filled up by the PMO
Work order: A0210417

Water Type :
☑ Waste water
☐ Potable

Sampling Method Used
☑ for Water Sampling Collection and Preservation (MP-PFL-013 ☑ Grab ○ Composite)

Sample ID	Appearance	Quick Test Results	Sampling Location	Weather	Sampling Point Observation
WA1 Time Start: Time Finish: 1212	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.97 Temp: 28.5 D.O: 0.35 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
WA2 Time Start: Time Finish: 1212	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.97 Temp: 28.7 D.O: 0.22 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
WA3 Time Start: Time Finish: 1221	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.99 Temp: 28.9 D.O: 0.36 Cond: Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:

1 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inonel	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	12-May-21 10:22

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID	M-PHM-04			Reading	/ TEMP	/ Element ID
Buffer Soln /	Reading	/ TEMP	/ Element ID	pH (LCS)	7.28	27.2 [illegible]
pH 4	3.99	26.0	[illegible]	pH (LCSD)	7.28	27.1
pH 7	6.98	26.9	[illegible]	Sample Duplicate:		
pH 10	10.01	27.1	M201668	Workorder	Reading	
Verification pH 10	10.01	27.2				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (Mandatory Set)	DO, mg/L
	DO, mg/L	WQ1	6.79
As verification		WQ7	6.58
		WQ5	6.23

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
0	M216419 [illegible]	[illegible]

Checked by: [illegible] May 2021
(To be checked by SRO)

2 of 2

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
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Annexes

HiAdvance Philippines Incorporated
(Formerly NCALABS Phils., Inc.)
www.hiadvance.com.ph

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Posnida	**Reported:** 12-May-21 10:22

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia Inc.
Project Name: Water Analysis
Work Order: R21D417
Date Received: 28 Apr 2021
Creator: MMB

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: ____	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded 8.9 °C	T	
7	COC is present. COC # 321983	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample container/s provided by the lab.	T	

1

MP-SPL-007-F01
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within holding time.	F	Out of hold for TAS
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	NA	
25	Multiphase samples are not present or < 10% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	pale yellow slight turbid
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified (pH criteria ≤ 2)	T	pH adjusted ≤2.0 for ONG
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific site.	NA	

Client Confirmation

M210417

2

MP-SFL-007-F01
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 12-May-21 10:22

WQ1
M21D417-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

WQ2
M21D417-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 8207

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

WQ3
M21D417-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

Metals by APHA/AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0079 - As Total ICP APHA 3120 B										
Blank (21E0079-BLK1)				Prepared & Analyzed: 06-May-21						
Arsenic	ND	0.0100	mg/L							
LCS (21E0079-BS1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.503	0.0100	mg/L	0.500		101	80-120			
LCS Dup (21E0079-BSD1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500		96.8	80-120	3.85	20	
Duplicate (21E0079-DUP1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	< 0.00416	0.0100	mg/L		< 0.00416				20	A-02a
Matrix Spike (21E0079-MS1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	0.481	0.0100	mg/L	0.500	< 0.00416	96.2	80-120			
Matrix Spike Dup (21E0079-MSD1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500	< 0.00416	96.8	80-120	0.622	20	
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Blank (21E0082-BLK1)				Prepared & Analyzed: 06-May-21						
Cadmium	ND	0.00200	mg/L							
LCS (21E0082-BS1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.295	0.00200	mg/L	0.300		98.3	80-120			
LCS Dup (21E0082-BSD1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.312	0.00200	mg/L	0.300		104	80-120	5.60	20	

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 12-May-21 10:22

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Duplicate (21E0082-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	< 0.000727	0.00200	mg/L		< 0.000727				20	A-02
Matrix Spike (21E0082-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.292	0.00200	mg/L	0.300	< 0.000727	97.3	80-120			
Matrix Spike Dup (21E0082-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.268	0.00200	mg/L	0.300	< 0.000727	89.3	80-120	8.57	20	
Batch 21E0083 - Pb Total ICP APHA 3120 B										
Blank (21E0083-BLK1)				Prepared & Analyzed: 06-May-21						
Lead	ND	0.0200	mg/L							
LCS (21E0083-BS1)				Prepared & Analyzed: 06-May-21						
Lead	2.93	0.0200	mg/L	3.00		97.7	80-120			
LCS Dup (21E0083-BSD1)				Prepared & Analyzed: 06-May-21						
Lead	3.32	0.0200	mg/L	3.00		111	80-120	12.5	20	
Duplicate (21E0083-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	< 0.00517	0.0200	mg/L		< 0.00517				20	A-02b
Matrix Spike (21E0083-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.19	0.0200	mg/L	3.00	< 0.00517	106	80-120			
Matrix Spike Dup (21E0083-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.23	0.0200	mg/L	3.00	< 0.00517	108	80-120	1.25	20	

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Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 8207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pumida	**Reported:** 12-May-21 10:22

Notes and Definitions

Report Specific Notes

A-02b	<0.00517 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
A-02a	<0.00416 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
A-02	<0.000727 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
<_b	< 0.00517
<_a	< 0.00416
<_	< 0.000727

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

Page 12 of 12

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21 May 2021

WO# M21D417

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 28-Apr-21

11:30. If you have any questions concerning this report, please feel free to contact me.

Note : HiAdvance Philippines Incorporated is former NCALABS Phils. Inc.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance

HiAdvance Philippines

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St.
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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ1	M21D417-01	Water	26-Apr-21 10:10	28-Apr-21 11:30
WQ2	M21D417-02	Water	26-Apr-21 12:53	28-Apr-21 11:30
WQ3	M21D417-03	Water	26-Apr-21 16:21	28-Apr-21 11:30

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:40

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: Water Analysis
Project Number: Inosel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 221003

Company: Amet Asia, Inc.	Contact: Ms. Pamella Andrea L. Pomida
Address: Unit 303, One Corporate Center Julia Vargas Ave. Cor. Meralco Ave. Pasig	Company: Amet Asia Inc
Email: Rhea.Rosario@amet-asia.com	Address: Pasig
Phone: 09153760175	Project: Water Analysis
Requested Due Date (TAT): Reg. TAT	Project Number:

REGULATORY AGENCY

Site Location: Cagayan de Oro

Requested Analysis Filtered (Y/N)

Sample ID	Collection Date	Collection Time	Matrix	Preservative	# Containers	Total Dissolved Solids (TDS)	Ammonia Nitrogen (as N)	Nitrate (as N)	Nitrite (as N)	Total Phosphorus (as P)	Total Coliform	Fecal Coliform	Total Chromium	Hexavalent Chromium	Total Cadmium	Total Lead	Total Mercury	Total Arsenic	Total Cyanide	Total Oil & Grease	Total Phenolics	Total Residual Chlorine (TRC)	HiAdvance Project No. (Lab ID)
WQ1																							M21D417
DO - 5.956 PH - 7.496					6	/	/	/														0	
DUP - 5.948 DUP - 7.492																							
WQ2																							
PH - 7.696 DO - 5.606					6	/	/	/														0	-02
DUP - 7.682 DUP - 5.588																							
WQ3																							
PH - 7.01 DO - 6.068					6	/	/	/														0	-03
DUP - 7.048 DUP - 6.056																							
WQ4																							
PH - 7.62 DO - 5.568																							
DUP - 7.608 DUP - 5.556																							

Additional Comments	Relinquished by (Signature)	Date	Time	Received by (Signature)	Date	Time	Sample Conditions
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5.7 / Y / — / N/A

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamelia Andrea L. Pornida	**Reported:** 21-May-21 09:40

HiAdvance Philippines

FIELD DATA SHEET

Date: 26 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet - Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamelia Andrea L. Pornida

Sampler's Name: [illegible]
Project Manager / Sales Personnel in Charge: LLL
Work order: M21041117

Water Type: ☑ Waste Water ☐ Potable

Sampling Method Used: ☑ Air, Water Sampling Collect and Preservation (MEPCOPLATS) ☐ Grab ☐ Composite

Sample ID	Appearance	Sampling Location	Weather	Sampling Point Observation
WA 1 Time Start: Time Finish: 10:10	☐ Clear ☑ Turbid ☐ Yellowish ☐ Dark Others:	pH: 7.97 Temp: 33.5 D.O. 8.56 Color: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ No unusual Observation ☐ If Other, please specify:
WA 2 Time Start: Time Finish: 12:14	☐ Clear ☑ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.63 Temp: 34.7 D.O. 5.62 Color: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ No unusual Observation ☐ If Other, please specify:
WA 3 Time Start: Time Finish: 16:21	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.96 Temp: 32.9 D.O. 6.36 Color: Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O. Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O. Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O. Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:

1 of 2

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:40

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID	M-PHM-04			Reading	TEMP	Element ID
Buffer Sorn	Reading	TEMP	Element ID	pH (LCS)	7.08	27.2 [illegible]
pH 4	3.99	26.0	M201666	pH (LCSD)	7.08	27.1
pH 7	6.98	26.9	M201667	Sample Duplicate:		
pH 10	10.01	27.1	M201668	Workorder	Reading	
Verification pH 10	10.01	27.2				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (Indicate per)	DO, mg/L
	DO, mg/L	NA1	5.79
for verification		NA1	0.58
		[illegible]	[illegible]

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
0	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SRO)

2 of 2

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Annabelle Bangoy, Project Manager

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Annexes

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Makati City, PHILIPPINES
Office : +632.729.4327
Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

HiAdvance Philippines

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia Inc
Project Name: Water Analysis
Work Order: [illegible]
Date Received: [illegible]
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No. _____	NA	
3	The cooler or samples did not appear to have been compromised or tampered	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded 5.7 °C	T	
7	COC is present. COC # 821903	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

1

MP-SPL-007-001
Rev. 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inone1
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

HiAdvance Philippines

14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	F	Out of hold for TDS
20	**If necessary**, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	**There is sufficient volume** for all **requested analyses**, including **any MS/MSD** request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	NA	
25	**Multiphase** samples are not present or < 10% mixture of solids/liquids/oil.	T	
26	**Sample appearance is noted.**	T	pale yellow slight turbid
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	T	pH adjusted ≤2.0 for ONG
29	Trip blank provided by the lab.	NA	
30	**Trip blanks used are those** provided for this specific site.	NA	

M210417

Client Confirmation

2

MP-SPL-007-F01
Rev. 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:40

WQ1
M21D417-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

WQ2
M21D417-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:40

WQ2
M21D417-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 21-May-21 09:40

WQ3
M21D417-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.
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Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pornida

Reported:
21-May-21 09:40

EPA 7470A - Quality Control

Pace Analytical Services, LLC - Minneapolis Lab

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 742753 - EPA 7470A										
BLANK (3959423)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	0.070	0.20	ug/L				-			U
LCS (3959424)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	5.0	0.20	ug/L	5		99	80-120			
MS (3959425)		Source: M21D417-02		Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.9	0.20	ug/L	5	0.070	97	80-120			
MSD (3959426)		Source: M21D417-02		Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.8	0.20	ug/L	5	0.070	96	80-120	1	20	

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:40

Notes and Definitions

Report Specific Notes

U	Indicates the compound was analyzed for, but not detected.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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15 May 2021 WO# M21E003

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager-Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E003Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E003-01 WQ4	pH on-site	pH Units	7.62	-
	Dissolved Oxygen on-site	mg/L	5.34	-
	COD	mg/L	51.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	*J-01*
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	25.2	-

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (**HCN**) and the cyanide ion (CN-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting **alkalinity** or acidity of the water.
residual is **Chlorine** a low level of **chlorine** remaining in water after its initial application.
Temperature - The degree of hotness or coldness of a body or environment.

Note:

J-01 ***0.0230*** *The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.*

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

SUMMARY OF RESULTS

REPORT NO. *M21E003Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E003-01 WQ4	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	85.0	-

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Salinity - is the saltiness or dissolved salt content of a body of water.

Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.

Note: M21E003 Water Analysis Rev01: *This report was revised to separate the Total Dissolved Solids and Salinity results as per customer's request. This final report replaces the one generated on 15 May 2021 at 13:15H. All other data results are not affected; data results remain unchanged.*

HiAdvance Philippines Incorporated

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Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ4	M21E003-01	Water	30-Apr-21 11:23	03-May-21 08:00

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Ieonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

CHAIN-OF-CUSTODY / Analytical Request Document

№ 321903

Company: Amet Asia, Inc.	Report To: Ms. Pamella Andrea L. Pomida	Attention: Ms. Pamella Andrea L. Pomida
Address: Unit 303, One corporate center, Julia Vargas Avenue, Meralco Ave. Pasig		Company Name: Amet Asia, Inc.
Email: Pamela.Pomida@amet-asia.com		Address: Pasig City
Phone: 0917-3700175	Project Name: Water Analysis	
Regulatory Site Classification: Reg 7		

REGULATORY AGENCY: ☐ DENR ☐ DOH ☐ BFAR ☐ OTHER _____

Site Location: Cagayan de Oro

SAMPLE ID	Collection Date	Collection Time	Sample Type	Requested Analysis (Filtered (Y/N))	Preservative Used	Total # of Containers	Sample Condition	Radiological Charge (Y/N)	HiAdvance Project No./ Lab I.D.
1	00 WQ1								M21E008
2	DB - 5.855.26.0								
3	DUP - 5.849.28.1								
4									
5	00 WQ3								
6	DB - 7.649.307								
7	DUP - 7.649.30.4								
8									
9	00 WQ8								
10	DB - 7.460.38.9								
11	DUP - 7.461.28.8								
12	00 WQ4								
13	DB - 3.622.22.2								
14	DUP - 3.622.22.2								

Additional Comments: | Relinquished by: | Date: | Time: | Received by: | Date: | Time: | Sample Condition: Good / Cool / Intact / Yes / N/A

Sampler Name and Signature: Jonel Sacro

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bengoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

HiAdvance Philippines

FIELD DATA SHEET

Date: 10 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida

Sampling Name: [illegible]
Project Manager / Sales Personnel in Charge: LLK
(to be filled up by the SAC)
Work order: 1021E085

Waste Type:
☑ Waste Water
☐ Potable

Sampling Method Used
☑ As Water Sample Collection and Preservation (MP-SPL-013) ○ Grab ○ Composite

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
1001H Time Start: Time Finish: 7:22	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.62 Temp: 28.3 D.O: 6.84 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☑ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:

1 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Ioonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	M-PHM-04			Reading	TEMP	Element ID
Buffer Soln	Reading	TEMP	Element ID	pH (LCS)	7.26	27.1
pH 4	8.97	27.2	M2A1666	pH (LCSD)	7.25	27.3
pH 7	7.01	27.0	M2A1667	Sample Duplicate:		
pH 10	10.01	27.2	M2A1668	Workorder	Reading	
Verification pH 10	10.02	27.3				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID:		Sample Duplicate (necessary per)	DO, mg/L
	DO, mg/L		
No verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
0	MAINES-01	0

Checked by: MMA 15 May 2021
(To be checked by SBO)

2 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 05 May 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: —	NA	
3	The cooler or samples did not appear to have been compromised or tampered	T	
4	Samples are received on ice, if applicable	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded: 9.3 °C	T	
7	COC is present. COC # 321903	T	
8	COC is filled out in ink and is legible	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample container/s provided by this lab.	T	

1

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	N/A	
24	Soil samples are free of air space.	N/A	
25	Multiphase samples are not present or < 20% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH < 2 for Oil & 2)	T	pH adjusted w.r. for OIL
29	Trip blank provided by the lab.	N/A	
30	Trip blanks used are those provided for this specific site.	N/A	

Client Confirmation

2

MF-SPL-007-F01
Rev. 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

WQ4
M21E003-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.62**		pH Units	1	21E0161	30-Apr-21	30-Apr-21	APHA 4500-H	T-01
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**85.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**25.2**		°C	"	21E0164	30-Apr-21	03-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**5.34**	0.200	mg/L	1	21E0168	"	30-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**51.0**	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	I-01
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	30-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Physical Parameters by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0104 - TDS APHA 2540-C										
Blank (21E0104-BLK1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	ND	7.41	mg/L							
LCS (21E0104-BS1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	47.0	7.41	mg/L	50.0		94.0	80-120			
LCS Dup (21E0104-BSD1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	44.0	7.41	mg/L	50.0		88.0	80-120	6.59	10	
Duplicate (21E0104-DUP1)		Source: M21E003-01		Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	85.0	7.41	mg/L		85.0			0.00	10	
Batch 21E0110 - Residual Chlorine										
Blank (21E0110-BLK1)				Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units							
LCS (21E0110-BS1)				Prepared & Analyzed: 07-May-21						
Salinity	35.8	0.212	Salinity units	35.0		102	80-120			
LCS Dup (21E0110-BSD1)				Prepared & Analyzed: 07-May-21						
Salinity	35.4	0.212	Salinity units	35.0		101	80-120	1.12	20	
Duplicate (21E0110-DUP1)		Source: M21D417-01		Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units		ND				10	

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0095 - COD - Closed Reflux APHA 5220D										
Blank (21E0095-BLK1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	ND	4.61	mg/L							
LCS (21E0095-BS1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	49.0	4.61	mg/L	50.0		98.0	80-120			
LCS Dup (21E0095-BSD1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	50.0	4.61	mg/L	50.0		100	80-120	2.02	20	
Duplicate (21E0095-DUP1)		Source: M21E003-01		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	51.0	4.61	mg/L		51.0			0.00	20	
Matrix Spike (21E0095-MS1)		Source: M21E003-01		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	96.0	4.61	mg/L	50.0	51.0	90.0	80-120			
Batch 21E0131 - O&G APHA 5520B										
Blank (21E0131-BLK1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L							
LCS (21E0131-BS1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	104	2.00	mg/L	111		93.3	80-120			
LCS Dup (21E0131-BSD1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	105	2.00	mg/L	112		93.8	80-120	0.957	10	
Duplicate (21E0131-DUP1)		Source: M21E033-01		Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L		ND				10	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 15-May-21 13:15

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0131 - O&G APHA 5520B										
Matrix Spike (21E0131-MS1)		**Source: M21E033-01**		Prepared & Analyzed: 10-May-21						
Oil & Grease	125	2.00	mg/L	131	ND	95.3	80-120			

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :
Annabelle Bangoy, Project Manager

Reviewed By :
Marizen B. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0014 - General Preparation										
Blank (21E0014-BLK1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	ND	0.0635	mg/L							
LCS (21E0014-BS1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.99	0.0635	mg/L	2.00		99.5	80-120			
LCS Dup (21E0014-BSD1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.96	0.0635	mg/L	2.00		98.0	80-120	1.52	200	
Duplicate (21E0014-DUP1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	0.0565	0.0635	mg/L		0.0565			0.00	20	J-01a
Matrix Spike (21E0014-MS1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	2.06	0.0635	mg/L	2.00	0.0565	100	75-125			

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0033 - Cr+6 APHA 3500-CrB										
Blank (21E0033-BLK1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L							
LCS (21E0033-BS1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.152	0.00500	mg/L	0.150		101	80-121			
LCS Dup (21E0033-BSD1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.153	0.00500	mg/L	0.150		102	80-121	0.656	20	
Duplicate (21E0033-DUP1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L		ND				20	
Matrix Spike (21E0033-MS1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.140	0.00500	mg/L	0.150	ND	93.3	68.6-117			

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Parnella Andrea L. Pomida	**Reported:** 15-May-21 13:15

Notes and Definitions

Report Specific Notes

T-04	25.2°C is the temperature taken in the field at the time of sampling.
J-01a	0.0565 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.
J-01	0.0230 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,
Limit	analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date
Note 1	Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT**********

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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15 May 2021 WO# M21E003

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact the undersigned or our Laboratory Manager- Ms. Princess Galvez or our Quality Assurance Manager.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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SUMMARY OF RESULTS

REPORT NO. *M21E003*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 30, 2021

Sample ID	Analysis	Unit	Results of Analysis	Remarks
M21E003-01 WQ4	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-

References:

U.S. EPA. 1994. "Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 4.4. Cincinnati, OH

Definition of Terms:

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form.

Cadmium exerts toxic effects on the kidney, the skeletal and the respiratory systems, and is classified as a human carcinogen. It is generally present in the environment at low levels. However, human activity has greatly increased those levels.

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world.

Note:

A-02 <0.000727 *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02a <0.00416 *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02b <0.00517 *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*

HiAdvance Philippines Incorporated

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Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Ponida	**Reported:** 15-May-21 13:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ4	M21E003-01	Water	30-Apr-21 11:23	03-May-21 08:00

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9807

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 321903

Amet-Asia, Inc.	Pamella Andrea L. Pomida	Pamella Andrea L. Pomida
Unit 303, One Corporate Center Julia Vargas Ave. Cor. Meralco Ave. Pasig		Amet-Asia, Inc.
Pam.pomida@amet-asia.com		
8815370175	Water Analysis	
Reg. TAT		

REGULATORY AGENCY: DENR / SCH / PNC

SAMPLE ID	COLLECTED	HiAdvance Project No./Lab I.D.
PH-5.85E26.0 / DUP-5.34E24.1		M21E008
WQ1		
PH-7.64E30.7 / DUP-7.68E30.9		
WQ2		
PH-7.46E28.9 / DUP-7.48E28.6		
WQ3		
PH-7.62E25.2 / DUP-7.58E25.2		
WQ4		
PH-5.34E24.0 / DUP-5.75E24.0		

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

Page 2 of 10

HiAdvance Philippines Incorporated
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HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

FIELD DATA SHEET

Date:
Site Location:
Client Name:
Project Name:
Contact Person:
Water Type :
☑ Waste water
☐ Potable

Samplers Name:
Project Manager / Sales Personnel in Charge:
Work order:
Sampling Method Used

Sample ID:	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
	Clear / Turbid / Yellowish / Dark / Others:	pH / Temp / D.O / Cond / Residual Cl. / Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy / Others:	No unusual Observation / If Other, please specify
Time Start: Time Finish:					
	Clear / Turbid / Yellowish / Dark / Others:	pH / Temp / D.O / Cond / Residual Cl. / Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy / Others:	No unusual Observation / If Other, please specify
Time Start: Time Finish:					
	Clear / Turbid / Yellowish / Dark / Others:	pH / Temp / D.O / Cond / Residual Cl. / Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy / Others:	No unusual Observation / If Other, please specify
Time Start: Time Finish:					
	Clear / Turbid / Yellowish / Dark / Others:	pH / Temp / D.O / Cond / Residual Cl. / Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy / Others:	No unusual Observation / If Other, please specify
Time Start: Time Finish:					
	Clear / Turbid / Yellowish / Dark / Others:	pH / Temp / D.O / Cond / Residual Cl. / Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy / Others:	No unusual Observation / If Other, please specify
Time Start: Time Finish:					

1 of 2

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Report Prepared By :

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Certified Correct By :

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	M-PHM-04			Reading	/ TEMP	/ Element ID
Buffer Soln /	Reading	/ TEMP	/ Element ID	pH (LCS)	7.26	27.1
pH 4	3.97	27.2	M20K66	pH (LCSD)	7.25	27.3
pH 7	7.01	27.0	M20K67	Sample Duplicate:		
pH 10	10.01	27.3	M20K68	Workorder		Reading
Verification pH 10	10.02	27.8				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID:		Sample Duplicate (microscopy per)	DO, mg/L
	DO, mg/L		
Air verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
0	[illegible]	0

Checked by: [illegible] 15 May 2021
(To be checked by SAO)

2 of 2

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia, Inc.
Project Name: NCHO Analysis
Work Order: [illegible]
Date Received: 09 May 2021
Creator: JAA

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background	NA	
2	The cooler's custody seal, if present, is intact. Cooler No. —	NA	
3	The cooler or samples did not appear to have been compromised or tampered	T	
4	Samples are received on ice, if applicable	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded. 5.3 °C	T	
7	COC is present. COC # 321923	T	
8	COC is filled out in ink and is legible	T	
9	COC is filled out with all pertinent information	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC	T	
12	Sample containers have legible labels	T	
13	Sample container/s provided by the lab.	T	

1

MP-SPL-007-R0
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

13	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter	N/A	
24	Soil samples are free of air spaces.	N/A	
25	Multiphase samples are not present (< 10% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria: 5-9)	T	pH adjusted >2 for O&G
29	Trip blank provided by the lab.	N/A	
30	Trip blanks used are those provided for this specific site.	N/A	

Client Confirmation: 5/12/2021

2

MP-SPL-001-F01
Rev. 01, 12 Nov 2019

HiAdvance Philippines Incorporated

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Report Prepared By :

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Certified Correct By :

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

WQ4
M21E003-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: (none) Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0079 - As Total ICP APHA 3120 B										
Blank (21E0079-BLK1)				Prepared & Analyzed: 06-May-21						
Arsenic	ND	0.0100	mg/L							
LCS (21E0079-BS1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.503	0.0100	mg/L	0.500		101	80-120			
LCS Dup (21E0079-BSD1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500		96.8	80-120	3.85	20	
Duplicate (21E0079-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	< 0.00416	0.0100	mg/L		ND				20	A-02a
Matrix Spike (21E0079-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	0.481	0.0100	mg/L	0.500	ND	96.2	80-120			
Matrix Spike Dup (21E0079-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500	ND	96.8	80-120	0.622	20	
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Blank (21E0082-BLK1)				Prepared & Analyzed: 06-May-21						
Cadmium	ND	0.00200	mg/L							
LCS (21E0082-BS1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.295	0.00200	mg/L	0.300		98.3	80-120			
LCS Dup (21E0082-BSD1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.312	0.00200	mg/L	0.300		104	80-120	5.60	20	

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Annabelle Bangoy, Project Manager

Certified Correct By :

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Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Incmel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 15-May-21 13:10

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Duplicate (21E0082-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	< 0.000727	0.00200	mg/L		ND				20	A-02
Matrix Spike (21E0082-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.292	0.00200	mg/L	0.300	ND	97.3	80-120			
Matrix Spike Dup (21E0082-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.268	0.00200	mg/L	0.300	ND	89.3	80-120	8.57	20	
Batch 21E0083 - Pb Total ICP APHA 3120 B										
Blank (21E0083-BLK1)				Prepared & Analyzed: 06-May-21						
Lead	ND	0.0200	mg/L							
LCS (21E0083-BS1)				Prepared & Analyzed: 06-May-21						
Lead	2.93	0.0200	mg/L	3.00		97.7	80-120			
LCS Dup (21E0083-BSD1)				Prepared & Analyzed: 06-May-21						
Lead	3.32	0.0200	mg/L	3.00		111	80-120	12.5	20	
Duplicate (21E0083-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	< 0.00517	0.0200	mg/L		ND				20	A-02b
Matrix Spike (21E0083-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.19	0.0200	mg/L	3.00	ND	106	80-120			
Matrix Spike Dup (21E0083-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.23	0.0200	mg/L	3.00	ND	108	80-120	1.25	20	

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Porrida	**Reported:** 15-May-21 13:10

Notes and Definitions

Report Specific Notes

A-02b <0.00517 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

A-02a <0.00416 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

A-02 <0.000727 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

<_b < 0.00517

<_a < 0.00416

<_ < 0.000727

Laboratory Reporting Conventions:

ND Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).

NR Not Reported

dry Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.

RPD Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).

MRL METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table

DIL Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.

Reporting Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,

Limit analytical dilutions and percent solid, where applicable

Prepared Date indicated is the same as Extraction Date

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
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HiAdvance

HiAdvance Philippines

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philippines@hiadvance.com

21 May 2021 WO# M21E003

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00. If you have any questions concerning this report, please feel free to contact me.

Note : HiAdvance Philippines Incorporated is former NCALABS Phils. Inc.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance

HiAdvance Philippines

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3F Mega Center, San Antonio St.
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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inotel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:45

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ4	M21E003-01	Water	30-Apr-21 11:23	03-May-21 08:00

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:45

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:45

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 321903

SAMPLE ID	HiAdvance Project No./ Lab I.D.
	M21E008

HiAdvance Philippines Incorporated

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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:45

FIELD DATA SHEET

Date:
Site Location:
Client Name:
Project Name:
Contact Person:
Water Type:
☑ Water water
☐ Potable

Sampling Name:
Project Manager / Sales Personnel in Charge:
Work order:
Sampling Method Used:
☑ Grab ○ Composite

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
	☐ Clear ☑ Turbid ☑ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☑ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☑ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☑ Rainy Others:	○ No unusual Observation ○ If Other, please specify:
Time Start: Time Finish:	☑ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	○ No unusual Observation ○ If Other, please specify:

1 of 2

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Annabelle Bangoy, Project Manager

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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:45

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID	M-PHM-04			Reading	/ TEMP	/ Element ID
Buffer Soln /	Reading	/ TEMP	/ Element ID	pH (LCS)	7.26	27.1
pH 4	3.97	27.2	[illegible]	pH (LCSD)	7.25	27.3
pH 7	7.01	27.0	[illegible]	Sample Duplicate:		
pH 10	10.01	27.4	[illegible]	Workorder		Reading
Verification pH 10	10.02	27.8				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (necessary for)	DO, mg/L
	DO, mg/L		
As verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
0	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SRO)

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Annabelle Bangoy, Project Manager

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Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:45

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 07 May 2021
Creator: JM

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: ___	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. Temperature should be 4 °C.	T	
6	Cooler temperature is recorded: 4.3 °C	T	
7	COC is present. COC # 321903	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

1

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Annabelle Bangoy, Project Manager

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Annexes

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:45

14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling	T	
18	Appropriate sample containers are used	T	
19	Samples are received within Holding Time	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is a 6mm (1/4") in diameter	N/A	
24	Soil samples are free of air space	N/A	
25	Multiphase samples are not present or a 50% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	
27	Samples did not require splitting or compositing	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	T	pH adjusted too for OIL
29	Trip blank provided by the lab	N/A	
30	Trip blanks used are those provided for this specific site.	N/A	

Client Confirmation

2

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:45

WQ4
M21E003-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:45

EPA 7470A - Quality Control

Pace Analytical Services, LLC - Minneapolis Lab

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 742753 - EPA 7470A										
BLANK (3959423)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	0.070	0.20	ug/L				-			U
LCS (3959424)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	5.0	0.20	ug/L	5		99	80-120			
MS (3959425)	Source: 10558914002			Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.9	0.20	ug/L	5	0.070	97	80-120			
MSD (3959426)	Source: 10558914002			Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.8	0.20	ug/L	5	0.070	96	80-120	1	20	

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Annabelle Baugay, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 21-May-21 09:45

Notes and Definitions

Report Specific Notes

U	Indicates the compound was analyzed for, but not detected.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,
Limit	analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date

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Annabelle Bangoy, Project Manager

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18 May 2021 WO# M21E006

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager- Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E006Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E006-01 WQ5	pH on-site	pH Units	7.40	-
	Dissolved Oxygen on-site	mg/L	5.85	-
	COD	mg/L	12.0	-
	Oil and Grease	mg/L	ND	*J-01a*
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	24.3	-
M21E006-02 WQ7	pH on-site	pH Units	7.38	-
	Dissolved Oxygen on-site	mg/L	6.14	-
	COD	mg/L	23.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	32.4	-
M21E006-03 WQ8	pH on-site	pH Units	7.22	-
	Dissolved Oxygen on-site	mg/L	7.70	--
	COD	mg/L	20.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	24.6	-

References:
Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:
Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (**HCN**) and the cyanide ion (CN-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
residual is **Chlorine** a low level of **chlorine** remaining in water after its initial application.
Temperature - The degree of hotness or coldness of a body or environment.
Note:
J-01a 1.29 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E006Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E006-01 WQ5	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	60.0	-
M21E006-02 WQ7	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	85.0	-
M21E006-03 WQ8	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	80.0	-

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Salinity - is the saltiness or dissolved salt content of a body of water.

Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.

Note: M21E006 Water Analysis Rev01: *This report was revised to separate the Total Dissolved Solids and Salinity results as per customer's request. This final report replaces the one generated on 18 May 2021 at 08:23H. All other data results are not affected; data results remain unchanged.*

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ5	M21E006-01	Water	30-Apr-21 09:30	03-May-21 08:00
WQ7	M21E006-02	Water	29-Apr-21 11:55	03-May-21 08:00
WQ8	M21E006-03	Water	29-Apr-21 10:15	03-May-21 08:00

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor *Chem. Tech PRC# 0001128*	Princess S. Galvez, Laboratory Manager *Chemist PRC# 9207*

Page 1 of 17

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

CHAIN-OF-CUSTODY / Analytical Request Document

SAMPLE ID	HiAdvance Project No/Lab ID
[illegible]	[illegible]

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor *Chem. Tech PRC# 0001128*	Princess S. Galvez, Laboratory Manager *Chemist PRC# 9207*

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

HiAdvance Philippines

FIELD DATA SHEET

Date: 29 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Water Type: ☑ Wastewater ☐ Potable
Sampler's Name: Jerry Cuarto
Project Manager / Sales Personnel in Charge: N.A.
Work order: B210008
Sampling Method Used: ☑ for Water Sample Collection and Preservation (SM-SPL-013-3) ☐ Others

Sample ID	Appearance	Onsite data readings	Sampling Location	Weather	Sampling Point Observation
WQ7	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.88 Temp: 29.4 D.O: 5.14 Cond: Residual Cl: 0	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish: 8:35	Others:	Others:		Others:	
WQ8	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.22 Temp: 29.6 D.O: 5.70 Cond: Residual Cl: 0	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish: 10:15	Others:	Others:		Others:	
WQ9	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.68 Temp: 28.6 D.O: 5.86 Cond: Residual Cl: 0	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish: 11:40	Others:	Others:		Others:	
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:	Others:		Others:	
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:	Others:		Others:	
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☑ Sunny ☑ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:	Others:		Others:	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

Other Field Notes:

pH Meter Calibration				Quality Control			
Equipment ID:	M - PHM-011			Reading	/ TEMP	/ Element ID	
Buffer Soln /	Reading	/ TEMP	/ Element ID	pH (LCS)	7.28	22.5	[illegible]
pH 4	4.01	26.9	[illegible]	pH (LCSD)	7.24	26.5	
pH 7	6.91	26.5	[illegible]	Sample Duplicate			
pH 10	9.98	26.5	[illegible]	Workorder		Reading	
Verification pH 10	9.98	26.6					

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (Calibration)		Quality Control	
Equipment ID:		Sample Duplicate (Reading per)	DO, mg/L
	DO, mg/L	WB 7	0.08
Air verification		WB 8	7.62

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	[illegible]	0

Checked by: [illegible] 18 May 2021
(To be checked by SRO)

2 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

FIELD DATA SHEET

Date: 30 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampler's Name: [illegible]
Project Manager / Sales Personnel in Charge: [illegible]
Work order: M21-086
Water Type: ☑ Waste water ☐ Potable
Sampling Method Used: ☑ Sampling Guidelines and Procedures (DENR-EMB-R10) ☐ Local ☐ Customer

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
WQ5	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.45 Temp: 27.5 D.O.: 5.56 Cond: [illegible] Residual Cl: [illegible] Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
WQ10	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: 7.46 Temp: 31.4 D.O.: 5.24 Cond: [illegible] Residual Cl: [illegible] Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
WQ6	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: 7.55 Temp: 30.9 D.O.: 4.66 Cond: [illegible] Residual Cl: [illegible] Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify

1 of 2

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inone1	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	18-May-21 08:23

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	[illegible]			Reading	TEMP	Element ID
Buffer Soln.	Reading	TEMP	Element ID	pH (LCS)	[illegible]	[illegible]
pH 4	[illegible]	[illegible]	[illegible]	pH (LCSD)	[illegible]	[illegible]
pH 7	[illegible]	[illegible]	[illegible]	Sample Duplicate		
pH 10	[illegible]	[illegible]	[illegible]	Workorder	Reading	
Verification pH 10	[illegible]	[illegible]				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID:		Sample Duplicate (necessary per)	DO, mg/L
	DO, mg/L	[illegible]	[illegible]
Air verification			

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	[illegible]	0

Checked by: [signature] 18 May 2021
(To be checked by SRO)

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

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LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet - Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 05 May 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: —	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be > 0 °C)	T	
6	Cooler temperature is recorded. 8.5 °C	T	
7	COC is present. COC # 321905	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

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MP-SPL-007-F02
Rev. 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC	T	
16	Sample collection date/time is provided	T	
17	Samples are received at least five (5) days after sampling	T	
18	Appropriate sample containers are used	T	
19	Samples are received within holding time	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs	T	Regular TAT
21	Sample bottles are completely filled	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request	T	
23	VOA sample vials did not have headspace or bubble in 4 mm (1/8") in diameter	N/A	
24	Soil samples are free of air space	N/A	
25	Multiphase samples are not present or a 100 mixture of solids/liquids/oil	T	
26	Sample appearance is noted	T	pale yellow slight turbid
27	Samples did not require splitting or compositing	T	
28	Sample preservation verified (pH criteria: ≤ 2)	T	pH adjusted as for OK
29	Trip blank provided by the lab	N/A	
30	Trip blanks used are those provided for this specific lab	N/A	

Client Confirmation

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Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

WQ5
M21E006-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.40**		pH Units	1	21E0161	30-Apr-21	30-Apr-21	APHA 4500-H	T-04
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**60.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**24.3**		°C	"	21E0160	30-Apr-21	11-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**5.86**	0.200	mg/L	1	21E0168	"	30-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**12.0**	4.61	mg/L	1	21E0093	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	I-01a
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	30-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Anabelle Dungo, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess M. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

WQ7
M21E006-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.38**		pH Units	1	21E0161	29-Apr-21	29-Apr-21	APHA 4500-H	T-06
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**85.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**32.4**		°C	"	21E0160	29-Apr-21	11-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**6.14**	0.200	mg/L	1	21E0168	"	29-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**23.0**	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	29-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor *Chem. Tech PRC# 0001128*	Princess S. Galvez, Laboratory Manager *Chemist PRC# 9207*

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 18-May-21 08:23

WQ8
M21E006-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.22**		pH Units	1	21E0161	29-Apr-21	29-Apr-21	APHA 4500-H	T-04a
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**80.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**24.6**		°C	"	21E0160	29-Apr-21	11-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**7.70**	0.200	mg/L	1	21E0148	"	29-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**20.0**	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	29-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

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Report Prepared By :	Reviewed By :	Certified Correct By :
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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pumida	**Reported:** 18-May-21 08:23

Physical Parameters by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0104 - TDS APHA 2540-C										
Blank (21E0104-BLK1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	ND	7.41	mg/L							
LCS (21E0104-BS1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	47.0	7.41	mg/L	50.0		94.0	80-120			
LCS Dup (21E0104-BSD1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	44.0	7.41	mg/L	50.0		88.0	80-120	6.59	10	
Duplicate (21E0104-DUP1)		Source: M21E003-01		Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	85.0	7.41	mg/L		85.0			0.00	10	
Batch 21E0110 - Residual Chlorine										
Blank (21E0110-BLK1)				Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units							
LCS (21E0110-BS1)				Prepared & Analyzed: 07-May-21						
Salinity	35.8	0.212	Salinity units	35.0		102	80-120			
LCS Dup (21E0110-BSD1)				Prepared & Analyzed: 07-May-21						
Salinity	35.4	0.212	Salinity units	35.0		101	80-120	1.12	20	
Duplicate (21E0110-DUP1)		Source: M21D417-01		Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units		ND				10	

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Certified Correct By :
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Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0095 - COD - Closed Reflux APHA 5220D										
Blank (21E0095-BLK1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	ND	4.61	mg/L							
LCS (21E0095-BS1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	49.0	4.61	mg/L	50.0		98.0	80-120			
LCS Dup (21E0095-BSD1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	50.0	4.61	mg/L	50.0		100	80-120	2.02	20	
Duplicate (21E0095-DUP1)		Source: M21E003-01		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	51.0	4.61	mg/L		51.0			0.00	20	
Matrix Spike (21E0095-MS1)		Source: M21E003-01		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	96.0	4.61	mg/L	50.0	51.0	90.0	80-120			
Batch 21E0131 - O&G APHA 5520B										
Blank (21E0131-BLK1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L							
LCS (21E0131-BS1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	104	2.00	mg/L	111		93.3	80-120			
LCS Dup (21E0131-BSD1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	105	2.00	mg/L	112		93.8	80-120	0.957	10	
Duplicate (21E0131-DUP1)		Source: M21E033-01		Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L		ND				10	

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Annabelle Bungoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0131 - O&G APHA 5520B										
Matrix Spike (21E0131-MS1)		**Source: M21E033-01**		Prepared & Analyzed: 10-May-21						
Oil & Grease	125	2.00	mg/L	131	ND	95.3	80-120			

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Chem. Tech PRC# 0001128

Certified Correct By :
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Chemist PRC# 9207

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Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0014 - General Preparation										
Blank (21E0014-BLK1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	ND	0.0635	mg/L							
LCS (21E0014-BS1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.99	0.0635	mg/L	2.00		99.5	80-120			
LCS Dup (21E0014-BSD1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.96	0.0635	mg/L	2.00		98.0	80-120	1.52	200	
Duplicate (21E0014-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 03-May-21						
Cyanide (free)	0.0565	0.0635	mg/L		0.0565			0.00	20	J-01
Matrix Spike (21E0014-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 03-May-21						
Cyanide (free)	2.06	0.0635	mg/L	2.00	0.0565	100	75-125			

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Annabelle Bangoy, Project Manager

Reviewed By :
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Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amrt Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andree L. Pomida	Reported: 18-May-21 08:23

Metals by APHA/AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0033 - Cr+6 APHA 3500-CrB										
Blank (21E0033-BLK1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L							
LCS (21E0033-BS1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.152	0.00500	mg/L	0.150		101	80-121			
LCS Dup (21E0033-BSD1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.153	0.00500	mg/L	0.150		102	80-121	0.656	20	
Duplicate (21E0033-DUP1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L		ND				20	
Matrix Spike (21E0033-MS1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.140	0.00500	mg/L	0.150	ND	93.3	68.6-117			

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :
Annabelle Bumpoy, Project Manager

Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

Page 16 of 17

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Ioonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:23

Notes and Definitions

Report Specific Notes

T-04b 32.4°C is the temperature taken in the field at the time of sampling.

T-04a 24.6°C is the temperature taken in the field at the time of sampling.

T-04 24.3°C is the temperature taken in the field at the time of sampling.

J-01a 1.29 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.

J-01 0.0565 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.

Laboratory Reporting Conventions:

ND Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).

NR Not Reported

dry Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.

RPD Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).

MRL METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table

DIL Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.

Reporting Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,

Limit analytical dilutions and percent solid, where applicable

Prepared Date indicated is the same as Extraction Date

Note 1 Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT**********

HiAdvance Philippines Incorporated

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor *Chem. Tech PRC# 0001128*	Princess S. Galyez, Laboratory Manager *Chemist PRC# 9207*

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18 May 2021 WO# M21E006

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact the undersigned or our Laboratory Manager- Ms. Princess Galvez or our Quality Assurance Manager.

Sincerely,

Annabelle Bangoy
Project Manager

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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SUMMARY OF RESULTS

REPORT NO. *M21E006*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E006-01 WQ5	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21E006-01 WQ7	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21E006-01 WQ8	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-

References:

U.S. EPA. 1994. "Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 4.4. Cincinnati, OH

Definition of Terms:

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form.

Cadmium exerts toxic effects on the kidney, the skeletal and the respiratory systems, and is classified as a human carcinogen. It is generally present in the environment at low levels. However, human activity has greatly increased those levels.

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world.

Note:

A-02 ***<0.000727*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02a ***<0.00416*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02b ***<0.00517*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ5	M21E006-01	Water	30-Apr-21 09:30	03-May-21 08:00
WQ7	M21E006-02	Water	29-Apr-21 11:55	03-May-21 08:00
WQ8	M21E006-03	Water	29-Apr-21 10:15	03-May-21 08:00

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess B. Galvez, Laboratory Manager
Chemist PRC# 9307

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

CHAIN-OF-CUSTODY / Analytical Request Document

N° 321905

SAMPLE ID

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pumida	**Reported:** 18-May-21 08:19

FIELD DATA SHEET

Date: 29 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet-Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pumida
Sampling Name: Jerry Gonzalez
Project Manager / Sales Personnel in Charge: AAL
Work order: P210206
Water Type: ☑ Waste water ☐ Potable
Sampling Method Used: ☑ Sampling Guidelines and Procedures (BP-SPL-013)

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
WQ7	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.38 Temp: 29.11 D.O: 4.14 Color: Residual Cl: 0	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
WQ8	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.33 Temp: 29.6 D.O: 3.98 Color: Residual Cl: 0	☐ Indoor ☑ Outdoor	☐ Sunny ☑ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
WQ9	☑ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.44 Temp: 28.6 D.O: 3.86 Color: Residual Cl: 0	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify

1 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 8207

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	M-A 450-01			Reading	TEMP	Equipment ID
Buffer Soln #	Reading	TEMP	Equipment ID	pH (LCS)	7.28	26.4
pH 4	4.21	26.4		pH (LCSD)	7.24	26.5
pH 7	6.99	26.5		Sample Duplicate:		
pH 10	9.95	26.5		Workorder	Reading	
Verification pH 10	7.98	26.6				

Conductivity Meter Calibration Verification		Quality Control	Conductivity uS/cm
Equipment ID:		LCS Reading	
	Conductivity uS/cm	LCSD Reading	
Calibration Std		Sample Duplicate:	
Verification Std		Workorder	Reading

DO Meter Verification (if applicable)		Quality Control	
Equipment ID:		Sample Duplicate	
	DO, mg/L	Workorder	DO, mg/L
		448	5.05
Re-verification		448	7.62

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
	[illegible]	[illegible]

Checked by: _____ 05 May 2021
(To be checked by SRO)

2 of 2

HiAdvance Philippines Incorporated

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Report Prepared By:

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

FIELD DATA SHEET

Name: [illegible]
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampling Name: [illegible]
Project Manager / Sampling Personnel in Charge: [illegible]
Work order: [illegible]
Water Type: Waste water / Potable
Sampling Method Used: [illegible]

Sample ID	Appearance	On-site data measurement	Sampling Location	Weather	Sampling Point Observation
W25	Clear / Turbid / Yellowish / Dark	pH: 7.78 Temp: 29.3 D.O: 0.36 Cond: Residual Cl: Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: [illegible] Time Finish: [illegible]	Others:			Others:	
W010	Clear / Turbid / Yellowish / Dark	pH: 7.46 Temp: [illegible] D.O: [illegible] Cond: Residual Cl: 0 Others: [illegible]	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: [illegible] Time Finish: [illegible]	Others:			Others:	
W26	Clear / Turbid / Yellowish / Dark	pH: [illegible] Temp: [illegible] D.O: [illegible] Cond: Residual Cl: 0 Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: [illegible] Time Finish: [illegible]	Others:			Others:	
	Clear / Turbid / Yellowish / Dark	pH: Temp: D.O: Cond: Residual Cl: Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: Time Finish:	Others:			Others:	
	Clear / Turbid / Yellowish / Dark	pH: Temp: D.O: Cond: Residual Cl: Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: Time Finish:	Others:			Others:	
	Clear / Turbid / Yellowish / Dark	pH: Temp: D.O: Cond: Residual Cl: Others:	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	No unusual Observation / If Other, please specify
Time Start: Time Finish:	Others:			Others:	

1 of 2

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inonel	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	18-May-21 08:19

Other Field Notes:

pH Meter Calibration				Quality Control	
Equipment ID	[illegible]			Reading	LTEMP / Element ID
Buffer Soln	Reading	TEMP	Element ID	pH (LCS)	[illegible]
pH 4	[illegible]	27.2	[illegible]	pH (LCSD)	[illegible]
pH 7	[illegible]	27.8	[illegible]	**Sample Duplicate**	
pH 10	[illegible]	27.6	[illegible]	Work order	Reading
Verification pH 10	18.02	27.3			

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Work order	Reading
Verification Std			

DO Meter Verification (Optional)		Quality Control	
Equipment ID		Sample Duplicate (Indicatively per)	DO, mg/L
	DO, mg/L	[illegible]	[illegible]
Air verification			

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Work order	Reading
	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SRO)

2 of 2

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

HiAdvance Philippines

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet - Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 18 May 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No. ___	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be 4 ± 6 °C)	T	
6	Cooler temperature is recorded 8.3 °C	T	
7	COC is present. COC # 32[illegible]	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

1

MP 101-007-101
Rev. 01, 12 Nov 2019

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

14	Containers are not broken or leaking.	T	
15	There are no discrepancies between the sample ID on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within Holding Time.	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	USA sample vials did not have headspace or bubble in a 6 mm (1/4") in diameter.	NA	
24	Soil samples are free of air spaces.	NA	
25	Multiphase samples are not present in a 50% mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	pale yellow slight turbid
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified. (pH criteria: 4.2)	T	pH adjusted 4.2 for OBC
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific site.	NA	

Client Confirmation

1

MR-SPL-007-F01
Rev. 01, 12 Nov 2014

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Isonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

WQ5
M21E006-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Chávez, Laboratory Manager
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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

WQ7
M21E006-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

Page 10 of 14

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

WQ7
M21E006-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

WQ8
M21E006-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0079 - As Total ICP APHA 3120 B										
Blank (21E0079-BLK1)				Prepared & Analyzed: 06-May-21						
Arsenic	ND	0.0100	mg/L							
LCS (21E0079-BS1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.503	0.0100	mg/L	0.500		101	80-120			
LCS Dup (21E0079-BSD1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500		96.8	80-120	3.85	20	
Duplicate (21E0079-DUP1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	< 0.00416	0.0100	mg/L		ND				20	A-02a
Matrix Spike (21E0079-MS1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	0.481	0.0100	mg/L	0.500	ND	96.2	80-120			
Matrix Spike Dup (21E0079-MSD1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500	ND	96.8	80-120	0.622	20	
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Blank (21E0082-BLK1)				Prepared & Analyzed: 06-May-21						
Cadmium	ND	0.00200	mg/L							
LCS (21E0082-BS1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.295	0.00200	mg/L	0.300		98.3	80-120			
LCS Dup (21E0082-BSD1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.312	0.00200	mg/L	0.300		104	80-120	5.60	20	

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

Metals by APHA/AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Duplicate (21E0082-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	< 0.000727	0.00200	mg/L		ND				20	A-02
Matrix Spike (21E0082-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.292	0.00200	mg/L	0.300	ND	97.3	80-120			
Matrix Spike Dup (21E0082-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Cadmium	0.268	0.00200	mg/L	0.300	ND	89.3	80-120	8.57	20	
Batch 21E0083 - Pb Total ICP APHA 3120 B										
Blank (21E0083-BLK1)				Prepared & Analyzed: 06-May-21						
Lead	ND	0.0200	mg/L							
LCS (21E0083-BS1)				Prepared & Analyzed: 06-May-21						
Lead	2.93	0.0200	mg/L	3.00		97.7	80-120			
LCS Dup (21E0083-BSD1)				Prepared & Analyzed: 06-May-21						
Lead	3.32	0.0200	mg/L	3.00		111	80-120	12.5	20	
Duplicate (21E0083-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	< 0.00517	0.0200	mg/L		ND				20	A-02b
Matrix Spike (21E0083-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.19	0.0200	mg/L	3.00	ND	106	80-120			
Matrix Spike Dup (21E0083-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Lead	3.23	0.0200	mg/L	3.00	ND	108	80-120	1.25	20	

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Annabelle Bangoy, Project Manager

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Chemist PRC# 8207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 18-May-21 08:19

Notes and Definitions

Report Specific Notes

A-02b <0.00517 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

A-02a <0.00416 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

A-02 <0.000727 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.

<_b < 0.00517

<_a < 0.00416

<_ < 0.000727

Laboratory Reporting Conventions:

ND Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).

NR Not Reported

dry Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.

RPD Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).

MRL METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table

DIL Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.

Reporting Limit Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable

Prepared Date indicated is the same as Extraction Date

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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14 May 2021 WO# M21E006

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Annabelle Bangoy
Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ5	M21E006-01	Water	30-Apr-21 09:30	03-May-21 08:00
WQ7	M21E006-02	Water	29-Apr-21 11:55	03-May-21 08:00
WQ8	M21E006-03	Water	29-Apr-21 10:15	03-May-21 08:00

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
14-May-21 09:30

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 321905

SAMPLE ID	

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Innnel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

HiAdvance Philippines

FIELD DATA SHEET

Date: 29 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida

Sampler's Name: [illegible]
Project Manager / Sales Personnel in Charge: [illegible]
Work order: P210004

Water Type:
☑ Waste water
☐ Potable

Sampling Method Used
☐ for Water Sample Collection and Preservation (MP-SPL-P12) ☑ Grab ○ Composite

Sample ID	Appearance	On-site test readings	Sampling Location	Weather	Sampling Point Observation
W07	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: 7.14 Temp: 28.4 D.O: 2.14 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ○ If Other, please specify:
W08	☐ Clear ☑ Turbid ☐ Yellowish ☐ Dark Others:	pH: 7.14 Temp: 34.4 D.O: 7.14 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ○ If Other, please specify:
W09	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: 7.64 Temp: 28.6 D.O: 2.86 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ○ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ○ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ○ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ○ If Other, please specify:

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:				Reading	TEMP	Element ID
Buffer Soln /	Reading	TEMP	Element ID	pH (LCS)		
pH 4				pH (LCSD)		
pH 7				Sample Duplicate:		
pH 10				Workorder	Reading	
Verification pH 10						

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
	Conductivity µS/cm	LCSD Reading	
Calibration Std		Sample Duplicate:	
Verification Std		Workorder	Reading

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate	DO, mg/L
	DO, mg/L		
Air verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading

Checked by: _____ (To be checked by SRO)

2 of 2

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES.

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
14-May-21 09:30

FIELD DATA SHEET

Date: 28 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampler's Name: Jonas Rosario
Project Manager / Sales Personnel in Charge: LL
Work order: AR21066
Water Type: ☑ Waste water ☐ Potable
Sampling Method Used: ☑ Sampling Collection and Preservation ☐ Grab ☐ Composite

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
N25	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark ☐ Others:	pH: 7.70 Temp: 27.5 D.O.: 9.56 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:
W10	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark ☐ Others:	pH: 7.46 Temp: 27.1 D.O.: 9.46 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:
W26	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark ☐ Others:	pH: 7.45 Temp: 28.9 D.O.: 5.46 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☑ Dark ☐ Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☑ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark ☐ Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark ☐ Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy ☐ Others:	☐ No unusual Observation ☐ If Other, please specify:

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Annabelle Bangoy, Project Manager

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Annexes

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
14-May-21 09:30

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID	[illegible]			Reading	TEMP	Element ID
Buffer Sol'n	Reading	TEMP	Element ID	pH (LCS)	[illegible]	[illegible]
pH 4	2.99	27.2	[illegible]	pH (LCSD)	7.25	27.6
pH 7	2.01	27.8	[illegible]	Sample Duplicate:		
pH 10	10.01	27.6	[illegible]	Workorder	Reading	
Verification pH 10	10.02	27.3				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate:	
Calibration Std.		Workorder	Reading
Verification Std.			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (decreasing per)	DO, mg/L
	DO, mg/L	[illegible]	5.76
As verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SRO)

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet-Asia, Inc
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 13 May 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No: —	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded: 8.3 °C	T	
7	COC is present. COC# 3219[illegible]	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC	T	
12	Sample containers have legible labels.	T	
13	Sample container(s) provided by the lab	T	

1

MP-SPL-001-F02
Rev. 01, 12 Nov 2014

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC	T	
16	Sample collection date/time is provided	T	
17	Samples are received at least five (5) days after sampling	T	
18	Appropriate sample containers are used	T	
19	Samples are received within Holding Time	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs	T	Regular TAT
21	Sample bottles are completely filled	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD requests	T	
23	VOA sample vials did not have headspace or bubble ≥ 6mm (1/4") in diameter	N/A	
24	Soil samples are free of air spaces	N/A	
25	Multiphase samples are not present or ≥ 10% mixture of solids/liquids/oil	T	
26	Sample appearance is noted	T	pale yellow slight turbid
27	Samples did not require splitting or compositing	T	
28	Sample preservation verified. (pH criteria: ≤ 2)	T	pH adjusted to 1 for DRC
29	Trip blank provided by the lab	N/A	
30	Trip blanks used are those provided for this specific site	N/A	

Client Confirmation

2

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Makati City, PHILIPPINES
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Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

WQ5
M21E006-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	740844	09-May-21	10-May-21	7470AW	

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Annabelle Bungoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: Water Analysis Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

WQ7
M21E006-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	740844	09-May-21	10-May-21	7470AW	

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Annabelle Bangoy, Project Manager

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philippines@hiadvance.com

Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
14-May-21 09:30

WQ8
M21E006-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	740844	09-May-21	10-May-21	7470AW	

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

EPA 7470A - Quality Control

Pace Analytical Services, LLC - Minneapolis Lab

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 740844 - EPA 7470A										
BLANK (3948287)				Prepared: 09-May-21 Analyzed: 10-May-21						
Mercury	0.070	0.20	ug/L				-			U
LCS (3948288)				Prepared: 09-May-21 Analyzed: 10-May-21						
Mercury	5.3	0.20	ug/L	5		105	80-120			
MS (3948289)		Source: M21E006-01		Prepared: 09-May-21 Analyzed: 10-May-21						
Mercury	5.2	0.20	ug/L	5	<0.070	105	80-120			
MSD (3948290)		Source: M21E006-01		Prepared: 09-May-21 Analyzed: 10-May-21						
Mercury	5.3	0.20	ug/L	5	<0.070	106	80-120	1	20	

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 14-May-21 09:30

Notes and Definitions

Report Specific Notes

U	Indicates the compound was analyzed for, but not detected.
<0.070	<0.070

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable Prepared Date indicated is the same as Extraction Date

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Annabelle Bangoy, Project Manager

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17 May 2021 WO# M21E008

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact our Laboratory Manager-Ms. Princess Galvez or our Quality Manager.

Our Laboratory is a DENR Recognized laboratory with CR No. 046/2019 valid until 25th of July 2022.

While our DOH recognition with accreditation number 13-0006-2020-LW-2, is valid until 31st of December 2022.

Sincerely,

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E008Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	Analysis	Unit	Results of Analysis	Remarks
M21E008-01 WQ9	pH on-site	pH Units	7.63	-
	Dissolved Oxygen on-site	mg/L	7.86	-
	COD	mg/L	21.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	26.6	-
M21E008-02 WQ10	pH on-site	pH Units	7.64	-
	Dissolved Oxygen on-site	mg/L	5.16	-
	COD	mg/L	20.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	23.0	-
M21E008-03 WQ6	pH on-site	pH Units	7.88	-
	Dissolved Oxygen on-site	mg/L	5.63	—
	COD	mg/L	21.0	-
	Oil and Grease	mg/L	ND	-
	Cyanide (free)	mg/L	ND	-
	Residual Chlorine	mg/L	ND	-
	Hexavalent Chromium	mg/L	ND	-
	Temperature on-site	°C	26.9	-

References:
Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (**HCN**) and the cyanide ion (CN^-), which represent the more toxic forms of cyanide
Dissolved oxygen *analysis* measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
residual is **Chlorine** a low level of **chlorine** remaining in water after its initial application.
Salinity - is the saltiness or dissolved salt content of a body of water.
Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.
Temperature - The degree of hotness or coldness of a body or environment.

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This summary is only a part of the complete analytical report and must be reproduced in its entirety.

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E008Rev01*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E008-01 WQ9	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	90.0	-
M21E008-02 WQ10	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	99.0	-
M21E008-03 WQ6	Salinity	Salinity Units	ND	-
	Total Dissolved Solids	mg/L	105	-

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Salinity - is the saltiness or dissolved salt content of a body of water.

Total Dissolved Solids (TDS) is the portion of solids that passes through a filter of 2.0µm (or smaller) nominal pore size under specified conditions.

Note: M21E008 Water Analysis Rev01: *This report was revised to separate the Total Dissolved Solids and Salinity results as per customer's request. This final report replaces the one generated on 17 May 2021 at 07:48H. All other data results are not affected; data results remain unchanged.*

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Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pumida	**Reported:** 17-May-21 07:48

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ9	M21E008-01	Water	29-Apr-21 09:10	03-May-21 08:00
WQ10	M21E008-02	Water	30-Apr-21 07:45	03-May-21 08:00
WQ6	M21E008-03	Water	30-Apr-21 10:10	03-May-21 08:00

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Alavez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

CHAIN-OF-CUSTODY / Analytical Request Document

REGULATORY AGENCY

SAMPLE ID

HiAdvance Philippines Incorporated

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Report Prepared By :
Annabelle Hangoy, Project Manager

Reviewed By :
Marizen B. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

FIELD DATA SHEET

Date: 19 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc
Project Name: Water Analysis
Contact Person: Mr. Romulo Andrew L. Pimentel
Water Type: ☑ Wastewater ☐ Potable
Sampler's Name: J. Pinto, Quintin
Project Manager / Sales Personnel in Charge: LLL
Work order: 2021-005
Sampling Method Used: ☑ By Water Sample Collection and Preservation (MC SPL-01) ☐ Grab ☐ Composite

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
MW7	☑ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: 09:15 Time Finish: 09:15 Others:	pH: 7.55 Temp: 31.4°C D.O.: 6.16 Cond: 1.14 Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ Not unusual observation ☐ If Other, please specify:
MW29	☑ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: 09:45 Time Finish: 09:45 Others:	pH: 7.48 Temp: 31.4°C D.O.: 5.46 Cond: 1.14 Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ Not unusual observation ☐ If Other, please specify:
MW9	☑ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: 09:11 Time Finish: 09:11 Others:	pH: 7.86 Temp: 31.6°C D.O.: 5.86 Cond: 0.9 Residual Cl: 0 Others:	☐ Indoor ☐ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ Not unusual observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: Time Finish: Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☑ Light Rain ☐ Rainy Others:	☐ Not unusual observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: Time Finish: Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☑ Light Rain ☐ Rainy Others:	☐ Not unusual observation ☐ If Other, please specify:
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Time Start: Time Finish: Others:	pH: Temp: D.O.: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ Not unusual observation ☐ If Other, please specify:

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen B. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inone1 Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

Other Field Notes:

pH Meter Calibration				Quality Control			
Equipment ID	M - PHM-04			Reading	TEMP	Element ID	
Buffer Soln	Reading	TEMP	Element ID	pH 0.DB	7.28	26.4	[illegible]
pH 4	4.01	26.9	M21[illegible]	pH 0.DBD	7.04	26.5	
pH 7	4.01	26.5	M21[illegible]	Sample Duplicate			
pH 10	9.98	26.5	M21[illegible]	Workorder		Reading	
Verification pH 10	9.98	20.6					

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (Equipment)		Quality Control	
Equipment ID		Sample Duplicate (Workorder)	DO, mg/L
	DO, mg/L	0.89	7.84
DO verification			

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	M21[illegible]-01	0

Checked by: _____ [illegible] 18 May 2021
(To be checked by SRO)

2 of 2

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 8207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: fzonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

FIELD DATA SHEET

Date: 31 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Water Type: ☑ Waste water ☐ Potable
Analyst Name: [illegible]
Project Manager / Sales Personnel in Charge: [illegible]
Work order: [illegible]
Sampling Method Used: ☑ Sampling Collection and Preservation (SM, APL 9215 ☑ Grab ☐ Composite)

Sample ID:	Appearance	On-site Data Readings	Sampling Location	Weather	Sampling Point Observation
WC5	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.46 Temp: 28.6 D.O: 8.26 Cond: Residual Cl: 0.1	☐ Indoor ☑ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
WC10	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.46 Temp: 28.6 D.O: 8.26 Cond: Residual Cl: 0.1	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify
WC6	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.48 Temp: 28.7 D.O: 9.26 Cond: Residual Cl: 0.7	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☐ Sunny ☑ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☑ Rainy	☐ No unusual Observation ☐ If Other, please specify
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Cond: Residual Cl:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify

1 of 2

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Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Ieonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

Other Field Notes:

pH Meter Calibration				Quality Control	
Equipment ID	m - pHm - 001			Reading	
Buffer Soln.	Reading			pH 10.00	
pH 4	4.19	27.2		pH 10.00	7.45 27.2
pH 7	7.01	27.2		Sample Duplicate:	
pH 10	10.01	27.5		Workorder	Reading
Verification pH 10	10.01	27.2			

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
	Conductivity µS/cm	LCSD Reading	
Calibration Std		Sample Duplicate:	
Verification Std		Workorder	Reading

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (Mg/Liters per)	DO, mg/L
	DO, mg/L	0.10	5.22
All precipitation		0.10	5.22

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
	[illegible]	0

Checked by: _____ 15 May 2021
(To be checked by SRO)

2 of 2

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody documents. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Annexes

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: [illegible]
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No. ___	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable (temperature should be < 6 °C).	T	
6	Cooler temperature is recorded [illegible] °C.	T	
7	COC is present. COC# [illegible]	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the field sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

1

MP-SPL-027-R01
Rev. 01, 12 Nov 2014

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14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC.	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling.	T	
18	Appropriate sample containers are used.	T	
19	Samples are received within holding Time.	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled.	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA	
24	Soil samples are free of air space.	NA	
25	Multiphase samples are not present in a 100 mixture of solids/liquids/oil.	T	
26	Sample appearance is noted.	T	pale yellow slight turbid
27	Samples did not require splitting or compositing.	T	
28	Sample preservation verified, spot contains 2	T	pH adjusted 5.0 for DRC
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific use.	NA	

Client Confirmation

2

MP-SPL-003-P01
Rev. 01, 17 Nov 2014

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

WQ9
M21E008-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.63**		pH Units	1	21E0161	29-Apr-21	29-Apr-21	APHA 4500-H	T-94a
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**90.0**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**26.6**		°C	"	21E0164	30-Apr-21	03-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**7.86**	0.200	mg/L	1	21E0168	29-Apr-21	29-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**21.0**	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	29-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

HiAdvance Philippines Incorporated

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 17-May-21 07:48

WQ10
M21E008-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	7.64		pH Units	1	21E0161	30-Apr-21	30-Apr-21	APHA 4500-H	T-01
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	99.0	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	23.0		°C	"	21E0164	30-Apr-21	03-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	5.16	0.200	mg/L	1	21E0168	"	30-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	20.0	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	30-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

WQ6
M21E008-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Physical Parameters by APHA/AWWA Methods									
pH on-site	**7.88**		pH Units	1	21E0161	30-Apr-21	30-Apr-21	APHA 4500-H	T-04b
Salinity	ND	0.212	Salinity units	"	21E0110	07-May-21	07-May-21	APHA 2520	
Total Dissolved Solids	**105**	7.41	mg/L	"	21E0104	06-May-21	07-May-21	APHA 2540C	
Temperature on-site	**26.9**		°C	"	21E0164	30-Apr-21	03-May-21	APHA 2550 B	
Inorganic Non-Metallic Constituents by APHA/AWWA Methods									
Dissolved Oxygen on-site	**5.63**	0.200	mg/L	1	21E0168	"	30-Apr-21	APHA 4500-O G	
Aggregate Organic Constituents by APHA/AWWA Methods									
Chemical Oxygen Demand	**21.0**	4.61	mg/L	1	21E0095	07-May-21	07-May-21	APHA 5220D	
Oil & Grease	ND	2.00	"	"	21E0131	10-May-21	10-May-21	APHA 5520B	
Conventional Chemistry Parameters by EPA Methods									
Cyanide (free)	ND	0.0635	mg/L	1	21E0014	03-May-21	03-May-21	EPA 9213	
Miscellaneous Physical/Conventional Chemistry Parameters									
Residual Chlorine	ND	0.200	mg/L	1	21E0117	30-Apr-21	03-May-21	DPD Chlorine Test Kit	
Metals by APHA/ AWWA Standard Methods									
Hexavalent Chromium	ND	0.00500	mg/L	1	21E0033	04-May-21	04-May-21	APHA 3500-Cr B	

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Annabelle Bangoy, Project Manager	Marizen O. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 17-May-21 07:48

Physical Parameters by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0104 - TDS APHA 2540-C										
Blank (21E0104-BLK1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	ND	7.41	mg/L							
LCS (21E0104-BS1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	47.0	7.41	mg/L	50.0		94.0	80-120			
LCS Dup (21E0104-BSD1)				Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	44.0	7.41	mg/L	50.0		88.0	80-120	6.59	10	
Duplicate (21E0104-DUP1)		Source: M21E003-01		Prepared: 06-May-21 Analyzed: 07-May-21						
Total Dissolved Solids	85.0	7.41	mg/L		85.0			0.00	10	
Batch 21E0110 - Residual Chlorine										
Blank (21E0110-BLK1)				Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units							
LCS (21E0110-BS1)				Prepared & Analyzed: 07-May-21						
Salinity	35.8	0.212	Salinity units	35.0		102	80-120			
LCS Dup (21E0110-BSD1)				Prepared & Analyzed: 07-May-21						
Salinity	35.4	0.212	Salinity units	35.0		101	80-120	1.12	20	
Duplicate (21E0110-DUP1)		Source: M21D417-01		Prepared & Analyzed: 07-May-21						
Salinity	ND	0.212	Salinity units		ND				10	

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Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0095 - COD - Closed Reflux APHA 5220D										
Blank (21E0095-BLK1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	ND	4.61	mg/L							
LCS (21E0095-BS1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	49.0	4.61	mg/L	50.0		98.0	80-120			
LCS Dup (21E0095-BSD1)				Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	50.0	4.61	mg/L	50.0		100	80-120	2.02	20	
Duplicate (21E0095-DUP1)		**Source: M21E003-01**		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	51.0	4.61	mg/L		51.0			0.00	20	
Matrix Spike (21E0095-MS1)		**Source: M21E003-01**		Prepared & Analyzed: 07-May-21						
Chemical Oxygen Demand	96.0	4.61	mg/L	50.0	51.0	90.0	80-120			
Batch 21E0131 - O&G APHA 5520B										
Blank (21E0131-BLK1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L							
LCS (21E0131-BS1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	104	2.00	mg/L	111		93.3	80-120			
LCS Dup (21E0131-BSD1)				Prepared & Analyzed: 10-May-21						
Oil & Grease	105	2.00	mg/L	112		93.8	80-120	0.957	10	
Duplicate (21E0131-DUP1)		**Source: M21E033-01**		Prepared & Analyzed: 10-May-21						
Oil & Grease	ND	2.00	mg/L		ND				10	

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Reviewed By :
Marizen D. Bendana, Department Supervisor
Chem. Tech PRC# 0001128

Certified Correct By :
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Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

Aggregate Organic Constituents by APHA/AWWA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0131 - O&G APHA 5520B										
Matrix Spike (21E0131-MS1)		**Source: M21E033-01**		Prepared & Analyzed: 10-May-21						
Oil & Grease	125	2.00	mg/L	131	ND	95.3	80-120			

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: [none]	Reported:
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	17-May-21 07:48

Conventional Chemistry Parameters by EPA Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0014 - General Preparation										
Blank (21E0014-BLK1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	ND	0.0635	mg/L							
LCS (21E0014-BS1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.99	0.0635	mg/L	2.00		99.5	80-120			
LCS Dup (21E0014-BSD1)				Prepared & Analyzed: 03-May-21						
Cyanide (free)	1.96	0.0635	mg/L	2.00		98.0	80-120	1.52	200	
Duplicate (21E0014-DUP1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	0.0565	0.0635	mg/L		0.0565			0.00	20	J-01
Matrix Spike (21E0014-MS1)		Source: M21D417-01		Prepared & Analyzed: 03-May-21						
Cyanide (free)	2.06	0.0635	mg/L	2.00	0.0565	100	75-125			

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrez L. Pomida	**Reported:** 17-May-21 07:48

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0033 - Cr+6 APHA 3500-CrB										
Blank (21E0033-BLK1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L							
LCS (21E0033-BS1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.152	0.00500	mg/L	0.150		101	80-121			
LCS Dup (21E0033-BSD1)				Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.153	0.00500	mg/L	0.150		102	80-121	0.656	20	
Duplicate (21E0033-DUP1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	ND	0.00500	mg/L		ND				20	
Matrix Spike (21E0033-MS1)		Source: M21E003-01		Prepared & Analyzed: 04-May-21						
Hexavalent Chromium	0.140	0.00500	mg/L	0.150	ND	93.3	68.6-117			

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:48

Notes and Definitions

Report Specific Notes

T-04b	26.9°C is the temperature taken in the field at the time of sampling.
T-04a	26.6°C is the temperature taken in the field at the time of sampling.
T-04	23.0°C is the temperature taken in the field at the time of sampling.
J-01	0.0565 The reported result is an estimated value. The analyte was detected at a level which is below the reporting limit for the analysis.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts,
Limit	analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date
Note 1	Estimates of measurement of uncertainty available upon request

********** END OF TEST REPORT**********

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared By :	Reviewed By :	Certified Correct By :
Annabelle Bangoy, Project Manager	Marizen D. Bendana, Department Supervisor Chem. Tech PRC# 0001128	Princess S. Galvez, Laboratory Manager Chemist PRC# 9207

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17 May 2021 WO# M21E008

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00.

If you have any questions concerning this report, please feel free to contact the undersigned or our Laboratory Manager- Ms. Princess Galvez or our Quality Assurance Manager.

Sincerely,

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21E008*

Project : Water Analysis
Customer : Arnet Asia, Inc.
Sampling Date : April 29 & 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*	*Remarks*
M21E008-01 WQ9	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21E008-01 WQ10	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-
M21E008-01 WQ6	Arsenic	mg/L	<0.00416	*A-02a*
	Cadmium	mg/L	<0.000727	*A-02*
	Lead	mg/L	<0.00517	*A-02b*
	Mercury	ug/L	<0.070	-

References:

U.S. EPA. 1994. "Method 200.7: Determination of Metals and Trace Elements in Water and Wastes by Inductively Coupled Plasma-Atomic Emission Spectrometry," Revision 4.4. Cincinnati, OH

Definition of Terms:

Arsenic is a natural component of the earth's crust and is widely distributed throughout the environment in the air, water and land. It is highly toxic in its inorganic form.

Cadmium exerts toxic effects on the kidney, the skeletal and the respiratory systems, and is classified as a human carcinogen. It is generally present in the environment at low levels. However, human activity has greatly increased those levels.

Lead is a toxic metal whose widespread use has caused extensive environmental contamination and health problems in many parts of the world.

Note:

A-02 ***<0.000727*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02a ***<0.00416*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*
A-02b ***<0.00517*** *The analyte was detected at a level which is below the method detection and reporting limit for the analysis.*

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ9	M21E008-01	Water	29-Apr-21 09:10	03-May-21 08:00
WQ10	M21E008-02	Water	30-Apr-21 07:45	03-May-21 08:00
WQ6	M21E008-03	Water	30-Apr-21 10:10	03-May-21 08:00

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Report Prepared By :

Annabelle Bangoy, Project Manager

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Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

CHAIN-OF-CUSTODY / Analytical Request Document

NI 121907

REGULATORY AGENCY

SAMPLE ID

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Report Prepared By :

Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

FIELD DATA SHEET

Date: 29 Apr 2021
Site Location: Agusan de Sur
Client Name: Amet Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampler Name: J. Ong Garcia
Project Manager / Sales Personnel in Charge: LLL
Work order: M21E008
Water Type: Waste water / Potable
Sampling Method Used: Grab

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observations
WB7	Clear / Cloudy / Turbid / Dark	pH / Temp / D.O. / Cond.	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	Time Start / Time Finish
WC9	Clear / Cloudy / Turbid / Dark	pH / Temp / D.O. / Cond.	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	Time Start / Time Finish
WA9	Clear / Cloudy / Turbid / Dark	pH / Temp / D.O. / Cond.	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	Time Start / Time Finish
	Clear / Cloudy / Turbid / Dark	pH / Temp / D.O. / Cond.	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	Time Start / Time Finish
	Clear / Cloudy / Turbid / Dark	pH / Temp / D.O. / Cond.	Indoor / Outdoor	Sunny / Cloudy / Light Rain / Rainy	Time Start / Time Finish

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

Other Field Notes:

pH Meter Calibration				Quality Control			
Equipment ID:	[illegible]			Reading	/ LOT	/ Element ID	
Buffer Soln #	Reading	/ TEMP	/ Element ID	pH (LCS)	7.75	20.4	[illegible]
pH 4	4.01	26.5	[illegible]	pH (LCSD)	7.24	26.5	
pH 7	6.93	26.5	[illegible]	Sample Duplicate:			
pH 10	9.95	26.5	[illegible]	Workorder		Reading	
Verification pH 10	9.95	20.6					

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID:		LCS Reading	
	Conductivity µS/cm	LCSD Reading	
Calibration Std		Sample Duplicate:	
Verification Std		Workorder	Reading

DO Meter Verification Calibration		Quality Control	
Equipment ID:		Sample Duplicate (Verification pH)	DO, mg/L
	DO, mg/L	[illegible]	7.84
DO Verification			

Residual Chlorine	Quality Control	
	Sample Duplicate:	
	Workorder	Reading
	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SBO)

2 of 2

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Princess S. Galvez, Laboratory Manager
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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: (none) Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

FIELD DATA SHEET

Date: 30 Apr 21
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Pomida
Sampler's Name: Chris Bolon
Work order: P21E008
Water Type: Potable water
Sampling Method Used: Grab

Sample ID	Appearance	Sampling Location	Weather	Sampling Point Observation
NR6	Clear		Sunny	
WR10	Clear	Outdoor	Sunny	
WR6	Clear	Outdoor	Sunny	
	Clear	Outdoor	Sunny	
	Clear	Indoor	Sunny	
	Clear	Outdoor	Sunny	
	Yellowish	Indoor	Sunny	

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID:	[illegible]			Reading	TEMP	Element ID
Buffer Soln	Reading	TEMP	Element ID	pH (LCS)	[illegible]	[illegible]
pH 4	[illegible]	[illegible]	[illegible]	pH (LCSD)	[illegible]	[illegible]
pH 7	[illegible]	[illegible]	[illegible]	Sample Duplicate		
pH 10	[illegible]	[illegible]	[illegible]	Workorder	Reading	
Verification pH 10	[illegible]	[illegible]				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (Workorder)	DO, mg/L
	DO, mg/L	[illegible]	[illegible]
For verification		[illegible]	[illegible]

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	[illegible]	[illegible]

Checked by: [illegible] 05 May 2021
(To be checked by SRG)

2 of 2

HiAdvance Philippines Incorporated

Report Prepared By :

Annabelle Bangoy, Project Manager

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Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inorel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet-Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 15 May 2021
Creator: [illegible]

Item #	Question	Y / T / N/A	Remarks
1	Sample activity either is not measured or, if measured, is at or below background.	N/A	
2	The cooler is custody sealed, if present, in intact. Cooler No. ___	N/A	
3	The cooler or samples did not appear to have been compromised or tampered	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (Temperature range 0 to + 6 °C)	T	
6	Cooler temperature is recorded. 5.5 °C	T	
7	COC is present. COC # 5-2-2-0-0-0	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample containers have legible labels.	T	
13	Sample containers provided by the lab.	T	

MA-SPL-001-F06
Rev. 01, 22 Nov 2019

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Chávez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

14	Containers are not broken or leaking.	T
15	There are no discrepancies between the sample IDs on the containers and the COC.	T
16	Sample collection date/time is provided.	T
17	Samples are received at least five (5) days after sampling.	T
18	Appropriate sample containers are used.	T
19	Samples are received within holding time.	T
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T Regular TAT
21	Sample bottles are completely filled.	T
22	There is sufficient volume for all requested analyses, including any MS/MSD requests.	T
23	VOA sample vials did not have headspace or bubble is < 6mm (1/4") in diameter.	NA
24	Sm samples are free of air space.	NA
25	Multiphase samples are not present in > 10% mixture of solids/liquids/air.	T
26	Sample appearance is noted.	T pale yellow slightly turbid
27	Samples did not require splitting or compositing.	T
28	Sample preservation verified. (pH criteria ≤ 2)	T pH adjusted 5.0 for DRC
29	Trip blank provided by the lab.	NA
30	Trip blanks used are those provided by this (pH 4) lab.	NA

Client Confirmation MARIZOSS

2

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Asset Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 17-May-21 07:43

WQ9
M21E008-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

HiAdvance Philippines Incorporated

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess [illegible] Galvez, Laboratory Manager
Chemist PRC# 9207

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

WQ10
M21E008-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Report Prepared By :

Annabelle Rungoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 17-May-21 07:43

WQ6
M21E008-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
HiAdvance Philippines Incorporated									
Metals by APHA/ AWWA Standard Methods									
Arsenic	< 0.00416	0.0100	mg/L	1	21E0079	06-May-21	06-May-21	APHA 3120 B	A-02a
Cadmium	< 0.000727	0.00200	"	"	21E0082	06-May-21	06-May-21	"	A-02
Lead	< 0.00517	0.0200	"	"	21E0083	06-May-21	06-May-21	"	A-02b

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

Metals by APHA/ AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0079 - As Total ICP APHA 3120 B										
Blank (21E0079-BLK1)				Prepared & Analyzed: 06-May-21						
Arsenic	ND	0.0100	mg/L							
LCS (21E0079-BS1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.503	0.0100	mg/L	0.500		101	80-120			
LCS Dup (21E0079-BSD1)				Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500		96.8	80-120	3.85	20	
Duplicate (21E0079-DUP1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	< 0.00416	0.0100	mg/L		ND				20	A-02a
Matrix Spike (21E0079-MS1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	0.481	0.0100	mg/L	0.500	ND	96.2	80-120			
Matrix Spike Dup (21E0079-MSD1)		**Source: M21D417-01**		Prepared & Analyzed: 06-May-21						
Arsenic	0.484	0.0100	mg/L	0.500	ND	96.8	80-120	0.622	20	
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Blank (21E0082-BLK1)				Prepared & Analyzed: 06-May-21						
Cadmium	ND	0.00200	mg/L							
LCS (21E0082-BS1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.295	0.00200	mg/L	0.300		98.3	80-120			
LCS Dup (21E0082-BSD1)				Prepared & Analyzed: 06-May-21						
Cadmium	0.312	0.00200	mg/L	0.300		104	80-120	5.60	20	

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES.	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	Reported: 17-May-21 07:43

Metals by APHA/AWWA Standard Methods - Quality Control

HiAdvance Philippines Incorporated

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 21E0082 - Cd Total ICP APHA 3120 B										
Duplicate (21E0082-DUP1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Cadmium	< 0.00727	0.00200	mg/L		ND				20	A-02
Matrix Spike (21E0082-MS1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Cadmium	0.292	0.00200	mg/L	0.300	ND	97.3	80-120			
Matrix Spike Dup (21E0082-MSD1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Cadmium	0.268	0.00200	mg/L	0.300	ND	89.3	80-120	8.57	20	
Batch 21E0083 - Pb Total ICP APHA 3120 B										
Blank (21E0083-BLK1)				Prepared & Analyzed: 06-May-21						
Lead	ND	0.0200	mg/L							
LCS (21E0083-BS1)				Prepared & Analyzed: 06-May-21						
Lead	2.93	0.0200	mg/L	3.00		97.7	80-120			
LCS Dup (21E0083-BSD1)				Prepared & Analyzed: 06-May-21						
Lead	3.32	0.0200	mg/L	3.00		111	80-120	12.5	20	
Duplicate (21E0083-DUP1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Lead	< 0.00517	0.0200	mg/L		ND				20	A-02b
Matrix Spike (21E0083-MS1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Lead	3.19	0.0200	mg/L	3.00	ND	106	80-120			
Matrix Spike Dup (21E0083-MSD1)		Source: M21D417-01		Prepared & Analyzed: 06-May-21						
Lead	3.23	0.0200	mg/L	3.00	ND	108	80-120	1.25	20	

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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(formerly NCALABS Phils., Inc.)
www.hiadvance.com.ph

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 17-May-21 07:43

Notes and Definitions

Report Specific Notes

A-02b	<0.00517 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
A-02a	<0.00416 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
A-02	<0.000727 The analyte was detected at a level which is below the method detection and reporting limit for the analysis.
<_b	< 0.00517
<_a	< 0.00416
<_	< 0.000727

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable
	Prepared Date indicated is the same as Extraction Date

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Report Prepared By :

Annabelle Bangoy, Project Manager

Certified Correct By :

Princess S. Galvez, Laboratory Manager
Chemist PRC# 9207

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21 May 2021 WO# M21E008

Ms. Pamella Andrea L. Pomida
Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig, PHILIPPINES

RE: Water Analysis

Enclosed are the results of analyses for samples received by the laboratory on 03-May-21 08:00. If you have any questions concerning this report, please feel free to contact me.

Note : HiAdvance Philippines Incorporated is former NCALABS Phils. Inc.

Sincerely,

Annabelle Bangoy
Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: Water Analysis Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:36

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
WQ9	M21E008-01	Water	29-Apr-21 09:10	03-May-21 08:00
WQ10	M21E008-02	Water	30-Apr-21 07:45	03-May-21 08:00
WQ6	M21E008-03	Water	30-Apr-21 10:10	03-May-21 08:00

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: fnonel Project Manager: Ms. Pamella Andrea L. Pornida	**Reported:** 21-May-21 09:56

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:56

CHAIN-OF-CUSTODY / Analytical Request Document

Nº 321907

SAMPLE ID

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Ponsida

Reported:
21-May-21 09:56

FIELD DATA SHEET

Date: 29 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet-Asia, Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Ponsida

Sampler's Name: [illegible]
Project Manager / Sales Personnel in Charge: LLL
Work order: MAL6008

Water Type:
☑ Waste water
☐ Potable

Sampling Method Used
☑ As Water Sample Collection and Preservation (MP-SPL-013)

Sample ID	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
WW7	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.35 Temp: 28.4 D.O: 6.24 Color: Residual Cl: 0 Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify: Cloudy and rainy day
Time Start: Time Finish: 1155	Others:		☐ Outdoor		
WW8	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.29 Temp: 28.6 D.O: 5.46 Color: Residual Cl: 0 Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish: 1145	Others:		☐ Outdoor		
WW9	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark	pH: 7.36 Temp: 28.6 D.O: 5.86 Color: Residual Cl: 0 Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☑ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish: 1110	Others:		☐ Outdoor		
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:		☐ Outdoor		
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:		☐ Outdoor		
	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark	pH: Temp: D.O: Color: Residual Cl: Others:	☐ Indoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	Others:		☐ Outdoor		

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Annabelle Bangoy, Project Manager

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Annexes

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

Other Field Notes

pH Meter Calibration				Quality Control			
Equipment ID	M-PHM-04			Reading	TEMP	Element ID	
Buffer Soln	Reading	TEMP	Element ID	pH (LCS)	7.28	26.4	[illegible]
pH 4	4.01	26.9	[illegible]	pH (LCSD)	7.24	26.5	
pH 7	6.99	26.5	[illegible]	Sample Duplicate			
pH 10	9.98	26.5	[illegible]	Workorder		Reading	
Verification pH 10	9.98	26.6					

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration (ss)		Workorder	Reading
Verification (ss)			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (reliability per)	DO, mg/L
	DO, mg/L	WD9	7.84
No verification			

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SRO)

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Poenida	**Reported:** 21-May-21 09:56

FIELD DATA SHEET

Date: 20 Apr 2021
Site Location: Cagayan de Oro
Client Name: Amet Asia Inc.
Project Name: Water Analysis
Contact Person: Ms. Pamella Andrea L. Poenida
Sampling Name: Inonel Espina
Project Manager / Team Personnel in Charge: LLL
Work order: 1021E005

Water Type:
☐ Waste water
☐ Potable

Sampling Method Used
☑ for Water Sample Collection and Preservation (MP-SPL-013) ☐ Grab ☐ Composite

Sample ID:	Appearance	On-site data readings	Sampling Location	Weather	Sampling Point Observation
WQ5 Time Start: Time Finish: 0930	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.24 Temp: 26.8 D.O: 9.16 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ☐ If Other, please specify:
WQ10 Time Start: Time Finish: 0945	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.24 Temp: 26.8 D.O: 9.16 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ☐ If Other, please specify:
WQ6 Time Start: Time Finish: 1010	☐ Clear ☐ Turbid ☑ Yellowish ☐ Dark Others:	pH: 7.22 Temp: 26.8 D.O: 9.66 Cond: Residual Cl: 0 Others:	☐ Indoor ☑ Outdoor	☑ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☑ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:
Time Start: Time Finish:	☐ Clear ☐ Turbid ☐ Yellowish ☐ Dark Others:	pH: Temp: D.O: Cond: Residual Cl: Others:	☐ Indoor ☐ Outdoor	☐ Sunny ☐ Cloudy ☐ Light Rain ☐ Rainy Others:	☐ No unusual Observation ☐ If Other, please specify:

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Annabelle Bangoy, Project Manager

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Annexes

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Amet Asia, Inc.	Project: Water Analysis	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.	Project Number: Inonel	**Reported:**
Pasig PHILIPPINES,	Project Manager: Ms. Pamella Andrea L. Pomida	21-May-21 09:56

Other Field Notes:

pH Meter Calibration				Quality Control		
Equipment ID	[illegible]			Reading	TEMP	Element ID
Buffer Soln	Reading	TEMP	Element ID	pH (LCS)	[illegible]	[illegible]
pH 4	[illegible]	27.2	[illegible]	pH (LCSD)	[illegible]	27.5
pH 7	[illegible]	27.0	[illegible]	Sample Duplicate		
pH 10	10.01	27.5	[illegible]	Workorder	Reading	
Verification pH 10	10.02	27.3				

Conductivity Meter Calibration Verification		Quality Control	Conductivity µS/cm
Equipment ID		LCS Reading	
		LCSD Reading	
	Conductivity µS/cm	Sample Duplicate	
Calibration Std		Workorder	Reading
Verification Std			

DO Meter Verification (if applicable)		Quality Control	
Equipment ID		Sample Duplicate (Inorganic)	DO, mg/L
	DO, mg/L	[illegible]	[illegible]
Air verification		[illegible]	[illegible]

Residual Chlorine	Quality Control	
	Sample Duplicate	
	Workorder	Reading
	[illegible]	0
	[illegible]	0

Checked by: [illegible] 05 May 2021
(To be checked by SAO)

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

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LOGIN SAMPLE RECEIPT CHECKLIST

Client: Amet Asia, Inc.
Project Name: Water Analysis
Work Order: [illegible]
Date Received: 05 May 2021
Creator: [illegible]

Item #	Question	T / F / NA	Remarks
1	Radioactivity either is not measured or, if measured, is at or below background.	NA	
2	The cooler's custody seal, if present, is intact. Cooler No.: —	NA	
3	The cooler or samples did not appear to have been compromised or tampered.	T	
4	Samples are received on ice, if applicable.	T	
5	Cooler temperature is acceptable. (temperature should be < 6 °C)	T	
6	Cooler temperature is recorded. 5.1 °C	T	
7	COC is present. COC # 52909	T	
8	COC is filled out in ink and is legible.	T	
9	COC is filled out with all pertinent information.	T	
10	Is the Field Sampler's name present on COC?	T	
11	Number of containers received match with COC.	T	
12	Sample container's have legible labels.	T	
13	Sample container/s provided by the lab.	T	

1

MP-SPL-007-F01
Rev. 01, 12 Nov 2014

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Amet Asia, Inc.
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave.
Pasig PHILIPPINES,

Project: **Water Analysis**
Project Number: Inonel
Project Manager: Ms. Pamella Andrea L. Pomida

Reported:
21-May-21 09:56

14	Containers are not broken or leaking	T	
15	There are no discrepancies between the sample IDs on the containers and the COC	T	
16	Sample collection date/time is provided.	T	
17	Samples are received at least five (5) days after sampling	T	
18	**Appropriate sample containers are used**	T	
19	Samples are received within Holding Time	T	
20	If necessary, staffs have been informed of any short hold time or quick TAT needs.	T	Regular TAT
21	Sample bottles are completely filled	T	
22	There is sufficient volume for all requested analyses, including any MS/MSD request.	T	
23	VOA sample vials did not have headspace or bubble is 4 mm (1/4") in diameter.	NA	
24	**Soil samples are free of air space**	NA	
25	Multiphase samples are not present or < 10% mixture of solids/liquids/oil	T	
26	Sample appearance is noted.	T	pale yellow slight turbid
27	Samples did not require splitting or composting.	T	
28	Sample preservation verified. (pH interval < 2)	T	pH adjusted 5<1 for DRS
29	Trip blank provided by the lab.	NA	
30	Trip blanks used are those provided for this specific site.	NA	

Client Confirmation

MR/EDB

2

MP-GPL-007-401
Rev 01, 12 Nov 2014

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Porróda	**Reported:** 21-May-21 09:56

WQ9
M21E008-01 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

HiAdvance Philippines Incorporated

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inomel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

WQ10
M21E008-02 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

HiAdvance Philippines Incorporated

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Amet Asia, Inc. Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project: **Water Analysis** Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

WQ6
M21E008-03 (Water)

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Pace Analytical Services, LLC - Minneapolis Lab									
EPA 7470A									
Mercury	<0.070	0.20	ug/L	1	742753	17-May-21	18-May-21	7470AW	U

HiAdvance Philippines Incorporated

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Annabelle Bangoy, Project Manager

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Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: Inonel Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

EPA 7470A - Quality Control

Pace Analytical Services, LLC - Minneapolis Lab

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 742753 - EPA 7470A										
BLANK (3959423)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	0.070	0.20	ug/L				-			U
LCS (3959424)				Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	5.0	0.20	ug/L	5		99	80-120			
MS (3959425)		Source: 10558914002		Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.9	0.20	ug/L	5	0.070	97	80-120			
MSD (3959426)		Source: 10558914002		Prepared: 17-May-21 Analyzed: 18-May-21						
Mercury	4.8	0.20	ug/L	5	0.070	96	80-120	1	20	

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Annabelle Bangoy, Project Manager

Page 13 of 14

HiAdvance

HiAdvance Philippines

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Fax No : +632.854.8365
philippines@hiadvance.com

Amet Asia, Inc.	Project: **Water Analysis**	
Unit 303, One Corporate Center, Julia Vargas Ave. Cor. Meralco Ave. Pasig PHILIPPINES,	Project Number: [none] Project Manager: Ms. Pamella Andrea L. Pomida	**Reported:** 21-May-21 09:56

Notes and Definitions

Report Specific Notes

U	Indicates the compound was analyzed for, but not detected.

Laboratory Reporting Conventions:

ND	Analyte NOT DETECTED at or above the reporting limit (MDL or MRL, as appropriate).
NR	Not Reported
dry	Sample results reported on a dry weight basis. Reporting Limits have been corrected for % Solid.
RPD	Relative Percent Difference. (RPDs calculated using Results, not Percent Recoveries).
MRL	METHOD REPORTING LIMIT. Reporting level at, or above, the lowest level standard of the Calibration Table
DIL	Dilutions are calculated based on deviations from the standard dilution performed for an analysis and may not represent the Dilution found on the analytical raw data.
Reporting Limit	Reporting limits (MDLs and MRLs) are adjusted based on variations in sample preparation amounts, analytical dilutions and percent solid, where applicable Prepared Date indicated is the same as Extraction Date

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Annabelle Bangoy, Project Manager

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High Rainfall

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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Website: www.hiadvance.com.ph

SUMMARY OF RESULTS

REPORT NO. *M21G429*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 26 & 27, 2021

Sample ID	Analysis	Unit	Results of Analysis
M21G429-01 WQ-1	pH on-site	pH Units	8.36
	Dissolved Oxygen on-site	mg/L	6.90
	COD	mg/L	ND
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Temperature on-site	°C	27.9
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070
M21G429-02 WQ-2	pH on-site	pH Units	7.23
	Dissolved Oxygen on-site	mg/L	4.97
	COD	mg/L	ND
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Temperature on-site	°C	26.1
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070
M21G429-03 WQ-10	pH on-site	pH Units	7.81
	Dissolved Oxygen on-site	mg/L	5.25
	COD	mg/L	4.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Temperature on-site	°C	24.7
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070

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Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21H005*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 29, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*
M21H005-01 WQ-4	pH on-site	pH Units	7.59
	Temperature on-site	°C	24.3
	Dissolved Oxygen on-site	mg/L	6.14
	COD	mg/L	5.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070
M21H005-02 WQ-5	pH on-site	pH Units	7.10
	Temperature on-site	°C	24.8
	Dissolved Oxygen on-site	mg/L	5.03
	COD	mg/L	3.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070
M21H005-03 WQ-6	pH on-site	pH Units	8.08
	Temperature on-site	°C	23.0
	Dissolved Oxygen on-site	mg/L	6.48
	COD	mg/L	4.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070

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Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

Sample ID	Analysis	Unit	Results of Analysis
M21G429-04 WQ-9	pH on-site	pH Units	7.09
	Dissolved Oxygen on-site	mg/L	5.46
	COD	mg/L	4.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Temperature on-site	°C	23.7
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070
M21G429-05 WQ-8	pH on-site	pH Units	8.00
	Dissolved Oxygen on-site	mg/L	5.27
	COD	mg/L	3.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Temperature on-site	°C	26.8
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (HCN) and the cyanide ion (CN^-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
residual is **Chlorine** a low level of **chlorine** remaining in water after its initial application.
Temperature - The degree of hotness or coldness of a body or environment.

Note:

Please see the "Report Specific Notes" on the last part of the Analytical Report for applicable qualifiers.

HiAdvance Philippines Incorporated

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Annabelle Bangoy
Project Manager

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DENR Recognized Laboratory with CR No. 086/2018

DOH Accredited for Drinking Water Accreditation No. 10-024-1820-LW-2

Original Issue ☑
Duplicate Issue by Request ☐
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CERTIFICATE OF ANALYSIS

Customer : HiAdvance Philippines, Inc.
Address : 3rd Floor Maga Center Bldg. San Antonio St. Paseo de Magallanes Makati City
Attention : Ms. Annabelle Bangoy
Contact Information : 729-4327

CAN : C21-08-039M-1
Date of Issue : 8/18/2021
RAN : R21-07-054M
INVOICE # : -
Date Received : 7/29/2021
Date Sampled : -
Date Analyzed : 7/29-8/1/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-4 7/29/2021 11:47 am	Fecal Coliform	40	MPN/100 mL	Multiple Tube Fermentation Technique
WQ-5 7/29/2021 11:10 am	Fecal Coliform	350	MPN/100 mL	Multiple Tube Fermentation Technique
WQ-6 7/29/2021 09:27 am	Fecal Coliform	55	MPN/100 mL	Multiple Tube Fermentation Technique
WQ-7 7/29/2021 07:55 am	Fecal Coliform	55	MPN/100 mL	Multiple Tube Fermentation Technique

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C21-08-039M-1

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Sample Descriptions	Parameters	Results	Units	Method
GW-9 7/27/2021 09:25 am	Fecal Coliform	17	MPN/100 mL	Multiple Tube Fermentation Technique
GW-10 7/27/2021 08:45 am	Fecal Coliform	2.0	MPN/100 mL	Multiple Tube Fermentation Technique

Total Analysis: 6

Total No. of Sample : 6
Sample Submission : Submitted by the Customer
Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:

KISHA MARIE T. HALLAZGO, RMT
Medical Technologist
PRC No. 0063765

JANE KARLA M. MARVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:

ALVIN P. BASCO, RCh
Head of Operations
PRC No. 0011786

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L21-08-036M-1

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DENR Recognized Laboratory with CR No. 086/2018

DOH Accredited for Drinking Water Accreditation No. 10-024-1820-LW-2

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Address : 3rd Floor Maga Center Bldg. San Antonio St. Paseo de Magallanes Makati City
Attention : Ms. Annabelle Bangoy
Contact Information : 729-4327

CAN : C21-08-036M-1
Date of Issue : 8/17/2021
RAN : R21-07-052M
INVOICE # : -
Date Received : 7/27/2021
Date Sampled : -
Date Analyzed : 7/27-30/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-8 7/27/2021 11:35 am	Fecal Coliform	21	MPN/100 mL	Multiple Tube Fermentation Technique
WQ-9 7/27/2021 09:55 am	Fecal Coliform	11	MPN/100 mL	Multiple Tube Fermentation Technique
WQ-10 7/27/2021 08:30 am	Fecal Coliform	8.2	MPN/100 mL	Multiple Tube Fermentation Technique
GW-8 7/27/2021 10:55 am	Fecal Coliform	<1.8	MPN/100 mL	Multiple Tube Fermentation Technique

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Sample Descriptions	Parameters	Results	Units	Method
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

Total Analysis: 42

Total No. of Sample : 6
Sample Submission : Submitted by the Customer
Reference : *US EPA 352.1, Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:
JANE KARLA M. [illegible]RVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:
[illegible] BASCO, RCh
Head of Operations
PRC No. 0011786

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C21-08-036M

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Contact Information : 729-4327

CAN : C21-08-036M
Date of Issue : 8/17/2021
RAN : R21-07-052M
INVOICE # : -
Date Received : 7/27/2021
Date Sampled : -
Date Analyzed : 7/27-8/16/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-8	Color (True)	10	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
11:35 am	Total Suspended Solids (TSS)	4	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.12	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.03	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
WQ-9	Color (True)	5	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:55 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	<0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	20	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	<0.01	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

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Sample Descriptions	Parameters	Results	Units	Method
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

Total Analysis: 42

Total No. of Sample : 6
Sample Submission : Submitted by the Customer
Reference : *US EPA 352.1, Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
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Certified Correct by:
JANE KARLA M. NARVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:
ALVIN P. PASCO, RCh
Head of Operations
PRC No. 0011786

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Sample Descriptions	Parameters	Results	Units	Method
WQ-6	Color (True)	5	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:27 am	Total Suspended Solids (TSS)	3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.04	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.12	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
WQ-7	Color (True)	10	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
07:55 am	Total Suspended Solids (TSS)	10	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	<0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	11	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.05	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-5	Color (True)	<5	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
10:11 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	1.03	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-6	Color (True)	<5	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:00 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.10	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.42	mg/L	Colorimetric/Brucine

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Attention : Ms. Annabelle Bangoy
Contact Information : 729-4327

CAN : C21-08-039M
Date of Issue : 8/18/2021
RAN : R21-07-054M
INVOICE # : -
Date Received : 7/29/2021
Date Sampled : -
Date Analyzed : 7/29-8/16/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-4	Color (True)	5	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
11:47 am	Total Suspended Solids (TSS)	4	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.03	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	4	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.26	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
WQ-5	Color (True)	<5	CU	Visual Comparison
7/29/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
11:10 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	<0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.44	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

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DENR Recognized Laboratory with CR No. 086/2018

DOH Accredited for Drinking Water Accreditation No. 10-024-1820-LW-2

Original Issue ☑
Duplicate Issue by Request ☐
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CERTIFICATE OF ANALYSIS

Customer : HiAdvance Philippines, Inc.
Address : 3rd Floor Maga Center Bldg. San Antonio St. Paseo de Magallanes Makati City
Attention : Ms. Annabelle Bangoy
Contact Information : 729-4327

CAN : C21-08-035M-1
Date of Issue : 8/17/2021
RAN : R21-07-051M
INVOICE # :-
Date Received : 7/26/2021
Date Sampled :-
Date Analyzed : 7/26-8/1/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-1 7/26/2021 10:50 am	Fecal Coliform	350	MPN/100mL	Multiple Tube Fermentation Technique
WQ-2 7/26/2021 02:00 pm	Fecal Coliform	$92x10^2$	MPN/100mL	Multiple Tube Fermentation Technique
GW-1 7/26/2021 09:45 am	Fecal Coliform	<1.8	MPN/100mL	Multiple Tube Fermentation Technique

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CAN : C21-08-035M
Date of Issue : 8/17/2021
RAN : R21-07-051M
INVOICE # : -
Date Received : 7/26/2021
Date Sampled : -
Date Analyzed : 7/26-8/16/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-1	Color (True)	5	CU	Visual Comparison
7/26/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
10:50 am	Total Suspended Solids (TSS)	47	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.08	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.03	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
WQ-2	Color (True)	10	CU	Visual Comparison
7/26/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
02:00 pm	Total Suspended Solids (TSS)	50	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.11	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	8	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.41	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Sample ID	Analysis	Unit	Results of Analysis
M21H005-04 WQ-7	pH on-site	pH Units	7.69
	Temperature on-site	°C	20.7
	Dissolved Oxygen on-site	mg/L	5.43
	COD	mg/L	ND
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Arsenic	mg/L	0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (HCN) and the cyanide ion (CN^-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
Residual is Chlorine a low level of **chlorine** remaining in water after its initial application.
Temperature - The degree of hotness or coldness of a body or environment.

Note:

Please see the "Report Specific Notes" on the last part of the Analytical Report for applicable qualifiers.

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This summary is only a part of the complete analytical report and must be reproduced in its entirety.

Annabelle Bangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21H006*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 30, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*
M21H006-01 WQ-3	pH on-site	pH Units	7.42
	Temperature on-site	°C	26.7
	Dissolved Oxygen on-site	mg/L	7.79
	COD	mg/L	14.0
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Hexavalent Chromium	mg/L	ND
	Arsenic	mg/L	<0.0035
	Cadmium	mg/L	<0.00028
	Lead	mg/L	<0.0026
	Mercury	mg/L	<0.000070

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

Definition of Terms:

Chemical Oxygen Demand (COD) is the amount of oxygen required to degrade the organic compounds of water.
Cyanide can be measured either as free or total cyanide. Free cyanide consists of hydrogen cyanide (**HCN**) and the cyanide ion (CN^-), which represent the more toxic forms of cyanide
Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution
Hexavalent chromium (chromium VI) refers to chemical compounds that contain the element chromium in the +6 oxidation state. Chromium+6 is generally associated with industrial processes, though it does occur naturally in very small amounts.
Oil and Grease is defined as any material recovered as a substance soluble in the solvent. It includes other material extracted by the solvent from an acidified sample and not volatilized during the test.
pH is a measurement of the hydrogen ion concentration reflecting alkalinity or acidity of the water.
Residual is Chlorine a low level of chlorine remaining in water after its initial application.
Temperature – The degree of hotness or coldness of a body or environment.

Note:

Please see the "Report Specific Notes" on the last part of the Analytical Report for applicable qualifiers.

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Annex 5. Laboratory report of groundwater water quality analysis

HiAdvance Philippines Incorporated
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

SUMMARY OF RESULTS

REPORT NO. *M21G428*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 26 & 27, 2021

Sample ID	*Analysis*	*Unit*	*Results of Analysis*
M21G428-01 GW-1	pH on-site	pH Units	7.43
	Dissolved Oxygen on-site	mg/L	3.50
	COD	mg/L	4.00
	Oil and Grease	mg/L	<0.939
	Cyanide (free)	mg/L	0.0205
	Residual Chlorine	mg/L	<0.200
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	<0.00114
	Temperature on-site	°C	28.2
	Mercury	mg/L	<0.000070
M21G428-02 GW-2	pH on-site	pH Units	6.57
	Dissolved Oxygen on-site	mg/L	3.62
	COD	mg/L	6.00
	Oil and Grease	mg/L	<0.939
	Cyanide (free)	mg/L	<0.0159
	Residual Chlorine	mg/L	<0.200
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	<0.00114
	Temperature on-site	°C	26.7
	Mercury	mg/L	<0.000070

HiAdvance Philippines Incorporated

Annabelle Bangoy
Project Manager

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Website: www.hiadvance.com.ph

SUMMARY OF RESULTS

REPORT NO. *M21H002*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 30, 2021

Sample ID	Analysis	Unit	Results of Analysis
M21H002-01 GW-3	pH on-site	pH Units	6.71
	Temperature on-site	°C	26.3
	Dissolved Oxygen on-site	mg/L	4.09
	COD	mg/L	4.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	ND
	Mercury	mg/L	<0.000070
M21H002-02 GW-4	pH on-site	pH Units	6.57
	Temperature on-site	°C	25.1
	Dissolved Oxygen on-site	mg/L	3.93
	COD	mg/L	7.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	ND
	Mercury	mg/L	<0.000070
M21H002-03 GW-7	pH on-site	pH Units	7.83
	Temperature on-site	°C	23.1
	Dissolved Oxygen on-site	mg/L	5.54
	COD	mg/L	3.00
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	ND
	Mercury	mg/L	<0.000070

HiAdvance Philippines Incorporated

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Annabelle Hangoy
Project Manager

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SUMMARY OF RESULTS

REPORT NO. *M21H001*

Project : Water Analysis
Customer : Amet Asia, Inc.
Sampling Date : July 29, 2021

Sample ID	Analysis	Unit	Results of Analysis
M21H001-01 GW-5	pH on-site	pH Units	6.48
	Temperature on-site	°C	26.2
	Dissolved Oxygen on-site	mg/L	4.28
	COD	mg/L	13.0
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	ND
	Mercury	mg/L	<0.000070
M21H001-02 GW-6	pH on-site	pH Units	6.10
	Temperature on-site	°C	24.9
	Dissolved Oxygen on-site	mg/L	4.43
	COD	mg/L	14.0
	Oil and Grease	mg/L	ND
	Cyanide (free)	mg/L	ND
	Residual Chlorine	mg/L	ND
	Arsenic	mg/L	<0.00697
	Cadmium	mg/L	<0.000723
	Lead	mg/L	<0.00365
	Hexavalent Chromium	mg/L	ND
	Mercury	mg/L	<0.000070

References:

Standard Methods for the Examination of Water and Wastewater 23rd Edition, APHA/AWWA
EPA 9213 "Potentiometric Determination of Cyanide in Aqueous Samples and Distillates with Ion-Selective Electrode",Rev. 0, 1996

HiAdvance Philippines Incorporated

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Project Manager

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Attention : Ms. Annabelle Bangoy
Contact Information : 729-4327

CAN : C21-08-040M
Date of Issue : 8/18/2021
RAN : R21-07-056M
INVOICE # :-
Date Received : 7/30/2021
Date Sampled :-
Date Analyzed : 7/30-8/16/2021

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Method
WQ-3	Color (True)	10	CU	Visual Comparison
7/30/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
11:54 am	Total Suspended Solids (TSS)	13	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.03	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	2	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.13	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-3	Color (True)	<5	CU	Visual Comparison
7/30/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
10:42 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	<0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	1.09	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

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Sample Descriptions	Parameters	Results	Units	Method
GW-1	Color (True)	5	CU	Visual Comparison
7/26/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:45 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.31	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	46	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.91	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-2	Color (True)	<5	CU	Visual Comparison
7/26/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
01:20 pm	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.06	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.68	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

Total Analysis: 28

Total No. of Sample : 4
Sample Submission : Submitted by the Customer with signed waiver of liability.
Reference : *US EPA 352.1, Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:
JANE [illegible]IVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:
[illegible], RCh
Head of Operations
PRC No. 0011786

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Sample Descriptions	Parameters	Results	Units	Method
GW-4	Color (True)	<5	CU	Visual Comparison
7/30/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:44 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.14	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	1.74	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-7	Color (True)	<5	CU	Visual Comparison
7/30/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
08:00 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.12	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	10	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.69	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS

Total Analysis: 28

Total No. of Sample : 4
Sample Submission : Submitted by the Customer
Reference : *US EPA 352.1, Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:
JANE KARLA M. NARVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:
P. ALVIN P. TIBOCO, RCh
Head of Operations
PRC No. 0011786

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Sample Descriptions	Parameters	Results	Units	Method
WQ-10	Color (True)	15	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
08:30 am	Total Suspended Solids (TSS)	5	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.04	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	<1	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.03	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-8	Color (True)	<5	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
10:55 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.04	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	2	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	1.19	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-9	Color (True)	<5	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
09:25 am	Total Suspended Solids (TSS)	3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	<0.01	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	4	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.81	mg/L	Colorimetric/Brucine
	*Surfactants (MBAS)	<0.10	mg/L	Anionic Surfactants as MBAS
GW-10	Color (True)	<5	CU	Visual Comparison
7/27/2021	Biochemical Oxygen Demand (BOD)	<1	mg/L	5 - Day BOD Test
08:45 am	Total Suspended Solids (TSS)	<3	mg/L	Gravimetric (dried @ 103-105°C)
	*Phosphate (PO_4^{3-}-P)	0.10	mg/L	Stannous Chloride
	*Sulfate (SO_4^{2-})	3	mg/L	Turbidimetric
	Nitrate (NO_3^--N)	0.40	mg/L	Colorimetric/Brucine

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Sample Descriptions	Parameters	Results	Units	Method
GW-2 7/26/2021 01:20 pm	Fecal Coliform	27	MPN/100mL	Multiple Tube Fermentation Technique

Total Analysis: 4

Total No. of Sample : 4
Sample Submission : Submitted by the Customer with signed waiver of liability.
Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:

KISHA MARIE T. HALLAZGO, RMT
Medical Technologist
PRC No. 0063765

JANE KARLA [illegible] RIVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:

AMIN P. [illegible]O, RCh
Head of Operations
PRC No. 0011786

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C21-08-035M-1

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Uninterrupted Total Quality Service Since 1976

Sample Descriptions	Parameters	Results	Units	Method
GW-5 7/29/2021 10:11 am	Fecal Coliform	<1.8	MPN/100 mL	Multiple Tube Fermentation Technique
GW-6 7/29/2021 09:00 am	Fecal Coliform	4.5	MPN/100 mL	Multiple Tube Fermentation Technique

Total Analysis: 6

Total No. of Sample : 6
Sample Submission : Submitted by the Customer
Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:

KISHA MARIE T. HALLAZGO, RMT
Medical Technologist
PRC No. 0063765

JANE KAYLA M. NARVASA, RCh
Laboratory Head
PRC No. 0012581

Approved by:

F. ALVIN R. BOSCO, RCh
Head of Operations
PRC No. 0011786

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CEI-08-037M-1

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Uninterrupted Total Quality Service Since 1976

Annexes

Sample Descriptions	Parameters	Results	Units	Method
GW-7 7/30/2021 08:00 am	Fecal Coliform	<1.8	MPN/100 mL	Multiple Tube Fermentation Technique

Total Analysis: 4

Total No. of Sample : 4
Sample Submission : Submitted by the Customer
Reference : Standard Methods for the Examination of Water and Wastewater, 23rd ed.
Remarks : Results relate only to the item tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarifications on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:

KISHA MARIE T. HALLAZGO, RMT
Medical Technologist
PRC No. 0065765

JANE KAHLA M. NARVASA, RCh
Laboratory Head
PRC No. 0012581

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ALVIN P. [illegible], RCh
Head of Operations
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C21-08-04SM-1

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Uninterrupted Total Quality Service Since
1976

Annex 6. Local Water District Information

Tagoloan water district

a. Service area (barangay, municipality or city)

Barangay	Municipality
Brgy. Mohon	Tagoloan
Santa Cruz of Sihayon left and right	
Poblacion	
Baluarte	
Sogbongcogon	
Gracia	
Promise Land	
Natumolan	

b. Water source (river, well, spring, rain, etc.) and location

Water Source Name	Location	Service Area
Jasaan Spring	Jasaan, Mis. Or.	Dumaguing and Corales
Sobongcogon deep well	Sogbongcogon, Tagoloan	Mohon, Santa Cruz left, Sihayon, Poblacion, Baluarte, Portion of Natumolan
Gracia deep well	Gracia, Tagoloan	
Promise land deep well	Promise Land, Tagoloan	
Santa Cruz deep well	Santa Cruz, Tagoloan	
Sihayon Right deep well	Sihayon, Tagoloan	

c.Water Treatment

Chlorination - collection through intake box then apply chlorine, and Hypochloride before distribution

d. Method of distribution

water Metering - level 3 water system

e. Monthly volume of water distributed (2018 – 2020)

no data

f. Projected water usage (2020 onwards), if available

no data

g. Capita of Household water demand factor

33 L

Cagayan de Oro city water district

CAGAYAN DE ORO CITY WATER DISTRICT
Management Services Department
Corporate Planning Division

July 22, 2021
Date

REQUEST FOR COWD DATA

Date of Request : **July 21, 2021**
Requested by : **Ms. Nina Arra DJ. Rivera**
Agency : **Amet-Asia Inc.**
Address : **Unit 303 One Corporate Center, Julia Vargas Avenue, corner Meralco Ave., Ortigas Center, Psaig City 1605**

DATA REQUESTED

A. Service Area of the Water Concessionaire

Name of Barangay	Name of Barangay
West Service Area	***East Service Area***
Balulang	Agusan
Bayabas	Bugo
Bonbon	Camaman-an
Bulua	Consolacion
Canitoan	Cugman
Carmen	Gusa
Iponan	Lapasan
Kauswagan	Macabalan
Lumbia	Macasandig
Pagatpat	Nazareth
Patag	Poblacion
Opol	Puerto
(Opol includes only the following barangays:Barra, Bonbon,	Puntod
Igpit, Luyong Bonbon, Malanang, Poblacion, and Taboc)	Tablon
	Casinglot, Tagoloan

B. Water Source and Location

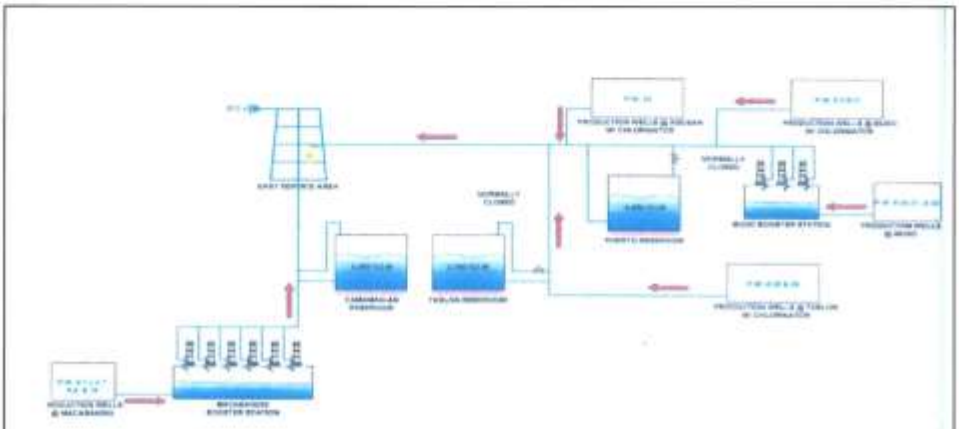
Water Source	Location	Coordinates		Status
		Longitude	Latitude	
Deepwell				
PW No. 1	Pilot de Lara St., Macasandig	124° 38' 10.00"	8° 28" 7.00"	Operational
PW No. 2	Bontula, Macasandig	124° 38' 53.1"	8° 27" 56.50"	Operational
PW No. 3A	Tomas Saco St., Macasandig	124° 28' 43.90"	8° 27" 51.30"	Under Rehabilitation
PW No. 4	Biasong, Macasandig	124° 38' 37.50"	8° 28" 3.40"	Operational
PW No. 5	Reyes Subdivision, Bugo	124° 46' 28.00"	8° 30" 52.00"	Operational
PW No. 6	Bantiles, Bugo	124° 45' 45.00"	8° 30" 17.00"	
PW No. 7	Biasong, Macasandig	124° 38' 17.90"	8° 27" 51.10"	Operational
PW No. 8	Ramonal Village, Nazareth	124° 39' 5.50"	8° 28" 9.60"	Operational
PW No. 9	Biasong, Macasandig	124° 38' 4.90"	8° 27" 34.80"	Operational
PW No. 10	PN Roa Subdivision, Calaanan	124° 36' 22.70"	8° 27" 49.00"	
PW No. 10A	PN Roa Subdivision, Calaanan	124° 36' 22.70"	8° 27" 49.00"	Operational
PW No. 11	Bantiles, Bugo	124° 45' 29.30"	8° 30" 10.80"	Operational

Water Source	Location	Coordinates		Status
		Longitude	Latitude	
Deepwell				
PW No. 12	PN Roa Subdivision, Calaanan	124° 36' 21.30"	8° 28" 6.30"	Not Operational
PW No. 14	Balongis, Balulang	124° 37' 58.10"	8° 27" 23.00"	Operational
PW No. 15	CDO Resettlement , Calaanan	124° 38' 22.70"	8° 27" 49.00"	Under Rehabilitation
PW No. 16	Tomas Saco St., Macasandig	124° 38' 45.30"	8° 28" 9.40"	Operational
PW No. 17	Balongis, Balulang	124° 37' 59.00"	8° 27" 48.00"	Operational
PW No. 18	San Agustin Valley, Calaanan	124° 36' 40.00"	8° 27" 38.00"	Not Operational
PW No. 19	Balulang	124° 38' 24.00"	8° 26" 41.00"	Operational
PW No. 20	Villa Trinitas Subdivision, Bugo	124° 46' 16.00"	8° 30" 31.00"	Operational
PW No. 21	Villa Trinitas Subdivision, Bugo	124° 46' 38.00"	8° 30" 41.00"	Operational
PW No. 22	Villa Trinitas Subdivision, Bugo	124° 46' 20.00"	8° 30" 55.00"	Operational
PW No. 23	Agusan	124° 45' 14.00"	8° 30" 1.00"	Operational
PW No. 24	Caballero Compound, Balulang	124° 38' 16.00"	8° 26" 43.00"	Operational
PW No. 25	Villa Angela Subdivision, Balulang	124° 38' 22.00"	8° 27" 33.00"	Operational
PW No. 26	Balulang	124° 38' 3.00"	8° 27" 46.00"	Operational
PW No. 27	Macanhan, Carmen	124° 38' 24.00"	8° 28" 42.00"	Operational
PW No. 28	Phasco Village, Tablon	124° 44' 30.00"	8° 29" 17.00"	Operational
PW No. 29	Phasco Village, Tablon	124° 44' 44.00"	8° 28" 23.00"	Operational
PW No. 30	Biasong, Macasandig	124° 38' 9.60"	8° 27" 40.30"	Operational
PW No. 31	Ayesa Subdivision, Camaman-an	124° 39' 38.70"	8° 27" 51.05"	Operational
PW No. 32	Macapaya, Camaman-an	124° 40' 19.33"	8° 26" 43.89"	Operational
Spring				
Malasag Spring	Cugman	124° 41' 50.20"	8° 26" 34.00"	Operational
Surface Water				
Bulk Water Supply (COBI)	Pualas, Baungon, Bukidnon			Operational

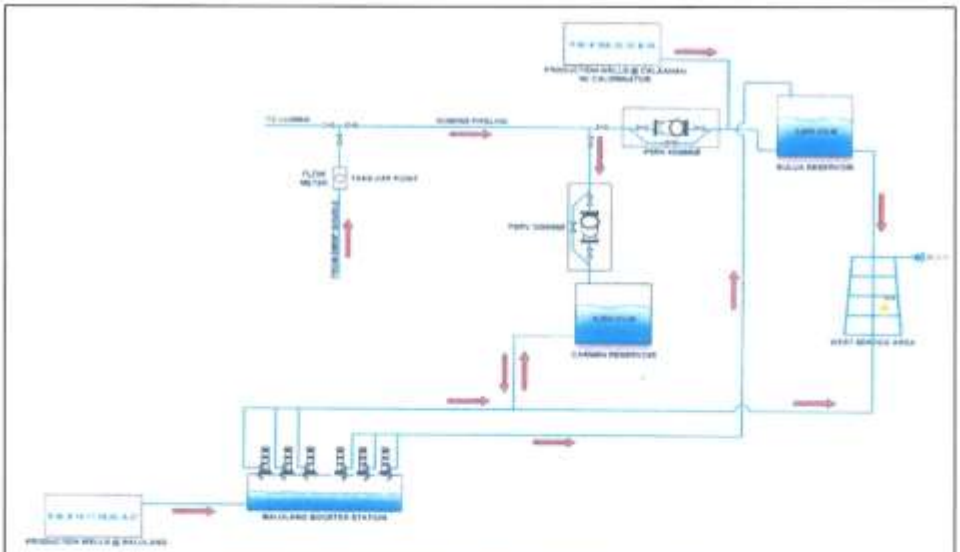
C. Type of Water Treatment

COWD applies Chlorination, using Gas Chlorine or Chlorine Dioxide, for the disinfection of water supply.

D. Method of Water Distribution



COWD WSS SCHEMATIC DIAGRAM - EAST AREA



COWD WSS SCHEMATIC DIAGRAM - WEST AREA

E. Monthly Volume of Water Distributed (2018 - 2020)

YEAR	ACTUAL WATER PRODUCED AND DISTRIBUTED		
	Bulk Water Supply (in cubic meters)	Production Wells (in cubic meters)	Total
2018	18,276,165	42,940,425	**61,216,590**
2019	28,584,053	44,485,806	**73,069,859**
2020	29,331,198	45,560,522	**74,891,720**

F. Projected Water Usage (2020 onwards)

No available data as of the moment. COWD Business Plan is still in progress.

G. Capita of Household Water Demand Factor

Water Consumption per day per person (in lpd) ***for CY 2020:***

164 liters per capita per day for a household size of 5

Prepared by:

ANNALYN F. MACALOLOT
Sr. Research Analyst A

Checked by:

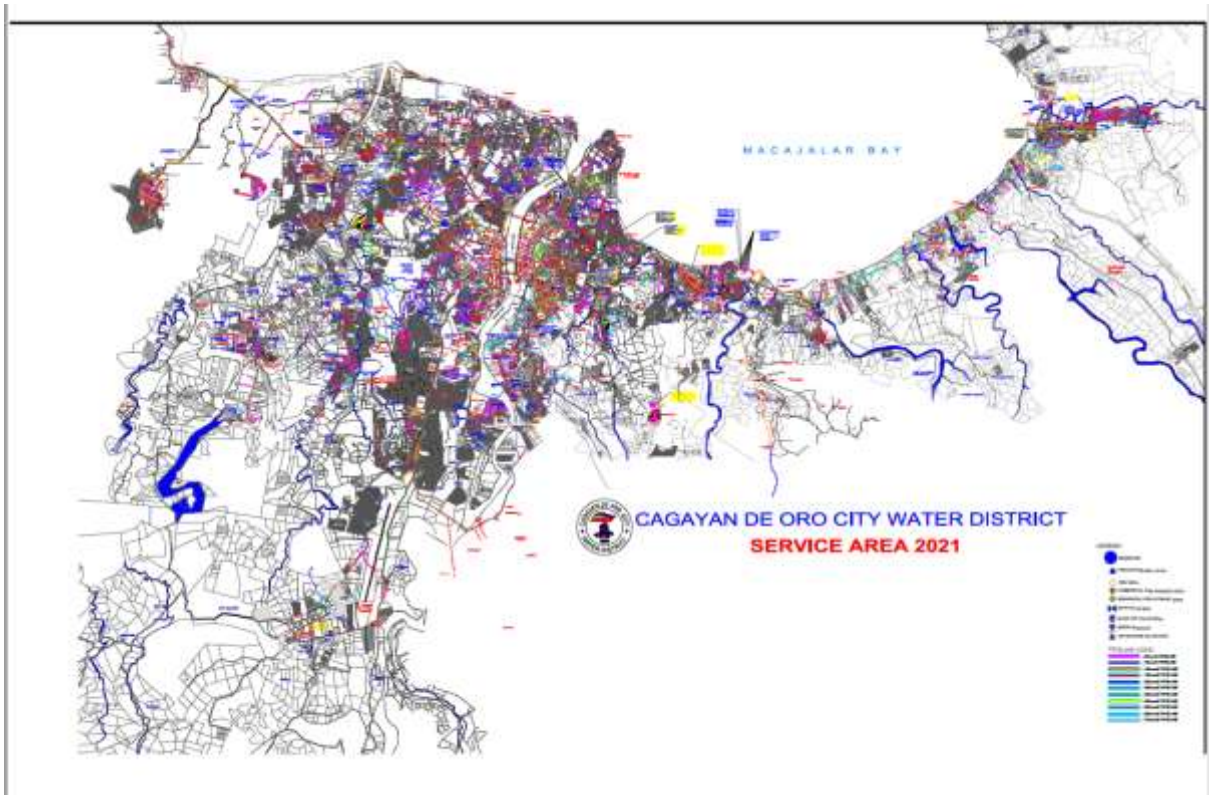
JOSE JISELO P. ABRAGAN
OIC, Corporate Planning Division

Noted by:

SULDIE D. LARANIO 7/28/21
Manager, Management Services Dept.

Approved by:

BIENVENIDO V. BATAR, JR.
General Manager


MACAJALAR BAY
CAGAYAN DE ORO CITY WATER DISTRICT
SERVICE AREA 2021

Manolo Fortich Water District

MANOLO FORTICH WATER DISTRICT
Manolo Fortich 8703, Bukidnon
website: www.mfwd.gov.ph; e-mail: mfwd_buk@yahoo.com
Mobile Hotline : 09177181311

SERVICE AREA
AS OF JULY 2021

MANOLO FORTICH, BUKIDNON

1 TANKULAN
2 LINGION
3 DICKLUM
4 STO. NIÑO
5 SAN MIGUEL
6 DAMILAG
7 AGUSAN CANYON
8 LUNOCAN
9 MANTIBUGAO
10 ALAE
11 MAMBATANGAN

CAGAYAN DE ORO CITY
Barangays
12 P7 PUERTO
13 BALUBAL

MONTHLY VOLUME OF WATER DISTRIBUTED

Month	Year		
	2018	2019	2020
	CUBIC METER		
January	201,426	224,174	254,803
February	185,649	216,973	246,892
March	193,244	212,410	237,422
April	221,117	241,758	274,220
May	222,411	238,893	251,831
June	234,873	252,701	246,558
July	205,949	224,263	244,956
August	205,313	240,254	260,844
September	221,275	244,452	245,156
October	212,380	235,785	233,505
November	234,275	244,621	256,527
December	218,971	228,111	249,221
TOTAL	**2,556,883**	**2,804,395**	**3,001,935**

PREPARED BY:

EVELYN C. NARA
CSA-A

MANOLO FORTICH WATER DISTRICT
Manolo Fortich Bukidnon

. LIST OF WATER SOURCES

No.	Source Type	Name of Barangay	Longitude	Latitude
1	Artajo Pumping Station (deepwell)	Alae, Manolo Fortich Bukidnon	124°48'42"	08°25'18"
2	Balamban 1 Spring Source	Agusan Canyon, MF, Bukidnon	124°48'59"	08°17'40"
3	Balamban 2 Spring Source	Agusan Canyon, MF, Bukidnon	124°49'02"	08°17'46"
4	Bayabason 1 Spring Source	Damilag, MF, Bukidnon	124°48'35"	08°20'55"
5	Bayabason 2 Spring Source	Damilag, MF, Bukidnon	124°40'00"	08°20'80"
6	Belen Homes (deepwell)	Damilag, MF, Bukidnon	124°48'38.80"	08°22'11.20"
7	Cristan Villa 2	Diclum, MF, Bukidnon	124°50'50"	08°22'38"
8	Diclum 3 spring source	Diclum, MF, Bukidnon	124°50'20"	08°21'15"
9	Diclum 2 spring source	Diclum, MF, Bukidnon	124°50'20"	08°20'43"
10	Diclum 1 spring source	Diclum, MF, Bukidnon	124°50'19"	08°20'08"
11	Kihare pumping station (deepwell)	Tankulan, MF Bukidnon	124°51'48.06"	08°21'38.28"
12	Lingi-on spring source	Lingi-on, MF, Bukidnon	124°52'50.1"	08°24'34.1"
13	Lunocan spring source	Lunocan, MF, Buk	124°49'50"	08°24'08.4"
14	Miranda pumping station (deepwell)	Damilag, MF, Bukidnon	124°49'16"	08°20'53.20"
15	Mulberry Pumping Sta. (deepwell)	Tankulan, MF Bukidnon	124°51'42.84"	08°21'41.10"
16	PCH-1 (deepwell)	Damilag, MF, Bukidnon	124°48'44"	08°21'47.60"
17	PCH-2 (deepwell)	San Miguel, MF, Buk	124°40'46"	08°23'19"
18	Tagbalula 1 spring source	Alae, Manolo Fortich Bukidnon	124°49'28"	08°24'00"
19	Kisabong spring source	Agusan Canyon, MF, Bukidnon	124°48'45"	08°19'15"
20	Mangima Spring source	Tankulan, MF Bukidnon	124°52'30"	08°22'20"

TYPE OF WATER TREATMENT
Disinfection- Chlorination process

METHOD OF WATER DISTRIBUTION
Direct Pumping

c. Water Treatment
Disinfection-chlorination

d. Method of distribution
direct pumping

E. Capita of Household water demand factor
678.66L/cap/day/HH as of 2020

KISOLON -SAN VICENTE WATER SUPPLY SYSTEM (SUMILAO)

a. Service area (barangay, municipality or city)

Barangay	Municipality
Kisolon	Sumilao
San Vicente	

b. Water source (river, well, spring, rain, etc.) and location

Water Source Name	Location
Larok spring	Kisolon, Sumilao
Kisolon Spring	

c.Water Treatment

Filtration and chlorination

d. Method of distribution

gravity

e. Monthly volume of water distributed (2018 – 2020)

Items sold Year	Month	Cubic Used	Amount
2018	January	59,789	889,256.07
	February	33,982	501,777.61
	March	36,351	528,438.20
	April	29,595	441,059.22
	May	43,869	639,198.65
	June	34,749	514,073.49
	July	34,367	530,455.14
	August	35,362	523,001.15
	September	34,501	496,776.70
	October	48,124	706,858.60
	November	45,175	664,293.50
	December	56,770	834,852.10
	Total	**492,634**	**7,270,040.43**
2019	January	46,870	690,238.60
	February	42,166	619,543.80
	March	49,571	731,505.30
	April	47,770	699,431.10
	May	35,927	510,884.00
	June	54,662	810,422.70
	July	46,137	682,200.60
	August	52,821	720,247.60
	September	52,961	721,164.20
	October	57,018	766,392.00
	November	49,082	658,492.00
	December	44,300	567,742.40
	Total	**579,285**	**8,178,264.30**
2020	January	51,868	682,468.00
	February	42,872	565,685.00
	March	54,188	707,108.80
	April	54,172	707,660.72
	May	43,884	567,934.00
	June	51,792	678,662.00
	July	49,923	653,061.12
	August	47,772	617,807.00
	September	49,387	631,276.00
	October	43,929	558,272.00
	November	44,122	565,044.00
	December	50,505	641,258.00
	Total	**584,414**	**7,576,236.64**

g. Capita of Household water demand factor

33 L/HH/day

MUNICIPAL ECONOMIC ENTERPRISE DEVELOPMENT OFFICE

a. Service area (barangay, municipality or city)

Barangay	Municipality
Sitio Kabangan, Poblacion	Impasug-ong
Sitio San Juan, La Fortuna	
Sitio Kiasin, Capt. Bayong	

b. Water source (river, well, spring, rain, etc.) and location

Water Source Name	Location
Iglerop spring	Intavas, La Fortuba, Impasug-ong
Deep Well	Poblacion, Impasug-ong

c. Water Treatment

Manual chlorination

d. Method of distribution

gravity

e. Monthly volume of water distributed (2018 – 2020)

36.9 LPs

Malaybalay city water district

a. Service area (barangay, municipality or city)

Barangay	Municipality
Bry. 1	Malaybalay
Brgy. 2	
Brgy. 3	
Bry. 4	
Brgy. 5	
Brgy. 6	
Brgy. 7	
Brgy. 8	
Brgy. 9	
Brgy. 10	
Brgy. 11	
Brgy. Dalwangan	
Brgy. Kalasungay	
Brgy. Sumpong	
Brgy. Can-ayan	
Brgy. Casisang	
Brgy. San Jose	
Brgy. Laguitas	
Bry. Aglayan	
Brgy. Cabangahan	
Brgy. Bangcud	

b. Water source (river, well, spring, rain, etc.) and location

B.1 Rivers/ Creeks

Name:	*Location of Sump/Dam:*
1. Sawaga	Brgy. Sumpong, M.C.
2. Kibalabag	Brgy. Kibalabag, M.C.
3. Lalawan	Sitio Damitan, Brgy. Dalwangan, M.C.
4. Bag-as	Brgy. Kalasungay, M.C.
5. Lumayagan	Brgy. Kalasungay, M.C.

B.2 Wells:

Name:	*Location of Well:*
1. Bureau of Soils Pump Station	Purok 3, Brgy. Dalwangan, M.C.
2. Depot Bliss Pump Station	Purok 7, Brgy. Casisang, M.C.
3. VCDU Greenfields Pump Station	Purok 6, Brgy. Casisang, M.C.
4. Azura Pump Station	Purok 11, Brgy. Casisang, M.C.
5. San Jose Pump Station	Purok 6, Brgy. San Jose, M.C.
6. Cabangahan Pump Station	Purok 1, Brgy. Cabangahan, M.C.

WATER SOURCES	DESCRIPTION	COORDINATES
A. SURFACE:		
1. Sawaga River	Mountain source (absence of forest cover/vegetation)	LATITUDE: 8° 9'40.35"N
		LONGITUDE: 125° 7'6.22"E
2. Kibalabag Creek	Mountain source (absence of forest cover/vegetation)	LATITUDE: 8°13'57.36"N
		LONGITUDE: 125°10'8.72"E
3. Bag-as Creek	Mountain source (present forest cover/vegetation)	LATITUDE: 8°12'10.76"N
		LONGITUDE: 125° 5'40.31"E

WATER SOURCES	DESCRIPTION	COORDINATES
4. Lumayagan Creek	Mountain source (present forest cover/vegetation)	LATITUDE: 8°12'9.61"N LONGITUDE: 125° 6'3.35"E
5. Lalawan Creek	Mountain source (present forest cover/vegetation)	LATITUDE: 8° 9'40.39"N LONGITUDE: 125° 0'10.40"E
B. UNDERGROUND:		
1. Dalwangan Deep well (Bureau of Soils)	Underground source (absence of forest cover/vegetation)	LATITUDE: 8°12'36.24"N LONGITUDE: 125° 1'59.54"E
2. BLISS/ Depot, Casisang Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 8'32.10"N LONGITUDE: 125° 6'58.59"E
3. Azura, Casisang Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 7'37.26"N LONGITUDE: 125° 7'40.04"E
4. Mabuhay, San Jose Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 6'15.08"N LONGITUDE: 125° 8'12.70"E
5. Cabangahan Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 0'41.67"N LONGITUDE: 125° 8'4.84"E
6. Greenfields, Casisang Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 8'7.11"N LONGITUDE: 125° 7'17.18"E
7. Brgy. 1 Pump Station	Underground source (absence of forest cover/vegetation)	LATITUDE: 8° 9'38.55"N LONGITUDE: 125° 7'54.01"E

C. Water treatment

Treatment Plant/Facility Location	Treatment Process
A. Sumpong Treatment Plant	*Primary Treatment* a. Collection at the sump thru a submersible pump a. Screening to remove solid wastes *Secondary Treatment* b. Flocculation (addition of Alum. Sulfate) c. Settling at up flow tanks d. Filtration at rapid sand filters *Tertiary Treatment* a. Disinfection using gas chlorine Storage at Ground Reservoirs Release to Distribution
B. Kalasungay Filtration Faciltiy	Collection at intake dams Screening to remove solid wastes Filtration using rapid sand filters Disinfection with gas chlorine Storage at Ground Reservoirs Release to Distribution
C. All pump stations D. Dalwangan Hilltribe	Disinfection with gas chlorine Storage at Ground Reservoirs (except for San Jose & Cabangahan Pump Station) Release to Distribution Collection at intake dams Screening to remove solid wastes Disinfection with gas chlorine Storage at Ground Reservoir Release to distribution

d. Method of distribution

d.1 Direct Pumping

Service Area:

1. Part of Purok 2, Purok 5, VCDU Pinewoods Phase 1 at Brgy. San Jose, M.C.
2. Purok 6 at Brgy. San Jose, M.C.
3. Part of Purok 7, NHA Phase 3 at Brgy. Casisang, M.C.
4. Purok 1 and Purok 6 at Brgy. Cabangahan, M.C.
5. New Life, Baptist Seminary and part of Purok 5 at Brgy. Bangcud, M.C.

d.2 Gravity

Service Area:

1. The Rest of Service Area excluding *C.1 Direct Pumping Areas above.*
d. Method of distribution
d.1 Direct Pumping
Service Area:
1. Part of Purok 2, Purok 5, VCDU Pinewoods Phase 1 at Brgy. San Jose, M.C.
2. Purok 6 at Brgy. San Jose, M.C.
3. Part of Purok 7, NHA Phase 3 at Brgy. Casisang, M.C.
4. Purok 1 and Purok 6 at Brgy. Cabangahan, M.C.
5. New Life, Baptist Seminary and part of Purok 5 at Brgy. Bangcud, M.C.
d.2 Gravity
Service Area:
1. The Rest of Service Area excluding C.1 Direct Pumping Areas above.

E. Monthly volume of water distributed

Total water produces in 2018 (in cu.m.)

Month	Sawaga	Kalasungay	Azura	Depot	Dalwangan (Bureau of Soils)	Dalwangan (Hill Tribe)	San Jose PS	Kibalabag	Cabangahan	Greenfields Pump Station	Production Per Month
	A	B	C	D	E	F	G	H	I	J	K
Feb	106,465.40	114,847.80	4,086.00	10,288.00	2,972.00	2,204.20	2,279.00	373,680.00	8,746.00	2,118.00	627,686.40
Mar	118,262.10	129,729.10	4,494.00	10,148.00	3,928.00	2,913.20	3,109.00	410,862.00	7,192.00	2,399.00	693,036.40
Apr	106,606.10	123,827.50	5,854.00	10,142.00	3,643.00	2,701.90	2,666.00	403,005.00	9,656.00	2,049.00	670,150.50
May	111,505.20	129,110.50	9,213.00	10,177.00	3,952.00	2,931.00	1,872.00	421,010.00	10,183.00	2,286.00	702,239.70
Jun	102,419.80	121,754.70	9,809.00	8,638.00	4,201.00	3,115.70	1,571.00	409,880.00	9,779.00	2,254.20	673,422.40
Jul	108,144.80	124,801.20	9,513.00	8,631.00	4,084.00	3,028.90	441	424,255.00	11,012.00	2,015.00	695,925.90
Aug	106,497.70	126,155.40	9,770.00	7,965.00	3,613.00	2,679.60	0	427,789.00	10,770.00	2,105.00	697,344.70
Sep	107,346.00	118,270.70	9,456.00	7,267.00	3,568.00	2,645.80	1,177.00	434,273.00	9,717.00	1,993.00	695,713.50
Oct	106,757.20	117,750.60	8,500.00	7,615.00	3,729.00	2,771.40	1,479.00	466,745.00	10,307.00	2,229.00	727,883.20
Nov	108,497.30	129,691.10	7,752.00	7,491.00	3,295.00	2,626.00	1,607.00	411,645.00	10,219.00	2,515.00	685,338.40
Dec	111,452.90	128,816.90	8,967.00	6,464.00	3,902.00	3,727.00	298	415,571.00	10,846.00	2,608.00	692,652.80
Total	1,307,454.50	1,456,857.80	92,955.00	106,437.00	44,598.00	34,096.80	18,030.00	5,017,977.00	118,497.00	26,990.20	8,223,893.30

Total water produces in 2019 (in cu.m.)

Month	Sawaga Source	Kalasungay Water System	Azura Deep Well	Depot Deep Well	Dalwangan Deep Well	Dalwangan Lalawan Source	Cabangahan Pump Station	San Jose Pump Station	Greenfields Pump Station	Kaamulan Spring	Bulk Water Supplier/ Kibalabag	Production Per Month
Jan	92,250.00	112,564.60	100	4,682.00	4,667.00	12,268.00	11,039.00	120	0	0	484,350.00	722,040.60
Feb	99,147.00	91,350.50	0	3,959.00	5,289.00	10,744.00	10,011.00	1,343.00	0	0	451,238.00	673,081.50
Mar	108,417.00	71,827.19	1,582.00	4,394.00	4,955.00	11,787.00	9,544.00	2,340.00	295	0	505,325.00	720,466.19
Apr	105,322.00	64,731.80	3,782.00	5,908.00	4,121.00	10,849.00	11,126.00	2,656.00	738	0	501,870.00	711,103.80
May	107,164.60	56,357.00	4,124.00	9,004.00	4,165.00	8,460.00	12,903.90	2,521.00	861	201.7	529,896.10	735,658.30
Jun	104,574.80	146,638.70	4,129.00	8,201.00	2,895.00	9,006.10	15,325.00	2,537.00	413	0	488,404.00	782,123.60
Jul	109,058.50	154,097.90	3,841.00	8,506.00	4,052.00	8,246.00	15,689.00	3,173.00	305	0	503,180.00	810,148.40

Month	Sawaga Source	Kalasungay Water System	Azura Deep Well	Depot Deep Well	Dalwangan Deep Well	Dalwangan Lalawan Source	Cabangahan Pump Station	San Jose Pump Station	Greenfields Pump Station	Kaamulan Spring	Bulk Water Supplier/ Kibalabag	Production Per Month
Aug	98,931.00	153,962.00	4,149.00	8,516.80	4,383.00	7,080.10	12,259.00	2,391.00	287	0	504,564.00	796,522.90
Sep	93,739.60	152,581.70	4,372.00	7,763.20	4,938.00	8,279.30	11,922.00	2,295.00	113	0	481,137.00	767,140.80
Oct	93,534.80	123,452.90	4,363.00	8,553.00	5,257.00	9,170.00	13,617.00	2,649.00	365	0	496,227.87	757,189.57
Nov	97,678.00	92,392.16	3,972.00	7,653.00	5,324.00	8,324.80	13,302.00	2,444.00	400	0	496,293.67	727,783.63
Dec	105,363.10	97,113.00	3,595.00	7982	4778	10338.6	13,680.00	2,670.00	307	0	496,293.67	742,120.37
Total	1,215,180.40	1,317,069.45	38,009.00	85,122.00	54,824.00	114,552.90	150,417.90	27,139.00	4,084.00	201.7	5,938,779.31	8,945,379.66

Total water produces in 2020 (in cu.m.)

Month	Sawaga Source	Kalasungay Water System	Azura Deepwell	Depot Deepwell	Dalwangan Deepwell	Dalwangan/ Lalawan Source	Cabangahan Pump Station	San Jose Pump Station	Greenfields Pump Station	Kaamulan Spring	Kibalabag	Production Per Month
Jan	103,434	75,768	2,677	7,770	4,957	9,642	13,382	2,885	1,055	-	496,294	717,864.00
Feb	98,037	63,162	2,656	6,265	4,425	5,847	12,646	2,613	659	-	495,509	691,819.00
March	100,636	72,771	5,502	5,836	4,948	4,783	14,313	3,436	798	-	491,083	704,106.00
April	98,737	26,845	6,235	5,208	4,894	632	12,183	4,854	1,746	473	491,083	652,890.00
May	103,658	37,557	5,676	6,438	4,358	4,471	12,697	4,799	1,354	186	491,083	672,277.00
Jun	89,181	82,476	4,621	6,493	4,487	8,422	12,619	4,598	1,372	-	491,083	705,352.00
Jul	94,306	111,080	4,020	7,428	4,524	10,227	13,120	4,755	1,159	-	491,083	741,702.00
August	88,539	121,280	5,164	7,458	6,099	6,879	13,293	5,008	1,450	-	491,083	746,253.00
Sept	91,877	120,032	4,568	7,536	7,206	5,576	12,975	4,888	2,116		491,083	747,857.00
Oct	94,747	112,141	4,256	6,543	8,992	5,157	13,836	5,179	3,050	-	525,128	779,029.00
Nov	85,570	116,327	3,680	5,117	7,996	7,310	14,090	4,818	3,747	-	545,287	793,942.00
Dec	48,483	109,483	3,531	4,341	6,303	7,556	14,604	5,061	4,262	-	496,294	699,918.00
Total	1,097,205	1,048,922	52,586	76,433	69,189	76,502	159,758	52,894	22,768	659	5,996,093	8,653,009.00

f. Projected water usage (2020 onwards), if available

Year:	Projected No. of Connections:	Projected Water Usage (CMD):
2020	19,604.00	14,703.00
2021	20,585.00	15,644.60
2022	21,614.00	16,642.78
2023	22,695.00	17,702.10
2024	23,829.00	18,824.91
2025	25,021.00	20,016.80
2026	26,272.00	21,017.60
2027	27,585.00	22,068.00
2028	28,965.00	23,172.00
2029	30,413.00	24,330.40
2030	31,933.00	25,546.40

g. Capita of Household water demand factor
75li/HH-day

Annex 7. Laboratory report of air quality analysis

Low rainfall

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AMET-Asia Inc.
Unit 303, One Corporate Center, Julia Vargas Ave.
cor. Meralco Ave, Pasig
Contact No.: 09153701175

01-June-2021

Attention: **Ms. Pamella Andrea L. Pomida**

Subject: **Ambient Air Sampling and Testing Report**

Ms. Pomida:

We hereby submit the attached report on ambient air sampling conducted for 24 hours on ten (10) sampling stations located at Cagayan De Oro to Bukidnon.

Please feel free to contact us if you have any questions regarding this report.

Thank you for choosing HiAdvance in serving your air quality requirement. We look forward to a continued partnership and new opportunities.

Sincerely,

Annabelle Bangoy
Project Manager

M21E113 AMET-Asia Inc./ *Ambient Air Sampling and Testing Report*

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AMBIENT AIR SAMPLING REPORT

Company Name	AMET-Asia Inc.
Address	Unit 303, One Corporate Center, Julia Vargas Ave.,cor. Meralco Ave. Pasig
Project Name	**Ambient Air Monitoring**
Project Site(s)	Cagayan De Oro - Bukidnon
Sampling Date	23rd of April to 6th of May, 2021
Contact Person	Ms. Pamella Andrea L. Pomida

1.0 INTRODUCTION

HiAdvance Philippines, Incorporated (HiAdvance) was contracted by AMET-Asia Inc. to conduct a 1-hour and 24- hours ambient air sampling at their ten (10) sampling points located at Cagayan De Oro and Bukidnon project sites. The sampling activity was conducted last April 23 to May 6, 2021. Sampling was done to determine the concentrations of Nitrogen Dioxide, Sulfur Dioxide, Total Suspended Particulates (TSP), Particulate Matter as PM10, Carbon Monoxide (CO), Ozone (O_3), Pb (Lead), Wind Direction and Wind Speed.

Noise Level was also measured at the sampling locations. The values determined are presented in a separate report.

2.0 METHODOLOGY

Ambient air sampling equipment and analytical procedures used were based on DENR Standards. All supporting field data sheets and calibration record of equipments are provided as attachments. The equipment and procedures are as follows:

Total Suspended Particulates (TSP)
Reference Procedure: USEPA 40 CFR, Part 50, Appendix B
Sampling Equipment: High Volume Sampler
Method of Analysis: Hi Volume Gravimetric Method

Particulate Matter as PM10
Reference Procedure: USEPA 40 CFR, Part 50, Appendix J
Sampling Equipment: High Volume with 10-micron particle-size inlet
Method of Analysis: Hi Volume Gravimetric Method

Nitrogen Dioxide (NO_2)
Reference Procedure: Methods of Air Sampling and Analysis - 3rd ed. / James P. Lodge, Jr.
Sampling Equipment: RAC3 Gas Analyzer\SKC Pump
Method of Analysis: Impinger Griess-Saltzman Reaction Method

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Sulfur Dioxide (SO_2)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix A
Sampling Equipment:	RAC3 Gas Analyzer/SKC Pump
Method of Analysis:	Tetra-chloromercurate (TCM) Absorber –Pararosaniline Colorimetric

Carbon Monoxide (CO)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix C
Sampling Equipment:	Air Quality Meter
Method of Analysis:	Direct Readout (Datalogged)

Lead (Pb)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix G
Sampling Equipment:	High Volume Sampler/Filter
Method of Analysis:	Atomic Absorption Spectroscopy

Ozone (O_3)

Reference Procedure:	Method 411, of Air Sampling and Analysis - 3rd ed. /James P. Lodge, Jr.
Sampling Equipment:	SKC Pump
Method of Analysis:	Colorimetric Method

Wind Direction

Sampling Equipment:	KESTREL 5500L
Method of Analysis:	Direct Readout (Datalogged)

Wind Speed

Sampling Equipment:	KESTREL 5500L
Method of Analysis:	Direct Readout (Datalogged)

The NO_2 and SO_2 samples were stored in amber bottles and were preserved on a cooler with ice. The samples were submitted and analyzed in the laboratory using a Spectrophotometer. The TSP and PM10 filters were conditioned before undergoing gravimetric analysis. Filter papers for Lead analysis were desiccated before submission to a DENR recognized subcontractor laboratory together with the sample for Ozone analysis. Carbon Monoxide (CO), Wind Direction and Wind Speed were measured using a calibrated air quality meter and weather meter through direct reading.

Stock solutions, standard reagents and other reagents are prepared using chemicals recommended by the reference methods mentioned above.

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3.0 SAMPLING LOCATION

3.1 The estimated location of the sampling stations is briefly described as follows:

Station **AQN1- Brgy. Casinglot Purok Zone 2B**

Latitude: 8.515825 N
Longitude: 124.757942 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a grassy ground; beside highway approximately 1-2m away from the main road
- Frequent passing of light to heavy vehicles were observed
- Sunny weather condition
- Rain occurred at around 1630H,

Station **AQN2- Brgy. Purok 7 Mambatangan**

Latitude: 8.463833 N
Longitude: 124.800872 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a rocky and grassy ground surface
- Approximately 50m away from the residential area
- 5-10m away from the access road, open field surrounded by trees
- Sunny to cloudy weather condition

Station **AQN3- Zone 4 Alae**

Latitude: 8.412193 N
Longitude: 124.804962 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a rocky and grassy ground
- 10-15m away from the residential houses, surrounded by trees
- Cloudy weather condition

Station **AQN4- Zone 1 Diclum**

Latitude: 8.371687 N
Longitude: 124.852996 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a rocky with some grass ground surface
- Approximately 3-5m away from the main road and 2-3m away from the cliff
- Sunny weather condition

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Station **AQN5- Brgy. San Roque Purok 4**

Latitude: 8.329792 N
Longitude: 124.933255 E

Remarks/Sampling Environment Conditions:

- Equipment set up in a grassy ground inside San Roque Elementary School
- 8m away from the access road and 20m away from residential area
- Minimal passing of motorcycles and other light vehicles along the access road
- Fair weather condition

Station **AQN6- Brgy. Poblacion**

Latitude: 8.312317 N
Longitude: 124.983626 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a grassy and soft soil ground
- Approximately 5m away from the road
- 5m away from the nearby home
- Sunny weather condition

Station **AQN7- Brgy. Lafortuna Zone 7**

Latitude: 8.266137 N
Longitude: 124.996892 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a grassy/soil ground (elevated area)
- 5m away from the access road and 8m to 10m from the residential area
- Fair weather condition

Station **AQN8- Brgy. Impalutao Zone 3**

Latitude: 8.23260 N
Longitude: 125.028944 E

Remarks/Sampling Environment Conditions:

- Equipment were set up beside the main road, in a grassy/soil ground
- Approximately 3-5m away from the highway
- Sunny weather condition

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Station **AQN9- Brgy. Patpat Zone 5**

Latitude: 8.195157 N
Longitude: 125.053188 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a soft soil ground
- Approximately 1-2m away from the highway road
- 3-5m away from the poultry area
- Sunny to cloudy weather condition

Station **AQN10- Brgy. Kalasungay Zone 1**

Latitude: 8.165801 N
Longitude: 125.113448 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a rocky and grassy ground beside the road
- Approximately 2m away from the highway and 8m to 10m away from the *Birhen sa Lourdes Chapel*
- Around 1728H burning of dry leaves approximately 10-15m away were observed
- Sunny to cloudy weather condition

3.2 **Sampling Period**

- **Twenty-four (24) Hours** for Nitrogen (NO_2), Sulfur Dioxide (SO_2), Total Suspended Particulates (TSP), Particulate Matter 10 micron (PM10) and Lead (Pb)
- **Eight (8) Hours** for Carbon Monoxide (CO) & Ozone (O_3)
- **Twenty-four (24) Hours** for Wind Direction and Wind Speed by Direct read-out (data logged)

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4.0 AMBIENT AIR SAMPLING RESULTS

Below is the ambient air sampling result. All supporting field data, analytical reports and calibration records are provided as attachments.

- **Table 4.1.1. 24-hours Ambient Air Sampling (NO_2, SO_2, TSP & PM10)**

STATION NO.	LOCATION	NO_2 (µg / Nm³)	SO_2 (µg / Nm³)	TSP (µg / Nm³)	PM10 (µg / Nm³)
AQN1	Brgy. Casinglot Purok Zone 2B	8.56	*<11.8**	155	62.1
AQN2	Brgy. Purok 7 Mambatangan	6.41	*<12.1**	34.3	21.0
AQN3	Zone 4 Alae	4.88	*<12.3**	36.7	27.0
AQN4	Zone 1 Diclum	6.57	*<12.4**	91.0	55.1
AQN5	Brgy. San Roque Purok 4	3.88	*<12.5**	102	41.4
AQN6	Brgy. Poblacion	6.61	*<12.5**	107	55.8
AQN7	Brgy. Lafortuna Zone 7	3.94	*<12.7**	23.3	16.5
AQN8	Brgy. Impalutao Zone 3	6.76	*<12.8**	67.9	31.7
AQN9	Brgy. Patpat Zone 5	5.69	*<12.9**	67.3	29.5
AQN10	Brgy. Kalasungay Zone 1	3.37	*<12.7**	71.2	35.4
DENR NAAQSSAP		**150**	**180**	**230**	**150**
Averaging Time (min)		**1440**	**1440**	**1440**	**1440**

**Values detected are below the laboratory's Method detection limit*

- **Table 4.1.2. 24-hours Ambient Air Sampling (Lead)**

STATION NO.	LOCATION	Lead (µg/Ncm)
AQN1	Brgy. Casinglot Purok Zone 2B	0.0282
AQN2	Brgy. Purok 7 Mambatangan	0.0269
AQN3	Zone 4 Alae	0.00974
AQN4	Zone 1 Diclum	0.00756

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AQN5	Brgy. San Roque Purok 4	0.0151
AQN6	Brgy. Poblacion	0.0202
AQN7	Brgy. Lafortuna Zone 7	0.00751
AQN8	Brgy. Impalutao Zone 3	0.00383
AQN9	Brgy. Patpat Zone 5	0.00335
AQN10	Brgy. Kalasungay Zone 1	0.00987
STANDARDS (DAO2000-81)		-
Averaging Time (min)		**1440**

- **Table 4.1.3. 24-hour Sampling (Ozone)**

STATION NO.	LOCATION	O_3 (µg/Ncm)
AQN1	Brgy. Casinglot Purok Zone 2B	1.02
AQN2	Brgy. Purok 7 Mambatangan	2.09
AQN3	Zone 4 Alae	1.22
AQN4	Zone 1 Diclum	1.48
AQN5	Brgy. San Roque Purok 4	1.87
AQN6	Brgy. Poblacion	1.01
AQN7	Brgy. Lafortuna Zone 7	2.52
AQN8	Brgy. Impalutao Zone 3	6.58
AQN9	Brgy. Patpat Zone 5	2.53
AQN10	Brgy. Kalasungay Zone 1	4.59
DENR NAAQGV		**60**
Averaging Time (min)		**480**

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- **Table 4.1.4 Data logged (Wind Direction & Wind Speed)**

STATION NO.	Time	Wind Speed (mph)	Average (Direction-True)	Average (Direction-Mag)	Cardinal Direction
AQN1	1020H-1020H	0.2	145	145	SE
AQN2	1420H-1420H	0.7	259	259	W
AQN3	1500H-1500H	0.3	216	216	SE
AQN4	1300H-1300H	0.1	114	113	ESE
AQN5	1020H-1020H	0.5	*ND	*ND	*ND
AQN6	1730H-1730H	0.3	*ND	*ND	*ND
AQN7	1345H-1345H	1.1	*ND	*ND	*ND
AQN8	0915H-0915H	0.6	200	201	SSW
AQN9	1030H-1030H	1.5	133	133	SE
AQN10	1330H-1330H	0.4	166	166	SSE

*Note: ND- No Detectable

- **Table 4.1.5 - Carbon Monoxide (Data logged)**

Station No.	Time	CO Value (ppm)
AQN1	10:20:04-18:20:04	14
AQN2	14:30:03-22:30:03	*ND
AQN3	15:39:18-23:39:18	*ND
AQN4	13:01:21-21:01:21	3.0
AQN5	10:21:17-18:21:17	1.0
AQN6	17:30:37-01:30:38	8.0
AQN7	13:50:06-21:50:06	*ND
AQN8	09:20:36-17:20:36	7.0
AQN9	10:31:17-18:31:17	7.0
AQN10	13:30:39-21:30:39	10
DENR NAAQGV		**9**
Averaging Time (min)		**480**

*Note: ND- No Detectable

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5.0 DISCUSSION OF RESULTS

Ambient air quality standards (AAQS) define clean air, and are established to protect even the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health.

The sampling activity was conducted on a sunny, cloudy to windy with light rain shower weather conditions. Results of NO_2, SO_2, TSP, PM10, Lead and Ozone (8 hrs.) for the samples collected for 24 hours were compared to the National Ambient Air Quality Guideline Value (NAAQGV). *See Table 4.1.1 to Table 4.1.3.* All values for the pollutants identified are below its maximum permissible limits.

Currently, there are no existing limits from DENR for Lead measured for 24 hrs. There are only guidance values available at present for samples taken for 24 hours. *See Table 4.1.2.*

The values from direct reading for Carbon Monoxide (CO) using Air Quality Meter was tabulated in *Table 4.3.* At the time of measurement, Carbon Monoxide concentration measured in the sampling station 1 and station 10 exceeds 9 ppm *(NAAQSSAP Standard)* while the remaining stations (station 2 to station 9) did not exceed the standard limit. Light to heavy automobile emissions passing along the main road (4 lanes) near the monitoring points may have influenced the high CO (Carbon Monoxide) concentration. It must be emphasized, however, that the results are individual measurement during a certain point in time. They should not be considered as a universal condition of the area or process involved.

The KESTREL 5500L was used to determine air movement via direct reading with a data logger. Wind movement detected is as follows: Station AQN1 is from the southeast, Station AQN2 is from the west, Station AQN3 is from the southeast, and Station AQN4 is from the east-southeast. Moreover, wind movement at Station AQN8 is from the south-southwest, Station AQN9 is in the southeast, and Station AQN10 is from the south-southeast, as indicated in *Table 4.1.4*. There are no wind movement recorded during the whole 24-hour period at Stations AQN5, AQN6, and AQN7.

6.0 CONCLUSION

The results of sampling and analysis for the sampling locations demonstrated that the ambient concentrations of NO_2, SO_2, TSP, PM10, Ozone and CO (Station 2 to Station 9) are within the acceptable limits of the standards stipulated in the IRR of the Philippine Clean Air Act. On the other hand, the CO concentrations for stations 1 and 10 exceeded the standard limit. The Lead (24-hr) are still for further evaluation as there are no existing limits for the specific sampling duration done on the sampling points.

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ATTACHMENT 1

- Computation of Ambient Air Parameters
  - Nitrogen Dioxide
  - Sulfur Dioxide
  - Total Suspended Particulates (TSP)
  - Particulate Matter as PM10
  - Lead
  - Ozone

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	1440	0.2	0.2825	2.418	8.56

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	1440	0.2	0.2825	*1.74*	*<11.8*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{at}}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	1440	1.237	1747.4	271400	155

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	1440	1.184	1672.5	103900	62.1

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	1440	1.237	1747.4	49.20	0.0282

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = Q_{a} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{,} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				Ll/min	Vmstd, Nm^3	µg	µg/Ncm
AQN1	28.8	301.8	29.73	755.1	23-24 Apr 2021	1020H-1020H	480	1.000	0.4709	0.48	1.02

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = ("O_3" \ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	0.2	0.2751	1.762	6.41

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	0.2	0.2751	0.87	<12.1

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	1.232	1694.5	58200	34.3

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	1.232	1694.5	58200	34.3

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	1.179	1621.6	34000	21.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	1440	1.232	1694.5	45.6	0.0269

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{ai}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{.} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	27.4	300.4	28.80	731.6	24-25 Apr 2021	1420H-1420H	480	1.0	0.458	1.0	2.09

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = ("O_3" \; mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1530H-1530H	1440	0.2	0.2714	1.33	4.88

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
ACN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1530H-1530H	1440	0.2	0.2714	*0.87*	*<12.3*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1530H-1530H	1440	1.226	1663.7	61000	36.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1530H-1530H	1440	1.177	1597.2	43200	27.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1300H-1300H	1440	1.226	1663.7	16.20	0.00974

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN3	27.6	300.6	28.44	722.4	27-28 Apr 2021	1530H-1530H	480	1.0	0.452	0.55	1.22

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = (\text{"}O_3\text{"}\ mas s)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	1440	0.2	0.2683	1.762	6.57

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Ll/min	Vmstd, Nm^3	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	1440	0.2	0.2683	*0.87*	*<12.4*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	1440	1.223	1640.9	149400	91.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	1440	1.171	1571.1	86600	55.1

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	1440	1.223	1640.9	12.40	0.00756

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN4	27.4	300.4	28.10	713.7	26-27 Apr 2021	1300H-1300H	480	1.0	0.447	0.66	1.48

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = (\text{"}O_3\text{"}\ mas s)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.4	299.4	27.81	706.4	30 Apr-01 May 2021	1020H-1020H	1440	0.2	0.2664	1.034	3.88

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar.}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN5	26.4	299.4	27.81	706.4	30 Apr-01 May 202	1020H-1020H	1440	0.2	0.2664	0.523	<12.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQNS	26.4	299.4	27.81	706.4	0 Apr-01 May 20	1020H-1020H	1440	1.219	1623.7	166100	102

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.4	299.4	27.81	706.4	0 Apr-01 May 202	1020H-1020H	1440	1.162	1547.8	64100	41.4

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.4	299.4	27.81	706.4	0 Apr-01 May 20	1020H-1020H	1440	1.219	1623.7	24.50	0.0151

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{.} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQNS	26.4	299.4	27.81	706.4	0 Apr-01 May 20	1020H-1020H	480	1.0	0.444	0.83	1.87

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = ("O_3" \; mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Ll/min	Vmstd, Nm^3	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	1440	0.2	0.2666	1.762	6.61

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	1440	0.2	0.2666	*1.92*	*<12.5*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	1440	1.223	1630.3	174200	107

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	1440	1.169	1558.3	87000	55.8

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	1440	1.223	1630.3	33.0	0.0202

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.86	707.6	28-29 Apr 2021	1730H-1730H	480	1.0	0.444	0.45	1.01

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = ("O_3" \; mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	1440	0.2	0.2622	1.034	3.94

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				L/min	Vmstd, Nm^3	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	1440	0.2	0.2622	1.046	<12.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	1440	1.219	1598.2	37300	23.3

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	1440	1.176	1541.8	25400	16.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	1440	1.219	1598.2	12.0	0.00751

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ , = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN7	25.7	298.7	27.30	693.5	01-02 May 2021	1345H-1345H	480	1.0	0.437	1.10	2.52

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = (\text{"}O_3\text{"}\ mas s)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	1440	0.2	0.2609	1.762	6.76

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	1440	0.2	0.2609	*0.871*	*<12.8*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	1440	1.216	1586.2	107700	67.9

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	1440	1.167	1522.3	48200	31.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{a}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	1440	1.216	1586.2	6.07	0.00383

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN8	24.6	297.6	27.07	687.7	03-04 May 2021	0915H-0915H	480	1.0	0.435	2.86	6.58

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Ll/min	Vmstd, Nm^3	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	1440	0.2	0.2586	1.471	5.69

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	1440	0.2	0.2586	*1.220*	*<12.9*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	1440	1.218	1574.8	106000	67.3

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	1440	1.163	1503.7	44300	29.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	1440	1.218	1574.8	5.27	0.00335

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.5	298.5	26.91	683.5	04-05 May 2021	1030H-1030H	480	1.0	0.431	1.09	2.53

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mas\ s)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	1440	0.2	0.2639	0.889	3.37

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	1440	0.2	0.2639	0.697	<12.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

Annexes

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	1440	1.221	1611.0	114700	71.2

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	1440	1.170	1543.8	54600	35.4

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{act}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	1440	1.221	1611.0	15.9	0.00987

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN10	26.5	299.5	27.55	699.9	05-06 May 2021	1330H-1330H	480	1.0	0.440	2.02	4.59

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{ai}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = (\text{"}O_3\text{"}\ mas s)/V\_(m(std))$$

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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ATTACHMENT 2

- Certificate of Laboratory Analysis

HiAdvance

HiAdvance Philippines

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SUMMARY REPORT

Amet Asia, Inc.

Project: Ambient Air Monitoring

Unit 303, One Corporate Center, Julia Vargas Ave. Cor.
Meralco Ave., Pasig, PHILIPPINES

Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

SAMPLED : 23-Apr-21 to 06-May-21
RECEIVED: 10-May-21

ANALYZED: 10-May-21 to 17-May-21
REPORTED: 26-May-21 09:38

LAB #	M21E113-01	M21E113-02	M21E113-03	M21E113-04	M21E113-05		
MATRIX	Ambient Air	Ambient Air	Ambient Air	Ambient Air	Ambient Air		
SAMPLE ID	STN1 AQN1	STN2 AQN2	STN3 AQN3	STN4 AQN4	STN5 AQN5		
Parameters							
Total Suspended Particulates, TSP	**155**	**34.3**	**36.7**	**91.0**	**102**	µg/Ncm	High Volume – Gravimetric Metho
Nitrogen Dioxide	**8.56**	**6.41**	**4.88**	**6.57**	**3.88**	µg/Ncm	Griess- Saltzman Method
Sulfur Dioxide	*<11.8**	*<12.1**	*<12.3**	*<12.4**	*<12.5**	µg/Ncm	Pararosaniline Method
Particulate Matter 10 Micron, PM10	**62.1**	**21.0**	**27.0**	**55.1**	**41.4**	µg/Ncm	High Volume – Gravimetric Metho

Special Notes
** Values detected are below the laboratory's Method Detection Limit*

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared by

Annabelle Bangoy
Project Manager

Certified Correct by

Princess Galvez, RCh
Laboratory Manager

Page 1 of 2

HiAdvance

HiAdvance Philippines

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SUMMARY REPORT

Amet Asia, Inc.

Project: Ambient Air Monitoring

Unit 303, One Corporate Center, Julia Vargas Ave. Cor.
Meralco Ave., Pasig, PHILIPPINES

Project Number: [none]
Project Manager: Ms. Pamella Andrea L. Pomida

SAMPLED : 23-Apr-21 to 06-May-21
RECEIVED: 10-May-21

ANALYZED: 10-May-21 to 17-May-21
REPORTED: 26-May-21 09:38

LAB #	M21E113-06	M21E113-07	M21E113-08	M21E113-09	M21E113-10		
MATRIX	Ambient Air	Ambient Air	Ambient Air	Ambient Air	Ambient Air		
SAMPLE ID	STN6 AQN6	STN7 AQN7	STN8 AQN8	STN9 AQN9	STN10 AQN10		
Parameters							
Total Suspended Particulates, TSP	**107**	**23.3**	**67.9**	**67.3**	**71.2**	µg/Ncm	High Volume – Gravimetric Metho
Nitrogen Dioxide	**6.61**	**3.94**	**6.76**	**5.69**	**3.37**	µg/Ncm	Griess- Saltzman Method
Sulfur Dioxide	*<12.5**	*<12.7**	*<12.8**	*<12.9**	*<12.7**	µg/Ncm	Pararosaniline Method
Particulate Matter 10 Micron, PM10	**s**	**16.5**	**31.7**	**29.5**	**35.4**	µg/Ncm	High Volume – Gravimetric Metho

Special Notes
** Values detected are below the laboratory's Method Detection Limit*

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared by

Annabelle Bangoy
Project Manager

Certified Correct by

Princess Galvez, RCh
Laboratory Manager

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HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

TSP	M21E113-01	M21E113-02	M21E113-03	M21E113-04	M21E113-05
Pressure, inHg	29.73	28.80	28.44	28.10	27.81
Temperature, °C	28.8	27.4	27.6	27.4	26.4
Flowrate, m^3/min	1.237	1.232	1.226	1.223	1.219
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1747.4	1694.5	1663.7	1640.9	1623.7
µg TSP (MDL = 1665)	271400	58200	61000	149400	166100
Concentration, µg/Ncm	155	34.3	36.7	91.0	102

NO_2	M21E113-01	M21E113-02	M21E113-03	M21E113-04	M21E113-05
Pressure, inHg	29.73	28.80	28.44	28.10	27.81
Temperature, °C	28.8	27.4	27.6	27.4	26.4
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2825	0.2751	0.2714	0.2683	0.2664
µg NO_2 (MDL 24hrs=0.871)	2.42	1.76	1.33	1.76	1.03
Concentration, µg/Ncm	8.56	6.41	4.88	6.57	3.88

SO_2	M21E113-01	M21E113-02	M21E113-03	M21E113-04	M21E113-05
Pressure, inHg	29.73	28.80	28.44	28.10	27.81
Temperature, °C	28.8	27.4	27.6	27.4	26.4
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2825	0.2751	0.2714	0.2683	0.2664
µg SO_2 (MDL 24hrs=3.34)	*1.74*	*0.871*	*0.871*	*0.871*	*0.523*
Concentration, µg/Ncm	*6.17*	*3.17*	*3.21*	*3.25*	*1.96*
Reported as less than, ug/Ncm	*11.8*	*12.1*	*12.3*	*12.4*	*12.5*

Note: Values in italics are less than the laboratory's Method Detection Limit

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

PM10	M21E113-01	M21E113-02	M21E113-03	M21E113-04	M21E113-05
Pressure, inHg	29.73	28.80	28.44	28.10	27.81
Temperature, °C	28.8	27.4	27.6	27.4	26.4
Flowrate, m^3/min	1.184	1.179	1.177	1.171	1.162
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1672.5	1621.6	1597.2	1571.1	1547.8
µg PM10 (MDL= 1972)	103900	34000	43200	86600	64100
Concentration, µg/Ncm	62.1	21.0	27.0	55.1	41.4

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

TSP	M21E113-06	M21E113-07	M21E113-08	M21E113-09	M21E113-10
Pressure, inHg	27.86	27.30	27.07	26.91	27.55
Temperature, °C	26.7	25.7	24.6	25.5	26.5
Flowrate, m^3/min	1.223	1.219	1.216	1.218	1.221
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1630.3	1598.2	1586.2	1574.8	1611.0
µg TSP (MDL = 1665)	174200	37300	107700	106000	114700
Concentration, µg/Ncm	107	23.3	67.9	67.3	71.2

NO_2	M21E113-06	M21E113-07	M21E113-08	M21E113-09	M21E113-10
Pressure, inHg	27.86	27.30	27.07	26.91	27.55
Temperature, °C	26.7	25.7	24.6	25.5	26.5
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2666	0.2622	0.2609	0.2586	0.2639
µg NO_2 (MDL 24hrs=0.871)	1.76	1.03	1.76	1.47	0.889
Concentration, µg/Ncm	6.61	3.94	6.76	5.69	3.37

SO_2	M21E113-06	M21E113-07	M21E113-08	M21E113-09	M21E113-10
Pressure, inHg	27.86	27.30	27.07	26.91	27.55
Temperature, °C	26.7	25.7	24.6	25.5	26.5
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2666	0.2622	0.2609	0.2586	0.2639
µg SO_2 (MDL 24hrs=3.34)	*1.92*	*1.05*	*0.871*	*1.22*	*0.697*
Concentration, µg/Ncm	*7.19*	*3.99*	*3.34*	*4.72*	*2.64*
Reported as less than, ug/Ncm	*12.5*	*12.7*	*12.8*	*12.9*	*12.7*

Note: Values in italics are less than the laboratory's Method Detection Limit

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

PM10	M21E113-06	M21E113-07	M21E113-08	M21E113-09	M21E113-10
Pressure, inHg	27.86	27.30	27.07	26.91	27.55
Temperature, °C	26.7	25.7	24.6	25.5	26.5
Flowrate, m^3/min	1.169	1.176	1.167	1.163	1.170
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1558.3	1541.8	1522.3	1503.7	1543.8
µg PM10 (MDL= 1972)	87000	25400	48200	44300	54600
Concentration, µg/Ncm	55.8	16.5	31.7	29.5	35.4

ELARSI, INC.

Unit 201-203 & 406 Rizalina Annex Bldg. 1677 Quezon Avenue, Quezon City
Tel. No. 8927-77-15 Fax No. 8929-4824 Email: info@elarsi.com

CLIENT	: HI ADVANCE PHIL. INC	Lab Report No	: 211313-AA
ADDRESS	: 3rd Floor, Maga Center Bldg., Paseo de Magallanes, Makati	Date Sampled	: 04-28-21 to 05-06-21
		Date Received	: 05-11-21
Contact Number	: 8854-8365	Date Analyzed	: 05-12-21 to 05-16-21
Nature of Sample/s	: Ambient Air Sample	Date Reported	: 05-17-21
No. of Sample/s Submitted	: Eleven (11)		

[REPORT OF ANALYSES]

Sample No.	Sample ID	Ozone (O_3), µg
ES-2106564	M21E113-01 F	0.48
ES-2106565	M21E113-02 F	0.96
ES-2106566	M21E113-03 F	0.55
ES-2106567	M21E113-04 F	0.66
ES-2106568	M21E113-05 F	0.83
ES-2106569	M21E113-06 F	0.45
ES-2106570	M21E113-07 F	1.10
ES-2106571	M21E113-08 F	2.86
ES-2106572	M21E113-09 F	1.09
ES-2106573	M21E113-10 F	2.02
ES-2106573A	Field Blank	0.37
Method		**Method 411 / Colorimetric**
Detection Limit		**0.30**

Reference
James P. Lodge. Methods for Ambient Air Sampling & Analysis. 3rd edition

Analyzed By:	Checked By:	Certified Correct By:
MIKO ALYSSA P. MAMANGON, RCh	JULIE CHRISTILLE HAPPY G. MORTE, RCh	RENATO M. GOFREDO, JR., RCh
Laboratory Analyst 1	Laboratory Supervisor	Laboratory Manager
PRC Lic. No. 0014933	*PRC Lic. No. 0012578*	*PRC Lic. No. 0009824*

Test results reflect the quality of the samples as received.

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DENR RECOGNIZED LABORATORY C.R. No. 005/2018

DOH ACCREDITED LABORATORY 13-008-2123-LW-2

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number:	MU21017105	Laboratory Number	MU21017105-001	Date:	05/20/2021
Customer:	NCRMKT-000089 HIADVANCE PHILIPPINES, INC.				
Address:	3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City				

Date Sampled:	04/24/2021 *	Analyzed Date:	05/11/2021
Date Received:	05/11/2021		
Sample Description:	Air Ambient Sample in Filter Paper		

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 01 C	Lead	Flame AAS	ug	49.2

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Checked by:	Certified by:	Noted by:
Katrina V. Pegulayan, RCh	Marisa T. Manaor, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC#: 0013681	PRC#: 0005465	

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21017106 Laboratory Number MU21017106-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 04/25/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 02 C	Lead	Flame AAS	ug	45.6

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Checked by:	Certified by:	Noted by:
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PRC#: 0013681	PRC#: 0005465	

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Result of Analysis

Job Number: MU21017107 Laboratory Number MU21017107-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 04/28/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 03 C	Lead	Flame AAS	ug	16.2

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Result of Analysis

Job Number: MU21017108 **Laboratory Number** MU21017108-001 **Date:** 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 04/27/2021 * **Analyzed Date:** 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 04 C	Lead	Flame AAS	ug	12.4

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis, ISC 3rd Edition.

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Checked by:	Certified by:	Noted by:
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Chemist	Supervising Chemist	Technical Manager
PRC#: 0013881	PRC#: 0005465	

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Result of Analysis

Job Number: MU21017109 Laboratory Number MU21017109-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 05/01/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 05 C	Lead	Flame AAS	ug	24.5

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Result of Analysis

Job Number: MU21017110 Laboratory Number MU21017110-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 04/29/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 06 C	Lead	Flame AAS	ug	33.0

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21017111 Laboratory Number MU21017111-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 05/02/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 07 C	Lead	Flame AAS	ug	12.0

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Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Chemist
PRC#: 0013681

Certified by:
Marisa T. Manaor, RCh
Supervising Chemist
PRC#: 0005465

Noted by:
Aladino M. Abulencia, ChE
Technical Manager

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Result of Analysis

Job Number: MU21017112 Laboratory Number MU21017112-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 05/04/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 08 C	Lead	Flame AAS	ug	6.07

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Reference:
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Chemist	Supervising Chemist	Technical Manager
PRC#: 0013881	PRC#: 0005465	

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Result of Analysis

Job Number: MU21017113 Laboratory Number MU21017113-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 05/05/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 09 C	Lead	Flame AAS	ug	5.27

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Reference:
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PRC# 0013681

Certified by:
Marisa T. Manaor, RCh
Supervising Chemist
PRC#: 0005403

Noted by:
Aladino B. Apulencia, ChE
Technical Manager

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21017114 Laboratory Number MU21017114-001 Date: 05/20/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Mega Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 05/06/2021 * Analyzed Date: 05/11/2021
Date Received: 05/11/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21E113 - 10 C	Lead	Flame AAS	ug	15.9

Reference:
Lodge, James P. Jr., Methods of Air Sampling and Analysis. ISC 3rd Edition.

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Chemist
PRC#: 0013681

Certified by:
Marisa T. Mansor, RCh
Supervising Chemist
PRC#: 0005465

Noted by:
Aladino M. Abulencia, ChE
Technical Manager

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(formerly NCALABS Phils., Inc.)
www.hiadvance.com.ph

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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

ATTACHMENT 3

- Field Data Sheet
- Sampling Pictures

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-4365
Fax No: (632) 739-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 23 Apr 21
Address: Unit 30A, one corporate center, Julia Vargas Ave., cor. Meralco Ave, Pasig
Station No: 1 Location: Brgy. Casinglot, Zone 2B (AQN1)
Start Time: 1020H End Time: 1020H GPS Reading: Latitude 8.515825
Ambient Temperature: 37.2 Longitude 124.757942
Barometric Pressure: 29.69 Weather Condition: Sunny, rainy
Filter ID No: TSP 21.112 / PM10 21.090 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: TSP 2.6871 / PM10 4.4851
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, Noise
Remarks: equipments are set-up in a paste ground, beside highway approx 1-2 meters away from the road, sunny weather condition; around 1620H rain pour down - often passing of light to heavy vehicles were observed.
(main road - facing 2 way)

TSP Sampler:
Model: TE-5070X Serial No: 2169 Calibration Date: 04AUG2020

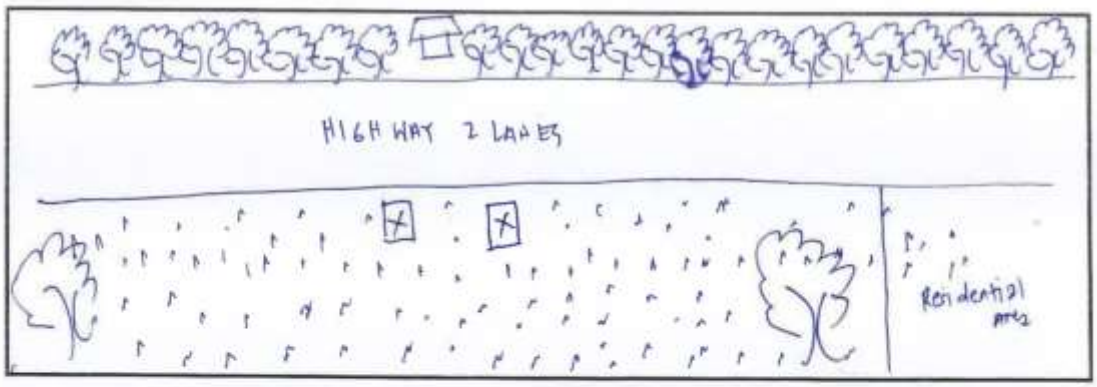
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

Three (3) Gas Sampler:
Model: M-965-01 Serial No: E8090001 Flow Rate: 0.2L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-59310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: – Serial No: – Calibration Date: –

INITIAL FILTER PRESSURE: TSP 22.1 / PM10 17.9 Carbon Monoxide: data logger
FINAL FILTER PRESSURE: 24.0 18.0 Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8355
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	1		Date: 20 April 2021	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.		–	21.090	21.112
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1440	1440
Initial Weight of Filter Paper (g)			4.7851 g	2.6371 g
Final Weight of Filter Paper (g)				
Dust Contents (g)				
Total Volume of Air Sampled (m^3)				

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8301
Fax No: (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	33.2	306.2	29.69	754.1	24 Mar 21	11:20 A	20 lpm	
1	33.0	306.0	29.69	754.1		12:20 A		
2	33.0	306.0	29.69	754.1		13:20 A		
3	33.1	306.1	29.69	754.1		14:20 A		
4	33.2	306.2	29.69	754.1		15:20 A		
5	32.1	305.1	29.65	753.1		16:20 A		
6	30.6	303.6	29.66	753.8		17:20 A		
7	30.5	303.5	29.66	753.4		18:20 A		
8	29.2	302.2	29.68	753.9		19:20 A		
9	28.4	301.4	29.69	754.1		20:20 A		
10	24.9	297.9	29.73	754.9		21:20 A		
11	25.0	298.0	29.77	756.2		22:20 A		
12	24.8	297.8	29.79	756.7		23:20 A	0 lpm	
13	25.0	298.0	29.78	756.4		00:20 A		
14	25.1	298.1	29.74	755.8	24 Mar 21	01:20 A		
15	25.2	298.2	29.73	755.1		02:20 A	4	
16	25.5	298.5	29.73	755.1		03:20 A		
17	25.3	298.3	29.74	755.8		04:20 A		
18	25.4	298.4	29.74	755.8		05:20 A		
19	26.8	299.8	29.75	755.7		06:20 A		
20	24.5	297.5	29.79	756.7		07:20 A		
21	29.5	302.5	29.80	756.5		08:20 A		
22	32.1	305.1	29.80	756.9		09:20 A		
23	31.5	304.5	29.80	756.5		10:20 A		
24	31.9	304.9	29.75	755.7		11:20 A		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

Annexes

HiAdvance Philippines, Inc.
3rd floor Mapa Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4127

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	32.2	306.2	29.69	754.1	24 Apr 21	10:20 H	25μ	
1	33.0	306.0	29.69	754.1		11:20 H		
2	33.0	306.0	29.69	754.1		12:20 H		
3	33.1	306.1	29.69	754.1		13:20 H		
4	33.2	306.2	29.69	754.1		14:20 H		
5	32.1	305.1	29.65	753.1		15:20 H		
6	30.6	303.6	29.66	753.4		16:20 H		
7	30.5	303.5	29.66	753.4		17:20 H		
8	29.2	302.2	29.68	753.9		18:20 H		
9	28.4	301.4	29.69	754.1		19:20 H		
10	24.9	297.9	29.72	754.9		20:20 H		
11	25.0	298.0	29.77	756.2		21:20 H	0.2	
12	24.8	297.8	29.79	756.7		22:20 H	L/m	
13	25.0	298.0	29.78	756.4		23:20 H		
14	25.1	298.1	29.74	755.4	24 Apr 21	00:20 H		
15	25.2	298.2	29.73	755.1		01:20 H		
16	25.5	298.5	29.73	755.1		02:20 H		
17	25.3	298.3	29.74	755.4		03:20 H		
18	25.4	298.4	29.74	755.4		04:20 H		
19	26.8	299.8	29.75	755.7		05:20 H		
20	26.5	299.5	29.79	756.7		06:20 H		
21	29.5	302.5	29.80	756.9		07:20 H		
22	32.1	305.1	29.80	756.9		08:20 H		
23	31.5	304.5	29.80	756.9		09:20 H		
24	31.9	304.9	29.75	755.7		10:20 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

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3rd floor Mega Centre
San Antonio St. Pasay City Metro Manila
Makati City, 1232
Phone No: (632) 854-8193
Fax No: (632) 723-4317

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 21-25 April 2021
Address: Unit 304, one corporate center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 2 Location: (AQN2) Brgy. Buhay 7 Mambetanga
Start Time: 1200H End Time: 1200H GPS Reading: Latitude 8.467833 Longitude 124.810872
Ambient Temperature: 29.2
Barometric Pressure: 28.67 Weather Condition: sunny, clear day
Filter ID No: 21.102 / 21.013 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: 2.6549 / 4.7550
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipment set up in a rocky and grass ground, approx. 50 meters away from the residential area, 5-10 meters away from the access road, open field surrounded by trees

TSP Sampler
Model: TE-5170X Serial No: 2169 Calibration Date: 04/06/2020

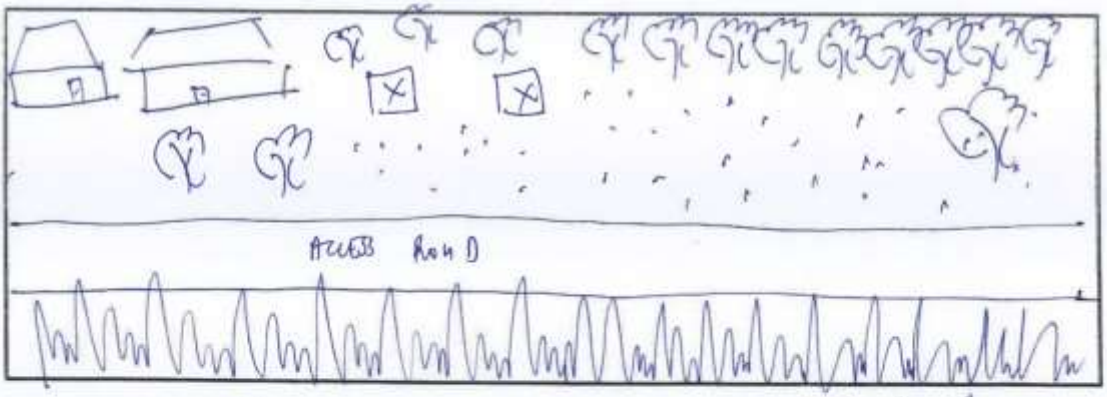
PM2.5/PM10 Sampler:
Model: TE-5170X Serial No: 2240 Calibration Date: 04/06/2020

Three (3) Gas Sampler:
Model: M-965-01 Serial No: E8090001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-59310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

INITIAL FILTER PRESSURE: 23.0 / 18.0 Carbon Monoxide: data logger
FINAL FILTER PRESSURE: 22.0 / 17.0 Total VOC: —



Team Leader: Qa/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
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San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	2		Date: 24 Apr 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.017	21 102
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.8797 / 4.8750	2.6349
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks:

Name & Signature of Official on Duty:

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8383
Fax No: (632) 729-4027

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.7	302.7	28.67	728.2	24 Mar 2021	14:20 H		
1	29.6	302.6	28.67	728.2		15:20 H		
2	29.4	302.4	28.67	728.2		16:20 H		
3	29.3	302.3	28.67	728.6		17:20 H		
4	27.0	300.0	28.70	729.4		18:20 H		
5	25.7	298.7	28.71	729.2		19:20 H		
6	25.7	298.7	28.72	729.5		20:20 H		
7	25.4	298.3	28.74	729.7		21:20 H		
8	24.8	297.8	28.78	730.0		22:20 H		
9	24.5	297.5	28.77	730.8		23:20 H		
10	24.1	297.1	28.76	730.5	25 Mar 2021	00:20 H		
11	23.7	296.7	28.75	730.3		01:20 H	0.2	
12	23.5	296.5	28.75	730.3		02:20 H	Lpm	
13	23.2	296.2	28.74	730.0		03:20 H		
14	22.0	295.0	28.73	730.5		04:20 H		
15	22.3	295.3	28.73	729.7		05:20 H		
16	22.5	295.5	28.74	730.0		06:20 H		
17	21.6	304.6	28.75	730.3		07:20 H		
18	21.5	304.5	28.75	730.4		08:20 H		
19	21.4	304.4	28.75	730.1		09:20 H		
20	21.1	304.1	28.75	730.5		10:20 H		
21	21.5	304.5	28.70	729.0		11:20 H		
22	21.6	304.6	28.70	727.0		12:20 H		
23	21.5	304.5	28.70	729.0		13:20 H		
24	21.5	304.5	28.70	729.0		14:20 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mapa Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.7	302.7	28.67	728.2	24 Apr '21	1430 H		
1	29.6	302.6	28.67	728.2		1530 H		
2	29.4	302.4	28.67	728.2		1630 H		
3	29.3	302.3	28.67	728.6		1730 H		
4	29.0	302.0	28.70	729.4		1830 H		
5	28.7	298.7	28.71	729.2		1930 H		
6	28.7	298.7	28.72	729.5		2030 H		
7	28.4	298.5	28.74	729.7		2130 H		
8	28.8	298.8	28.78	731.0		2230 H		
9	28.5	297.5	28.77	730.8		2330 H		
10	28.1	297.1	28.76	730.5	25 Apr '21	0030 H		
11	28.7	296.7	28.75	730.3		0130 H	0.2	
12	28.5	296.5	28.75	730.3		0230 H	lpm	
13	28.2	296.2	28.74	730.0		0330 H		
14	28.0	295.0	28.75	730.3		0430 H		
15	28.3	295.3	28.74	730.7		0530 H		
16	22.5	295.5	28.74	730.0		0630 H		
17	31.6	304.6	28.75	730.3		0730 H		
18	31.5	304.5	28.75	730.3		0830 H		
19	31.4	304.3	28.75	730.3		0930 H		
20	31.1	304.1	28.75	730.3		1030 H		
21	31.5	304.5	28.70	729.6		1130 H		
22	31.6	304.6	28.70	729.0		1230 H		
23	31.5	304.5	28.70	729.0		1330 H		
24	31.5	304.5	28.70	729.0		1430 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Pinnet - Asia Inc. Date: 27-28 Apr 2021
Address: Unit 304, one corporate center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 1 Location: ABNJ - Zone 1 Alae
Start Time: [illegible] Time: [illegible] GPS Reading: Latitude 8.412193
Ambient Temperature: 28.3 Longitude 124.804962
Barometric Pressure: 28.98 Weather Condition: cloudy
Filter ID No: 21-14 / 21-087 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: 4.4671 / 2.6848
Sampled Parameters: TSP, PM10, SO_2, NO_2, Pb, CO, O_3, wind speed & direction, noise
Remarks: equipments are set-up in a rocky and grassy ground, 10-15 meters away from the residential houses; surrounded by trees

TSP Sampler:
Model: TE-5070X Serial No: 269 Calibration Date: [illegible]

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2290 Calibration Date: [illegible]

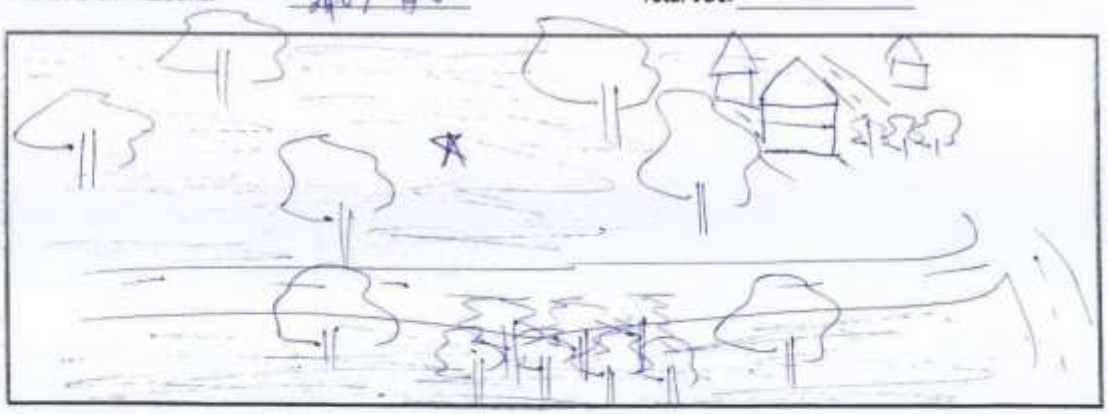
Three (3) Gas Sampler:
Model: M-965-01 Serial No: E809001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-543310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	4.0	18.0
FINAL FILTER PRESSURE:	24.0	19.0

Carbon Monoxide: data logger
Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	7		Date: 27 - 28 Mar 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.111	21.087
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)			
Initial Weight of Filter Paper (g)		4.4641	2.6140 / 2.6341
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: —

Name & Signature of Official on Duty: —

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm^3
0	29.7	302.7	28.38	720.5	27 Apr 2021	15:00 H		
1	30.0	303.0	28.38	720.9		16:00 H		
2	29.0	302.0	28.40	721.4		17:00 H		
3	25.9	298.9	28.45	722.6		18:00 H		
4	25.7	298.7	28.45	722.6		19:00 H		
5	25.7	298.7	28.45	722.6		20:00 H		
6	25.8	298.8	28.45	722.6		21:00 H		
7	25.8	298.8	28.45	722.6		22:00 H		
8	25.4	298.4	28.45	722.6		23:00 H		
9	24.9	297.9	28.46	722.9	28 Apr 2021	00:00 H	1.21/min	
10	24.3	297.3	28.46	722.9		01:00 H		
11	24.3	297.3	28.45	722.6		02:00 H		
12	24.0	297.0	28.45	722.6		03:00 H		
13	23.8	296.8	28.46	722.9		04:00 H		
14	23.9	296.9	28.46	722.9		05:00 H		
15	24.6	297.6	28.46	722.9		06:00 H		
16	24.7	297.7	28.46	722.9		07:00 H		
17	24.4	297.4	28.48	723.4		08:00 H		
18	32.1	305.1	28.48	723.4		09:00 H		
19	32.8	305.8	28.46	722.9		10:00 H		
20	32.3	305.3	28.43	722.1		11:00 H		
21	31.3	304.3	28.43	722.1		12:00 H		
22	31.4	304.4	28.43	722.1		13:00 H		
23	29.7	302.7	28.38	720.9		14:00 H		
24	30.0	303.0	28.38	720.9		15:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No. (632) 854-8365
Fax No. (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.7	302.7	28.38	720.9	27 Apr 2021	15:30 H		
1	30.0	303.0	28.38	720.9		16:30 H		
2	29.0	302.0	28.40	721.4		17:30 H		
3	25.9	298.9	28.45	722.6		18:30 H		
4	25.7	298.7	28.45	722.6		19:30 H		
5	25.7	298.7	28.45	722.6		20:30 H		
6	25.8	298.8	28.45	722.6		21:30 H		
7	25.8	298.8	28.45	722.6		22:30 H		
8	25.4	298.8	28.45	722.6		23:30 H		
9	24.9	297.9	28.46	722.9	28 Apr 2021	00:30 H		
10	24.3	297.3	28.46	722.9		01:30 H		
11	24.3	297.3	28.45	722.6		02:30 H	0.2 L/min	
12	24.0	297.0	28.45	722.6		03:30 H		
13	23.8	296.8	28.46	722.9		04:30 H		
14	23.9	296.9	28.46	722.9		05:30 H		
15	24.6	297.6	28.46	722.9		06:30 H		
16	26.7	299.7	28.46	722.9		07:30 H		
17	27.4	310.4	28.48	723.4		08:30 H		
18	32.1	318.1	28.48	723.0		09:30 H		
19	32.8	308.8	28.46	722.9		10:30 H		
20	32.9	313.3	28.43	722.1		11:30 H		
21	31.3	304.3	28.43	722.1		12:30 H		
22	31.4	304.4	28.43	722.1		13:30 H		
23	29.7	302.7	28.38	720.3		14:30 H		
24	30.0	303.0	28.38	720.3		15:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 26 April 2021
Address: Unit 30A, one corporate center, Julia Vargas Ave., cor. Meralco Ave, Pasig
Station No: 4 Location: ADNY - Zone 1 Dickson
Start Time: 1200H End Time: 1200H GPS Reading: Latitude 8.971687
Ambient Temperature: 72.1 Longitude 124.852996
Barometric Pressure: 28.04 Weather Condition: sunny
Filter ID No: Type of Filter Paper Used: Glass fiber / Quartz Initial Weight:
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipments are set-up in a rocky with some grass ground, approx 4-5 meters away from the main road, sunny weather condition, approx 2-4 meters away from the cliff

TSP Sampler
Model: TE-5070X Serial No: 269 Calibration Date: 04AUG2020

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

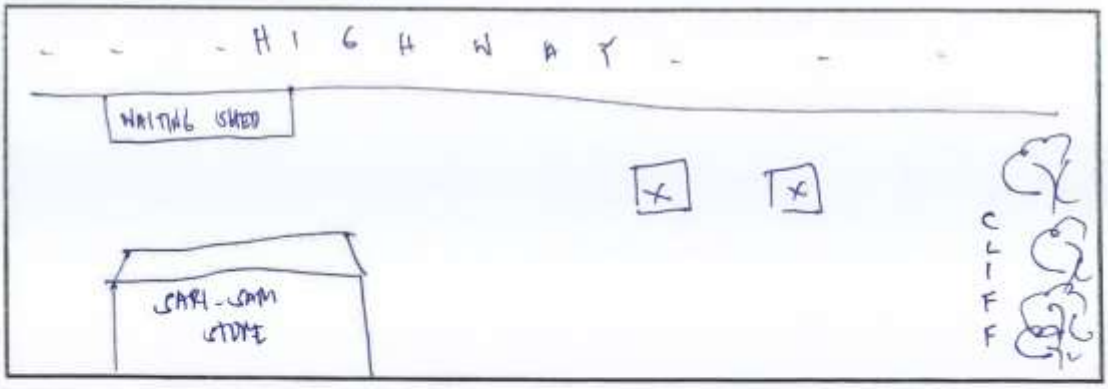
Three (3) Gas Sampler:
Model: M-365-01 Serial No: E8090001 Flow Rate: 0.2L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-59310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	24.0	19.0
FINAL FILTER PRESSURE:	25.0	20.0

Carbon Monoxide: data logger
Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0: 8 May 2018

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Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	4		Date: 26. 27 Apr 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.			
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)			
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks:

Name & Signature of Official on Duty:

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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3rd Floor Mapa Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8303
Fax No: (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.5	304.5	28.05	712.5	26 Apr 2021	0900 H		
1	31.5	304.5	28.05	712.5		1400 H		
2	32.0	305.0	28.04	712.0		1500 H		
3	32.1	305.1	28.04	712.0		1600 H		
4	27.7	300.7	28.04	712.2		1700 H		
5	27.7	300.7	28.04	712.2		1800 H		
6	27.6	300.6	28.04	712.2		1900 H		
7	25.0	298.0	28.11	714.0		2000 H		
8	25.3	298.3	28.13	714.5		2100 H		
9	25.1	298.1	28.12	714.2		2200 H		
10	25.0	298.3	28.14	714.8		2300 H	1.2 lpm	
11	23.8	296.8	28.12	714.2	27 Apr 2021	0000 H		
12	23.3	296.3	28.11	714.0		0100 H		
13	23.1	296.1	28.10	713.7		0200 H		
14	24.2	297.2	28.11	714.0		0300 H		
15	25.6	298.6	28.10	713.7		0400 H		
16	27.3	300.3	28.10	713.7		0500 H		
17	26.4	299.4	28.12	714.4		0600 H		
18	25.0	298.0	28.14	714.5		0700 H		
19	25.6	298.6	28.15	715.0		0800 H		
20	28.8	301.8	28.15	714.9		0900 H		
21	29.0	302.0	28.14	714.8		1000 H		
22	30.1	303.1	28.13	714.5		1100 H		
23	30.4	303.4	28.12	714.2		1200 H		
24	30.8	303.8	28.11	714.0		1300 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 2; 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.5	304.5	28.05	712.5	26 Apr 2021	12:00 H		
1	31.5	304.5	28.05	712.5		13:00 H		
2	32.0	305.0	28.05	712.0		15:00 H		
3	32.1	305.1	28.04	712.0		16:00 H		
4	27.7	300.7	28.04	712.2		17:00 H		
5	27.7	300.7	28.04	712.2		18:00 H		
6	27.6	300.6	28.04	712.2		19:00 H		
7	25.0	298.0	28.11	712.0		20:00 H		
8	25.3	298.3	28.13	714.5		21:00 H		
9	25.1	298.1	28.12	714.2		22:00 H	0.2 lpm	
10	25.0	298.3	28.14	714.8		23:00 H		
11	23.8	296.8	28.12	714.2	27 Apr 2021	00:00 H		
12	23.3	296.3	28.11	714.0		01:00 H		
13	23.1	296.1	28.10	714.7		02:00 H		
14	24.2	297.2	28.11	713.0		03:00 H		
15	23.6	296.6	28.10	714.7		04:00 H		
16	23.3	296.3	28.10	713.7		05:00 H		
17	26.4	299.4	28.12	713.2		06:00 H		
18	25.0	298.0	28.14	714.8		07:00 H		
19	25.6	298.6	28.15	714.8		08:00 H		
20	26.8	300.8	28.15	716.0		09:00 H		
21	29.0	302.0	28.10	715.0		10:00 H		
22	30.0	303.1	28.13	714.5		11:00 H		
23	30.4	303.4	28.12	714.8		12:00 H		
24	30.8	303.8	28.11	714.0		13:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

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AMBIENT AIR SAMPLING FIELD DATA SHEET

1X/E

Company: Amet - Asia Inc. Date: 30 April - 01 May
Address: Unit 303, one corporate center, Julia Vargas Ave., cor. Meralco Ave, Pasig
Station No: 5 Location: [illegible] Brgy. San Roque Purok 4
Start Time: 1020H End Time: 1020H GPS Reading: Latitude 8.729792
Ambient Temperature: 36.1 Longitude 124.933255
Barometric Pressure: 27.78 Weather Condition: Fair weather
Filter ID No: PM10 21.092 / TSP 21.080 Type of Filter Paper Used: Glass fiber / Quartz Initial Weight: PM10 4.414 / TSP 2.0997
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipments are set-up in a grassy ground inside the vicinity of San Roque Elem. school. 8m away from the access road & 20m away from residential. Minimal passing of motorcycles & vehicles along the access road.

TSP Sampler:
Model: TE-5070X Serial No: 269 Calibration Date: 04AUG2020

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

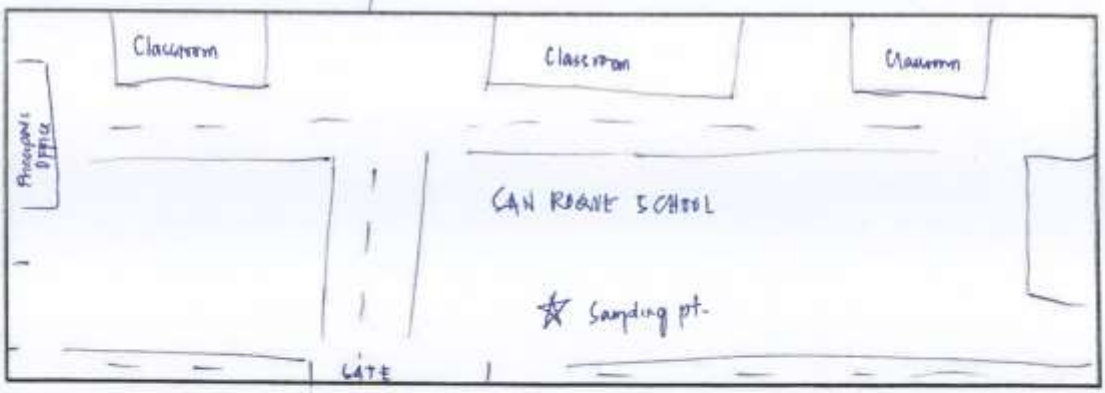
Three (3) Gas Sampler:
Model: M-365-01 Serial No: E8090001 Flow Rate: 0.2 l/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-54310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	24.0	21.0
FINAL FILTER PRESSURE:	24.8	21.8

Carbon Monoxide: data logger
Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

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Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	5		Date: 20 Apr - 21 May
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.082	21 080
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.414	2.6947
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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[illegible]
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Fax No. (632) 729-3327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION
Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	36.1	309.1	27.78	705.6	30 Apr 21	1020H		
1	36.2	309.2	27.78	705.6		1120 H		
2	33.0	306.0	27.78	705.6		1220 H		
3	32.8	305.8	27.76	705.1		1320H		
4	36.1	309.1	27.72	704.1		1420 H		
5	35.0	308.0	27.72	704.1		1520 H		
6	26.0	299.0	27.77	705.4		1620 H		
7	26.1	299.1	27.77	705.4		1720 H		
8	23.7	296.7	27.81	706.4		1820 H		
9	23.6	296.6	27.81	706.4		1920 H		
10	23.7	296.8	27.81	706.4		2020 H		
11	22.6	295.6	27.87	708.9		2120 H		
12	22.7	295.7	27.87	708.9		2220H		
13	23.2	296.2	27.84	707.1		2320 H		
14	21.4	294.4	27.84	707.1	01 May 21	0020H	0.2 L/min	
15	21.8	294.8	27.84	707.1		0120H		
16	21.7	294.7	27.85	707.4		0220H		
17	21.0	294.0	27.85	707.4		0320 H		
18	21.3	294.3	27.85	707.4		0420H		
19	21.9	294.9	27.85	707.4		0520H		
20	22.8	295.8	27.85	707.4		0620 H		
21	24.0	297.0	27.82	706.6		0720H		
22	25.5	298.5	27.83	706.9		0820 H		
23	28.4	301.4	27.83	706.9		0920 H		
24	29.0	302.0	27.84	707.1		1020H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	36.1	309.1	27.78	705.4	[illegible] 21	10:20 H		
1	36.2	309.2	27.78	705.6		11:20 H		
2	32.8	305.0	27.76	705.6		12:20 H		
3	29.9	302.8	27.74	705.1		13:20 H		
4	36.1	309.1	27.72	704.1		14:20 H		
5	35.0	308.0	27.72	704.1		15:20 H		
6	26.0	299.0	27.77	705.4		16:20 H		
7	26.1	299.1	27.77	705.4		17:20 H		
8	23.7	296.7	27.81	706.4		18:20 H		
9	23.6	296.6	27.81	706.4		19:20 H		
10	23.7	296.8	27.81	706.4		20:20 H		
11	23.6	296.6	27.80	706.9		21:20 H	[illegible]	
12	22.7	295.7	27.83	706.9		22:20 H		
13	23.2	296.2	27.84	707.1		23:20 H		
14	22.4	295.4	27.84	707.1	[illegible] 21	00:20 H		
15	21.8	294.8	27.85	707.1		01:20 H		
16	21.7	294.7	27.85	707.4		02:20 H		
17	21.8	294.8	27.85	707.4		03:20 H		
18	21.8	294.8	27.85	707.4		04:20 H		
19	21.9	294.9	27.85	707.4		05:20 H		
20	22.8	295.8	27.85	707.4		06:20 H		
21	24.1	297.0	27.82	706.6		07:20 H		
22	25.5	298.5	27.83	706.9		08:20 H		
23	26.4	299.4	27.83	706.9		09:20 H		
24	27.0	300.0	27.84	707.1		10:20 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0, 8 May 2018

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Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 28 - 29 Apr 2021
Address: Unit 30A, one corporate center, Julia Vargas Ave., cor. Meralco Ave, Pasig
Station No: 6 Location: 1QNG - Brgy Poblacion
Start Time: 1730H End Time: 1730H GPS Reading: Latitude 8.312317
Ambient Temperature: 27.0 Longitude 124.983626
Barometric Pressure: 27.85 Weather Condition: Sunny
Filter ID No: PM10 21.112 / TSP 21.092 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: PM10 4.4418 / TSP 2.6879
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipments are set up in a grassy & soft soil ground; approx. 5 meters away from the road; and 5 meters away from the nearby house;

TSP Sampler
Model: TE-5070X Serial No: 2169 Calibration Date: 04AUG2020

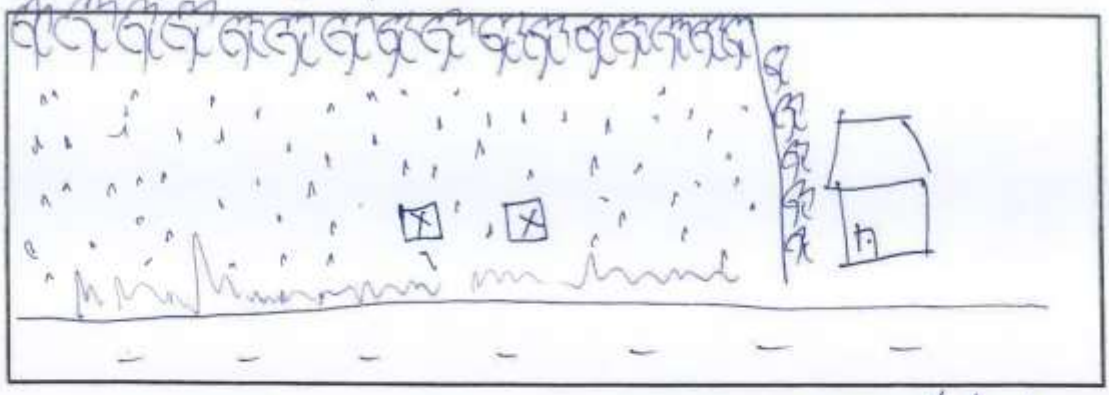
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

Three (3) Gas Sampler:
Model: M-965-01 Serial No: E8090001 Flow Rate: 0.2L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-54310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

INITIAL FILTER PRESSURE: TSP 27.6 | PM10 ~~27.6~~ 18.0 Carbon Monoxide: datalogger
FINAL FILTER PRESSURE: 25.0 | 22.0 Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

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Makati City, 1232
Phone No: (632) 854-8365
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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	6		Date: 28-29 Apr 201	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.			21.112	21.092
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1440	1440
Initial Weight of Filter Paper (g)			4.4418	2.6879
Final Weight of Filter Paper (g)				
Dust Contents (g)				
Total Volume of Air Sampled (m^3)				

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magellanes
Makati City, 1232
Phone No: (632) 834-8361
Fax No: (632) 779-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	24.0	296.0	27.85	707.4	28 Apr 21	17:30 H	—	—
1	24.1	296.1	27.85	707.4		18:30 H		
2	24.1	296.1	27.85	707.4		19:30 H		
3	22.5	295.5	27.85	707.4		20:30 H		
4	22.6	295.6	27.85	707.4		21:30 H		
5	22.7	295.7	27.85	707.4		22:30 H		
6	22.1	295.1	27.84	707.6		23:30 H		
7	22.1	295.1	27.84	707.6	29 Apr 21	00:30 H		
8	21.7	294.7	27.84	707.1		01:30 H		
9	21.6	294.6	27.84	707.1		02:30 H		
10	22.1	295.1	27.85	707.4		03:30 H	0.2 lpm	
11	21.7	294.7	27.84	707.1		04:30 H		
12	21.4	294.4	27.84	707.1		05:30 H	—	
13	21.5	294.5	27.91	708.9		06:30 H		
14	21.0	294.0	27.93	709.4		07:30 H		
15	21.0	294.0	27.84	707.7		08:30 H		
16	35.4	308.4	27.91	708.9		09:30 H		
17	35.5	308.5	27.91	708.9		10:30 H		
18	37.0	310.0	29.70	753.6		11:30 H		
19	38.4	311.4	27.84	707.1		12:30 H		
20	32.6	305.6	27.84	707.1		13:30 H		
21	32.5	305.5	27.84	707.1		14:30 H		
22	32.2	305.2	27.84	707.1		15:30 H		
23	27.4	300.4	27.86	707.6		16:30 H		
24	26.7	299.7	27.86	707.6		17:30 H	—	—

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0, 8 May 2018

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NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	27.0	296.0	27.85	707.4	28 Apr 21	1730 H		
1	27.1	296.1	27.85	707.4		1830 H		
2	27.1	296.1	27.85	707.4		1930 H		
3	22.5	295.5	27.85	707.4		2030 H		
4	22.6	295.6	27.85	707.4		2130 H		
5	22.7	295.7	27.85	707.4		2230 H		
6	22.1	295.1	27.86	707.6		2330 H		
7	22.1	295.1	27.86	707.6	29 Apr 21	0030 H		
8	22.7	294.7	27.84	707.1		0130 H		
9	21.6	294.6	27.84	707.1		0230 H		
10	22.1	295.1	27.85	707.4		0330 H	0.2 lpm	
11	21.7	294.7	27.84	707.1		0430 H		
12	21.4	294.4	27.84	707.1		0530 H		
13	21.5	294.5	27.91	708.9		0630 H		
14	22.0	295.0	27.93	709.4		0730 H		
15	24.0	297.0	27.94	709.7		0830 H		
16	35.4	308.4	27.91	708.9		0930 H		
17	35.5	308.5	27.91	708.9		1030 H		
18	37.6	310.6	27.90	708.6		1130 H		
19	38.4	311.4	27.84	707.1		1230 H		
20	32.0	305.0	27.84	707.1		1330 H		
21	32.5	305.5	27.84	707.1		1430 H		
22	32.2	305.2	27.84	707.1		1530 H		
23	27.4	300.4	27.86	707.6		1630 H		
24	26.7	299.7	27.86	707.6		1730 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

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Phone No: (632) 854-8365
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 01-02 May, 2021
Address: Unit 303, one corporate center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 7 Location: AQN7 - Argy. Lagartina Zone 7
Start Time: 1845H End Time: 1945H GPS Reading: Latitude 8.266177
Ambient Temperature: 72.1 Longitude 124.996892
Barometric Pressure: 27.25 Weather Condition: Fair
Filter ID No: 27740 / 21.081 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: 27740 / 4.4082
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: Sampling equipment was erected in a grassy / soil ground surface (Elevated area) 5 m away from the access road ; 8-10 m away from residential (houses)

TSP Sampler:
Model: TE-5070X Serial No: 2169 Calibration Date: 04AUG2020

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

Three (3) Gas Sampler:
Model: M-365-01 Serial No: E8090001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-54310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	24.0	17.0
FINAL FILTER PRESSURE:	24.0	17.0

Carbon Monoxide: data logger
Total VOC: —

Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

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Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	7	Date: 01-02 mar 201	
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.081	21.108
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		9.4062	2.7240
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks:

Name & Signature of Official on Duty:

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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Makati City, 1232
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Fax No. (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.0	302.0	27.35	692.2	[illegible]	1945 H		
1	27.4	300.4	27.26	692.4		1445 H		
2	27.9	300.9	27.25	692.2		1545 H		
3	27.9	300.7	27.26	692.4		1645 H		
4	24.6	297.6	27.29	693.2		1745 H		
5	23.5	296.5	27.31	693.7		1845 H		
6	23.0	296.0	27.33	694.2		1945 H		
7	22.7	295.7	27.33	694.2		2045 H		
8	22.3	295.3	27.33	694.2		2145 H		
9	22.9	295.9	27.34	694.0		2245 H		
10	23.0	296.0	27.34	694.4		2345 H		
11	23.3	296.3	27.32	693.9	02-24-21	00 45 H		
12	22.7	295.7	27.30	693.0		01 45 H	0.2 l/min	
13	22.4	295.4	27.30	693.4		02 45 H		
14	21.9	294.9	27.30	693.4		03 45 H		
15	21.6	294.6	27.29	693.2		04 45 H		
16	21.9	294.9	27.30	693.4		05 45 H		
17	25.1	298.1	27.29	693.2		06 45 H		
18	26.7	299.7	27.29	693.2		07 45 H		
19	30.1	303.1	27.31	693.4		08 45 H		
20	30.1	303.1	27.29	693.2		09 45 H		
21	29.7	302.7	27.29	693.2		10 45 H		
22	29.3	302.3	27.31	693.4		11 45 H		
23	30.2	303.2	27.30	693.4		12 45 H		
24	32.2	305.2	27.32	693.9		13 45 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_o = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_o}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F026
Rev. 0, 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd; Nm³
0	29.0	302.0	27.25	692.7		13:45H		
1	27.4	300.4	27.26	692.8		14:45H		
2	26.9	299.9	27.25	692.2		15:45H		
3	27.7	300.7	27.26	692.8		16:45H		
4	24.6	297.6	27.29	693.2		17:45H		
5	23.5	296.5	27.31	693.7	01 MAY 21	18:45H		
6	23.0	296.0	27.33	694.2		19:45H		
7	22.7	295.7	27.33	694.2		20:45H		
8	22.3	295.3	27.33	694.2		21:45H		
9	22.9	295.9	27.34	694.4		22:45H		
10	23.0	296.0	27.34	694.8		23:45H		
11	23.3	296.3	27.32	693.9		00:45H		
12	22.7	295.7	27.30	693.6		01:45H	0.21 lpm	
13	22.4	295.4	27.30	693.4		02:45H		
14	21.9	294.9	27.30	693.4		03:45H		
15	21.6	294.6	27.29	693.2		04:45H		
16	21.9	294.9	27.30	693.4		05:45H		
17	25.1	298.1	27.29	693.2		06:45H		
18	26.7	299.7	27.29	693.2		07:45H		
19	30.1	303.1	27.34	694.4	02 MAY 21	08:45H		
20	30.1	303.1	27.29	693.2		09:45H		
21	29.7	302.7	27.29	693.2		10:45H		
22	29.3	302.3	27.34	694.4		11:45H		
23	30.2	303.2	27.30	693.4		12:45H		
24	29.2	302.2	27.22	691.4		13:45H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

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San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8865
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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 3-4 May 2021
Address: Unit 3a, one corporate center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 8 Location: [illegible]
Start Time: 0915H End Time: 0915H GPS Reading: Latitude 8.239260
Ambient Temperature: 26.4 Longitude 125.023944
Barometric Pressure: 29.10 Weather Condition: cloudy very hot
Filter ID No: 21.004 / 21.107 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: PM10 4.4061 / TSP 2.7979
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipments are set-up beside the main road. approx 11.5 meters away from the highway, erected in a grassy / soil ground surface.

TSP Sampler
Model: TE-5170X Serial No: 2169 Calibration Date: [illegible]

PM2.5/PM10 Sampler:
Model: TE-5170X Serial No: 2240 Calibration Date: [illegible]

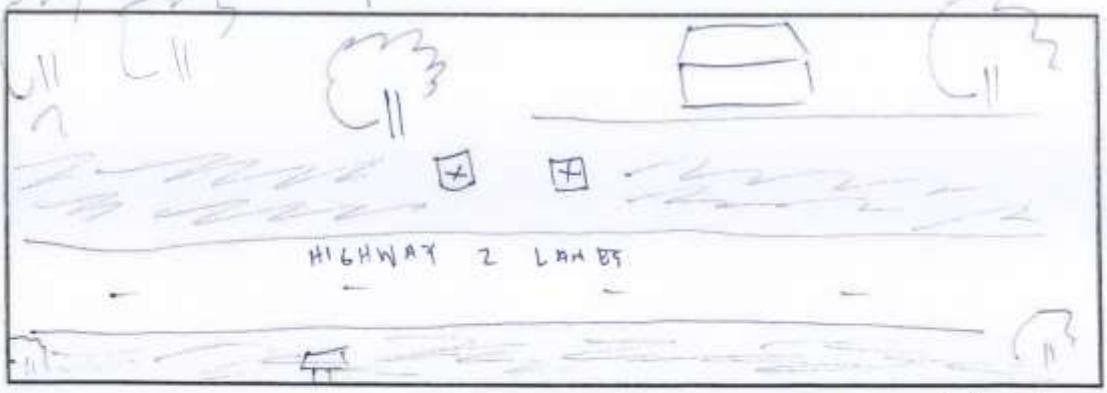
Three (3) Gas Sampler:
Model: M-965-01 Serial No: E8090001 Flow Rate: 0.2L/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-54310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	28.8	18.9
FINAL FILTER PRESSURE:	44.5	19.3

Carbon Monoxide: data logger
Total VOC: —



Team Leader: QA/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	8		Date: 3-4 May 2021	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.			21 097	21-107
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1440	1440
Initial Weight of Filter Paper (g)			4.4061	2.7377
Final Weight of Filter Paper (g)				
Dust Contents (g)				
Total Volume of Air Sampled (m^3)				

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.7	302.7	27.09	688.1	3 May 21	0915 H		
1	29.7	302.7	27.09	688.1		1015 H		
2	28.6	301.6	27.06	687.3		1115 H		
3	28.7	301.7	27.06	687.3		1215 H		
4	28.8	301.8	27.06	687.3		1315 H		
5	28.9	301.9	27.06	686.1		1415 H		
6	29.9	302.9	27.01	686.1		1515 H		
7	29.8	302.8	27.01	686.6		1615 H		
8	25.6	298.6	27.03	686.6		1715 H		
9	25.7	298.7	27.03	687.6		1815 H	0.2 lpm	
10	22.7	295.7	27.07	687.6		1915 H		
11	22.7	295.7	27.07	686.6		2015 H		
12	20.6	293.6	27.11	686.6		2115 H		
13	20.9	293.9	27.11	686.3		2215 H		
14	20.9	293.9	27.10	688.1		2315 H		
15	20.7	293.7	27.09	686.6	04 May 21	0015 H		
16	21.2	294.2	27.07	687.3		0115 H		
17	20.1	293.1	27.06	687.6		0215 H		
18	21.3	294.3	27.08	686.3		0315 H		
19	21.9	294.6	27.10	686.3		0415 H		
20	22.7	295.7	27.11	686.6		0515 H		
21	22.5	295.5	27.09	687.6		0615 H		
22	22.6	295.6	27.09	688.1		0715 H		
23	22.8	295.8	27.10	686.3		0815 H		
24	27.2	300.2	27.10	688.3		0915 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.7	302.7	27.09	688.1	08 May '21	0915 H		
1	27.7	300.7	27.09	688.1		1015 H		
2	28.6	301.6	27.06	687.3		11 15 H		
3	28.7	301.7	27.06	687.3		12 15 H		
4	28.8	301.8	27.06	687.3		13 15 H		
5	28.9	301.9	27.06	688.1		14 15 H		
6	29.9	302.9	27.01	686.1		15 15 H		
7	29.8	301.8	27.01	686.6		16 15 H		
8	25.6	298.6	27.03	686.6		17 15 H		
9	25.7	298.7	27.03	687.6		18 15 H	0.2 mlP	
10	22.7	295.7	27.07	687.6		19 15 H		
11	22.7	295.7	27.07	688.6		20 15 H		
12	20.6	293.6	27.11	688.6		21 15 H		
13	20.5	293.5	27.11	688.3		22 15 H		
14	20.9	293.9	27.10	688.1		23 15 H		
15	20.7	293.7	27.09	687.6	09 May '21	00 15 H		
16	21.2	294.2	27.07	687.3		01 15 H		
17	20.1	293.1	27.06	687.3		02 15 H		
18	21.3	294.3	27.08	688.3		03 15 H		
19	21.9	294.6	27.10	688.8		04 15 H		
20	20.7	293.7	27.11	688.6		05 15 H		
21	20.5	293.5	27.07	687.6		06 15 H		
22	20.6	293.6	27.09	688.1		07 15 H		
23	20.8	293.8	27.10	688.3		08 15 H		
24	29.2	302.2	27.10	688.3		09 15 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0, 8 May 2018

HiAdvance Philippines, Inc.
3rd Floor Mapfre Centre
San Antonio St., Poblacion Magallanes
Makati City, 1232
Phone No: (632) 854-6365
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - MGA Inc. Date: 4-5 May 2021
Address: Unit 3UA, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 9 Location: AQM9 - Brgy. Bulport Zone 5
Start Time: 10h01 End Time: 10h01 GPS Reading: Latitude 8.195157
Ambient Temperature: 29.2 Longitude 125.059188
Barometric Pressure: 26.92 Weather Condition: Sunny to cloudy
Filter ID No: 21-0261 (PM10) / 21-1049 (TSP) Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: 4.7859 (PM10) / 2.6771 (TSP)
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: Equipment was set up in a golf cart surrounded with approx 1-2 meters away from the highway, i.e. beside small pole the footing.

TSP Sampler
Model: TE-5070X Serial No: 2169 Calibration Date: [illegible]

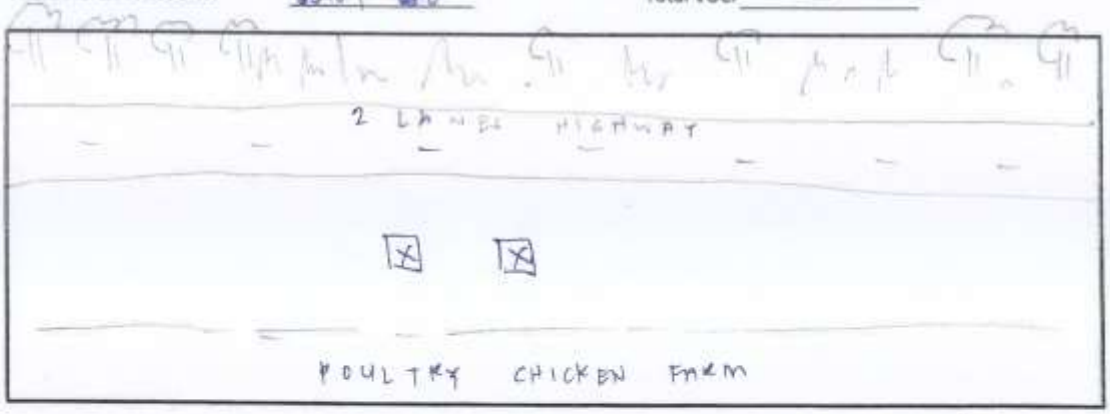
PM2.5/PM10 Sampler
Model: TE-5070X Serial No: 2240 Calibration Date: [illegible]

Three (3) Gas Sampler
Model: M-965-01 Serial No: E309001 Flow Rate: 0.2 L/min

Barometer/Thermometer
Model: PHB-318 Serial No: AH-593310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment
Model: Serial No: Calibration Date:

INITIAL FILTER PRESSURE: TSP 22.0 / PM10 19.0
FINAL FILTER PRESSURE: TSP 26.0 / PM10 20.0
Carbon Monoxide: data logger
Total VDC: —



Team Leader: Date:
QA/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	9		Date: 4-5 May 2021	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.		A	21.061	21.109
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1440	1440
Initial Weight of Filter Paper (g)			4.7859	3.6771
Final Weight of Filter Paper (g)				
Dust Contents (g)		B		
Total Volume of Air Sampled (m^3)				

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No (632) 814-8301
Fax No (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.2	302.2	26.92	683.6	4 May 21	10:30 H		
1	28.2	301.2	26.92	683.6		11:30 H		
2	28.1	301.1	26.92	683.8		12:30 H		
3	30.1	303.1	26.88	682.8		13:30 H		
4	33.6	306.6	26.86	682.2		14:30 H		
5	33.2	306.2	26.86	682.2		15:30 H		
6	28.5	301.5	26.86	682.2		16:30 H		
7	28.4	301.4	26.86	682.2		17:30 H		
8	24.8	297.8	26.89	683.0		18:30 H		
9	25.0	298.0	26.89	683.0		19:30 H	0.2 lpm	
10	23.8	296.8	26.91	683.5		20:30 H		
11	23.1	296.1	26.95	684.5		21:30 H		
12	22.4	295.4	26.95	684.5		22:30 H		
13	22.2	295.2	26.93	684.0		23:30 H		
14	21.9	294.9	26.92	683.8	5 May 21	00:30 H		
15	21.7	294.7	26.90	683.5		01:30 H		
16	21.4	294.4	26.88	682.8		02:30 H		
17	21.0	294.0	26.90	683.3		03:30 H		
18	20.9	293.9	26.92	683.7		04:30 H		
19	22.4	295.4	26.93	684.0		05:30 H		
20	22.0	295.0	26.92	683.8		06:30 H		
21	24.5	297.5	26.93	684.0		07:30 H		
22	23.3	296.3	26.95	684.5		08:30 H		
23	28.7	301.7	26.94	684.3		09:30 H		
24	28.8	301.8	26.94	683.3		10:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

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3rd floor Mega Centre
San Antonio St. Pasay de Magellanes
Makati City, 1232
Phone No. (632) 854-8383
Fax No. (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.2	302.2	26.92	683.5	04 May 21	10:30 H		
1	28.2	301.2	26.92	683.5		11:30 H		
2	28.1	301.1	26.92	683.5		12:30 H		
3	30.1	303.1	26.88	682.8		13:30 H		
4	29.6	302.6	26.84	682.2		14:30 H		
5	29.2	302.2	26.86	682.2		15:30 H		
6	28.5	301.5	26.86	682.2		16:30 H		
7	28.4	301.4	26.86	682.2		17:30 H		
8	24.8	297.8	26.89	683.0		18:30 H	0.2 lpm	
9	25.0	298.0	26.89	683.0		19:30 H		
10	23.8	296.8	26.91	683.5		20:30 H		
11	23.1	296.1	26.95	684.5		21:30 H		
12	22.9	295.9	26.95	684.5		22:30 H		
13	22.2	295.2	26.93	684.0		23:30 H		
14	21.9	294.9	26.92	683.8	5 May 21	00:30 H		
15	21.7	294.7	26.93	684.0		01:30 H		
16	21.4	294.4	26.88	682.8		02:30 H		
17	21.0	294.0	26.90	683.3		03:30 H		
18	20.9	293.9	26.92	683.8		04:30 H		
19	22.4	295.4	26.93	684.0		05:30 H		
20	22.0	295.0	26.92	683.8		06:30 H		
21	24.5	297.5	26.93	684.0		07:30 H		
22	23.9	296.9	26.95	684.5		08:30 H		
23	28.7	301.7	26.94	684.2		09:30 H		
24	28.8	301.8	26.94	684.2		10:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasco de Magallanes
Makati City, 1232
Phone No: (632) 854-8363
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: Amet - Asia Inc. Date: 5-6 May 2021
Address: Unit 30A, one corporate center, Julia Vargas Ave., cor. Meralco Ave, Pasig
Station No: 10 Location: (AQN10) - Brgy. Kalasungay Zone 1
Start Time: 1730H End Time: 1730H GPS Reading: Latitude 8.165801
Ambient Temperature: 30.8 Longitude 125.113448
Barometric Pressure: 29.51 Weather Condition: Sunny to cloudy
Filter ID No: 21.104 / 21.077 Type of Filter Paper Used: Glassfiber / Quartz Initial Weight: 2.6579 / 4.7966
Sampled Parameters: TSP, PM10, SO2, NO2, Pb, CO, O3, wind speed & direction, noise
Remarks: equipments were set-up in a hilly & grassy ground, 1-2 meters away from the highway, beside the road; approx 8-10 meters away from the Birhen sa lourdes chapel sunny to cloudy weather condition. 1728H burning of dry leaves apprt 10-15 meters away from the sampling point; gensel was used as power source

TSP Sampler
Model: TE-5070X Serial No: 2169 Calibration Date: 04AUG2020

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2240 Calibration Date: 04AUG2020

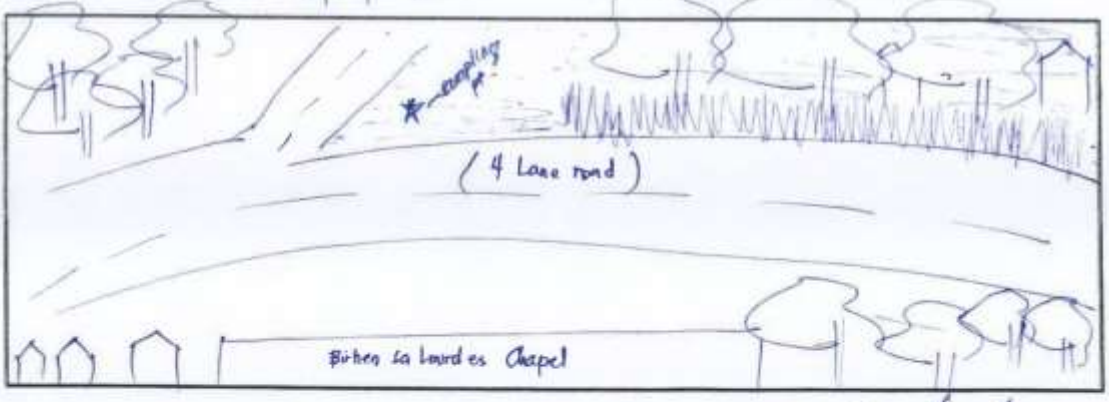
Three (3) Gas Sampler:
Model: M-365-01 Serial No: E8090001 Flow Rate: 0.2 l/min

Barometer/Thermometer:
Model: PHB-318 Serial No: AH-54310 Calibration Date: 29 June 2020

Multi RAE / Air Quality Meter Equipment:
Model: Serial No: Calibration Date:

	TSP	PM10
INITIAL FILTER PRESSURE:	24.0	20
FINAL FILTER PRESSURE:	24.8	19

Carbon Monoxide: data logger
Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	10		Date: 5-6 May 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21077	21-104
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.9966	2.5579
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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Phone No: (632) 854-8365
Fax No: (632) 729-4127

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.8	302.8	27.51	698.8	5 May '21	13:00 H		—
1	29.2	302.2	27.49	698.2		14:00 H		
2	29.3	302.3	27.49	698.2		15:00 H		
3	29.4	302.4	27.49	698.2		16:00 H		
4	29.2	302.2	27.52	699.0		17:00 H		
5	28.1	298.1	27.55	699.8		18:00 H		
6	28.1	298.1	27.55	699.8		19:00 H		
7	24.1	297.1	27.56	700.0		20:00 H		
8	24.2	297.2	27.58	700.5		21:00 H		
9	24.0	297.0	27.58	700.5		22:00 H	0.2	
10	23.8	296.8	27.59	700.5		23:00 H		
11	22.3	295.3	27.61	701.0	6 May '21	00:00 H	4h	
12	22.4	295.4	27.60	701.3		01:00 H		
13	22.1	295.1	27.59	701.0		02:00 H		
14	21.9	294.9	27.57	700.5		03:00 H		
15	21.7	294.7	27.51	700.3		04:00 H		
16	21.5	294.5	27.51	698.8		05:00 H		
17	21.8	294.8	27.60	698.8		06:00 H		
18	27.3	300.3	27.60	700.0		07:00 H		
19	27.5	300.5	27.60	700.0		08:00 H		
20	27.9	300.9	27.58	700.5		09:00 H		
21	29.5	302.5	27.58	700.5		10:00 H		
22	29.8	302.8	27.58	700.5		11:00 H		
23	29.0	302.0	27.54	699.5		12:00 H		
24	29.4	302.4	27.54	699.5		13:00 H		—

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0; 8 May 2018

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San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No. (632) 834-8365
Fax No. (632) 729-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	30.8	303.6	27.51	698.4	5 May '21	13 30 H		
1	30.7	303.2	27.49	698.2		14 30 H		
2	30.7	303.3	27.49	698.2		15 30 H		
3	30.4	303.4	27.49	698.2		16 30 H		
4	25.1 27.2	300.2	27.52	699.0		17 30 H		
5	25.1	298.1	27.55	699.8		18 30 H		
6	25.1	298.1	27.55	699.8		19 30 H		
7	24.1	297.1	27.56	700.6		20 30 H		
8	24.2	297.2	27.58	700.5		21 30 H		
9	24.0	297.0	27.58	700.5		22 30 H	0.2	
10	23.3	296.8	27.59	700.8		23 30 H		
11	22.3	295.3	27.61	701.3	06 May '21	00 30 H	4	
12	22.4	295.4	27.60	701.0		01 30 H		
13	22.1	295.1	27.59	700.8		02 30 H		
14	21.9	294.9	27.57	700.3		03 30 H		
15	21.7	294.7	27.51	698.8		04 30 H		
16	21.5	294.5	27.51	698.8		05 30 H		
17	21.7	299.8	27.60	701.0		06 30 H		
18	27.9	300.7	27.60	701.0		07 30 H		
19	27.5	300.5	27.60	701.0		08 30 H		
20	27.9	300.9	27.58	700.5		09 30 H		
21	29.5	302.5	27.57	700.5		10 30 H		
22	29.8	302.8	27.58	698.5		11 30 H		
23	29.0	302.0	27.58	699.5		12 30 H		
24	29.4	302.4	27.59	699.5		13 30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

HiAdvance Philippines Incorporated (formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro

Station AQN1

Station AQN2

HiAdvance Philippines Incorporated (formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
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Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro

Station AQN3

Station AQN4

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro

Station AQN5

Station AQN6

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro

Station AQN7

Station AQN8

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro

Station AQN9

Station AQN10

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
3F Mega Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

ATTACHMENT 4

- Calibration Certificates
- Planned Sampling Form

Switchtek Measurement Systems

A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave., Bahay Toro, Quezon City, 1100, Philippines
Tel Nos.02 4267591 / 9282869 / 9287769 Fax No.4537694
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.:	4000.24-4941-1-20	**Calibration of**	Air Quality meter
Identification:	HI ADVANCE PHILIPPINES, INC.		
Job:	P1	Test and Calibration	
Fin.acc:	32	Certificate of Calibration	
Done.....:	July 20, 2020	Initials...:	CAC
Categories	Calibration	**Man**	**Hours** / **Total cost** / **Type**
Cal Officer		1	1.0 / - / Certificate

CERTIFICATE OF TEST - AIR QUALITY METER

This report of test shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

Issued To: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

UNIT UNDER TEST (UUT):

Instrument:	Air Quality meter
Brand:	LUTRON
Model No.:	AQ-9001 SD
Serial No.:	Q615895
ID code:	M-AQM-01
Specification:	
	0 to 4000 ppm, CO2
	0 to 1000 ppm, CO
	0 to 90%, O2
	0 to 50 Deg. C, temp.
	5 to 95% RH
	-25.3 to 48.9 Deg. C, dewpoint
	-31.6 to 50 Deg. C, Wetbulb
Calibration Date:	July 15, 2020
Calibration Due:	July 14, 2021

CALIBRATOR INFORMATION:

Instrument:	Calibration Check Gas
Brand:	BW
Contents:	100 ppm, Carbon Monoxide
	18%, O2
	N2 balance
Instrument:	Flow regulator @ 500 cc/min
Brand:	MSA
Traceability:	NIST and NPL
Instrument:	CO2 Gas regulator
	0 to 5 LPM
Brand:	CSL
Instrument:	Calibration gas
Manufacturer:	Chemtron Science Laboratories Pvt. Ltd
Gas Component:	Carbon Dioxide, 5000 ppm
Certified concentratic	4901 ppm (V/V) +/-5%
Accuracy:	± 2%
Gas Component:	Nitrogen 99.5 %(V/V)
Certified concentratic	4901 ppm +/-5%
Accuracy:	± 2%
Reference no.:	CSL-160920-14130-1-1
Traceability:	NIST, NPL
Instrument:	Temperature and Humidity chamber
Model No.:	XB-OTS-34
Serial No.:	20130803
Traceability:	NIST

Environmental Condition:
Condition: DRY/BASIC/NEUTRAL
Relative Humidity: 55 ±5%, 1010 hPa

Ambient Temp. (Deg C): 21.2 ±2

Calibration Method:
By comparative technique, the unit under test was calibrated in reference with a Standard Calibration Gas, Process meter, Standard Platinum resistor, Temperature and humidity chamber. Procedures of test and calibration conform to the requirements of NPL (National Physical Laboratories) NIST and ISO Guide 17025.
Standard error and uncertainty were indicated on the attached sheet.

Remarks:
All data pertain only to the unit described obtained at the time of test. This certificate is not valid without seal and signature. Unauthorized reproduction is prohibited.

Calibrated By: [illegible]
Date: July 15, 2020

Certified By: [illegible] CAINEDOC
Date: [illegible]

Switchtek Measurement Systems
A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave.,
Bahay Toro,Quezon City, 1100, Philippines
Tel Nos.02 4267593 / 9282869 / 9287769 Fax No.4537654
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.: 4000.24-4041-1-20 **Calibration of** Air Quality meter
Identification: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

CERTIFICATE OF TEST - AIR QUALITY METER

This report of test shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

UNIT UNDER TEST (UUT):

Instrument: Air Quality meter **Job order No.:** 4041
Brand: LUTRON
Model No.: AQ-9001 SD
Serial No.: Q615895
ID code: M-AQM-01

Temperature:

REFERENCE READING (°C)	UNIT UNDER TEST READING (°C)	ERROR IN READING (°C)	STANDARD DEVIATION	REMARKS
10.20	10.3	-0.10	0.0707	The user should determine the suitability of the instrument for its intended use.
20.30	20.7	-0.40	0.2828	
30.30	30.7	-0.40	0.2828	
39.10	40.1	-1.00	0.7071	

Standard error: 0.67 Deg. C
Uncertainty: ± 0.80 Deg. C

Relative Humidity:

REFERENCE READING (%)	UNIT UNDER TEST READING (%)	ERROR IN READING (%)	STANDARD DEVIATION	REMARKS
69.00	72.3	-3.30	2.3335	The user should determine the suitability of the instrument for its intended use.
62.00	68.0	-6.00	4.2426	
55.00	57.0	-2.00	1.4142	
45.00	47.0	-2.00	1.4142	

Standard error: 3.04 % RH
Uncertainty: ± 2.50 % RH

Temperature* Pressure* Sound* Gas Detector/Analyzer *Flow *Volume* Weight* RH* Ph* Conductivity *Resistivity *Conductivity *Voltage *Amperes *Tachometer *Frequency Controller *Hygrometer *Glass & Bi-Metal Thermometer *PRV *SRV *TRV *Relief Valve *Recorder *Thermostat *Torque Wrench *Colorimeter *Caliper* Micrometer* Durometer *Refractometer *Multi-tester* Hydrometer* Capacitance & Inductance Meter *Ophthalmometer *Low Ohm meter *Dial Test Gauge *Gauge Block* Ruler* Oxygen Meter* Psychrometer* Viscosity* Dielectric HV Meter* Transformer Turns Ratio* Hi Pot Meter* Capacitance& Dissipation

Switchtek Measurement Systems
A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave.,
Bahay Toro,Quezon City, 1100, Philippines
Tel Nos.02 4267593 / 9282869 / 9287769 Fax No.4537694
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.: 4000.24-4041-1-20 Calibration of Air Quality meter
Identification: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

CERTIFICATE OF TEST - AIR QUALITY METER

This report of test shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

UNIT UNDER TEST (UUT):
Instrument: Air Quality meter Job order No.: 1528
Brand: LUTRON
Model No.: AQ-9001 SD
Serial No.: Q615895
ID code: M-AQM-01

Results: CO

REFERENCE READING - (ppm)	UNIT UNDER TEST READING (ppm)	ERROR IN READING (ppm)	STANDARD DEVIATION	REMARKS
100.00	98.00	(2.00)	1.4142	Passed.

Results: CO2

REFERENCE READING - (ppm)	UNIT UNDER TEST READING (ppm)	ERROR IN READING (ppm)	STANDARD DEVIATION	REMARKS
4000.00	3990.00	(10.00)	7.0711	Passed.

Results: O2

REFERENCE READING - (%)	UNIT UNDER TEST READING (%)	ERROR IN READING (%)	STANDARD DEVIATION	REMARKS
20.90	20.90	0.00	0.0000	Passed.

Temperature* Pressure* Sound* Gas Detector/Analyzer *Flow *Volume* Weight* Rh* Ph* Conductivity *Resistivity *Conductivity *Voltage *Amperes *Kwhmeter *Frequency Controller *Hygrometer *Glass & Bi-Metal Thermometer *PRV *SRV *TRV *Relief Valve *Recorder *Thermostat *Torque Wrench *Calorimeter *Caliper* Micrometer* Durometer *Refractometer *Multi-meter* Hydrometer* Capacitance & Inductance Meter *Tachygrammometer *Low Ohm meter *Dial Test Gauge *Gauge block* Ruler* Oxygen Meter* Psychometer* Vibration* Dielectric kV Meter* Transformer Turns Ratio* Hi Pot Meter* Capacitance& Dissipation

Switchtek Measurement Systems
A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave.,
Bahay Toro,Quezon City, 1100, Philippines
Tel Nos.02 4267593 / 9282869 / 9287769 Fax No. 4537694
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.:	4000.05-4124-1.20	Calibration of	High Volume sampler			
Identification:	HI ADVANCE PHILIPPINES, INC.					
Job:	P1	Test and Verification				
Fin.acc:	32	Certificate of Calibration				
Done.....:	June 18, 2020	Initials...:	CAC			
Categories	Test and Calibration	Men	Hours	Total cost		Type
Cal Officer		2	1.0		-	Certificate

CERTIFICATE OF CALIBRATION - HIGH VOLUME SAMPLER

This report of calibration shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

Issued To: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

UNIT UNDER TEST (UUT):

Instrument:	High Volume sampler
Brand:	TISCH
Model No.:	TSP
ID code:	No record
Instrument:	VFC Motor
Brand:	TISCH
Model No.:	TE-5070X
ID code:	No record
Serial No.:	2169
Calibration Date:	June 15, 2020
Calibration Due:	June 14, 2021

CALIBRATOR INFORMATION:

Instrument:	Digital Manometer	Instrument:	Rotating Vane Anemometer
Manufacturer:	DWYER		
Model No.:	Series 477	Manufacturer:	LUTRON
Serial No.:	Y13-DM23997	Model No:	AM-4206M
Range:	0-10.0 psi	Serial No:	Q432206
Traceability:	NIST	Range:	0 to 30.0 m/s 0 to 50.0 °C
		Origin:	USA
		Calibrated Against:	UKAS, thru Laser Doppler Anemometer

Environmental Condition:
Condition: DRY/BASIC/NEUTRAL
Relative Humidity: 55.0 ±5%, 1010 hPa

Ambient Temp. (Deg C): 21.2 ±2

Calibration Method:

By comparative technique, unit under test was tested in reference with a calibrated rotameter, manometer at planned intervals and was referenced in accordance with NIST, NPL and ISO/IEC Guide 17025. Data were gathered and tabulated.

During calibration, uncertainty of measurement is ± 0.084 m3/min with a confidence level of not less than 95%. Calculations were taken using Standard Deviation Formula.

Result:

TEST	PRESSURE (in H2O)	Qa (m3/min)
1	4.01	1.276
2	4.02	1.278
3	4.04	1.281
4	4.00	1.275
5	4.00	1.275

Remarks:
All data pertain only to the unit described obtained at the time of test. This certificate is not valid w/out seal/signature. Unauthorized reproduction is prohibited.

Calibrated By: [signature] CAC/DAD
Date: June 15, 2020

Certified By: [signature]
Date: June 18, 2020

Temperature* Pressure* Sound* Gas Detectors/Analyzer *Flow *Volume* Weight* RS* PH* Conductivity *Resistivity *Conductivity *Voltage* Amperes *Rotameter *Frequency Controller *Hygrometer *Elem & Bi-Metal Thermometer *PRV *SRV *TRV *Relief Valve *Recorder *Thermostat *Torque Wrench *Calorimeter *Caliper *Micrometer *Durometer *Refractometer *Multimeter* Hydrometer* Capacitance & Inductance Meter *Tachymetermanometer *Line Chrn meter *Dial Test Gauge *Gauge Block* Ruler* Oxygen Meter* Pluviometer* Vibration* Domestic Wt Meter* Transformer Turns Ratio* Hi Pot Meter* Capacitance& Dissipation

Switchtek Measurement Systems
A Division of Switchtek Construction Corporation
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Bahay Toro,Quezon City, 1100, Philippines
Tel Nos.02 4267593 / 9282869 / 9287769 Fax No. 4537694
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.:	4000.05-4301-2.20	Calibration of	High Volume sampler			
Identification:	HI ADVANCE PHILIPPINES, INC.					
Job:	P1	Test and Verification				
Fin.acc:	32	Certificate of Calibration				
Done.....:	August 5, 2020	Initials...:	CAC			
Categories	Test and Calibration	Men	Hours	Total cost		Type
Cal Officer		2	1.0		-	Certificate

CERTIFICATE OF CALIBRATION - HIGH VOLUME SAMPLER

This report of calibration shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

Issued To:	HI ADVANCE PHILIPPINES, INC.
Address:	3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

UNIT UNDER TEST (UUT):

Instrument:	High Volume sampler
Brand:	TISCH
Model No.:	FM10
ID code:	No record
Instrument:	VFC Motor
Brand:	TISCH
Model No.:	TE-5070X
ID code:	No record
Serial No.:	2240
Calibration Date:	August 4, 2020
Calibration Date:	August 3, 2021

CALIBRATOR INFORMATION:

Instrument:	Digital Manometer	Instrument:	Rotating Vane Anemometer
Manufacturer:	DWYER		
Model No.:	Series 477	Manufacturer:	LUTRON
Serial No.:	Y13-OM23997	Model No:	AM-4206M
Range:	0-10.0 psi	Serial No:	Q432206
Traceability:	NIST	Range:	0 to 30.0 m/s 0 to 50.0 °C
		Origin:	USA
		Calibrated Against:	UKAS, thru Laser Doppler Anemometer

Environmental Condition:
Condition: DRY/BASIC/NEUTRAL
Relative Humidity: 44.0 ±5%, 1010 hPa

Ambient Temp. (Deg C): 22.2 ±2

Calibration Method:

By comparative technique, unit under test was tested in reference with a calibrated rotameter, manometer at planned intervals and was referenced in accordance with NIST, NPL and ISO/IEC Guide 17025. Data were gathered and tabulated.

During calibration, uncertainty of measurement is ± 0.087 m3/min with a confidence level of not less than 95%. Calculations were taken using Standard Deviation Formula.

Result:

TEST	PRESSURE (in H2O)	Qa (m3/min)
1	3.8	1.240
2	3.9	1.260
3	4.00	1.280
4	4.00	1.280
5	3.8	1.260

Remarks:

All data pertain only to the unit described obtained at the time of test. This certificate is not valid w/out seal/signature. Unauthorized reproduction is prohibited.

Calibrated By: C.A. CASADO
Date: August 4, 2020

Certified By: [illegible]
Date: August 5, 2020

Temperature* Pressure* Sound* Gas Detector/Analyzer *Flow *Volume* Weight* RH* PH* Conductivity *Resistivity *Conductivity *Voltage *Amperes* Rectimeter *Frequency Controller *Hygrometer *Glass & Bimetal Thermometer *HRV *IRV *TRV *Relief Valve *Recorder *Thermostat *Torque Wrench *Calorimeter *Caliper* Micrometer* Durometer *[illegible]* Hydrometer* Capacitance & Inductance Meter *Sphygmomanometer *Low Ohm meter *Dial Test Gauge *Gauge Block* Ruler* Oxygen Meter* Psychrometer* Vibration* Detector, UV Meter* Transformer Turns Ratio* Hi Pot Meter* Capacitance& Dissipation

Switchtek Measurement Systems

A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave., Bahay Toro, Quezon City, 1100, Philippines
Tel Nos.02 4267503 / 9282869 / 9287769 Fax No. 4537694
email Address: switchtek@pldtdsl.net
www.switchtek.com.ph

Certificate No.:	4000.19-4124-1.20	Calibration of	RAC 3 Gas Sampler			
Identification:	HI ADVANCE PHILIPPINES, INC.					
Job:	P1	Test and Verification				
Fin acc:	32	Certificate of Calibration				
Done.....:	June 11, 2020	Initials..:	CAC			
Categories	Calibration	Man	Hours	Total cost	Type	
Cal Officer		1	1.0	-	Certificate	

CERTIFICATE OF CALIBRATION - PRESSURE

This report of calibration shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

Issued To: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

UNIT UNDER TEST (UUT):

Instrument:	RAC 3 Gas Sampler
Instrument:	Vacuum gauge
Brand:	HOSHOK
Model No.:	No record
Serial No.:	No record
ID code:	M-301-01
Range:	0 in Hg to 30.0 in Hg
Graduation:	0.5 in Hg
Connection:	1/4" NPT(M), bottom
Dial face:	2.5 inches
Instrument:	Flow regulating orifice
Flowrate:	200 ml/min.
Calibration Date:	June 11, 2020
Calibration Due:	June 10, 2021

CALIBRATOR INFORMATION:

Instrument:	Master gauge
Brand:	LA
Model No.:	No record
Serial No.:	E8090001
Range:	0 to 30.0 in Hg
Calibration Due:	November 2020
Calibrated Against:	ASME B40.1, UKAS

Environmental Condition:

Condition: DRY/BASIC/NEUTRAL
Relative Humidity: 55.5 ± 5%, 1010 hPa
Ambient Temp. (Deg C): 21.4 ±2

Calibration Method:

By comparison technique, test pressures were applied at the port, at planned intervals, by a Standard Pressure Calibrator. Procedures of test conducted conform to the requirements of UKAS and NIST in compliance with IEC/ISO Guide 17025. Data were gathered and tabulated.

During calibration, the unit was found to have a standard error of ± 0.57 in Hg with a confidence level of not less than 95%.

Uncertainty of measurement is ± 0.71 in Hg. Calculations were taken using the Standard Deviation Formula.

Reading:

APPLIED PRESSURE (in Hg)	UNIT UNDER TEST READING (in Hg)					REMARKS
	Increasing			Decreasing		
	Before	After	Correction	After	Correction	
0.00	0.0	0.0	0	0.0	0	The user should determine the suitability of the instrument for its intended use.
5.00	4.6	4.6	0.40	4.7	0.30	
10.00	9.8	9.8	0.20	9.8	0.20	
20.00	19.5	19.5	0.50	19.5	0.50	
30.00	29.2	29.2	0.80	29.2	0.80	

Remarks:

All data pertain only to the unit described obtained at the time of test. This certificate is not valid without seal and signature. Unauthorized reproduction is prohibited.

Calibrated By: C.A. CASADO
Date: June 11, 2020

Certified By: [illegible]
Date: June 11, 2020

Switchtek
Measurement Systems
A Division of Switchtek Construction Corporation
4th Floor Northridge Plaza, Annex A, 12 Congressional Ave.,
Bahay Toro, Quezon City, 1100, Philippines
Tel Nos.02 4767593 / 9282869 / 9287769 Fax No.4537694
email Address: switchtekoilers@yahoo.com
www.switchtek.com.ph

Certificate No.:	400.01-4923-2.21	Calibration of		Sound Level Meter		
Identification:	HI ADVANCE PHILIPPINES, INC.					
Job:	P1	Test and Verification				
Fin.acc:	32	Certificate of Calibration				
Done.....:	January 18, 2021	Initials...:	CAC			
Categories	Calibration	Men	Hours	Total cost	Type	
Cal Officer		2	1.0	-	Certificate	

CERTIFICATE OF CALIBRATION - SOUND LEVEL METER

This report of calibration shall document that the instrument herein was examined and tested in compliance with ISO/IEC 17025 against NIST traceable reference standards and its co-equal standards.

Issued To: HI ADVANCE PHILIPPINES, INC.
Address: 3F MEGA CENTER SAN ANTONIO STREET, PASEO DE MAGALLANES, MAKATI, PHILIPPINES

UNIT UNDER TEST (UUT):

Instrument:	Sound Level Meter
Brand:	EXTECH
Model No:	SDL600
Serial No:	H.399668
Range:	35 to 130 dB
ID Code:	No record
Calibration Date:	January 17, 2021
Calibration Due:	January 16, 2022

CALIBRATOR INFORMATION:

Instrument:	Sound Level Calibrator
Brand:	Lutron
Serial No:	I.278821
Model No:	SC-942
Traceability:	IEC 60942 Type II A Standard NIST and NPL

Environmental Condition:

Condition:	DRY/BASIC/NEUTRAL	Ambient Temp. (Deg C):	22.7 ±2
Relative Humidity:	46.2 ±5%, 1010 hPa		

Calibration Method:

By comparative technique, Standard Sound Generator was introduced at the unit under test at a constant value of 94.0 dB to 114 dB at a uniform frequency of 1000 Hz. Data were gathered and tabulated. Procedures of test conform to the requirements of DIML 88 Guidelines, IEC 60942 of the NIST and National Physical Laboratories.

During calibration, the unit was found to have a standard error of ± 0.100 dB with a confidence level of not less than 95%. Uncertainty of measurement is ±0.60 dB. Calculations were taken using the Standard Deviation Formula.

Results:

TRIALS	REFERENCE READING (dB)	UNIT UNDER TEST READING (dB)		ERROR IN READING	STANDARD DEVIATION	REMARKS
		AS FOUND	AS LEFT			
1	94.0	92.8	94.0	0.00	0.0000	Passed
2	114.0	112.9	114.2	0.20	0.1414	

Remarks:

All data pertain only to the unit described obtained at the time of test. This certificate is not valid w/out seal and signature. Unauthorized reproduction is prohibited.

Calibrated By: [illegible]
Date: January 17, 2021

Certified By: [illegible]
Date: January 18, 2021

Temperature* Pressure* Sound* Gas Detector/Analyzer *Flow *Volume* Weight* Rx* Pit* Conductivity *Resistivity *Conductivity *Voltage *Amperes *Kwhmeter *Frequency Controller *Hygrometer *Glass & Bi-Metal Thermometer *PRV *SRV *TRV *Relief Valve *Recorder *Thermostat *Torque Wrench *Calorimeter *Caliper* Micrometer* Dipometer *Refractometer* *Multi-Meter* Hydrometer* Capacitance & Inductance Meter *Sphygmomanometer *Low Ohm meter *Dial Test Gauge *Gauge Block* Ruler* Oxygen Meter* Pearlometer* Vibration* Detector Tester* Transformer Turns Ratio* Hi Pot Meter* Capacitance& Dissipation

Republic of the Philippines
DEPARTMENT OF SCIENCE AND TECHNOLOGY
Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

CALIBRATION CERTIFICATE NO. 084

Series 2020

CUSTOMER NAME AND ADDRESS
HiAdvance Philippines Inc.
Unit 5 Mega Center Bldg, San Antonio St. Paseo de Magallanes, Makati

END USER
HiAdvance Philippines Inc.
Unit 5 Mega Center Bldg, San Antonio St. Paseo de Magallanes, Makati

Type of instrument : Digital Barometer
Range : 960-1060 hPa
Brand : Lutron
Serial Number : AL50424
Body Number : M-DBR-01
Method : Comparative Measurement using Calibration Chamber and Standard Barometer
Date received : 05 June 2020
Date of calibration : 05-08 June 2020

This is to certify that the above instrument was calibrated at the PAGASA Calibration Laboratory of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) of the Department of Science and Technology (DOST) in accordance with the methods prescribed in "PCL-PM-01".

Calibration Results			
Reference Pressure, hPa	Observed Pressure, hPa	Correction, hPa	Uncertainty, hPa (±)
1020.0	1019.0	+1.0	0.16
1010.0	1009.0	+1.0	0.16
1000.0	999.1	+0.9	0.16
980.0	979.0	+1.0	0.16
960.0	959.0	+1.0	0.16

ENVIRONMENTAL CONDITIONS:
Temperature: 21.8 ± 1 °C Relative Humidity: 48% ± 5% RH Pressure: 1002.3 ± 2 hPa

Equipment used in calibration					
Type	Model	Serial Number	Calibration Date	Certificate Number	Issuing Lab/Traceability
Vaisala Barotransmitter	PTB 330	1023/J1440001	May 31, 2019	002 series 2019	PAGASA

Page 1 of 2

UNCERTAINTY OF MEASUREMENT:
The uncertainty stated has been calculated based on a standard uncertainty multiplied by a coverage factor k=2 with confidence level of 95%.
Required achievable measurement uncertainty: 0.15 hPa (refer to WMO - No. 8)

REMARKS:

1. Interpolate between different observed readings and corrections if necessary.
2. Calibration points were as per laboratory recommendation.

Approved Signatory:

Ferdinand Y. Barcenas
Senior Weather Specialist

PCL Reference

Control number:	Calibration performed by:	Calibration released:
0602PCL123007	Michelle M. Familaran Weather Observer I	7 July 2020

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"tracking the sky ...helping the country"

Science Garden Compound, BIR Road, Brgy. Central, Quezon City
Metro Manila, Philippines 1100
Website: http://bagong.pagasa.dost.gov.ph

Tel. No. (632) 8284 0800 (loc. 117)
Tel/Fax No. (632) 8929 2121
Email: imtu@pagasa.dost.gov.ph

Page 2 of 2

HiAdvance

PLANNED SAMPLING FORM

CLIENT: AMET-ASIA, INC.
ADDRESS: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave, Pasig.
TELEPHONE/FAX No: 9153701175

CONTROL N: PSF HPI 2021-194
QUOTATION No :

PROJECT NAME: Ambient Air Monitoring
PROJECT SITE: Cagayan De Oro-Bukidnon
PROJECT MANAGER: Ms. Pamella Andrea L. Pomida
CONTACT No : 9153701175
EMAIL ADD: pam.pomida@amet-asia.com

ANALYSES	NO. OF STATIONS	MATRIX	HOUR	SUBCON LAB
SO2	10	Ambient Air	24 Hours	N/A
NO2	10	Ambient Air	24 Hours	N/A
TSP	10	Ambient Air	24 Hours	N/A
PM10	10	Ambient Air	24 Hours	N/A
Lead	10	Ambient Air	24 Hours	Mach Union
Wind speed and Wind Direction	10	Ambient Air	24 Hours	N/A
Noise	10	Ambient Air	24 Hours	N/A
Carbon Monoxide	10	Ambient Air	8 Hours	N/A
Ozone	10	Ambient Air	8 Hours	Elensi

SAMPLING DATE/TIME: Apri 23 - May 6, 2021
FIELD SAMPLER:
OTHER DETAILS:
☐ INVOICE ☐ OFFICIAL RECEIPT

TAT:
☐ 10 Days
☐ 5-6 Days
☐ 3-4 Days
☐ 1 Day
☐ Others_____

TERM
100 % D.P
50/50%
15 days
30 days
60 days
Others _____

SPECIAL INSTRUCTIONS :

Prepared by: 14 APR 2021

Received by: 14 Apr 2021

Please submit COMPLETED Planned Sampling Form to PMG 2 DAYS before scheduled sampling date.
Please keep lab informed of any changes in schedule, number of samples, or analyses requested.

SAMPLING BOTTLES DISPATCHMENT

BOTTLE REQUEST CONTROL NUMBER:

GATE PASS No:

1

MP-SPL-013-F04
Rev.00; 05 Apr 2018

HiAdvance

FIELD CHECKLIST

Control No: PSF HPI 2021-194
Field sampler (initial and date): Date:

General:

Item List	Complete	Item List	Complete
Chain of Custody		Pencils	
Cooler (w/ Ice packs)		Markers	
Camera		Squirt Bottle	
Resealable Bags		Container Request	
Distilled Water		Planned sampling form	

Sampling Equipment:

Item List	Complete	Item List	Complete
DO Sampler (BOD Bottle)		Buckets	
Thermometer		Water Dipper	
DO meter		Bailers	
pH meter		Water level meter	
Conductivity Meter		Others:	

PPEs:

Item List	Complete	Item List	Complete
Gloves and mask		Hard Hat	
Goggles (Safety Glass)		Safety Shoes	

Checked by (initial and date): _____

SITE DATA SHEET

CLIENT:

SITE LOCATION:

SITE OBSERVATION

_____
_____
_____
_____
_____
_____

Field sampler (initial and date): _____

2

MP-SPL-013-F04
Rev.00; 05 Apr 2018

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)
www.hiadvance.com.ph

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

ATTACHMENT 5

- Test Participants
- Participants Certificate

HiAdvance Philippines Incorporated
(formerly RCALABS Phils., Inc.)
www.hiadvance.com.ph

HiAdvance Philippines Incorporated
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1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

Test Participants

- **AMET Asia Inc.**

  Ms. Pamella Andrea L. Pomida

- **HiAdvance Philippines Incorporated**

Marie Angellina P. Barcebal	-	Team Leader
Mary Grace T. Rivero	-	Project Coordinator
Bobdelon A. Fajardo	-	Field Sampler
Jonathan A. Sotto	-	Field Sampler
Patrocinio Ortega	-	Driver

Republic of the Philippines
DEPARTMENT OF LABOR AND EMPLOYMENT
Occupational Safety and Health Center

OSHC

ISO 9001:2008 Management System

TÜVRheinland CERTIFIED

awards this

Certificate of Completion

to

Marie Angellina P. Barcebal

BOSH OSHC-15-06-06

for having successfully completed the

Basic Occupational Safety and Health Training Course

for *40 hours, in pursuance with the Occupational Safety and Health Standards and DOLE Department Order 16-01*, held at the Occupational Safety and Health Center North Avenue corner Agham Road, Diliman, Quezon City on April 13-17, 2015.

Given this 17th day of April 2015

MA. TERESITA S. CUCUECO, MD, CESO III
Executive Director, OSHC

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for having successfully completed the 40-hour comprehensive training on BASIC OCCUPATIONAL SAFETY AND HEALTH – with 2-hour Training of Trainers on OSH, conducted on September 09-13, 2019, under the seal of Insafety, Inc., and the authority by the Department of Labor and Employment.

This Certificate is given on the 13th day of September 2019 at SAFETY CENTER OF THE PHILIPPINES INC., 128 Sun Valley Drive, Km. 15, West Service Road, South Superhighway, Parañaque City, in compliance with the pertinent implementing rules & regulations of the Labor Code of the Phil. (P.D. 442), as amended.

Engr. Ergesto L. Valenzuela
Senior Resident Safety Consultant
DOLE Accreditation No. 1030-052917-0149

Ms. Regina B. Quiambao
President & General Manager
DOLE Accreditation No.1033-181217-N-1138

• Certificate is NOT VALID without Insafety, Inc. seal

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for having successfully completed the 40-hour comprehensive training on BASIC OCCUPATIONAL SAFETY AND HEALTH – with 2-hr Training of Trainers on OSH, conducted on July 15-19, 2019, under the seal of Insafety, Inc., and the authority by the Department of Labor and Employment.

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Engr. Eugesto L. Valenzuela
Senior Resident Safety Consultant
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Ms. Regina B. Quiambao
President & General Manager
DOLE Accreditation No.1033-181217-N-1138

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High rainfall

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AMBIENT AIR SAMPLING REPORT

Company Name	AMET-Asia Inc.
Address	Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
Project Name	**Ambient Air Monitoring**
Project Site(s)	Cagayan De Oro - Bukidnon
Sampling Date	26th of July to 6th of August, 2021
Contact Person	Ms. Pamelle Andrea L. Pomida

1.0 INTRODUCTION

HiAdvance Philippines, Incorporated (HiAdvance) was contracted by AMET-Asia Inc. to conduct a 24-hours ambient air sampling at their ten (10) sampling points located at Cagayan De Oro and Bukidnon project sites. The sampling activity was conducted last July 26 to August 6, 2021. Sampling was done to determine the concentrations of Nitrogen Dioxide, Sulfur Dioxide, Total Suspended Particulates (TSP), Particulate Matter as PM10, Carbon Monoxide (CO), Ozone (O_3), Pb (Lead), Wind Direction and Wind Speed.

Noise Level was also measured at the sampling locations. The values determined are presented in a separate report.

2.0 METHODOLOGY

Ambient air sampling equipment and analytical procedures used were based on DENR Standards. All supporting field data sheets and calibration record of equipment are provided as attachments. The equipment and procedures are as follows:

Total Suspended Particulates (TSP)
Reference Procedure: USEPA 40 CFR, Part 50, Appendix B
Sampling Equipment: High Volume Sampler
Method of Analysis: Hi Volume Gravimetric Method

Particulate Matter as PM10
Reference Procedure: USEPA 40 CFR, Part 50, Appendix J
Sampling Equipment: High Volume with 10-micron particle-size inlet
Method of Analysis: Hi Volume Gravimetric Method

Nitrogen Dioxide (NO_2)
Reference Procedure: Methods of Air Sampling and Analysis - 3rd ed. / James P. Lodge, Jr.
Sampling Equipment: RAC3 Gas Analyzer\SKC Pump
Method of Analysis: Impinger Griess-Saltzman Reaction Method

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Sulfur Dioxide (SO_2)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix A
Sampling Equipment:	RAC3 Gas Analyzer/SKC Pump
Method of Analysis:	Tetra-chloromercurate (TCM) Absorber –Pararosaniline Colorimetric

Carbon Monoxide (CO)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix C
Sampling Equipment:	Air Quality Meter
Method of Analysis:	Direct Readout (Data logged)

Lead (Pb)

Reference Procedure:	USEPA 40 CFR, Part 50, Appendix G
Sampling Equipment:	High Volume Sampler/Filter
Method of Analysis:	Atomic Absorption Spectroscopy

Ozone (O_3)

Reference Procedure:	Method 411, of Air Sampling and Analysis - 3rd ed. /James P. Lodge, Jr.
Sampling Equipment:	SKC Pump
Method of Analysis:	Colorimetric Method

Wind Direction

Sampling Equipment:	KESTREL 5500L
Method of Analysis:	Direct Readout (Data logged)

Wind Speed

Sampling Equipment:	KESTREL 5500L
Method of Analysis:	Direct Readout (Data logged)

The NO_2 and SO_2 samples were stored in amber bottles and were preserved on a cooler with ice. The samples were submitted and analyzed in the laboratory using a Spectrophotometer. The TSP and PM10 filters were conditioned before undergoing gravimetric analysis. Filter papers for Lead analysis were desiccated before submission to a DENR recognized subcontractor laboratory together with the sample for Ozone analysis. Carbon Monoxide (CO), Wind Direction and Wind Speed were measured using a calibrated air quality meter and weather meter through direct reading.

Stock solutions, standard reagents and other reagents are prepared using chemicals recommended by the reference methods mentioned above.

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3.0 SAMPLING LOCATION

3.1 The estimated location of the sampling stations is briefly described as follows:

Station **AQN1- Brgy. Casinglot Purok Zone 2B**

Latitude: 8.51573 N
Longitude: 124.757969 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a grassy ground rocky ground, approximately 2-3 meters away from the 4-lanes highway
- At exactly 1322H, some people from nearby residential area burned papers and dry leaves (lasted for 20 minutes)
- Sunny with moderate wind blowing,

Station **AQN2- Brgy. Purok 7 Mambatangan**

Latitude: 8.463807 N
Longitude: 124.800563 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a soft soil and rocky ground, 2 meters away the access road where light are vehicles passing by.
- Approximately 50-60 meters away from residential area
- Near where coarse grass grows
- Around 1330H light rain pour down
- Sunny to fair weather condition

Station **AQN3- Zone 4 Alae**

Latitude: 8.463816 N
Longitude: 124.800455 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a soft soil, beside corn trees
- 3-5 meters away from houses
- Passing of motorcycles in the access road approximately 10-15 meters away from the sampling area was observed
- Around 1730H light rain occur
- Sunny to fair weather condition with light rain

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Station **AQN4- Zone 1 Diclum**

Latitude: 8.165051 N
Longitude: 125.127925 E

Remarks/Sampling Environment Conditions:

- Equipment were erected at rocky ground with some grass, set up beside the creek approximately 8-10 meters away
- Approximately 6-7m away from the highway and approximately 5 meters away from the store
- Passing of light to heavy vehicles were observed
- Sunny weather condition

Station **AQN5- Brgy. San Roque Purok 4**

Latitude: 8.329728 N
Longitude: 124.933511 E

Remarks/Sampling Environment Conditions:

- Equipment set up inside school premises, erected at grassy ground
- 15-20 meters away from the access road
- Passing of light vehicles such as motorcycle
- Around 1630H light to heavy rain started
- Sunny with strong wind blowing

Station **AQN6- Brgy. Poblacion**

Latitude: 8.164948N
Longitude: 125.127882 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a grassy surface beside the house approximately 3-5 meters away
- Approximately 5-6 meters away from the highway (four-lanes)
- Around 1700H light rain pour down
- Sunny with light rain weather condition

Station **AQN7- Brgy. Lafortuna Zone 7**

Latitude: 8.266074 N
Longitude: 124.996892 E

Remarks/Sampling Environment Conditions:

- Equipment were set up in a soft and grassy ground, near access road approximately 5-6m away
- Passing of light vehicles, near houses approximately 10-20 meters away
- Around 1600H light rain pour down
- Fair to sunny weather condition

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Station **AQN8- Brgy. Impalutao Zone 3**

Latitude: 8.233374N
Longitude: 125.028934 E

Remarks/Sampling Environment Conditions:

- Sampling station is erected at soil ground
- 4-5m away from the main road
- Near residential area, approximately 3 meters away
- Passing of light to heavy vehicles were observed
- Near 2 lanes main road
- Sunny weather condition

Station **AQN9- Brgy. Patpat Zone 5**

Latitude: 8.195198N
Longitude: 125.053261 E

Remarks/Sampling Environment Conditions:

- Equipment erected at a soft soil ground, near chicken poultry
- Sampling location approximately 3-4 meters away from a four-lanes highway
- Heavy rainfall observed at around 1630H
- Sunny to fair weather condition

Station **AQN10- Brgy. Kalasungay Zone 1**

Latitude: 8.165825 N
Longitude: 125.113326 E

Remarks/Sampling Environment Conditions:

- Sampling point is located near the main highway erected at grassy area
- 5 meters away from the main road
- Frequent passing of light to heavy vehicles were observed, mostly trucks
- Area is also near the corn plantation, generator set as source of electricity
- Sunny weather condition

3.2 **Sampling Period**

- **Twenty-four (24) Hours** for Nitrogen (NO_2), Sulfur Dioxide (SO_2), Total Suspended Particulates (TSP), Particulate Matter 10 micron (PM10) and Lead (Pb)
- **Eight (8) Hours** for Carbon Monoxide (CO) & Ozone (O_3)
- **Twenty-four (24) Hours** for Wind Direction and Wind Speed by Direct read-out (data logged)

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4.0 AMBIENT AIR SAMPLING RESULTS

Below is the ambient air sampling result. All supporting field data, analytical reports and calibration records are provided as attachments.

- **Table 4.1.1. 24-hours Ambient Air Sampling (NO_2, SO_2, TSP & PM10)**

STATION NO.	LOCATION	NO_2 (µg / Nm³)	SO_2 (µg / Nm³)	TSP (µg / Nm³)	PM10 (µg / Nm³)
AQN1	Brgy. Casinglot Purok Zone 2B	5.02	*<11.9**	269	65.6
AQN2	Brgy. Purok 7 Mambatangan	6.20	*<12.2**	54.5	19.7
AQN3	Zone 4 Alae	4.44	*<12.4**	45.8	19.5
AQN4	Zone 1 Diclum	*<3.27**	*<12.5**	103	43.5
AQN5	Brgy. San Roque Purok 4	5.03	*<12.6**	27.6	19.3
AQN6	Brgy. Poblacion	4.50	*<12.6**	59.2	30.0
AQN7	Brgy. Lafortuna Zone 7	5.64	*<12.7**	21.5	10.8
AQN8	Brgy. Impalutao Zone 3	4.91	*<12.9**	63.5	24.5
AQN9	Brgy. Patpat Zone 5	6.25	*<12.8**	184	49.7
AQN10	Brgy. Kalasungay Zone 1	7.19	18.0	73.0	37.6
DENR NAAQSSAP		150	180	230	150
Averaging Time (min)		**1440**	1440	1440	1440

**Values detected are below the laboratory's Method detection limit*

- **Table 4.1.2. 24-hours Ambient Air Sampling (Lead)**

STATION NO.	LOCATION	Lead (µg/Ncm)
AQN1	Brgy. Casinglot Purok Zone 2B	0.0125
AQN2	Brgy. Purok 7 Mambatangan	0.0021
AQN3	Zone 4 Alae	0.00200
AQN4	Zone 1 Diclum	0.00432
AQN5	Brgy. San Roque Purok 4	0.00141

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4.0 AMBIENT AIR SAMPLING RESULTS

Below is the ambient air sampling result. All supporting field data, analytical reports and calibration records are provided as attachments.

- **Table 4.1.1. 24-hours Ambient Air Sampling (NO_2, SO_2, TSP & PM10)**

STATION NO.	LOCATION	NO_2 (µg / Nm³)	SO_2 (µg / Nm³)	TSP (µg / Nm³)	PM10 (µg / Nm³)
AQN1	Brgy. Casinglot Purok Zone 2B	5.02	*<11.9**	269	65.6
AQN2	Brgy. Purok 7 Mambatangan	6.20	*<12.2**	54.5	19.7
AQN3	Zone 4 Alae	4.44	*<12.4**	45.8	19.5
AQN4	Zone 1 Diclum	*<3.27**	*<12.5**	103	43.5
AQN5	Brgy. San Roque Purok 4	5.03	*<12.6**	27.6	19.3
AQN6	Brgy. Poblacion	4.50	*<12.6**	59.2	30.0
AQN7	Brgy. Lafortuna Zone 7	5.64	*<12.7**	21.5	10.8
AQN8	Brgy. Impalutao Zone 3	4.91	*<12.9**	63.5	24.5
AQN9	Brgy. Patpat Zone 5	6.25	*<12.8**	184	49.7
AQN10	Brgy. Kalasungay Zone 1	7.19	18.0	73.0	37.6
DENR NAAQSSAP		150	180	230	150
Averaging Time (min)		**1440**	**1440**	**1440**	**1440**

**Values detected are below the laboratory's Method detection limit*

- **Table 4.1.2. 24-hours Ambient Air Sampling (Lead)**

STATION NO.	LOCATION	Lead (µg/Ncm)
AQN1	Brgy. Casinglot Purok Zone 2B	0.0125
AQN2	Brgy. Purok 7 Mambatangan	0.0021
AQN3	Zone 4 Alae	0.00200
AQN4	Zone 1 Diclum	0.00432
AQN5	Brgy. San Roque Purok 4	0.00141

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AQN6	Brgy. Poblacion	0.00129
AQN7	Brgy. Lafortuna Zone 7	0.00311
AQN8	Brgy. Impalutao Zone 3	0.00215
AQN9	Brgy. Patpat Zone 5	0.00468
AQN10	Brgy. Kalasungay Zone 1	0.00192
STANDARDS (DAO2000-81)		-
Averaging Time (min)		**1440**

- **Table 4.1.3. 24-hour Sampling (Ozone)**

STATION NO.	LOCATION	O_3 (µg/Ncm)
AQN1	Brgy. Casinglot Purok Zone 2B	4.66
AQN2	Brgy. Purok 7 Mambatangan	0.68
AQN3	Zone 4 Alae	10.5
AQN4	Zone 1 Diclum	0.92
AQN5	Brgy. San Roque Purok 4	1.01
AQN6	Brgy. Poblacion	7.69
AQN7	Brgy. Lafortuna Zone 7	<0.69
AQN8	Brgy. Impalutao Zone 3	14.2
AQN9	Brgy. Patpat Zone 5	1.27
AQN10	Brgy. Kalasungay Zone 1	0.77
DENR NAAQGV		**60**
Averaging Time (min)		**480**

- **Table 4.1.4 Data logged (Wind Direction & Wind Speed)**

STATION NO.	Time	Wind Speed (mph)	Average (Direction-True)	Average (Direction-Mag)	Cardinal Direction
AQN1	1000H-1000H	0.3	86.7	86.2	E
AQN2	1130H-1130H	0.3	223	223	SW
AQN3	1500H-1500H	0.0	214	213	SW

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AQN4	1530H-1530H	0.0	135	135	SE
AQN5	1200H-1200H	0.0	266	266	W
AQN6	1330H-1330H	0.3	124	124	SE
AQN7	1410H-1410H	0.6	203	202	SSW
AQN8	1300H-1300H	0.4	175	175	S
AQN9	1450H-1450H	0.3	123	124	SE
AQN10	1515H-1515H	0.2	287	286	WNW

- **Table 4.1.5 - Carbon Monoxide (Data logged)**

Station No.	Time	CO Value (ppm)
AQN1	1000H-1800H	7.0
AQN2	1130-1930H	*ND*
AQN3	1500H-2300H	*ND*
AQN4	1530H-2330H	3.0
AQN5	1200H-2000H	ND
AQN6	1330H-2130H	2.0
AQN7	1410H-2210H	2.0
AQN8	1300H-2100H	1.0
AQN9	1450H-2250H	*ND*
AQN10	1515H-2315H	4.0
DENR NAAQGV		**9**
Averaging Time (min)		**480**

**Note: ND- No Detectable*

5.0 DISCUSSION OF RESULTS

Ambient air quality standards (AAQS) define clean air, and are established to protect even the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health.

The sampling activity was conducted on a sunny, cloudy to windy with light to heavy rain fall weather conditions. Results of NO_2, SO_2, TSP, PM10, Lead and Ozone (8 hrs.) were compared to the National Ambient Air Quality Guideline Value (NAAQGV). *See Table 4.1.1 to Table 4.1.3.* All values for the pollutants identified are below its maximum permissible limits except for the TSP value at station 1.

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The air monitoring of TSP readings at station 1 was influenced by the continuous passing of light to heavy vehicles during the 24-hour monitoring period, which is also a four-lane road, and at precisely 1322H burning of papers and dry leaves was observed from the nearby residential area that lasted for 20 minutes.

Currently, there are no existing limits from DENR for Lead measured for 24 hrs. There are only guidance values available at present for samples taken for 24 hours. *See Table 4.1.2.*

The values from direct reading for Carbon Monoxide (CO) using Air Quality Meter was tabulated in *Table 4.3*. At the time of measurement, Carbon Monoxide concentration measured for all sampling stations did not exceed the standard limit. It must be emphasized, however, that the results are individual measurement during a certain point in time. They should not be considered as a universal condition of the area or process involved.

The KESTREL 5500L was used to determine air movement using a data logger and direct reading. The following wind movement has been detected: coming from the east at Station AQN1, south-west for Stations AQN2 and AQN3 and from south-east for Stations AQN4, AQN6, and AQN9. Furthermore, wind movement at Station AQN5 is from the west, wind movement at Station AQN7 is from the south-southwest, wind movement at Station AQN8 is from the south, and wind movement at Station AQN10 is from the west-northwest as indicated in *Table 4.1.4*.

6.0 CONCLUSION

The results of sampling and analysis for the sampling locations demonstrated that the ambient concentrations of NO_2, SO_2, TSP (Stations 2-10), PM10, Ozone and CO are within the acceptable limits of the standards stipulated in the IRR of the Philippine Clean Air Act. On the other hand, the TSP concentration for station 1 exceeded the standard limit. The Lead (24-hr) are still for further evaluation as there are no existing limits for the specific sampling duration done on the sampling points.

Prepared by:

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Reviewed by:

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Noted by:

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ATTACHMENT 1

- Computation of Ambient Air Parameters
  - Nitrogen Dioxide
  - Sulfur Dioxide
  - Total Suspended Particulates (TSP)
  - Particulate Matter as PM10
  - Lead
  - Ozone

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	480	1.0	0.443	0.34	0.77

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	1440	1.218	1617.2	3.10	0.00192

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ , = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	1440	1.165	1546.8	58100	37.6

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	1440	1.218	1617.2	118100	73.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = Q_a \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	1440	0.2	0.2657	4.78	18.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	In. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN10	25.2	298.2	27.62	701.6	05-06 Aug 2021	1515H-1515H	1440	0.2	0.2657	1.911	7.19

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	480	1.0	0.434	0.55	1.27

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass	Concentration
										Pb	Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	1440	1.215	1580.8	7.40	0.00468

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{,} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	1440	1.158	1506.6	74900	49.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	1440	1.215	1580.8	290200	184

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{\text{[illegible]}} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	1440	0.2	0.2602	*0.512*	*<12.8*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				L/min	Vmstd, Nm^3	µg	µg/Ncm
AQN9	25.4	298.4	27.07	687.5	04-05 Aug 2021	1450H-1450H	1440	0.2	0.2602	1.63	6.25

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	480	1.0	0.430	6.10	14.2

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{min} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	1440	1.223	1578.8	3.40	0.00215

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ . = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	1440	1.167	1506.5	36900	24.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	1440	1.223	1578.8	100200	63.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	1440	0.2	0.2582	0.682	<12.9

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN8	27.6	300.6	27.06	687.3	01-02 Aug 2021	1300H-1300H	1440	0.2	0.2582	1.268	4.91

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume		Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³		µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	480	1.0	0.438	<	0.30	<0.69

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{ai}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = ("O_3" \ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	1440	1.224	1607.7	5.00	0.00311

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{t} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{.} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	1440	1.167	1532.8	16500	10.8

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	1440	1.224	1607.7	34600	21.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	1440	0.2	0.2627	0.853	<12.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K [25°C + 273]
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN7	25.1	298.1	27.30	693.4	03-04 Aug 2021	1410H-1410H	1440	0.2	0.2627	1.482	5.64

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.79	705.8	02-03 Aug 2021	1330H-1330H	480	1.0	0.443	3.41	7.69

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mas s)/V\_(m(std))$$

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Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.79	705.8	02-03 Aug 2021	1330H-1330H	1440	1.223	1625.6	2.10	0.00129

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{.} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance
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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.79	705.8	02-03 Aug 2021	1330H-1330H	1440	1.167	1551.2	46600	30.0

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN6	26.7	299.7	27.79	705.8	02-03 Aug 2021	1330H-1330H	1440	0.2	0.2660	0.85	<12.6

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass	Concentration
										TSP	TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN6	26.7	299.7	27.79	705.8	02-03 Aug 2021	1330H-1330H	1440	1.223	1625.6	96300	59.2

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mm Hg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN6	26.7	299.7	27.79	706.8	02-03 Aug 2021	1330H-1330H	1440	0.2	0.2660	1.20	4.50

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

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Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQNS	26.2	299.2	27.76	705.2	31 Jul-01 Aug 202	1200H-1200H	480	1.0	0.444	0.45	1.01

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = ("O_3" \ mass)/V\_(m(std))$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.2	299.2	27.76	705.2	31 Jul-01 Aug 202	1200H-1200H	1440	1.222	1626.1	2.30	0.00141

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{,} = \frac{Pbmass}{V_{m(std)}}$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.2	299.2	27.76	705.2	31 Jul-01 Aug 2021	1200H-1200H	1440	1.156	1538.2	29700	19.3

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{T} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.2	299.2	27.76	705.2	31 Jul-01 Aug 2021	1200H-1200H	1440	1.222	1626.1	44800	27.6

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{T} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN5	26.2	299.2	27.76	705.2	31 Jul-01 Aug 2021	1200H-1200H	1440	0.2	0.2661	*1.194*	<12.6

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN5	26.2	299.2	27.76	705.2	31 Jul-01 Aug 2021	1200H-1200H	1440	0.2	0.2661	1.339	5.03

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	In. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	480	1.0	0.444	0.41	0.92

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{min} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	1440	1.226	1633.8	7.05	0.00432

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{act}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{.} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	1440	1.169	1557.8	67800	43.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass	Concentration
										TSP	TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	1440	1.226	1633.8	168700	103

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	1440	0.2	0.2665	3.07	<12.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				L/min	Vmstd, Nm^3	µg	µg/Ncm
AQN4	29.4	302.4	28.10	713.7	29-30 Jul 2021	1530H-1530H	1440	0.2	0.2665	0.696	<3.27

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.4	28-29 Jul 2021	1500H-1500H	480	1.0	0.450	4.73	10.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm³
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm³

$$O_3 conc. = (\text{"}O_3\text{"}\ mass)/V\_(m(std))$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.4	28-29 Jul 2021	1300H-1300H	1440	1.224	1650.6	3.30	0.00200

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc. = \frac{Pbmass}{V_{m(std)}}$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.3	28-29 Jul 2021	1500H-1500H	1440	1.171	1579.1	30800	19.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm[std] = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.4	28-29 Jul 2021	1500H-1500H	1440	1.224	1650.6	75600	45.8

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.4	28-29 Jul 2021	1500H-1500H	1440	0.2	0.2697	0.51	<22.4

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2\,conc. = \frac{SO_2\,mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN3	27.8	300.8	28.28	718.4	28-29 Jul 2021	1500H-1500H	1440	0.2	0.2697	1.20	4.44

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm^3	µg	µg/Ncm
AQN2	29.1	302.1	28.80	731.6	27-28 Jul 2021	1130H-1130H	480	1.0	0.456	0.31	0.68

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min

Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = ("O_3" \ mass)/V\_(m(std))$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	29.1	302.1	28.80	731.5	27-28 Jul 2021	1130H-1130H	1440	1.236	1690.0	3.50	0.0021

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc_{,} = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass	Concentration
										PM10	PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN2	29.1	302.1	28.80	731.6	27-28 Jul 2021	1130H-1130H	1440	1.177	1609.3	31700	19.7

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
ACN2	29.1	302.1	28.80	731.6	27-28 Jul 2021	1130H-1130H	1440	1.236	1690.0	92100	54.5

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN2	29.1	302.1	28.80	731.6	27-28 Jul 2021	1130H-1130H	1440	0.2	0.2735	*1.53*	*<12.2*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

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STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-Asia Inc.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN2	29.1	302.1	28.80	731.5	27-28 Jul 2021	1130H-1130H	1440	0.2	0.2735	1.697	6.20

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standar ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

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Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT O_3 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass O_3	Concentration O_3
	°C	K	In. Hg	mmHg				Li/min	Vmstd, Nm^3	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	26-27 Jul 2021	1000H-1000H	480	1.000	0.4680	2.18	4.66

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
O_3 mass = mass of Ozone, µg
O_3 conc. = Ozone concentrations, µg/Nm^3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. O_3 concentration, µg/Nm^3

$$O_3 conc. = ("O_3" \ mass)/V\_(m(std))$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT Pb SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass Pb	Concentration Pb
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	26-27 Jul 2021	1000H-1000H	1440	1.239	1739.4	21.7	0.0125

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
Pb mass = mass of lead, µg
Pbconc. = Lead concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. Pb concentration, µg/Nm3

$$Pbconc\ , = \frac{Pbmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT PM10 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass PM10	Concentration PM10
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	23-24 Apr 2021	1020H-1020H	1440	1.180	1656.6	108600	65.6

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
PM10 mass = mass of particulate matter 10, µg
PM10 conc. = Particulate Matter 10 concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:

a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. PM10 concentration, µg/Nm3

$$PM10conc = \frac{PM10mass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT TSP SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass TSP	Concentration TSP
	°C	K	in. Hg	mmHg				m3/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	23-24 Apr 2021	1020H-1020H	1440	1.239	1739.4	467800	269

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minutes
Vm(std) = sampled volume corrected to standard conditions, Nm3
TSP mass = mass of total suspended particulates, µg
TSPconc. = Total Suspended Particulates concentrations, µg/Nm3
Qa = actual flowrate , m3/min
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_{AL}}{} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. TSP concentration, µg/Nm3

$$TSPconc. = \frac{TSPmass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT SO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass SO_2	Concentration SO_2
	°C	K	in. Hg	mmHg				L/min	Vmstd, Nm^3	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	26-27 Jul 2021	1000H-1000H	1440	0.2	0.2808	*0.68*	*<11.9*

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
SO2 mass = mass of sulfur dioxide, µg
SO2 conc. = sulfur dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. SO2 concentration, µg/Nm3

$$SO_2 conc. = \frac{SO_2 mass}{V_{m(std)}}$$

HiAdvance
Philippines Incorporated

STANDARDIZED SAMPLE VOLUMES
FOR 24-HOUR AMBIENT NO2 SAMPLING
PROJECT NAME: Ambient Air Monitoring
COMPANY NAME : AMET-ASIA, INC.

Station	Ambient Temperature (T)		Barometric Pressure (Pbar)		Sampling Date	Sampling Time	Sampling Duration (t,minutes)	Flow Rate	Standard Volume	Mass NO_2	Concentration NO_2
	°C	K	in. Hg	mmHg				Li/min	Vmstd, Nm³	µg	µg/Ncm
AQN1	30.2	303.2	29.68	753.8	26-27 Jul 2021	1000H-1000H	1440	0.2	0.2808	1.411	5.02

A. Nomenclature (Terms are listed by the order of their appearance in the table above)
T = ambient temperature, K
Pbar = barometric pressure, mm Hg
t = total sampling time, minute
Qa = actual flowrate through the orifice, fixed at 0.2 lpm
Vm(std) = sampled volume corrected to standard conditions, Nm3
NO2 mass = mass of nitrogen dioxide, µg
NO2 conc. = nitrogen dioxide concentrations, µg/Nm3
1,000 = conversion from liters to m3
Philippine Standard Pressure and Temperature
298 = Standard ambient temperature, K (25°C + 273)
760 = Standard atmospheric pressure, mm Hg

B. Formulas used in Calculations:
a. Total volume of air sampled, corrected to standard condition (Nm3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

b. NO2 concentration, µg/Nm3

$$NO_2 conc. = \frac{NO_2 mass}{V_{m(std)}}$$

HiAdvance Philippines Incorporated
(formerly RC&LABS Phils., Inc.)

HiAdvance Philippines Incorporated
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

ATTACHMENT 2

- Certificate of Laboratory Analysis

HiAdvance

HiAdvance Philippines

HiAdvance Philippines Incorporated
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Fax No : +632.854.8365
philippines@hiadvance.com

SUMMARY REPORT

Amet Asia, Inc.

Unit 303, One Corporate Center, Julia Vargas Ave. Cor.
Meralco Ave., Pasig, PHILIPPINES

Project: Ambient Air Monitoring
Project Number: [none]
Project Manager: Ms. Pamelle Andrea L. Pomida

SAMPLED : 26-Jul-21 to 06-Aug-21
RECEIVED: 10-Aug-21
ANALYZED: 10-Aug-21 to 24-Aug-21
REPORTED: 24-Aug-21 18:31

LAB #	M21H151-01	M21H151-02	M21H151-03	M21H151-04	M21H151-05		
MATRIX	Ambient Air	Ambient Air	Ambient Air	Ambient Air	Ambient Air		
SAMPLE ID	Stn 1 AQN1	Stn 2 AQN2	Stn 3 AQN3	Stn 4 AQN4	Stn 5 AQN5		
Parameters							
Total Suspended Particulates, TSP	**269**	**54.5**	**45.8**	**103**	**27.6**	µg/Ncm	High Volume – Gravimetric Metho
Nitrogen Dioxide	**5.02**	**6.20**	**4.44**	*<3.27**	**5.03**	µg/Ncm	Griess- Saltzman Method
Sulfur Dioxide	*<11.9**	*<12.2**	*<12.4**	*<12.5**	*<12.6**	µg/Ncm	Pararosaniline Method
Particulate Matter 10 Micron, PM10	**65.6**	**19.7**	**19.5**	**43.5**	**19.3**	µg/Ncm	High Volume – Gravimetric Metho

Special Notes
** Values detected are below the laboratory's Method Detection Limit*

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared by
Annabelle Bangoy
Project Manager

Certified Correct by
Princess Galvez, RCh
Laboratory Manager

Page 1 of 1

HiAdvance

HiAdvance Philippines

HiAdvance Philippines Incorporated
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philippines@hiadvance.com

SUMMARY REPORT

Amet Asia, Inc.

Unit 303, One Corporate Center, Julia Vargas Ave. Cor.
Meralco Ave., Pasig, PHILIPPINES

Project: Ambient Air Monitoring
Project Number: [none]
Project Manager: Ms. Pamelle Andrea L. Pomida

SAMPLED : 26-Jul-21 to 06-Aug-21
RECEIVED: 10-Aug-21
ANALYZED: 10-Aug-21 to 24-Aug-21
REPORTED: 24-Aug-21 18:31

LAB #	M21H1S1-06	M21H1S1-07	M21H1S1-08	M21H1S1-09	M21H1S1-10		
MATRIX	Ambient Air	Ambient Air	Ambient Air	Ambient Air	Ambient Air		
SAMPLE ID	Stn 8 AQN8	Stn 6 AQN6	Stn 7 AQN7	Stn 9 AQN9	Stn 10 AQN10		
Parameters							
Total Suspended Particulates, TSP	**63.5**	**59.2**	**21.5**	**184**	**73.0**	µg/Ncm	High Volume – Gravimetric Metho
Nitrogen Dioxide	**4.91**	**4.50**	**5.64**	**6.25**	**7.19**	µg/Ncm	Griess- Saltzman Method
Sulfur Dioxide	*<12.9**	*<12.6**	*<12.7**	*<12.8**	**18.0**	µg/Ncm	Pararosaniline Method
Particulate Matter 10 Micron, PM10	**24.5**	**30.0**	**10.8**	**49.7**	**37.6**	µg/Ncm	High Volume – Gravimetric Metho

Special Notes
** Values detected are below the laboratory's Method Detection Limit*

HiAdvance Philippines Incorporated

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Report Prepared by
Annabelle Bangoy
Project Manager

Certified Correct by
Princess Galvez, RCh
Laboratory Manager

Page 2 of 2

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

TSP	M21H151-01	M21H151-02	M21H151-03	M21H151-04	M21H151-05
Pressure, inHg	29.68	28.80	28.28	28.10	27.76
Temperature, °C	30.2	29.1	27.8	29.4	26.2
Flowrate, m^3/min	1.239	1.236	1.224	1.226	1.222
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1739.4	1690.0	1650.6	1633.8	1626.1
µg TSP (MDL = 1665)	467800	92100	75600	168700	44800
Concentration, µg/Ncm	269	54.5	45.8	103	27.6

NO_2	M21H151-01	M21H151-02	M21H151-03	M21H151-04	M21H151-05
Pressure, inHg	29.68	28.80	28.28	28.10	27.76
Temperature, °C	30.2	29.1	27.8	29.4	26.2
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2808	0.2735	0.2697	0.2665	0.2661
µg NO_2 (MDL 24hrs=0.871)	1.41	1.70	1.20	*0.696*	1.34
Concentration, µg/Ncm	5.02	6.20	4.44	*2.61*	5.03
Reported as less than, ug/Ncm				*3.27*	

SO_2	M21H151-01	M21H151-02	M21H151-03	M21H151-04	M21H151-05
Pressure, inHg	29.68	28.80	28.28	28.10	27.76
Temperature, °C	30.2	29.1	27.8	29.4	26.2
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2808	0.2735	0.2697	0.2665	0.2661
µg SO_2 (MDL 24hrs=3.34)	*0.682*	*1.53*	*0.512*	*3.07*	*1.19*
Concentration, µg/Ncm	*2.43*	*5.61*	*1.90*	*11.5*	*4.49*
Reported as less than, ug/Ncm	*11.9*	*12.2*	*12.4*	*12.5*	*12.6*

Note: Values in italics are less than the laboratory's Method Detection Limit

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

PM10	M21H151-06	M21H151-07	M21H151-08	M21H151-09	M21H151-10
Pressure, inHg	27.06	27.79	27.30	27.07	27.62
Temperature, °C	27.6	26.7	25.1	25.4	25.2
Flowrate, m^3/min	1.167	1.167	1.167	1.158	1.165
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1506.5	1551.2	1532.8	1506.6	1546.8
µg PM10 (MDL= 1972)	36900	46600	16500	74900	58100
Concentration, µg/Ncm	24.5	30.0	10.8	49.7	37.6

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

TSP	M21H151-06	M21H151-07	M21H151-08	M21H151-09	M21H151-10
Pressure, inHg	27.06	27.79	27.30	27.07	27.62
Temperature, °C	27.6	26.7	25.1	25.4	25.2
Flowrate, m^3/min	1.223	1.223	1.224	1.215	1.218
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1578.8	1625.6	1607.7	1580.8	1617.2
µg TSP (MDL = 1665)	100200	96300	34600	290200	118100
Concentration, µg/Ncm	63.5	59.2	21.5	184	73.0

NO_2	M21H151-06	M21H151-07	M21H151-08	M21H151-09	M21H151-10
Pressure, inHg	27.06	27.79	27.30	27.07	27.62
Temperature, °C	27.6	26.7	25.1	25.4	25.2
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2582	0.2660	0.2627	0.2602	0.2657
µg NO_2 (MDL 24hrs=0.871)	1.27	1.20	1.48	1.63	1.91
Concentration, µg/Ncm	4.91	4.50	5.64	6.25	7.19

SO_2	M21H151-06	M21H151-07	M21H151-08	M21H151-09	M21H151-10
Pressure, inHg	27.06	27.79	27.30	27.07	27.62
Temperature, °C	27.6	26.7	25.1	25.4	25.2
Flowrate, L/min	0.2	0.2	0.2	0.2	0.2
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Vm	0.2582	0.2660	0.2627	0.2602	0.2657
µg SO_2 (MDL 24hrs=3.34)	*0.682*	*0.853*	*0.853*	*0.512*	4.78
Concentration, µg/Ncm	*2.64*	*3.21*	*3.25*	*1.97*	18.0
Reported as less than, ug/Ncm	*12.9*	*12.6*	*12.7*	*12.8*	

Note: Values in italics are less than the laboratory's Method Detection Limit

HiAdvance Philippines Incorporated

Data Summary for Ambient Air Analysis

PM10	M21H151-01	M21H151-02	M21H151-03	M21H151-04	M21H151-05
Pressure, inHg	29.68	28.80	28.28	28.10	27.76
Temperature, °C	30.2	29.1	27.8	29.4	26.2
Flowrate, m^3/min	1.180	1.177	1.171	1.169	1.156
Sampling Duration, min	1440	1440	1440	1440	1440
Pressure, STD	29.92	29.92	29.92	29.92	29.92
Temperature, STD	298	298	298	298	298
Volume of Air, Nm^3	1656.6	1609.3	1579.1	1557.8	1538.2
µg PM10 (MDL= 1972)	108600	31700	30800	67800	29700
Concentration, µg/Ncm	65.6	19.7	19.5	43.5	19.3

ELARSI, INC.

Unit 201-203 & 406 Rizalina Annex Bldg. 1677 Quezon Avenue, Quezon City
Tel. No. 8927-77-15 Fax No. 8929-4824 Email: info@elarsi.com

CLIENT	: **HI ADVANCE PHIL. INC**	Lab. Report No.	: 212319-AA
ADDRESS	: 3rd Floor, Maga Center Bldg., Paseo de Magallanes, Makati	Date Sampled	: 06-27-21 to 08-06-21
		Date Received	: 08-13-21
Contact Number	: 8854-8365	Date Analyzed	: 08-13-21
Nature of Sample/s	: Ambient Air Sample	Date Reported	: 08-20-21
No. of Sample/s Submitted	: Eleven (11)		

[REPORT OF ANALYSES]

Sample No.	Sample ID	Ozone (O_3), µg[a]
ES-2111535	M21H151-01 - AQN1	2.18
ES-2111536	M21H151-02 - AQN2	0.31
ES-2111537	M21H151-03 - AQN3	4.73
ES-2111538	M21H151-04 - AQN4	0.41
ES-2111539	M21H151-05 - AQN5	0.45
ES-2111540	M21H151-06 - AQN8	6.10
ES-2111541	M21H151-07 - AQN6	3.41
ES-2111542	M21H151-08 - AQN7	< 0.30
ES-2111543	M21H151-09 - AQN9	0.55
ES-2111544	M21H151-10 - AQN10	0.34
ES-2111544A	M21H151 - Blank	< 0.30

[a] - Method 411 / Colorimetric

Reference:
James P. Lodge, Methods for Ambient Air Sampling & Analysis, 3rd edition

Analyzed By:	Checked By:	Certified Correct By:
MARINELLA FRANCESCA S. CARLOS, RChT	**JULIE CHRISTILLE HAPPY G. MORTE, RCh**	**RENATO M. GOFREDO, JR., RCh**
Laboratory Chemical Technician	Laboratory Supervisor	Laboratory Manager
PRC Lic. No. 0003462	*PRC Lic. No. 0012578*	*PRC Lic. No. 0009824*

Test results reflect the quality of the samples as received.

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DENR RECOGNIZED LABORATORY C.R. No. 005/2018

DOH ACCREDITED LABORATORY 13-008-2123-LW-2

Page 1 of 1 Page/s

EI_HRAFORM_10

MACH UNION LABORATORIES INC.

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Extension Office: Anfra Bldg., FMC-LTO Cmpd., 314 Alabang-Zapote Road, Talon 1, 1740 Las Piñas City
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Email: info@machunion.com • Website: www.machunion.com
Accredited: Philippine Accreditation Bureau (PhilAB) • Department of Health (DOH) • Food & Drugs Administration (FDA)
Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (BAI)

Result of Analysis

Job Number: MU21030184 Laboratory Number MU21030184-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 08/06/2021 Analyzed Date: 08/13/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Mach Union Water Laboratory, Inc. does not guarantee that sample(s) submitted is (are) representative of the whole bulk from where it/they was (were) taken. Reproduction of this report is not authorized except in full, without written approval of the laboratory.

Sample ID	Analyte	Method	Units	Result
M21H151 - 10 C	Lead	Flame AAS	ug	3.10

References:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA. 1999

**Customer/s is/are given (7) days upon receipt of report to question any discrepancies (i.e. customer name & address, sample description, result, etc.)
This document has been signed by those names that appear on this report and are the authorised signatories.

Checked by:
Katrina D. Pajulayan, RCh
Chemist
PRC#: 0013681

Certified by:
Marisa T. Mandor, RCh
Supervising Chemist
PRC#: 0005465

Noted by:
Aladino M. Abulencia, ChE
Technical Manager

MU21030184_FINAL_210819 13331

Page 1 of 1

Annexes

MACH UNION LABORATORIES INC.

Main Office: Mach Union Building, 335 Alabang-Zapote Road, Talon 3, 1740 Las Piñas City, Philippines
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Tel. No.: (02) 8553-8381 / (02) 8553-8382 / (02) 8553-8879 / (02) 8550-2573 Fax No.: (02) 8553-8878
Email: info@machunion.com • Website: www.machunion.com
Accredited: Philippine Accreditation Bureau (DTI-PAB) • Department of Health (DOH) • Food & Drugs Administration (FDA)
Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21030183 Laboratory Number MU21030183-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 08/05/2021 * Analyzed Date: 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 09 C	Lead	Flame AAS	ug	7.40

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air, US EPA, 1999

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This document has been signed by those names that appear on this report and are the authorised signatories.

Checked by:
Katrina [illegible] Pagulayan, RCh
Chemist
PRC#: 0013681

Certified by:
Marisa [illegible] Mansor, RCh
Supervising Chemist
PRC#: 0005465

Noted by:
Aladino M. Abulencia, ChE
Technical Manager

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Annexes

MACH UNION LABORATORIES INC.

Main Office: Mach Union Building, 335 Alabang-Zapote Road, Talon 3, 1740 Las Piñas City, Philippines
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Email: info@machunion.com • Website: www.machunion.com
Accredited: Philippine Accreditation Bureau (DTI-PAB) • Department of Health (DOH) • Food & Drugs Administration (FDA)
Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number:	MU21030182	Laboratory Number	MU21030182-001	Date:	08/19/2021
Customer:	NCRMKT-000089 HIADVANCE PHILIPPINES, INC.				
Address:	3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City				

Date Sampled:	08/04/2021 *	Analyzed Date:	08/14/2021
Date Received:	08/13/2021		
Sample Description:	Air Ambient Sample in Filter Paper		

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 08 C	Lead	Flame AAS	ug	5.0

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air, US EPA, 1999

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Checked by:	Certified by:	Noted by:
Kathleen Pagulayan, RCh	Marisa T. Manaor, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC#: 0013681	PRC#: 0005465	

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number:	MU21030181	Laboratory Number	MU21030181-001	Date:	08/19/2021
Customer:	NCRMKT-000089 HIADVANCE PHILIPPINES, INC.				
Address:	3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City				

Date Sampled:	08/03/2021 *	Analyzed Date:	08/14/2021
Date Received:	08/13/2021		
Sample Description:	Air Ambient Sample in Filter Paper		

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 07 C	Lead	Flame AAS	ug	2.10

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA. 1999

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Checked by:	Certified by:	Noted by:
Katrina M. Pagulayan, RCh	Marisa Y. Mansor, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC#: 0013681	PRC#: 0005465	

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Accredited: Philippine Accreditation Bureau (DTI-PAB) • Department of Health (DOH) • Food & Drugs Administration (FDA)
Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21030180 Laboratory Number MU21030180-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 08/02/2021 * Analyzed Date: 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 06 C	Lead	Flame AAS	ug	3.40

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA. 1999

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Checked by:	Certified by:	Noted by:
Kathleen P. Paqulayan, RCh	Marina T. Macalo, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC#: 0013681	PRC#: 0005465	

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21030179 Laboratory Number MU21030179-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 08/01/2021 * Analyzed Date: 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 05 C	Lead	Flame AAS	ug	2.30

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA. 1999

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Checked by:	Certified by:	Noted by:
Katrina M. Pagulayan, RCh	Marita T. Manaor, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21030178 Laboratory Number MU21030178-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 07/30/2021 * Analyzed Date: 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
MZ1H151 - 04 C	Lead	Flame AAS	ug	7.05

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA, 1999

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Checked by:	Certified by:	Noted by:
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PRC#: 0013681	PRC#: 0006465	

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number: MU21030177 Laboratory Number MU21030177-001 Date: 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 07/29/2021 * Analyzed Date: 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 03 C	Lead	Flame AAS	ug	3.30

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air, US EPA, 1999

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Checked by:
Katrina M. Pagulayan, RCh
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Certified by:
Marisa T. Mansor, RCh
Supervising Chemist
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Aladino M. Abulencia, ChE
Technical Manager

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (BA-BAI)

Result of Analysis

Job Number: MU21030176 **Laboratory Number** MU21030176-001 **Date:** 08/19/2021
Customer: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
Address: 3rd Flr. Unit 5&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City

Date Sampled: 07/28/2021 * **Analyzed Date:** 08/14/2021
Date Received: 08/13/2021
Sample Description: Air Ambient Sample in Filter Paper

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 02 C	Lead	Flame AAS	ug	3.50

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA, 1999

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Checked by:	Certified by:	Noted by:
Katrina C. Pagulayan, RCh	Marlon M. Malinao, RCh	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC# 0013881	PRC# 0005465	

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Annexes

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Recognized: Department of Environment & Natural Resources (DENR-EMB) • Bureau of Animal Industry (DA-BAI)

Result of Analysis

Job Number:	MU21030175	Laboratory Number	MU21030175-001	Date:	08/19/2021
Customer:	NCRMKT-000089 HIADVANCE PHILIPPINES, INC.				
Address:	3rd Flr. Unit 6&6 Maga Center Bldg., San Antonio St., Paseo De Magallanes, Makati City				

Date Sampled:	07/27/2021 *	Analyzed Date:	08/14/2021
Date Received:	08/13/2021		
Sample Description:	Air Ambient Sample in Filter Paper		

Analysis are based on sample (s) of: NCRMKT-000089 HIADVANCE PHILIPPINES, INC.
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Sample ID	Parameters	Method	Units	Result
M21H151 - 01 C	Lead	Flame AAS	ug	21.7

Reference:
Compendium of Methods for the Determination of Inorganics Compound in Ambient Air. US EPA. 1999

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Checked by:	Certified by:	Noted by:
Kathryn [illegible] Pagulayan, RCh	[illegible]	Aladino M. Abulencia, ChE
Chemist	Supervising Chemist	Technical Manager
PRC#: 0013681	PRC#: 0005485	

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(formerly NCALABS Phils., Inc.)

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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

ATTACHMENT 3

- Field Data Sheet
- Sampling Pictures

HiAdvance Philippines, Inc.
3rd floor Mega Center
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 834-8163
Fax No: (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	26.7	299.7	27.56	700.6	05 Aug '21	15:15 H		
1	26.2	299.2	27.58	700.5		16:15 H		
2	26.1	299.1	27.58	700.5		17:15 H		
3	25.5	298.5	27.57	700.3		18:15 H		
4	24.7	297.7	27.59	700.8		19:15 H		
5	24.8	297.8	27.59	700.8		20:15 H		
6	24.0	297.0	27.62	701.5		21:15 H		
7	24.2	297.2	27.62	701.5		22:15 H		
8	22.9	295.9	27.66	702.6		23:15 H		
9	22.7	295.7	27.66	702.6	06 Aug '21	24:15 H		
10	22.7	295.7	27.64	702.1		01:15 H		
11	22.6	295.6	27.64	702.1		02:15 H		
12	22.7	295.7	27.63	701.8		03:15 H		
13	22.4	295.4	27.64	702.1		04:15 H		
14	22.1	295.1	27.64	702.1		05:15 H		
15	22.1	295.1	27.63	701.8		06:15 H		
16	23.9	296.9	27.64	702.1		07:15 H		
17	24.8	297.8	27.64	702.1		08:15 H		
18	26.4	299.4	27.66	702.6		09:15 H		
19	28.5	301.5	27.64	702.1		10:15 H		
20	28.7	301.7	27.64	702.1		11:15 H		
21	27.4	300.4	27.64	702.1		12:15 H		
22	27.6	300.6	27.62	701.5		13:15 H		
23	29.3	302.3	27.61	701.3		14:15 H		
24	29.6	302.6	27.61	701.3		15:15 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No. (632) 854-8383
Fax No. (632) 759-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	26.7	299.7	27.56	700.6	05 May 21	15 15 H		
1	26.2	299.2	27.58	700.5		16 15 H		
2	26.1	299.1	27.58	700.5		17 15 H		
3	25.5	298.5	27.57	700.3		18 15 H		
4	24.7	297.7	27.59	700.8		19 15 H		
5	24.8	297.8	27.59	700.8		20 15 H		
6	24.0	297.0	27.62	701.5		21 15 H		
7	24.2	297.2	27.62	701.5		22 15 H		
8	22.9	295.9	27.66	702.6		23 15 H		
9	22.7	295.7	27.66	702.6	06 May 21	00 15 H		
10	22.7	295.7	27.64	702.1		01 15 H		
11	22.6	295.6	27.64	702.1		02 15 H		
12	22.7	295.7	27.63	702.8		03 15 H	0.2	
13	22.4	295.4	27.64	702.1		04 15 H	L/m	
14	22.1	295.1	27.64	702.1		05 15 H		
15	22.4	295.4	27.63	702.8		06 15 H		
16	23.9	296.9	27.64	702.1		07 15 H		
17	24.8	297.8	27.64	702.1		08 15 H		
18	26.4	299.4	27.66	702.6		09 15 H		
19	28.5	301.5	27.64	702.1		10 15 H		
20	28.7	301.7	27.64	702.1		11 15 H		
21	27.4	300.4	27.64	702.1		12 15 H		
22	27.6	300.6	27.62	701.5		13 15 H		
23	29.3	302.3	27.61	701.3		14 15 H		
24	29.6	302.6	27.61	701.3		15 15 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

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San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	10		Date: 01 - 06 Aug 2017
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21162	21175
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.9970	2.6805
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks:

Name & Signature of Official on Duty:

Team Leader: QA / QC / Date:

MP-AIR-012-F03b
Rev. 0; 8 May 2018

Annexes

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasco de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4527

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 15 - 16 Aug 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 10 Location: AGNIO - Brgy. Balasingay Zone 1
Start Time: 1515H End Time: 1515H GPS Reading: Latitude 8.165825
Ambient Temperature: 30.7 Longitude 125.117726
Barometric Pressure: 27.52 Weather Condition: sunny weather breaker
Filter ID No: 21.167 | 21.175 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 4.7970 | 2.6802
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Sampling point is located near the main highway erected at grassy area 15 meters away from the main road; Often passing of light to heavy mostly trucks were observed. Area is also near the corn plantation; gensel as source of electricity.

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

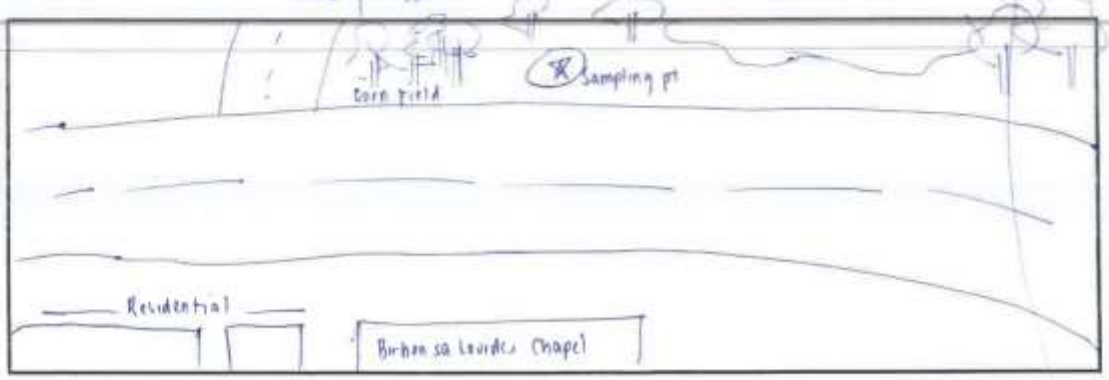
Three (3) Gas Sampler:
Model: SKC pump Serial No: E8009001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed instruments Serial No: 626910 Calibration Date: 22 June 2021

	TSP	PM10
INITIAL FILTER PRESSURE:	24.0	18.0
FINAL FILTER PRESSURE:	24.8	19.0

Carbon Monoxide: Data logger
Total VOC: –



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 454-8301
Fax No: (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	28.2	301.3	26.91	683.5	01 Aug. 21	14:50 H		
1	28.0	301.0	26.91	683.5		15:50 H		
2	28.0	301.0	26.90	683.3		16:50 H		
3	27.9	300.9	26.90	683.3		17:50 H		
4	24.7	297.7	26.99	684.6		18:50 H		
5	24.1	297.1	26.96	684.8		19:50 H		
6	24.2	297.2	26.95	684.5		20:50 H		
7	23.9	296.9	26.96	684.8		21:50 H		
8	23.5	296.5	27.02	686.5		22:50 H		
9	23.0	296.0	27.02	686.5		23:50 H		
10	22.9	295.9	27.01	686.1	02 Aug. 21	00:50 H		
11	22.5	295.7	27.04	686.9		01:50 H	0.2	
12	22.7	295.5	27.03	686.6		02:50 H	L/m	
13	22.5	295.0	27.06	687.3		03:50 H		
14	22.0	294.8	27.02	686.3		04:50 H		
15	22.0	295.9	26.98	685.3		05:50 H		
16	23.3	296.3	26.99	685.5		06:50 H		
17	23.7	296.7	27.20	703.6		07:50 H		
18	25.1	298.1	27.20	703.6		08:50 H		
19	25.6	298.6	27.21	703.8		09:50 H		
20	25.5	298.5	26.98	685.8		10:50 H		
21	25.6	298.6	26.98	685.3		11:50 H		
22	25.7	298.7	26.98	685.3		12:50 H		
23	25.0	298.0	26.98	685.3		13:50 H		
24	25.1	298.1	26.98	685.3		14:50 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02a

HiAdvance Philippines, Inc.

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm^3
0	28.2	301.2	26.91	683.5	14 Aug 21	14:50 H		
1	28.0	301.0	26.91	683.5		15:50 H		
2	28.0	301.0	26.90	683.3		16:50 H		
3	27.9	300.9	26.90	683.3		17:50 H		
4	24.7	297.7	26.97	685.0		18:50 H		
5	24.1	297.1	26.96	684.8		19:50 H		
6	24.2	297.2	26.93	683.5		20:50 H		
7	23.9	296.9	26.96	684.8		21:50 H		
8	23.5	296.5	27.30	693.5		22:50 H		
9	23.0	296.0	27.02	686.3		23:50 H		
10	22.9	295.9	27.01	686.0	15 Aug 21	00:50 H		
11	22.7	295.7	27.04	686.8		01:50 H		
12	22.5	295.5	27.03	686.5		02:50 H		
13	22.0	295.0	27.06	687.3		03:50 H		
14	21.8	294.8	27.02	686.3		04:50 H		
15	22.9	295.9	26.98	685.3		05:50 H		
16	23.3	296.3	26.99	685.5		06:50 H		
17	23.7	296.7	27.26	692.6		07:50 H		
18	25.1	298.1	27.10	688.4		08:50 H		
19	26.6	299.6	27.71	703.8		09:50 H		
20	28.5	301.5	26.99	685.3		10:50 H		
21	28.6	301.6	26.98	685.3		11:50 H		
22	28.7	301.7	26.98	685.3		12:50 H		
23	30.0	303.0	26.98	685.3		13:50 H		
24	30.1	303.1	26.98	685.3		14:50 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	9		Date: 04 - 05 Aug 2021	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.			21.159	21.198
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1440	1440
Initial Weight of Filter Paper (g)			4.4295	2.6645
Final Weight of Filter Paper (g)				
Dust Contents (g)				
Total Volume of Air Sampled (m^3)				

Remarks:

Name & Signature of Official on Duty:

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8361
Fax No: (632) 729-4927

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 04-05 Aug 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 9 Location: Agusan - Bugay Patpat Zone 5
Start Time: 1450H End Time: 1450H GPS Reading: Latitude 8.195198
Ambient Temperature: 28.2 Longitude 125.159261
Barometric Pressure: 26.91 Weather Condition: cloudy to fair
Filter ID No: 21.159 / 21.158 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 4.4195 / 2.6645
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Equipments erected at soft soil ground; near chicken poultry; sampling location approx. 2 to 4 meters away from the highway (4 lanes). Going to fair no2 so2 and tsp. Sound level will heavy vehicle occur

TSP Sampler
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

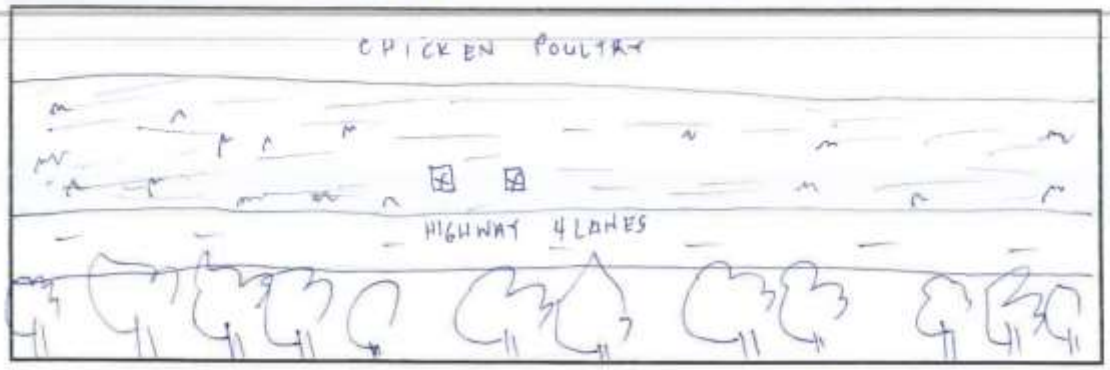
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Ivory Serial No: E8809001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.5970/181508474 Calibration Date: Jan. 28, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed Instruments Serial No: B6/7316 Calibration Date: 21 June 2021

INITIAL FILTER PRESSURE: 26.0 / 19.0 Carbon Monoxide: data logger
FINAL FILTER PRESSURE: 26.0 / 21.0 Total VOC: -



Team Leader: QA/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St., Paseo de Magallanes
Makati City, 1232
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Fax No: (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	33.0	306.0	27.01	686.3		13:00H		
1	33.3	306.3	27.00	685.8		14:00H		
2	33.1	306.1	27.00	685.8		15:00H		
3	33.0	306.0	27.00	685.8		16:00H		
4	30.2	303.2	27.01	686.1		17:00H		
5	27.2	300.2	27.01	686.1	01 AUG 2011	18:00H		
6	26.4	299.4	27.01	686.1		19:00H		
7	24.8	297.8	27.04	686.8		20:00H		
8	24.2	297.2	27.07	687.6		21:00H		
9	24.2	297.2	27.09	688.1		22:00H		
10	23.0	296.0	27.10	688.3		23:00H		
11	22.9	295.9	27.10	688.3		0:00H	0.21 mm	
12	22.1	295.1	27.09	687.8		01:00H		
13	21.8	294.1	27.07	687.5		02:00H		
14	22.0	295.0	27.07	687.6		03:00H		
15	21.8	294.8	27.08	687.8		04:00H		
16	21.7	294.7	27.08	687.8		05:00H		
17	22.9	295.9	27.09	688.1		06:00H		
18	25.0	298.0	27.10	688.3		07:00H		
19	29.7	302.7	27.09	688.1	02 AUG 2011	08:00H		
20	30.2	303.2	27.08	687.8		09:00H		
21	30.9	303.9	27.08	687.8		10:00H		
22	31.7	304.7	27.07	687.6		11:00H		
23	32.4	305.4	27.05	687.1		12:00H		
24	33.0	306.0	27.06	687.3		13:00H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c

HiAdvance Philippines, Inc.
[illegible]
[illegible]
[illegible]
[illegible]

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	42.1	315.6	27.02	686.3		1900H		
1	33.3	306.3	27.00	685.8		1400H		
2	33.1	306.4	27.00	685.8		1500H		
3	33.0	306.0	27.00	685.8		1600H		
4	30.2	303.2	27.01	686.1		1700H		
5	27.2	300.2	27.01	686.1		1800H		
6	26.4	299.4	27.01	686.1		1900H		
7	24.8	297.8	27.04	686.8	[illegible]	2000H		
8	24.2	297.2	27.07	687.5		2100H		
9	24.2	297.2	27.09	688.1		2200H		
10	23.0	296.0	27.10	688.3		2300H	0.2 L/min	
11	22.9	295.9	27.10	688.3		2400H		
12	22.1	295.1	27.07	687.5		0100H		
13	22.1	295.1	27.07	687.5		0200H		
14	22.1	295.0	27.07	687.5		0300H		
15	21.8	294.8	27.02	687.8		0400H		
16	21.7	294.7	27.10	687.8		0500H		
17	22.9	295.9	27.09	688.1		0600H		
18	25.0	298.0	27.10	688.3		0700H		
19	29.7	302.7	27.09	688.1	[illegible]	0800H		
20	30.2	303.2	27.08	687.8		0900H		
21	30.9	303.9	27.08	687.8		1000H		
22	31.7	304.7	27.07	687.5		1100H		
23	32.4	305.4	27.05	687.1		1200H		
24	33.0	306.0	27.06	687.3		1300H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [signature]

QA / QC / Date: [signature]

MP-AIR-017-F02b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mapa Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	AGAO		Date: August 01-02, 2021	
Parameter:		PM 2.5	PM 10	TSP
Filter Paper No.			21.160	21.221
Hourly Flow Rate (m^3/m)				
Average Flow Rate (m^3/m)				
Total Operation Time (min)			1140	1140
Initial Weight of Filter Paper (g)			2.4292	2.6939
Final Weight of Filter Paper (g)				
Dust Contents (g)				
Total Volume of Air Sampled (m^3)				

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mogo Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 01-02 Aug. 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 8 Location: AGNB - Brgy. Impalutao, Zone 3
Start Time: 1300H End Time: 1300H GPS Reading: Latitude 8.277774
Ambient Temperature: 42.0 Longitude 125.028974
Barometric Pressure: 27.02 Weather Condition: Sunny
Filter ID No: 21.201 / 21.160 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 2.0889 / 4.4372
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Sampling station is erected at soil ground ; 4 to 6 meters away from the main road ; near residential area (2 meters away) ; passing of light to heavy vehicles were observed - main road (2 lanes)

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

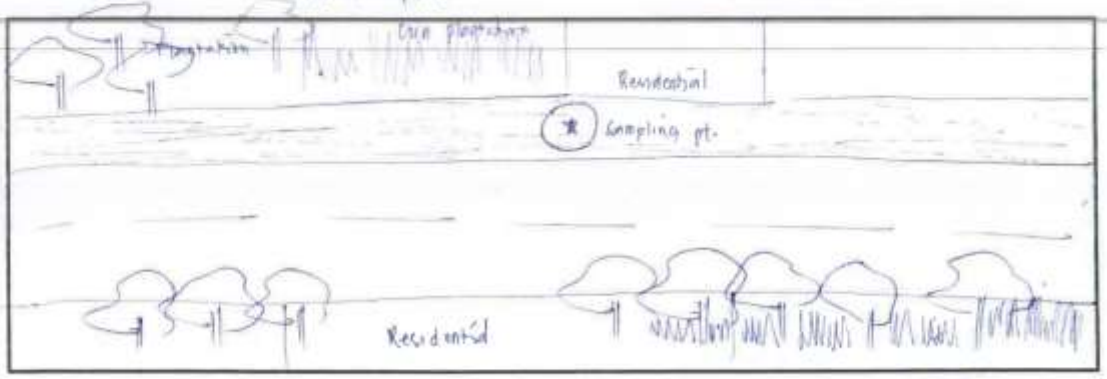
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC pump Serial No: E8U09001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH 54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: CO Analyzer Air Quality Meter Serial No: Q617310 Calibration Date:

	TSP	PM10		
INITIAL FILTER PRESSURE:	24.4	18.5	Carbon Monoxide:	data logger
FINAL FILTER PRESSURE:	24.6	19.0	Total VOC:	—



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F01
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 728-0327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	30.6	303.6	27.22	691.4	03 Aug 2021	1410 H		
1	30.7	303.7	27.22	691.4		1510 H		
2	25.9	298.9	27.23	691.6		1610 H		
3	26.0	299.0	27.23	691.6		1710 H		
4	25.9	298.9	27.22	691.4		1810 H		
5	22.6	295.6	27.31	693.7		1910 H		
6	22.4	295.4	27.32	693.9		2010 H		
7	22.0	295.0	27.33	693.9		2110 H		
8	22.0	295.0	27.33	693.9		2210 H		
9	22.7	295.7	27.34	694.8		2310 H		
10	22.3	295.3	27.35	694.7	04 Aug 2021	0010 H		
11	21.9	294.9	27.32	693.9		0110 H	0.2 l/m	
12	21.7	294.7	27.32	693.5		0210 H		
13	21.1	294.1	27.32	693.7		0310 H		
14	20.7	293.8	27.33	694.2		0410 H		
15	20.3	293.3	27.32	690.9		0510 H		
16	20.6	293.6	27.33	694.2		0610 H		
17	22.1	295.1	27.33	694.2		0710 H		
18	25.9	298.9	27.33	694.2		0810 H		
19	30.5	303.5	27.33	694.2		0910 H		
20	30.6	303.6	27.33	694.2		1010 H		
21	28.4	301.4	27.31	693.7		1110 H		
22	29.6	302.6	27.30	693.4		1210 H		
23	29.7	302.7	27.30	693.4		1310 H		
24	30.6	303.6	27.31	693.7		1410 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c

HiAdvance Philippines, Inc.
3rd Floor Mega Centre
San Antonio St. Pasay de Magellanes
Makati City, 1232
Phone No. (632) 854-8363
Fax No. (632) 719-4327

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	30.6	303.6	27.22	691.4	03 Aug. 2021	11:00 H		
1	30.7	303.7	27.22	691.4		12:00 H		
2	25.9	298.9	27.22	691.4		13:00 H		
3	26.0	299.0	27.22	691.4		14:00 H		
4	25.9	298.9	27.22	691.4		15:00 H		
5	22.6	295.6	27.22	691.4		16:00 H		
6	22.4	295.4	27.22	691.4		17:00 H		
7	22.0	295.0	27.22	691.4		18:00 H		
8	22.0	295.0	27.22	691.4		19:00 H		
9	22.4	295.4	27.34	694.4		20:00 H		
10	22.3	295.3	27.35	694.7	04 Aug. 21	00:00 H	0.2 lpm	
11	21.9	294.9	27.32	693.9		01:00 H		
12	21.7	294.7	27.32	693.9		02:00 H		
13	21.1	294.1	27.32	693.9		03:00 H		
14	21.3	294.3	27.32	693.9		04:00 H		
15	21.3	294.3	27.32	693.9		05:00 H		
16	21.6	294.6	27.33	694.2		06:00 H		
17	22.1	295.1	27.33	694.2		07:00 H		
18	22.9	295.9	27.33	694.2		08:00 H		
19	29.5	302.5	27.33	694.2		09:00 H		
20	29.6	302.6	27.31	693.7		10:00 H		
21	29.4	302.4	27.31	693.7		11:00 H		
22	29.6	302.6	27.30	693.4		12:00 H		
23	29.7	302.7	27.30	693.4		13:00 H		
24	29.6	302.6	27.31	693.7		14:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____ QA / QC / Date: _____

MP-AIR-017-FQQc
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Maga Centre
San Antonio St. Paseo de Magallanes
Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:			Date:
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.159	21.250
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)			
Initial Weight of Filter Paper (g)			
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks:

Name & Signature of Official on Duty:

Team Leader: QA / QC / Date:

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 03 - 04 Aug 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 7 Location: 8649 - Brgy. Lapasan, pnc 7
Start Time: 1400 H End Time: 1400H GPS Reading: Latitude 8.266874
Ambient Temperature: 30.4 Longitude 124.996897
Barometric Pressure: 29.24 Weather Condition: Sunny
Filter ID No: 21157 / 21300 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 4.4370 / 3.6668
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Equipment is set-up on a soft & grassy ground; near access road approx. 5-6 meters away, sunny & fair weather condition, passing of light vehicles, near houses approx 10-20 meters away, around lower light rise zone

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Pump Serial No: 19409401 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH 54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Rae Instruments Serial No: 6617910 Calibration Date: 22 June 2021

INITIAL FILTER PRESSURE: 24.0 / 17.0 Carbon Monoxide: data logger
FINAL FILTER PRESSURE: 27.0 / 18.0 Total VOC: –

☒ ☒
ELEVATED
ACCESS ROAD
RESIDENTIAL HOUSES

Team Leader: QA/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

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Makati City, 1232
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Fax No. (632) 729-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.7	304.7	27.71	704.6	03 May. 21	1330 H		
1	31.6	304.6	27.72	704.1		1430 H		
2	31.5	304.5	27.71	703.8		1530 H		
3	31.7	304.7	27.71	703.8		1630 H		
4	27.8	300.6	27.72	704.1		1730 H		
5	27.7	300.7	27.74	704.6		1830 H		
6	27.4	296.4	27.81	706.8		1930 H		
7	27.4	296.4	27.82	706.1		2030 H		
8	27.4	296.4	27.80	706.1		2130 H		
9	22.9	295.9	27.83	707.2		2230 H		
10	22.8	295.8	27.83	707.9		2330 H	0.2 L/m	
11	22.8	295.8	27.80	706.1	04 May. 21	0030 H		
12	22.9	295.9	27.80	706.1		0130 H		
13	22.0	295.0	27.80	706.1		0230 H		
14	22.5	295.5	27.80	706.1		0330 H		
15	22.6	295.6	27.82	706.6		0430 H		
16	22.1	295.1	27.83	706.6		0530 H		
17	22.6	295.6	27.84	707.1		0630 H		
18	26.1	299.1	27.83	706.9		0730 H		
19	30.4	302.0	27.82	706.6		0830 H		
20	31.0	304.0	27.82	706.6		0930 H		
21	31.3	304.3	27.82	706.6		1030 H		
22	31.0	304.0	27.82	706.6		1130 H		
23	31.0	304.0	27.74	704.6		1230 H		
24	31.7	304.7	27.74	704.6		1330 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____ QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0, 8 May 2019

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NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	21.7	294.2	27.74	703.6		1330 h		
1	21.6	294.6	27.78	704.1		1630 h		
2	21.5	294.5	27.71	703.8		1530 h		
3	21.7	294.7	27.71	703.8		1630 h		
4	21.8	300.5	27.72	704.1	02 Aug. 21	1730 h		
5	21.9	300.3	27.74	704.6		1830 h		
6	22.4	296.0	27.81	706.4		1930 h		
7	22.4	296.4	27.80	706.1		2030 h		
8	22.4	296.8	27.80	706.1		2130 h		
9	22.9	295.9	27.83	706.9		2230 h		
10	22.8	295.8	27.83	706.9		2330 h		
11	21.8	294.8	27.80	706.1		0030 h		
12	21.9	294.9	27.80	706.1		0130 h	0.2 lpm	
13	22.8	295.6	27.80	706.1		0230 h		
14	22.5	295.5	27.80	706.1		0330 h		
15	22.6	295.6	27.82	706.6		0430 h		
16	22.1	294.1	27.82	706.6	03 Aug. 21	0530 h		
17	22.6	295.6	27.84	707.1		0630 h		
18	21.1	294.1	27.83	706.9		0730 h		
19	20.4	292.4	27.82	706.6		0830 h		
20	21.0	294.0	27.82	706.6		0930 h		
21	21.0	294.0	27.82	706.6		1030 h		
22	21.0	294.0	27.82	706.6		1130 h		
23	21.0	294.0	27.74	704.6		1230 h		
24	21.7	294.7	27.74	704.6		1330 h		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0; 8 May 2018

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Makati City, 1232
Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	6		Date: 02-03 Aug. 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.	A	21 156	21 203
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.4782	2.6431
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: –

Name & Signature of Official on Duty: –

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mapa Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No: (632) 854-8861
Fax No: (632) 729-4327

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 02-03 August 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 6 Location: MSHS - Brgy. Poblacion
Start Time: 13:30H End Time: 13:30H GPS Reading: Latitude 8° 15.498 169.998 Longitude 125° 127.857
Ambient Temperature: 31.7
Barometric Pressure: 1st 24 87.94 Weather Condition: cloudy
Filter ID No: 1st 2021 / 2nd Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 1st 2.6478 / 2nd 4.4157
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Equipment is set up in a grassy ground beside the house approx. 3-5 meters away, approx. 5-6 meters away from the highway (4 lanes); cloudy weather condition; around 12:00H light rain pour down.

TSP Sample:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: GK Pump Serial No: P3009001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AR 54310/181508474 Calibration Date: Jan. 28, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Rae Instruments Serial No: 861 7310 Calibration Date: 03 Aug 2021

	TSP	PM10
INITIAL FILTER PRESSURE:	98.6	18.0
FINAL FILTER PRESSURE:	20.0	20.0

Carbon Monoxide: data logger
Total VOC: —

Team Leader: QA/QC /Date:

MP-AIR-001-F05
Rev. 0, 8 May 2018

Annexes

HiAdvance Philippines, Inc.
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Fax No: (632) 729-4127

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.8	304.8	27.74	704.6	31 July 2021	1200 H		
1	31.1	304.1	27.73	704.3		1300 H		
2	30.9	303.9	27.73	704.3		1400 H		
3	30.6	303.6	27.71	703.8		1500 H		
4	31.2	304.2	27.70	703.6		1600 H		
5	22.0	295.0	27.79	705.9		1700 H		
6	22.3	295.3	27.79	705.9		1800 H		
7	22.7	295.7	27.78	705.6		1900 H		
8	23.1	296.1	27.80	706.1		2000 H		
9	22.9	295.9	27.81	706.4		2100 H		
10	23.0	296.0	27.80	706.1		2200 H		
11	23.1	296.1	27.80	706.1		2300 H	0.2 lpm	
12	23.0	296.0	27.80	706.1	01 Aug 2021	0000 H		
13	22.3	295.3	27.77	705.9		0100 H		
14	22.0	295.0	27.79	705.9		0200 H		
15	24.1	297.1	27.78	705.6		0300 H		
16	24.0	297.0	27.78	705.6		0400 H		
17	24.7	297.7	27.76	705.1		0500 H		
18	24.7	297.7	27.76	705.1		0600 H		
19	24.4	297.6	27.76	705.1		0700 H		
20	25.4	298.4	27.76	705.1		0800 H		
21	30.9	300.9	27.79	704.3		0900 H		
22	31.9	304.9	27.74	704.6		1000 H		
23	31.8	304.8	27.74	704.6		1100 H		
24	31.9	304.9	27.74	704.6		1200 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [signature]

QA / QC / Date: [signature]

MP-AIR-018-F02c
Rev. 0, 8 May 2018

HiAdvance Philippines, Inc.
[illegible]

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION
Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.8	304.8	27.74	704.6	[illegible]	12:00 H		
1	31.1	304.1	27.79	704.3		13:00 H		
2	30.9	303.9	27.79	704.3		14:00 H		
3	30.6	303.6	27.71	703.8		15:00 H		
4	31.2	304.2	27.70	703.6		16:00 H		
5	22.0	295.0	27.79	705.5		17:00 H		
6	22.3	295.3	27.79	705.5		18:00 H		
7	22.2	295.2	27.78	705.4		19:00 H		
8	27.1	296.1	27.80	706.1		20:00 H		
9	22.9	295.9	27.81	706.4		21:00 H		
10	27.0	296.0	27.83	706.1		22:00 H	0.2	
11	27.1	296.1	27.80	706.1		23:00 H	L/m	
12	27.0	296.0	27.83	706.1	01 May 2018	00:00 H		
13	22.3	295.3	27.79	705.5		01:00 H		
14	22.0	295.0	27.79	705.5		02:00 H		
15	24.1	297.1	27.78	705.6		03:00 H		
16	24.0	297.0	27.78	705.6		04:00 H		
17	24.7	297.7	27.76	705.1		05:00 H		
18	24.7	297.7	27.76	705.1		06:00 H		
19	24.6	297.6	27.76	705.1		07:00 H		
20	25.4	298.4	27.76	705.1		08:00 H		
21	30.9	303.9	27.79	706.3		09:00 H		
22	31.9	304.9	27.74	706.6		10:00 H		
23	31.8	304.8	27.74	706.6		11:00 H		
24	31.9	304.9	27.74	706.6		12:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [illegible]

QA / QC / Date: [illegible]

MP-AIR-017-F02c
Rev. 0, 8 May 2018

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Makati City, 1232
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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	5		Date: 31 July - 01 Aug 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.126	21.204
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.4578	2.6564
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: —

Name & Signature of Official on Duty: —

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: July 31 - Aug. 01, 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 5 Location: AQN5 - Brgy. San Roque Purok 4
Start Time: 1200H End Time: 1200 GPS Reading: Latitude 8.929728
Ambient Temperature: 31.8 Longitude 124.979611
Barometric Pressure: 27.74 Weather Condition: Cuhng with strong wind blowing
Filter ID No: 21.126 / 21.204 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 4.4578 / 2.6564
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Equipment is set-up inside school premises, erected at grassy ground, strong weather condition, 15 to 20 meters away from the access road, passing of light vehicle and/or motorcycles around 1600 the rain gear

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

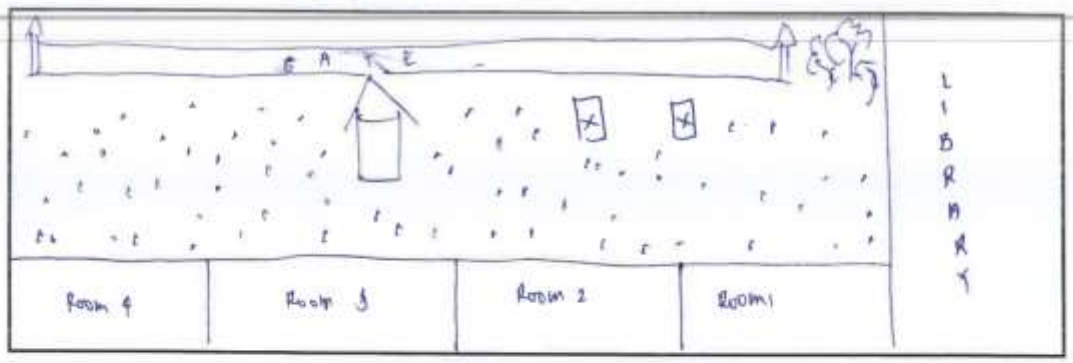
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Pump Serial No: E8009001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed Instrument Serial No: Q 417310 Calibration Date: June 22, 2021

	TSP	PM10		
INITIAL FILTER PRESSURE:	27.0	21.0	Carbon Monoxide:	data logger
FINAL FILTER PRESSURE:	24.8	22.0	Total VOC:	



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

HiAdvance Philippines, Inc.
3rd floor Mega Centre
San Antonio St. Pasay de Magallanes
Makati City, 1232
Phone No. (632) 854-8301
Fax No. (632) 739-4327

SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	39.1	312.1	28.01	712.5	29 May 2021	15:30 H		
1	33.8	306.8	28.01	712.5		16:30 H		
2	33.8	306.8	28.01	712.0		17:30 H		
3	31.4	304.4	28.03	712.0		18:30 H		
4	30.9	303.9	28.02	712.2		19:30 H		
5	28.3	301.3	28.05	712.2		20:30 H		
6	27.6	300.6	28.06	712.2		21:30 H		
7	25.9	298.9	28.09	714.0		22:30 H		
8	25.1	298.1	28.11	714.5		23:30 H		
9	24.6	297.6	28.13	714.2	30 May 2021	00:30 H		
10	24.5	297.5	28.11	714.8		01:30 H		
11	24.5	297.5	28.09	714.2		02:30 H	0.2	
12	24.3	297.3	28.10	714.0		03:30 H	L/m	
13	24.2	297.2	28.08	713.7		04:30 H		
14	24.9	296.9	28.08	714.0		05:30 H		
15	25.6	298.6	28.10	713.7		06:30 H		
16	29.9	302.9	28.10	713.7		07:30 H		
17	30.0	303.0	28.10	714.2		08:30 H		
18	30.0	303.0	28.10	714.8		09:30 H		
19	32.7	305.7	28.08	715.0		10:30 H		
20	32.6	305.6	28.08	715.0		11:30 H		
21	32.8	305.8	28.08	714.8		12:30 H		
22	33.9	306.0	28.06	714.5		13:30 H		
23	33.0	306.0	28.06	714.2		14:30 H		
24	33.1	306.1	28.06	714.0		15:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____ / _____

QA / QC / Date: _____

MP-AIR-018-F02c

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NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	39.1	312.1	28.01	712.5	29 July 2021	15:30 H		
1	33.8	306.8	28.01	712.5		16:30 H		
2	33.8	306.8	28.01	712.0		17:30 H		
3	31.4	304.4	28.03	712.0		18:30 H		
4	30.9	303.9	28.02	712.2		19:30 H		
5	28.3	301.3	28.05	712.2		20:30 H		
6	27.6	300.6	28.06	712.2		21:30 H		
7	25.9	298.9	28.09	714.0		22:30 H		
8	25.1	298.1	28.11	714.5		23:30 H		
9	24.6	297.6	28.13	714.2	30 July 2021	00:30 H		
10	24.5	297.5	28.11	714.8		01:30 H	0.2	
11	24.5	297.5	28.10	714.2		02:30 H	6/4	
12	24.3	297.3	28.09	714.0		03:30 H		
13	24.2	297.2	28.08	713.7		04:30 H		
14	23.9	296.9	28.08	714.0		05:30 H		
15	25.6	298.6	28.10	713.7		06:30 H		
16	29.9	302.9	28.10	713.7		07:30 H		
17	30.0	303.0	28.10	714.2		08:30 H		
18	30.0	303.0	28.10	714.8		09:30 H		
19	32.7	305.7	28.08	715.0		10:30 H		
20	32.6	305.6	28.08	715.0		11:30 H		
21	32.8	305.8	28.08	714.0		12:30 H		
22	33.4	306.4	28.06	714.5		13:30 H		
23	33.0	306.0	28.06	714.2		14:30 H		
24	33.1	306.1	28.06	714.0		15:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [signature]

QA / QC / Date: [signature]

MP-AIR-017-F03c
Rev. 0, 8 May 2018

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Phone No: (632) 854-8365
Fax No: (632) 729-4327

FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	4		Date: 29-30 July 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21758	81200
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.482	1.6671
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: —

Name & Signature of Official on Duty: —

Team Leader: _____ QA / QC / Date: _____

MP-AIR-012-F03b
Rev. 0; 8 May 2018

Annexes

HiAdvance Philippines, Inc.
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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 29-30 July 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 4 Location: Abuny - Zone 1 Dicion
Start Time: 1540H End Time: 1540H GPS Reading: Latitude 8.165851
Ambient Temperature: 29.1 Longitude 125.127925
Barometric Pressure: 28.61 Weather Condition: sunny weather
Filter ID No: TP 21-200 / Pmm 21.158 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: TP 3.667 / Pmm 4.4182
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Erected at rocky ground w/ some grass; 6-7 meters away from the highway, approx. 5 meters away from the store, set up beside the creek approx. 8-10 meters away, sunny weather condition. passing heavy and light vehicles

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

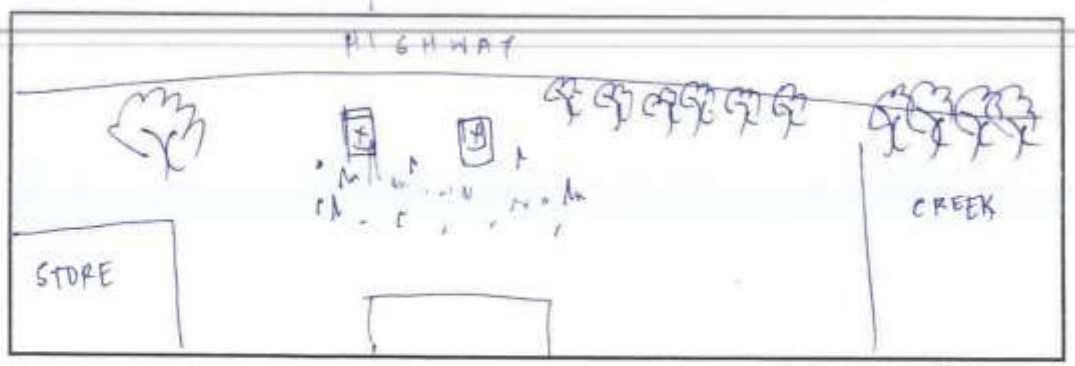
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC pump Serial No: E8009801 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed Instruments Serial No: Q617310 Calibration Date: June 22, 2021

INITIAL FILTER PRESSURE: TP 24.0 | Pmm 19.0 Carbon Monoxide: Datalogger
FINAL FILTER PRESSURE: 25.0 | 20.0 Total VOC: –



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	In Hg	mm Hg			lpm	Vstd, Nm³
0	29.1	302.1	28.27	717.0	[illegible]	15:00 H		
1	28.0	301.0	28.24	717.3		16:00 H		
2	28.1	301.1	28.24	717.3		17:00 H		
3	28.2	301.2	28.24	717.3		18:00 H		
4	27.0	300.0	28.27	718.1		19:00 H		
5	25.7	298.7	28.28	718.3		20:00 H		
6	26.1	299.1	28.31	719.1		21:00 H		
7	25.2	298.2	28.27	719.6		22:00 H		
8	25.5	298.0	28.27	719.6		23:00 H		
9	25.2	298.2	28.31	719.1	[illegible]	00:00 H		
10	24.7	297.7	28.30	718.8		01:00 H		
11	25.4	298.4	28.29	718.6		02:00 H	0.2 lpm	
12	24.6	297.6	28.31	718.5		03:00 H		
13	24.8	297.8	28.28	718.3		04:00 H		
14	24.0	297.0	28.28	718.3		05:00 H		
15	24.3	297.3	28.30	718.8		06:00 H		
16	24.4	297.4	28.30	718.8		07:00 H		
17	28.8	301.8	28.32	719.3		08:00 H		
18	31.2	304.2	28.32	719.3		09:00 H		
19	32.0	305.0	28.32	719.3		10:00 H		
20	32.0	305.0	28.30	718.8		11:00 H		
21	32.6	305.6	28.28	718.3		12:00 H		
22	32.5	305.5	28.28	718.3		13:00 H		
23	32.7	305.7	28.28	718.3		14:00 H		
24	32.6	305.6	28.28	718.3		15:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____ QA / QC / Date: _____

MP-AIR-018-F02c

HiAdvance Philippines, inc.
[illegible]

NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	29.1	302.1	28.29	717.0	[illegible]	1500 H		
1	29.0	301.0	28.24	717.3		1600 H		
2	28.1	301.1	28.24	717.3		1700 H		
3	28.2	301.2	28.24	717.2		1800 H		
4	27.0	300.0	28.27	718.1		1900 H		
5	26.7	299.7	28.28	718.1		2000 H		
6	26.1	299.1	28.31	719.1		2100 H		
7	25.2	298.2	28.33	719.6		2200 H		
8	25.5	298.0	28.32	719.6		2300 H		
9	25.2	298.2	28.31	719.1	[illegible]	0000 H		
10	24.9	297.9	28.30	718.8		0100 H	0.2	
11	25.4	298.4	28.29	718.6		0200 H	L/A	
12	24.6	297.6	28.21	716.5		0300 H		
13	24.0	297.0	28.28	718.3		0400 H		
14	24.0	297.0	28.28	718.3		0500 H		
15	24.3	297.3	28.30	718.2		0600 H		
16	24.4	297.6	28.30	718.6		0700 H		
17	28.4	301.5	28.32	719.3		0800 H		
18	31.2	304.2	28.32	719.3		0900 H		
19	32.0	305.0	28.32	719.3		1000 H		
20	32.0	305.0	28.30	718.2		1100 H		
21	32.6	305.6	28.28	718.3		1200 H		
22	32.5	305.5	28.28	718.3		1300 H		
23	32.2	305.2	28.28	718.3		1400 H		
24	32.6	305.6	28.28	718.3		1500 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_o = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_o}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____ / _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	3		Date: 28 - 29 JUN 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.163	2.199
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.4425	2.6482
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: —

Name & Signature of Official on Duty: —

Team Leader: QA / QC / Date:

MP-AIR-012-F03b
Rev. 0; 8 May 2018

Annexes

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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 28 - 29 July 2020
Address: Unit 303, One Corporate Center, Julia Vargas Ave, cor. Meralco Ave, Pasig
Station No: 3 Location: Abaca - Zone 4 Alae
Start Time: 1500H End Time: 1500H GPS Reading: Latitude 8.463816
Ambient Temperature: 29.1 Longitude 124.850 [illegible]
Barometric Pressure: 28.29 Weather Condition: sunny to fair weather
Filter ID No: PM10 21169 / 21199 TSP Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: PM10 4.4425 / TSP 2.6482
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: equipment is set-up in a soft soil, beside corn trees; 3-5 meters away from the nearby house. passing of motorcycles on the access road approx 10-15 meters away from the sampling area around 1730H light rain occur

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

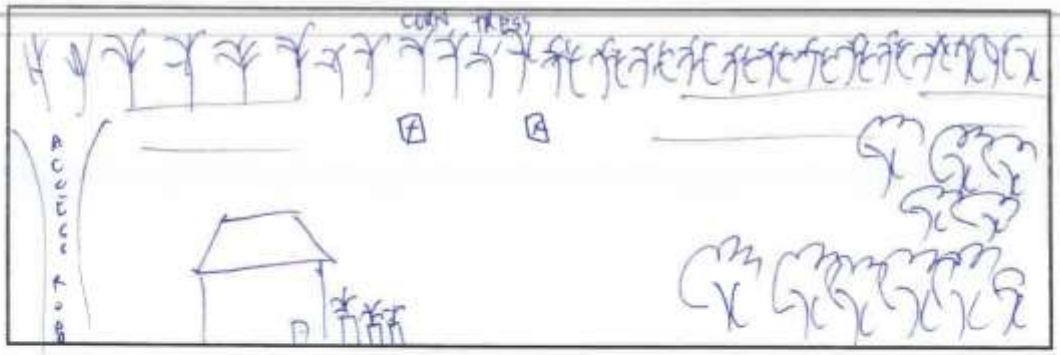
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Pump Serial No: E8009001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed Instruments Serial No: G617710 Calibration Date: June 22, 2021

INITIAL FILTER PRESSURE: TSP 24.0 | PM10 18.1 Carbon Monoxide: data logger
FINAL FILTER PRESSURE: 25.1 | 19.0 Total VOC: —



Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-F05
Rev. 0; 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.6	304.6	28.60	726.2	[illegible]	1170 H		
1	31.6	304.6	28.60	726.2		1270 H		
2	30.8	303.8	28.59	726.2		1370 H		
3	30.5	303.5	28.59	725.6		1470 H		
4	30.5	303.5	28.59	724.0		1570 H		
5	30.6	303.6	28.59	727.2		1670 H		
6	29.9	302.9	28.60	729.5		1770 H		
7	26.4	299.4	28.65	729.7		1870 H		
8	26.3	299.3	28.66	731.0		1970 H		
9	25.4	298.4	28.68	730.5		2070 H		
10	25.4	298.4	28.68	730.5		2170 H		
11	25.5	298.5	28.68	730.3		2270 H	0.2	
12	25.0	298.5	28.67	730.3		2370 H	L/S	
13	24.7	297.0	28.68	730.0	[illegible]	0070 H		
14	24.3	297.3	28.66	730.3		0170 H		
15	24.0	297.3	28.67	729.7		0270 H		
16	24.1	297.0	28.67	730.0		0370 H		
17	24.8	297.0	28.69	730.3		0470 H		
18	25.9	297.5	28.68	730.1		0570 H		
19	25.4	298.9	28.69	730.3		0670 H		
20	25.7	298.7	28.69	730.3		0770 H		
21	25.9	298.9	28.70	729.0		0870 H		
22	26.0	309.0	28.69	729.0		0970 H		
23	31.8	304.8	28.69	729.0		1070 H		
24	26.4	299.4	28.70	729.0		1170 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [illegible]

QA / QC / Date: [illegible]

MP-AIR-018-F02c

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NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	31.6	304.6	28.60	728.7	29 Jul 2020	11:30 H		
1	31.6	304.6	28.60	728.7		12:30 H		
2	30.8	303.8	28.59	728.2		13:30 H		
3	30.5	303.5	28.59	728.0		14:30 H		
4	30.5	303.5	28.59	728.4		15:30 H		
5	30.6	302.6	28.59	729.7		16:30 H		
6	29.9	302.9	28.60	729.5		17:30 H		
7	26.4	299.4	28.65	729.7		18:30 H		
8	26.3	299.3	28.65	731.0		19:30 H		
9	25.4	298.4	28.68	730.8		20:30 H		
10	25.4	298.4	28.68	730.5		21:30 H		
11	25.5	298.5	28.68	730.3		22:30 H	0.2	
12	25.0	298.0	28.67	730.3		23:30 H	L/m	
13	24.7	297.7	28.68	730.0	30 Jul 2020	00:30 H		
14	24.3	297.3	28.66	730.3		01:30 H		
15	24.0	297.0	28.67	729.7		02:30 H		
16	24.0	297.0	28.67	730.0		03:30 H		
17	24.8	297.8	28.67	730.3		04:30 H		
18	25.9	298.9	28.68	730.7		05:30 H		
19	35.4	308.4	28.69	730.7		06:30 H		
20	35.7	308.7	28.69	730.3		07:30 H		
21	35.9	308.9	28.70	730.0		08:30 H		
22	36.0	309.0	28.69	729.0		09:30 H		
23	31.8	300.8	28.70	729.0		10:30 H		
24	36.1	309.1	28.70	729.0		11:30 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm³

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m³

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm³)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: [signature]

QA / QC / Date: [signature]

MP-AIR-017-702c
Rev. 0; 8 May 2018

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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	2		Date: 27 - 28 July 2021
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		2146	2147
Hourly Flow Rate (m^3/m)	N/A		
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.4490	2.8449
Final Weight of Filter Paper (g)			
Dust Contents (g)	N/A		
Total Volume of Air Sampled (m^3)			

Remarks: N/A

Name & Signature of Official on Duty:

Team Leader: [signature] QA / QC / Date: [signature]

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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Fax No: (632) 729-4027

AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 27 - 28 July 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 2 Location: AQM2 Brgy. Puntat & Mambatangan
Start Time: 11AM End Time: 11AM GPS Reading: Latitude 8. 96 A357
Ambient Temperature: 77.8 Longitude 124. 8856 67
Barometric Pressure: 28.60 Weather Condition: Sunny to Fair Weather Condition
Filter ID No: 21 17 / 21 166 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 2 8040 / 4 4466
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Equipment is set-up in a soft soil and rocky ground. 2 meters away from the access road where light vehicles passing by. Approx. 50-60 meters away from the residential area, near coarse grass ground. Small light run poor drain

TSP Sampler
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Pump Serial No: [illegible] Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Reed Instruments Serial No: [illegible] Calibration Date: June 27, 2021

INITIAL FILTER PRESSURE: mm 220 / mmHg 17.4
FINAL FILTER PRESSURE: 220 / 18.2
Carbon Monoxide: datalogger
Total VOC: –

Team Leader: [signature] QA/QC /Date: [signature]

MP-AIR-001-705
Rev. 0; 8 May 2018

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SULFUR DIOXIDE (SO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	33.9	306.6	29.66	753.4	21 [illegible]	10:00 H		
1	33.5	306.5	29.65	753.1		11:00 H		
2	33.4	306.4	29.65	753.1		12:00 H		
3	33.5	306.5	29.65	753.1		13:00 H		
4	33.6	306.6	29.65	753.1		14:00 H		
5	33.6	306.6	29.65	753.1		15:00 H		
6	33.5	306.5	29.65	753.1		16:00 H		
7	33.2	306.2	29.65	753.1		17:00 H		
8	33.8	306.8	29.65	753.1		18:00 H		
9	33.2	306.2	29.66	753.6		19:00 H		
10	28.3	301.3	29.79	755.1		20:00 H	0.2	
11	28.3	301.3	29.79	755.1		21:00 H	L/m	
12	28.1	301.1	29.71	754.6		22:00 H		
13	28.0	301.0	29.71	754.6		23:00 H		
14	27.7	300.7	29.69	754.1	22 [illegible]	00:00 H		
15	27.6	300.6	29.69	754.1		01:00 H		
16	27.5	300.5	29.68	753.9		02:00 H		
17	27.2	300.2	29.68	753.9		03:00 H		
18	26.7	299.7	29.67	753.6		04:00 H		
19	26.5	299.5	29.68	753.9		05:00 H		
20	27.2	300.2	29.68	753.9		06:00 H		
21	29.0	302.0	29.68	753.9		07:00 H		
22	29.6	302.6	29.69	754.1		08:00 H		
23	30.8	303.8	29.68	753.9		09:00 H		
24	31.6	304.6	29.69	754.1		10:00 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-018-F02c
Rev. 0: 9 May 2018

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NITROGEN DIOXIDE (NO_2) AIR VOLUME CALCULATION

Twenty Four (24) Hour Sampling

Hourly Reading	Ambient Temp., T		Barometric Pressure, Pbar		Sampling Date	Sampling Time	Flow Rate	Standard Volume
	°C	K	in Hg	mm Hg			lpm	Vstd, Nm³
0	33.9	306.6	29.66	753.4	26 [illegible] 2018	1000 H		
1	33.5	306.5	29.65	753.1		1100 H		
2	33.4	306.4	29.65	753.1		1200 H		
3	33.5	306.5	29.65	753.1		1300 H		
4	33.6	306.6	29.65	753.1		1400 H		
5	33.6	306.6	29.65	753.1		1500 H		
6	33.5	306.5	29.65	753.1		1600 H		
7	31.7	304.7	29.65	753.1		1700 H		
8	31.8	304.8	29.65	753.1		1800 H		
9	31.2	304.2	29.66	753.4		1900 H		
10	28.3	301.3	29.73	755.1		2000 H		
11	28.3	301.3	29.73	755.1		2100 H		
12	28.1	301.1	29.71	754.6		2200 H		
13	28.0	301.0	29.71	754.6		2300 H	0.2	
14	27.7	300.7	29.69	754.1	27 [illegible] 2018	0000 H	L/m	
15	27.6	300.6	29.69	754.1		0100 H		
16	27.5	300.5	29.68	753.9		0200 H		
17	27.2	300.2	29.68	753.9		0300 H		
18	26.7	299.7	29.67	753.6		0400 H		
19	26.8	299.8	29.68	753.9		0500 H		
20	27.2	300.2	29.68	753.9		0600 H		
21	29.0	302.0	29.68	753.9		0700 H		
22	29.6	302.6	29.69	754.1		0800 H		
23	30.8	303.8	29.68	753.9		0900 H		
24	31.0	304.0	29.69	754.1		1000 H		

A. Nomenclature (Terms are listed by the order of their appearance in the table above)

T = ambient temperature, K

P_{bar} = barometric pressure, mm Hg

t = total sampling time, minutes

$V_{m(std)}$ = sampled volume corrected to standard conditions, Nm^3

Q_a = actual flowrate through the orifice, fixed at 0.2 lpm

1,000 = conversion from liters to m^3

Philippine Standard Pressure and Temperature

298 = Standar ambient temperature, K (25°C + 273)

760 = Standard atmospheric pressure, mm Hg

B. Formula used in Calculation:

a. Total volume of air sampled, corrected to standard condition (Nm^3)

$$V_{m(std)} = \frac{Q_a}{1{,}000} \times \frac{298}{T} \times \frac{P_{bar}}{760} \times t$$

Team Leader: _____

QA / QC / Date: _____

MP-AIR-017-F02c
Rev. 0, 8 May 2018

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FIELD DATA SHEET FOR PARTICULATE MATTER

Twenty four (24) Hour Sampling

Station:	ABN1	Date: 26-27 July 2021	
Parameter:	PM 2.5	PM 10	TSP
Filter Paper No.		21.165	21.197
Hourly Flow Rate (m^3/m)			
Average Flow Rate (m^3/m)			
Total Operation Time (min)		1440	1440
Initial Weight of Filter Paper (g)		4.4121	2.6788
Final Weight of Filter Paper (g)			
Dust Contents (g)			
Total Volume of Air Sampled (m^3)			

Remarks: M/A

Name & Signature of Official on Duty: —

Team Leader: [signature] QA / QC / Date: [signature]

MP-AIR-012-F03b
Rev. 0; 8 May 2018

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AMBIENT AIR SAMPLING FIELD DATA SHEET

Company: AMET-Asia Inc. Date: 26 - 29 July 2021
Address: Unit 303, One Corporate Center, Julia Vargas Ave. cor. Meralco Ave, Pasig
Station No: 1 Location: AMNI - Brgy. Casinglot Purok Zone 2B
Start Time: 10:00 AM End Time: 10:00 AM GPS Reading: Latitude 8.51579 Longitude 124.75779.9
Ambient Temperature: 29.66
Barometric Pressure: 759.9 Weather Condition: Sunny, moderate wind blowing
Filter ID No: 21165 / 21192 Type of Filter Paper Used: Quartz/Glassfiber Initial Weight: 4.4121 / 2.6788
Sampled Parameters: No2, So2, TSP, PM10, Lead, Wind Speed and Wind Direction, Noise, Carbon Monoxide, Ozone
Remarks: Set-up in a grassy/rocky ground, apart 2.5 meters away from the highway 4 lanes. Sunny weather condition. Surrounding residential bare ground & dry leaves (cut up to 20mm) passing of light to heavy vehicles were observed.

TSP Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

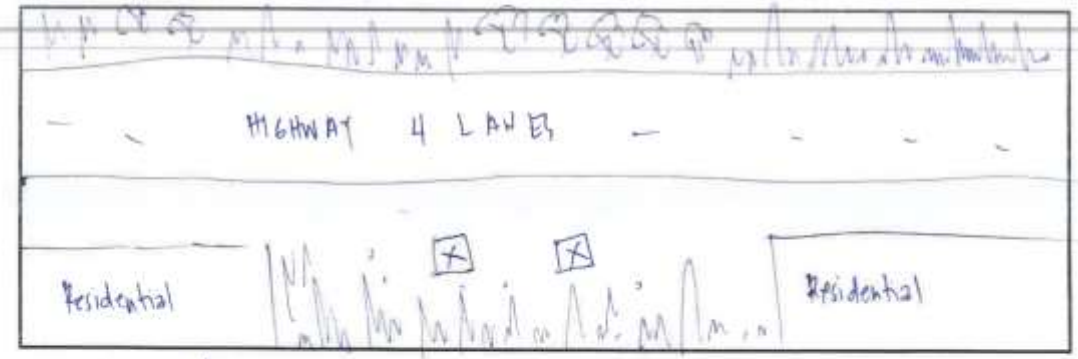
PM2.5/PM10 Sampler:
Model: TE-5070X Serial No: 2169/2139 Calibration Date: Jun 24, 2021 / Sep. 8, 2021

Three (3) Gas Sampler:
Model: SKC Impact Serial No: E8009001 Flow Rate: 0.2 L/min

Barometer/Thermometer:
Model: Lutron/Traceable Serial No: AH.54310/181508474 Calibration Date: Jan. 24, 2021 / Aug. 6, 2021

Multi RAE / Air Quality Meter Equipment:
Model: Rad Instrument Serial No: Q617310 Calibration Date: June 2021

INITIAL FILTER PRESSURE: 22.0 / 18.0 Carbon Monoxide: datalogger
FINAL FILTER PRESSURE: 22.0 / 19.9 Total VOC: –



Team Leader: QA/QC /Date:

MP-AIR-001-F05
Rev. 0; 8 May 2018

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Website: www.hiadvance.com.ph

COMPANY NAME: AMET-Asia Inc.
Company Address: Unit 303, One Corporate Center, Julia Vargas Ave., cor. Meralco Ave. Pasig
24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro to Bukidnon

Station AQN9

Station AQN10

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COMPANY NAME: AMET-Asia Inc.
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24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro to Bukidnon

Station AQN7

Station AQN8

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24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro to Bukidnon

Station AQN5

Station AQN6

HiAdvance Philippines Incorporated

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24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro to Bukidnon

Station AQN3

Station AQN4

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COMPANY NAME: AMET-Asia Inc.
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24-Hours Ambient Air Sampling and Monitoring
SAMPLING SITE: Cagayan De Oro to Bukidnon

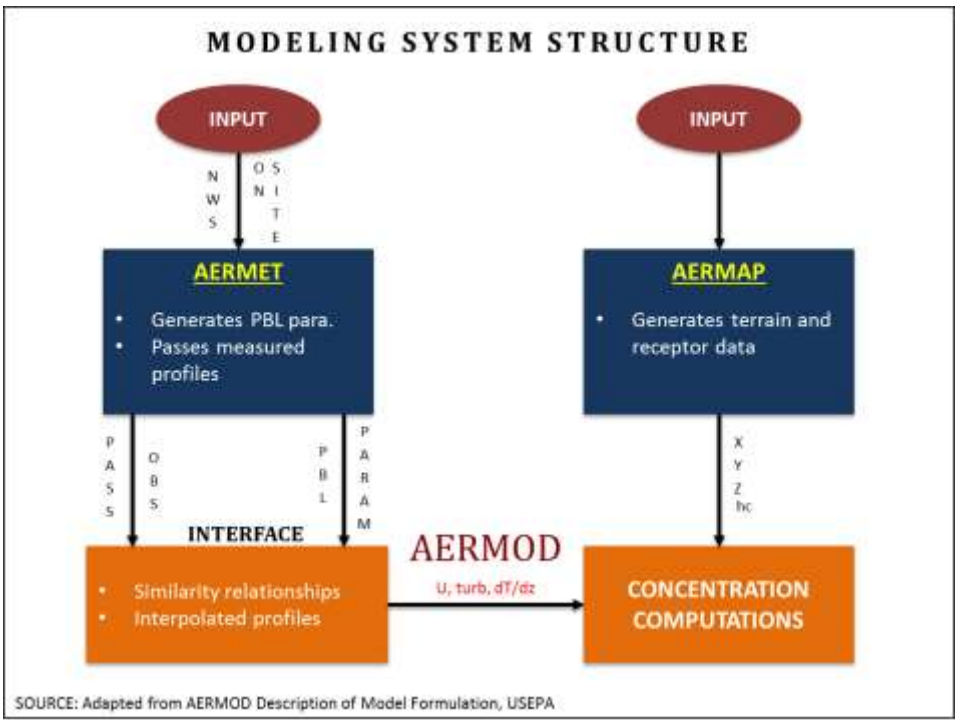
Station AQN1

Station AQN2

Annex 8. Air dispersion modeling methodology

The AERMOD model is a steady-state plume model that assumes all concentrations at all distances during a modeled hour are governed by the temporally averaged meteorology of the hour. The steady state assumption yields useful results since the statistics of the concentration distribution are of primary concern rather than specific concentrations at particular times and locations. The flow of information implemented by the model is shown in **Figure 2-1**.

Figure 2-1. Data flow in the AERMOD modeling system



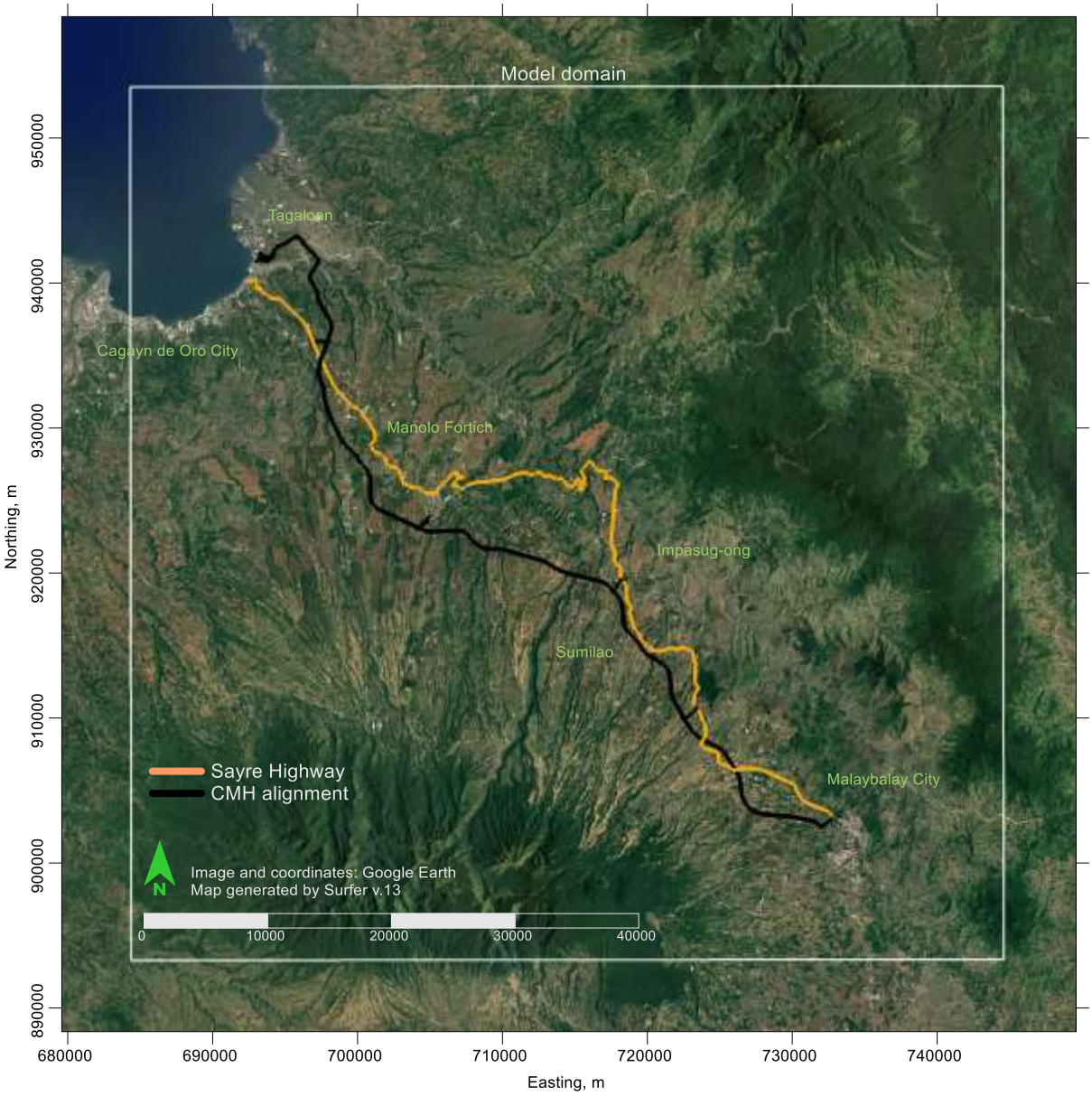
Modeling domain and receptors - The model domain is 60-kilometer square with a 200-meter resolution grid (Figure 2-2, Table 2-1). The coordinates and elevations of each node were determined Google Earth, Excel™ formulas, online tools, and data from the Space Shuttle Radar Topography Mission 3 (SRTM3) database. In addition to the grid nodes, a sensitive receptor at 25, 50, 100, 200, and 300 meters from the center of the roads were also generated (Figure 2-5).

Table 2-1. Technical description of the model domain

Parameter	Axis	Value
Axis length, m	x	60000
	y	60000
SW corner UTM	x	684588
	y	893371
NE corner UTM	x	744588
	y	953371
Resolution, m	x	200
	y	200
# of lines	x	301
	y	301

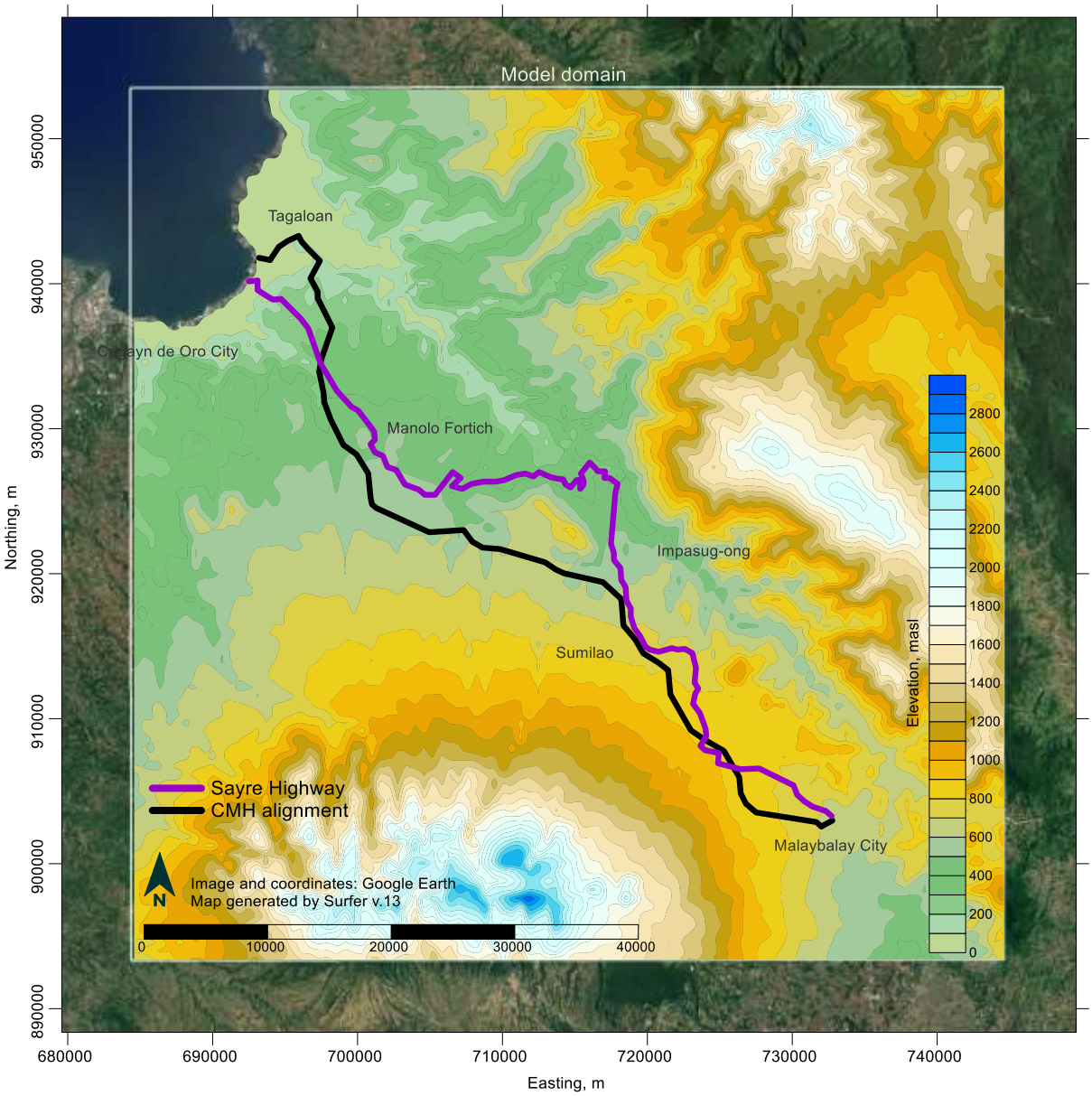
# of nodes	x,y	90601

Figure 2-2. Model domain of the CMH Project



Digital Elevation Model (DEM) – A DEM was generated to determine the elevations inside the model domain (**Figure 2-3**). Topography inside the DEM domain is characterized by mountainous terrain with elevations ranging from sea-level to 2,884 masl with a mean of 936 masl. Such terrain is called as "complex" in air dispersion modeling and will have effects on the predicted GLCs because these elevations are higher than the emission sources.

Figure 2-3. Digitized elevation map of the model domain



Meteorological data – The three-stage procedure for generating the required 2020 surface and profile met files for the AERMOD model is described below.

Stage 1 – Weather Research and Forecasting Model (WRF) - The WRF is a next-generation mesoscale numerical weather prediction system designed for both atmospheric research and operational forecasting applications. It is the most commonly used prognostic model by the USEPA and the modeling community and provides state-of-the-science parameterizations of the atmosphere. The WRF (version 4.1, ARW core) was initialized with the NCEP FNL (Final) Operational Global Analysis Data 3 operationally prepared every 6 hours on a 1x1 degree grid. The model was run at 45 vertical levels, up to 50 mb, with a three-level nested domain with resolutions of 27, nine, and three kilometers. The innermost WRF domain extended about 200 km along both longitude and latitude.

1. Stage 2 – Mesoscale Model Interface Program (MMIF) - The USEPA MMIF was used to convert the WRF output fields to the parameters and formats required for direct input into AERMET, the meteorological pre-processor of AERMOD. The MMIF has options to produce either input files for AERMET or meteorological input files for AERMOD bypassing AERMET. The MMIF was used to create the required files ONSITE for the AERMET pre-processor.

2. Stage 3 – AERMET Pre-processor - The AERMOD surface and profile met files with hourly resolution were generated by AERMET. The variables included in the surface file are: sensible heat flux, friction velocity, convective velocity, vertical temperature gradient in the first 500m above the planetary boundary layer, extents of the convective and mechanical boundary layers, the Monin-Obukhov length, surface roughness, Bowen ratio, albedo, wind speed, wind direction, anemometer height, temperature, and thermometer height. Variables included in the vertical profile for each elevation above ground are elevation, wind speed, wind direction, temperature, and standard deviations of wind direction and vertical wind speed.

Source configuration **–** The existing Sayre Highway and proposed CMH alignment were divided into five sections based on the traffic projections of JICA (**Figure 2-4**). Emission rates assigned to each section were dependent on existing traffic count and projections. The roads were represented as volume sources following USEPA guidelines. The model objects in the AERMOD software representing the roads and receptors are shown in **Figure 2-5**.

Figure 2-4. Source configuration for modelling

Annexes

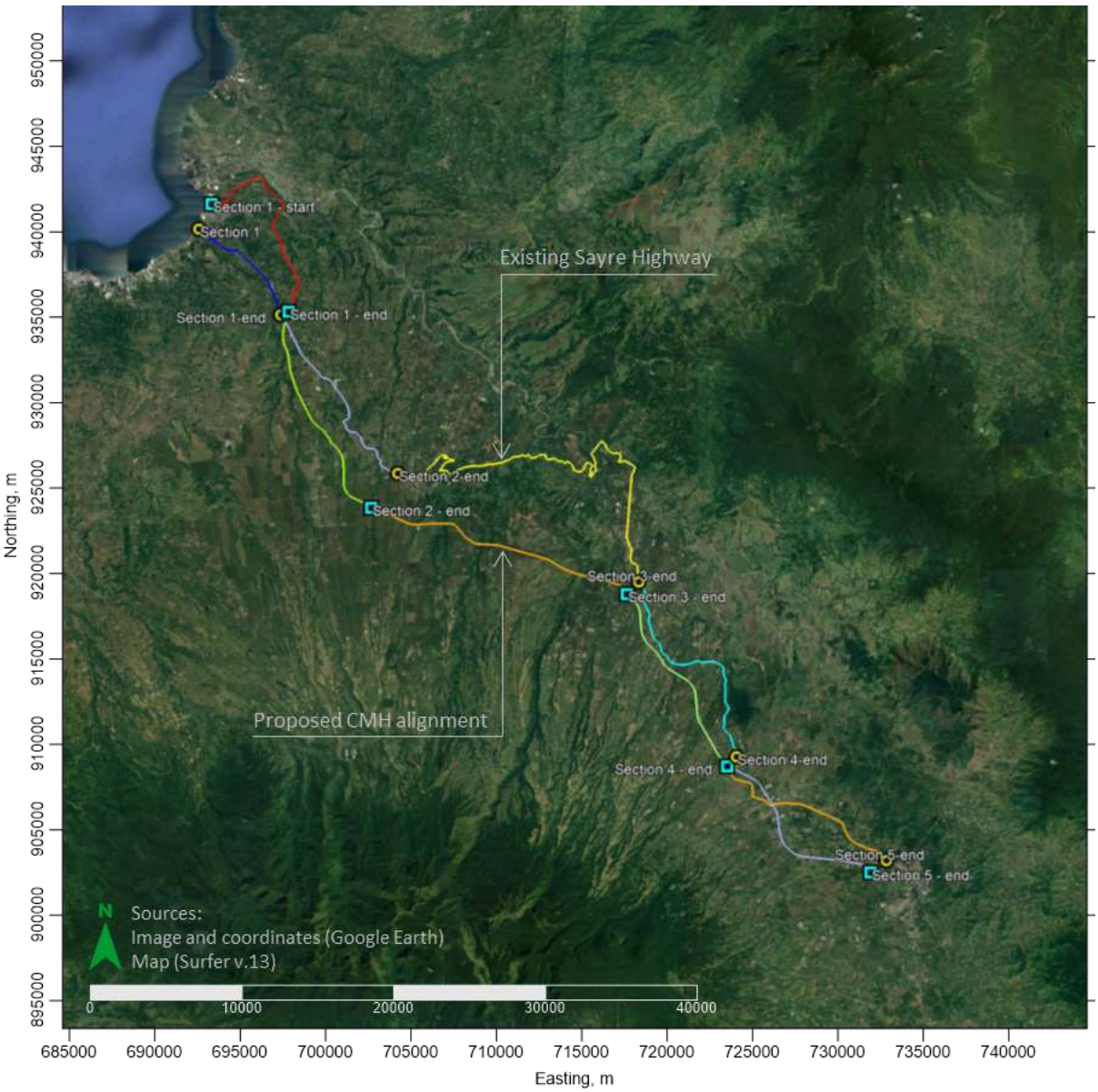
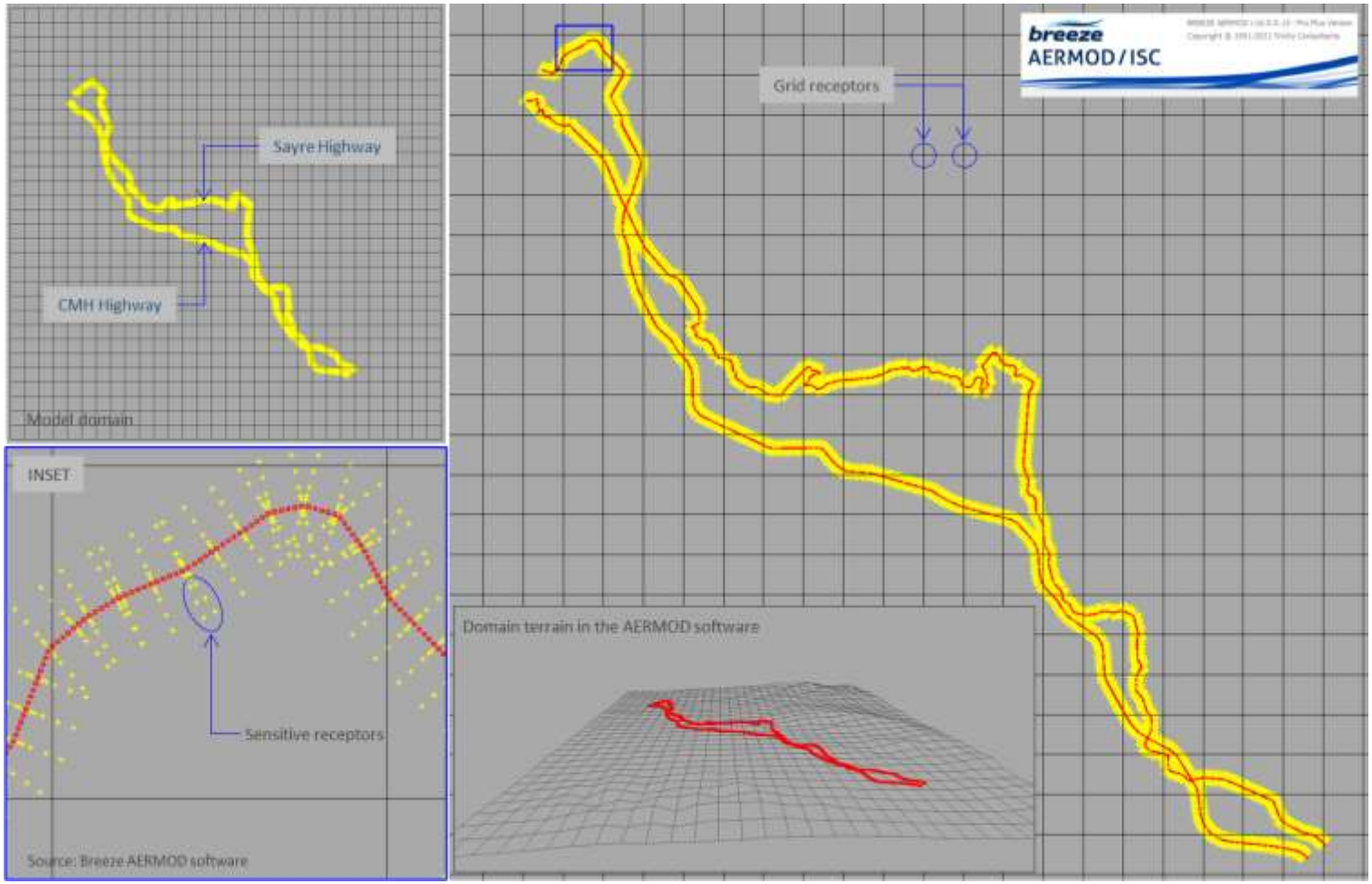

Section 1 - start
Section 1
Section 1-end
Section 1 - end
Existing Sayre Highway
Section 2-end
Section 2 - end
Section 3-end
Section 3 - end
Proposed CMH alignment
Section 4 - end
Section 4-end
Section 5-end
Section 5 - end
N
Sources:
Image and coordinates (Google Earth)
Map (Surfer v.13)
0
10000
20000
30000
40000
Northing, m
895000
900000
905000
910000
915000
920000
925000
930000
935000
940000
945000
950000
Easting, m
685000
690000
695000
700000
705000
710000
715000
720000
725000
730000
735000
740000

Figure 2-5. Model objects in the AERMOD software



Emission rates – The first step in estimating the emission rates was to determine the existing and projected traffic. The existing traffic was based on the survey conducted during the EIA while the traffic projection in 2040 by section was provided by JICA (**Table 2-2**). The traffic projection in 2026 was hindcasted from the 2040 projection using the equation below.

$$r = \left[\left(\frac{P^{(t+n)}}{P_t}\right)^{\frac{1}{n}} - 1\right] x\ 100$$

where r - average annual growth rate
P_t – traffic count of base year
$P^{(t+n)}$ - traffic count at projected year
n - time interval in years

Table 2-2. Traffic projections in Sayre Highway and proposed CMH (2040)

Road	Vehicle Type	Section 1	Section 2	Section 3	Section 4	Section 5
Proposed CMH	Car	13,600	11.700	12,000	10,500	10,600
	Jeepney	0	0	0	0	0
	Bus	2,200	2.200	1,500	1,600	1,600
	Truck	4,800	4.800	3,500	3,400	3,500
	Sub-Total	20,600	18,700	17,000	15,500	15,700
Existing Sayre Highway	Car	4,900	6.000	3,100	4,100	3,700
	Jeepney	1,000	900	600	600	500
	Bus	0	100	100	0	0
	Truck	0	100	100	100	0
	Others	0	0	0	0	0
	Sub-Total	5,900	7.100	3,900	4,800	4,200
	GRAND TOTAL	**26,500**	**25,800**	**20,900**	**20,300**	**19,900**

Source: JICA

The traffic volumes used to estimate emissions for the scenarios *With Project (Sayre Highway only)*, *With Project (CMH only)*, and *Cumulative (both Sayre Highway and CMH alignment)* are shown in **Table 2-3**.

Table 2-3. Number of vehicles for calculating emission rates

		Without Project*		With Project**		CMH and Sayre	
Section	Vehicle type	2026	2040	2026	2040	2026	2040
1	CAR	778,658	1,106,250	2,292,097	3,295,951	3,070,755	4,402,201
	JPY	45,978	65,321	359,573	517,282	405,551	582,604
	BUS	19,940	28,329	101,306	145,707	121,246	174,037
	TRU	671,212	953,599	1,630,065	2,344,052	2,301,277	3,297,651
	OT	0	0	222,414	320,013	222,414	320,013
	TOTAL	1,515,788	2,153,500	4,605,456	6,623,006	6,121,244	8,776,506
2	CAR	993,971	1,412,098	1,753,611	2,491,770	2,747,583	3,903,869
	JPY	20,815	29,571	151,505	215,201	172,320	244,773
	BUS	20,459	29,066	69,033	98,032	89,492	127,098
	TRU	788,844	1,120,681	1,098,718	1,560,798	1,887,561	2,681,479
	OT	0	0	59,564	84,603	59,564	84,603

		Without Project*		With Project**		CMH and Sayre	
Section	**Vehicle type**	2026	2040	2026	2040	2026	2040
	TOTAL	1,824,090	2,591,417	3,132,430	4,450,405	4,956,520	7,041,822
3	CAR	525,765	746,555	1,166,964	1,669,294	1,692,728	2,415,849
	JPY	21,446	30,692	89,976	129,005	111,423	159,697
	BUS	17,398	24,554	84,826	121,237	102,224	145,791
	TRU	437,353	621,699	1,066,687	1,525,430	1,504,040	2,147,129
	OT	0	0	186,920	267,803	186,920	267,803
	TOTAL	1,001,962	1,423,500	2,595,373	3,712,769	3,597,335	5,136,269
4	CAR	663,636	942,839	1,400,319	2,029,093	2,063,955	2,971,932
	JPY	13,350	18,966	261,571	379,054	274,920	398,020
	BUS	26,497	37,645	87,501	126,818	113,997	164,463
	TRU	529,736	752,604	1,158,607	1,678,766	1,688,342	2,431,371
	OT	0	0	247,298	358,384	247,298	358,384
	TOTAL	1,233,218	1,752,054	3,155,295	4,572,116	4,388,513	6,324,170
5	CAR	430,250	611,242	1,262,440	1,793,529	1,692,690	2,404,772
	JPY	185,728	263,858	414,796	589,294	600,524	853,153
	BUS	19,624	27,879	65,909	93,703	85,532	121,581
	TRU	443,461	630,011	637,882	906,221	1,081,343	1,536,232
	OT	0	0	405,339	575,970	405,339	575,970
	TOTAL	1,079,062	1,532,990	2,786,366	3,958,717	3,865,428	5,491,707

The next step was to estimate the emission rates of NOx, SOx, and particulates using the emission factors in **Table 2-4**. Fugitive particulate emissions were also calculated from vehicles travelling in paved roads using the equation[1] below. The values used for the parameters are 0.024 (TSP) and 0.0046 (PM10) for k_i, sL=0.1, and AW=3.1 (default). The resulting emission factors using the equation are 0.0036 kg/km for TSP and 0.000689 kg/km for PM10.

$$EF_i = k_i * \left({}^{sL}/_{2}\right)^{0.65} * \left({}^{AW}/_{3}\right)^{1.5}$$

where EFi – emission factor for particle size i, kg/km
Ki – empirical factor for particle size i
sL – road surface silt loading, g/m^2
AW – average vehicle weight, MT

Table 2-4. Vehicle emission factors for NOx, SOx, SPM

Pollutant	Vehicle type	EF, g/km	Pollutant	Vehicle type	EF, g/km
NOx	Car	2.78	SPM	Car	0.05
	Truck	3.53		Truck	0.05
	Jeepney	7.01		Jeepney	0.81
	Bus	9.22		Bus	0.80
	OT	5.64		OT	0.43
SOx	Car	0.01	Source: JICA & NEDA, Roadmap for Transport Infrastructure Development for Metro Manila and its Surrounding Areas		
	Truck	3.53			
	Jeepney	0.11			

[1] Emissions Estimation Technique Manual, National Pollutant Inventory, Department of Agriculture, Water, and Environment, Australian Government

Pollutant	Vehicle type	EF, g/km	Pollutant	Vehicle type	EF, g/km
	Bus	0.10	Final Report, Technical Report No. 1, March 2014; NOTES: OT – mean of Car, Jeepney, Bus, Truck; vehicle speed >20kph; SPM – suspended particulate matter		
	OT	0.94			

The annual emissions from traffic and particulate matter from unpaved roads at each section, scenario, and year are summarized in **Table 2-5** to **Table 2-9** and the final emission rates for the simulations are shown in **Table 2-10**.

Table 2-5. Annual pollutant emissions from vehicles in Section 1

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
Number of vehicles	CAR	778,658	1,106,250	2,292,097	3,295,951	3,070,755	4,402,201
	JPY	45,978	65,321	359,573	517,282	405,551	582,604
	BUS	19,940	28,329	101,306	145,707	121,246	174,037
	TRU	671,212	953,599	1,630,065	2,344,052	2,301,277	3,297,651
	OT	0	0	222,414	320,013	222,414	320,013
	TOTAL	*1,515,788*	*2,153,500*	*4,605,456*	*6,623,006*	*6,121,244*	*8,776,506*
NOx	CAR	1.83E+07	2.60E+07	8.45E+07	1.22E+08	1.85E+08	2.66E+08
	JPY	2.72E+06	3.86E+06	3.34E+07	4.81E+07	6.17E+07	8.86E+07
	BUS	1.55E+06	2.20E+06	1.24E+07	1.78E+07	2.43E+07	3.48E+07
	TRU	2.00E+07	2.84E+07	7.63E+07	1.10E+08	1.76E+08	2.53E+08
	OT	0.00E+00	0.00E+00	1.66E+07	2.39E+07	2.72E+07	3.91E+07
	TOTAL	*4.25E+07*	*6.04E+07*	*2.23E+08*	*3.21E+08*	*4.75E+08*	*6.81E+08*
Sox	CAR	7.23E+04	1.03E+05	3.34E+05	4.81E+05	7.33E+05	1.05E+06
	JPY	4.27E+04	6.06E+04	5.25E+05	7.55E+05	9.68E+05	1.39E+06
	BUS	1.68E+04	2.39E+04	1.34E+05	1.93E+05	2.63E+05	3.78E+05
	TRU	2.00E+07	2.84E+07	7.63E+07	1.10E+08	1.76E+08	2.53E+08
	OT	0.00E+00	0.00E+00	2.77E+06	3.98E+06	4.53E+06	6.51E+06
	TOTAL	*2.01E+07*	*2.86E+07*	*8.01E+07*	*1.15E+08*	*1.83E+08*	*2.62E+08*
PM	CAR	5.18E+07	7.36E+07	1.52E+06	2.19E+06	3.33E+06	4.78E+06
	JPY	1.64E+07	2.34E+07	3.86E+06	5.56E+06	7.13E+06	1.02E+07
	BUS	7.38E+06	1.05E+07	1.07E+06	1.55E+06	2.10E+06	3.02E+06
	TRU	9.83E+07	1.40E+08	1.08E+06	1.55E+06	2.50E+06	3.58E+06
	OT	0.00E+00	0.00E+00	1.26E+06	1.81E+06	2.06E+06	2.97E+06
	TOTAL	*1.74E+08*	*2.47E+08*	*8.80E+06*	*1.27E+07*	*1.71E+07*	*2.46E+07*

NOTES: values are in grams; JPY – jeepney; TRU – trucks; OT – oversized trucks; PM – particulate matter; *Sayre Highway only; **CMH only

Table 2-6. Annual pollutant emissions from vehicles in Section 2

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
Number of vehicles	CAR	993,971	1,412,098	1,753,611	2,491,770	2,747,583	3,903,869
	JPY	20,815	29,571	151,505	215,201	172,320	244,773
	BUS	20,459	29,066	69,033	98,032	89,492	127,098
	TRU	788,844	1,120,681	1,098,718	1,560,798	1,887,561	2,681,479
	OT	0	0	59,564	84,603	59,564	84,603
	TOTAL	*1,824,090*	*2,591,417*	*3,132,430*	*4,450,405*	*4,956,520*	*7,041,822*
NOx	CAR	3.57E+07	5.08E+07	6.55E+07	9.31E+07	2.01E+08	2.86E+08
	JPY	1.89E+06	2.68E+06	1.43E+07	2.03E+07	3.19E+07	4.53E+07

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
	BUS	2.44E+06	3.47E+06	8.55E+06	1.21E+07	2.18E+07	3.09E+07
	TRU	3.60E+07	5.12E+07	5.21E+07	7.41E+07	1.76E+08	2.50E+08
	OT	0.00E+00	0.00E+00	4.51E+06	6.41E+06	8.85E+06	1.26E+07
	TOTAL	*7.61E+07*	*1.08E+08*	*1.45E+08*	*2.06E+08*	*4.40E+08*	*6.25E+08*
Sox	CAR	1.41E+05	2.01E+05	2.59E+05	3.68E+05	7.97E+05	1.13E+06
	JPY	2.96E+04	4.21E+04	2.24E+05	3.18E+05	5.00E+05	7.10E+05
	BUS	2.65E+04	3.76E+04	9.28E+04	1.32E+05	2.36E+05	3.35E+05
	TRU	3.60E+07	5.12E+07	5.21E+07	7.41E+07	1.76E+08	2.50E+08
	OT	0.00E+00	0.00E+00	7.51E+05	1.07E+06	1.47E+06	2.09E+06
	TOTAL	*3.62E+07*	*5.15E+07*	*5.35E+07*	*7.59E+07*	*1.79E+08*	*2.54E+08*
PM	CAR	6.43E+05	9.13E+05	1.18E+06	1.67E+06	3.62E+06	5.15E+06
	JPY	2.18E+05	3.10E+05	1.65E+06	2.34E+06	3.68E+06	5.23E+06
	BUS	2.12E+05	3.01E+05	7.42E+05	1.05E+06	1.89E+06	2.68E+06
	TRU	5.10E+05	7.25E+05	7.38E+05	1.05E+06	2.49E+06	3.54E+06
	OT	0.00E+00	0.00E+00	3.42E+05	4.86E+05	6.72E+05	9.54E+05
	TOTAL	*1.58E+06*	*2.25E+06*	*4.65E+06*	*6.61E+06*	*1.24E+07*	*1.76E+07*

NOTES: values are in grams; JPY – jeepney; TRU – trucks; OT – oversized trucks; PM – particulate matter; *Sayre Highway only; **CMH only

Table 2-7. Annual pollutant emissions from vehicles in Section 3

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
Number of vehicles	CAR	525,765	746,555	1,166,964	1,669,294	1,692,728	2,415,849
	JPY	21,446	30,692	89,976	129,005	111,423	159,697
	BUS	17,398	24,554	84,826	121,237	102,224	145,791
	TRU	437,353	621,699	1,066,687	1,525,430	1,504,040	2,147,129
	OT	0	0	186,920	267,803	186,920	267,803
	TOTAL	*1,001,962*	*1,423,500*	*2,595,373*	*3,712,769*	*3,597,335*	*5,136,269*
NOx	CAR	4.37E+07	6.20E+07	5.25E+07	7.51E+07	2.17E+08	3.09E+08
	JPY	4.49E+06	6.43E+06	1.02E+07	1.46E+07	3.60E+07	5.16E+07
	BUS	4.79E+06	6.77E+06	1.27E+07	1.81E+07	4.34E+07	6.19E+07
	TRU	4.61E+07	6.56E+07	6.10E+07	8.72E+07	2.45E+08	3.49E+08
	OT	0.00E+00	0.00E+00	1.71E+07	2.44E+07	4.85E+07	6.95E+07
	TOTAL	*9.91E+07*	*1.41E+08*	*1.53E+08*	*2.19E+08*	*5.89E+08*	*8.42E+08*
Sox	CAR	1.73E+05	2.45E+05	2.08E+05	2.97E+05	8.58E+05	1.22E+06
	JPY	7.05E+04	1.01E+05	1.60E+05	2.30E+05	5.65E+05	8.09E+05
	BUS	5.20E+04	7.34E+04	1.37E+05	1.96E+05	4.71E+05	6.72E+05
	TRU	4.61E+07	6.56E+07	6.10E+07	8.72E+07	2.45E+08	3.49E+08
	OT	0.00E+00	0.00E+00	2.84E+06	4.07E+06	8.08E+06	1.16E+07
	TOTAL	*4.64E+07*	*6.60E+07*	*6.43E+07*	*9.20E+07*	*2.55E+08*	*3.64E+08*
PM	CAR	7.86E+05	1.12E+06	9.45E+05	1.35E+06	3.90E+06	5.57E+06
	JPY	5.19E+05	7.43E+05	1.18E+06	1.69E+06	4.16E+06	5.96E+06
	BUS	4.16E+05	5.87E+05	1.10E+06	1.57E+06	3.77E+06	5.37E+06
	TRU	6.54E+05	9.29E+05	8.64E+05	1.23E+06	3.47E+06	4.95E+06
	OT	0.00E+00	0.00E+00	1.29E+06	1.85E+06	3.68E+06	5.28E+06
	TOTAL	*2.37E+06*	*3.37E+06*	*5.38E+06*	*7.70E+06*	*1.90E+07*	*2.71E+07*

NOTES: values are in grams; JPY – jeepney; TRU – trucks; OT – oversized trucks; PM – particulate matter; *Sayre Highway only; **CMH only

Table 2-8. Annual pollutant emissions from vehicles in Section 4

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
Number of vehicles	CAR	663,636	942,839	1,400,319	2,029,093	2,063,955	2,971,932
	JPY	13,350	18,966	261,571	379,054	274,920	398,020
	BUS	26,497	37,645	87,501	126,818	113,997	164,463
	TRU	529,736	752,604	1,158,607	1,678,766	1,688,342	2,431,371
	OT	0	0	247,298	358,384	247,298	358,384
	TOTAL	*1,233,218*	*1,752,054*	*3,155,295*	*4,572,116*	*4,388,513*	*6,324,170*
NOx	CAR	2.62E+07	3.72E+07	4.73E+07	6.85E+07	1.51E+08	2.18E+08
	JPY	1.33E+06	1.89E+06	2.23E+07	3.23E+07	5.08E+07	7.35E+07
	BUS	3.47E+06	4.93E+06	9.80E+06	1.42E+07	2.77E+07	4.00E+07
	TRU	2.66E+07	3.77E+07	4.97E+07	7.20E+07	1.57E+08	2.26E+08
	OT	0.00E+00	0.00E+00	1.69E+07	2.45E+07	3.67E+07	5.32E+07
	TOTAL	*5.76E+07*	*8.18E+07*	*1.46E+08*	*2.11E+08*	*4.23E+08*	*6.11E+08*
Sox	CAR	1.04E+05	1.47E+05	1.87E+05	2.71E+05	5.98E+05	8.62E+05
	JPY	2.09E+04	2.96E+04	3.49E+05	5.06E+05	7.97E+05	1.15E+06
	BUS	3.76E+04	5.35E+04	1.06E+05	1.54E+05	3.00E+05	4.33E+05
	TRU	2.66E+07	3.77E+07	4.97E+07	7.20E+07	1.57E+08	2.26E+08
	OT	0.00E+00	0.00E+00	2.82E+06	4.08E+06	6.11E+06	8.86E+06
	TOTAL	*2.67E+07*	*3.80E+07*	*5.31E+07*	*7.70E+07*	*1.65E+08*	*2.37E+08*
PM	CAR	4.71E+05	6.70E+05	8.50E+05	1.23E+06	2.72E+06	3.92E+06
	JPY	1.54E+05	2.18E+05	2.57E+06	3.73E+06	5.87E+06	8.50E+06
	BUS	3.01E+05	4.28E+05	8.50E+05	1.23E+06	2.40E+06	3.47E+06
	TRU	3.76E+05	5.35E+05	7.04E+05	1.02E+06	2.22E+06	3.20E+06
	OT	0.00E+00	0.00E+00	1.28E+06	1.86E+06	2.79E+06	4.04E+06
	TOTAL	*1.30E+06*	*1.85E+06*	*6.26E+06*	*9.07E+06*	*1.60E+07*	*2.31E+07*

NOTES: values are in grams; JPY – jeepney; TRU – trucks; OT – oversized trucks; PM – particulate matter; *Sayre Highway only; **CMH only

Table 2-9. Annual *pollutant* emissions from vehicles in Section 5

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
Number of vehicles	CAR	430,250	611,242	1,262,440	1,793,529	1,692,690	2,404,772
	JPY	185,728	263,858	414,796	589,294	600,524	853,153
	BUS	19,624	27,879	65,909	93,703	85,532	121,581
	TRU	443,461	630,011	637,882	906,221	1,081,343	1,536,232
	OT	0	0	405,339	575,970	405,339	575,970
	TOTAL	*1,079,062*	*1,532,990*	*2,786,366*	*3,958,717*	*3,865,428*	*5,491,707*
NOx	CAR	1.50E+07	2.12E+07	4.05E+07	5.75E+07	1.13E+08	1.61E+08
	JPY	1.63E+07	2.31E+07	3.35E+07	4.76E+07	1.01E+08	1.44E+08
	BUS	2.26E+06	3.21E+06	7.01E+06	9.96E+06	1.90E+07	2.69E+07
	TRU	1.96E+07	2.78E+07	2.60E+07	3.69E+07	9.18E+07	1.30E+08
	OT	0.00E+00	0.00E+00	2.63E+07	3.74E+07	5.49E+07	7.80E+07
	TOTAL	*5.31E+07*	*7.54E+07*	*1.33E+08*	*1.89E+08*	*3.80E+08*	*5.40E+08*
Sox	CAR	5.92E+04	8.41E+04	1.60E+05	2.28E+05	4.48E+05	6.36E+05
	JPY	2.55E+05	3.63E+05	5.26E+05	7.48E+05	1.59E+06	2.26E+06
	BUS	2.45E+04	3.49E+04	7.60E+04	1.08E+05	2.06E+05	2.92E+05
	TRU	1.96E+07	2.78E+07	2.60E+07	3.69E+07	9.18E+07	1.30E+08
	OT	0.00E+00	0.00E+00	4.38E+06	6.23E+06	9.14E+06	1.30E+07
	TOTAL	*1.99E+07*	*2.83E+07*	*3.11E+07*	*4.42E+07*	*1.03E+08*	*1.47E+08*
PM	CAR	2.69E+05	3.82E+05	7.28E+05	1.03E+06	2.03E+06	2.89E+06

		Without Project*		With Project**		CMH and Sayre	
Parameter	Vehicle type	2026	2040	2026	2040	2026	2040
	JPY	1.88E+06	2.67E+06	3.88E+06	5.51E+06	1.17E+07	1.66E+07
	BUS	1.96E+05	2.79E+05	6.08E+05	8.65E+05	1.64E+06	2.34E+06
	TRU	2.77E+05	3.94E+05	3.68E+05	5.23E+05	1.30E+06	1.85E+06
	OT	0.00E+00	0.00E+00	2.00E+06	2.84E+06	4.17E+06	5.92E+06
	TOTAL	*2.62E+06*	*3.73E+06*	*7.58E+06*	*1.08E+07*	*2.08E+07*	*2.96E+07*

NOTES: values are in grams; JPY – jeepney; TRU – trucks; OT – oversized trucks; PM – particulate matter; *Sayre Highway only; **CMH only

Table 2-10. Final emission rates for model input

		Without Project		With Project		CMH and Sayre	
Pollutant	Year	2026	2040	2026	2040	2026	2040
Nox	Section 1	1.35	1.92	7.08	10.18	15.05	21.59
	Section 2	2.41	3.43	4.60	6.53	13.94	19.81
	Section 3	3.14	4.47	4.86	6.96	18.69	26.69
	Section 4	1.83	2.59	4.63	6.71	13.43	19.36
	Section 5	1.68	2.39	4.23	6.01	12.05	17.12
SO2	Section 1	0.64	0.91	2.54	3.65	5.80	8.31
	Section 2	1.15	1.63	1.70	2.41	5.67	8.05
	Section 3	1.47	2.09	2.04	2.92	8.07	11.53
	Section 4	0.85	1.20	1.68	2.44	5.23	7.53
	Section 5	0.63	0.90	0.99	1.40	3.27	4.65
TSP	Section 1	6.39	9.08	4.46	6.41	9.63	13.81
	Section 2	1.66	2.37	3.03	4.30	9.34	13.27
	Section 3	2.12	3.02	3.05	4.36	11.94	17.05
	Section 4	1.24	1.76	2.82	4.09	8.42	12.14
	Section 5	1.01	1.43	2.44	3.47	7.02	9.97
PM10	Section 1	0.17	0.24	0.80	1.15	1.74	2.50
	Section 2	0.31	0.44	0.55	0.78	1.71	2.44
	Section 3	0.39	0.56	0.55	0.79	2.17	3.10
	Section 4	0.23	0.33	0.50	0.73	1.52	2.19
	Section 5	0.18	0.25	0.42	0.60	1.22	1.73

NOTE: emission rates are in grams per second

Annexes

Attachment 1. Sample AERMOD Meteorological Input File (.sfc/.pfl)

Surface file

```
    8.341N  124.955E          UA_ID:    99999  SF_ID:          OS_ID:    99999     VERSION: 19191  ADJ_U*  BULKRN/MMIF  TEMP_Sub          MMIF VERSION :
20  1  1   1  1  -64.0  0.674 -9.000 -9.000 -999. 1329.    402.7  0.3493   0.02   1.00   5.49  167.4   10.0  294.4   2.0  9999   0.00   51.  942.
20  1  1   1  2  -64.0  0.684 -9.000 -9.000 -999. 1133.    288.6  0.3493   0.02   1.00   4.97  168.1   10.0  294.0   2.0  9999   0.00   52.  942.
20  1  1   1  3  -64.0  0.640 -9.000 -9.000 -999. 1227.    343.9  0.3493   0.02   1.00   5.24  166.6   10.0  294.3   2.0  9999   0.00   55.  942.
20  1  1   1  4  -64.0  0.817 -9.000 -9.000 -999. 1768.    716.4  0.3493   0.02   1.00   6.57  163.3   10.0  295.2   2.0  9999   0.00   56.  943.
20  1  1   1  5  -64.0  0.928 -9.000 -9.000 -999. 2136.   1049.0  0.3493   0.02   1.00   7.42  163.6   10.0  295.5   2.0  9999   0.00   61.  943.
20  1  1   1  6  -64.0  1.005 -9.000 -9.000 -999. 2410.   1334.4  0.3493   0.02   1.00   8.02  161.3   10.0  295.5   2.0  9999   0.00   62.  942.
20  1  1   1  7  -49.5  0.987 -9.000 -9.000 -999. 2356.   1632.9  0.3493   0.02   0.44   7.88  162.0   10.0  295.8   2.0  9999   0.00   70.  943.    1
20  1  1   1  8    4.2  1.008  0.172  0.005   41. 2427. -8888.0  0.3493   0.02   0.23   8.45  155.2   10.0  297.4   2.0  9999   0.00   64.  943.
20  1  1   1  9    7.4  1.065  0.285  0.005  105. 2630. -8888.0  0.3493   0.02   0.17   8.93  151.9   10.0  298.3   2.0  9999   0.00   72.  943.
20  1  1   1 10    9.7  0.948  0.354  0.005  154. 2222. -7221.7  0.3493   0.02   0.16   7.87  151.8   10.0  299.7   2.0  9999   0.00   65.  942.
20  1  1   1 11   11.1  0.930  0.399  0.005  193. 2155. -6002.0  0.3493   0.02   0.15   7.78  149.7   10.0  300.3   2.0  9999   0.00   51.  942.
20  1  1   1 12   11.4  0.932  0.425  0.005  226. 2159. -5976.6  0.3493   0.02   0.15   7.80  152.9   10.0  300.7   2.0  9999   0.00   48.  942.
20  1  1   1 13   10.6  0.781  0.432  0.005  255. 1694. -3777.7  0.3493   0.02   0.15   6.53  149.2   10.0  300.9   2.0  9999   0.00   48.  941.
20  1  1   1 14    8.8  0.736  0.417  0.005  277. 1523. -3818.0  0.3493   0.02   0.15   6.15  147.4   10.0  300.3   2.0  9999   0.00   50.  941.
20  1  1   1 15    6.5  0.757  0.384  0.005  292. 1579. -5619.3  0.3493   0.02   0.16   6.34  152.2   10.0  298.9   2.0  9999   0.00   57.  941.
20  1  1   1 16    3.3  0.803  0.309  0.005  299. 1724. -8888.0  0.3493   0.02   0.19   6.73  154.7   10.0  297.2   2.0  9999   0.00   67.  942.
20  1  1   1 17    0.3  0.785  0.138  0.005  299. 1671. -8888.0  0.3493   0.02   0.31   6.58  154.6   10.0  295.5   2.0  9999   0.00   72.  943.    1
20  1  1   1 18  -64.0  0.811 -9.000 -9.000 -999. 1750.    700.1  0.3493   0.02   1.00   6.52  156.7   10.0  295.9   2.0  9999   0.00   69.  943.
20  1  1   1 19  -64.0  0.874 -9.000 -9.000 -999. 1957.    879.1  0.3493   0.02   1.00   7.01  152.1   10.0  295.7   2.0  9999   0.00   73.  944.
20  1  1   1 20  -64.0  0.857 -9.000 -9.000 -999. 1906.    827.9  0.3493   0.02   1.00   6.88  158.4   10.0  295.2   2.0  9999   0.00   71.  944.
20  1  1   1 21  -64.0  0.845 -9.000 -9.000 -999. 1867.    794.5  0.3493   0.02   1.00   6.79  158.5   10.0  295.5   2.0  9999   0.00   63.  944.
20  1  1   1 22  -64.0  0.749 -9.000 -9.000 -999. 1573.    552.5  0.3493   0.02   1.00   6.05  157.6   10.0  295.5   2.0  9999   0.00   78.  943.
20  1  1   1 23  -64.0  0.683 -9.000 -9.000 -999. 1153.    288.5  0.3493   0.02   1.00   4.97  157.8   10.0  295.4   2.0  9999   0.00   78.  943.
20  1  1   1 24  -64.0  0.568 -9.000 -9.000 -999. 1032.    241.2  0.3493   0.02   1.00   4.72  160.2   10.0  295.4   2.0  9999   0.00   79.  944.
20  1  2   2  1  -55.2  0.394 -9.000 -9.000 -999.  622.     93.4  0.3493   0.02   1.00   3.65  158.3   10.0  294.4   2.0  9999   0.00   82.  943.
20  1  2   2  2  -64.0  0.569 -9.000 -9.000 -999. 1029.    241.4  0.3493   0.02   1.00   4.72  162.4   10.0  294.5   2.0  9999   0.00   80.  942.
20  1  2   2  3  -51.6  0.345 -9.000 -9.000 -999.  535.     67.1  0.3493   0.02   1.00   3.37  166.6   10.0  294.0   2.0  9999   0.00   79.  943.
20  1  2   2  4  -64.0  0.514 -9.000 -9.000 -999.  883.    178.3  0.3493   0.02   1.00   4.34  161.7   10.0  294.9   2.0  9999   0.00   82.  944.
20  1  2   2  5  -64.0  0.542 -9.000 -9.000 -999.  957.    209.3  0.3493   0.02   1.00   4.54  160.9   10.0  294.9   2.0  9999   0.00   81.  944.
20  1  2   2  6  -62.7  0.437 -9.000 -9.000 -999.  702.    111.7  0.3493   0.02   1.00   3.94  163.1   10.0  294.7   2.0  9999   0.00   80.  943.
20  1  2   2  7   -7.8  0.404 -9.000 -9.000 -999.  618.    710.6  0.3493   0.02   0.44   3.27  162.5   10.0  296.4   2.0  9999   0.00   80.  944.    1
20  1  2   2  8    4.1  0.621  0.168  0.005   39. 1174. -4915.7  0.3493   0.02   0.23   5.19  138.5   10.0  298.0   2.0  9999   0.00   76.  944.
20  1  2   2  9    7.3  0.884  0.283  0.006  104. 1725. -5974.3  0.3493   0.02   0.17   6.73  130.4   10.0  299.0   2.0  9999   0.00   73.  945.
20  1  2   2 10    9.6  0.680  0.370  0.005  176. 1187. -1974.3  0.3493   0.02   0.16   5.08  134.9   10.0  299.9   2.0  9999   0.00   68.  943.
20  1  2   2 11   11.0  0.248  0.426  0.005  236.  494.  -116.1  0.3493   0.02   0.15   1.93  175.3   10.0  301.0   2.0  9999   0.00   63.  942.
20  1  2   2 12   11.2  0.615  0.453  0.005  278. 1158. -1749.6  0.3493   0.02   0.15   5.13  136.5   10.0  301.6   2.0  9999   0.00   64.  943.
20  1  2   2 13    4.9  0.540  0.350  0.005  293.  961. -2706.2  0.3493   0.02   0.15   4.51  154.5   10.0  298.9   2.0    11   0.05   75.  942.
20  1  2   2 14    8.6  0.159  0.435  0.005  321.  390.   -39.0  0.3493   0.02   0.15   1.13   63.9   10.0  301.2   2.0  9999   0.00   59.  941.
20  1  2   2 15    6.3  0.383  0.400  0.005  339.  569.  -744.5  0.3493   0.02   0.16   3.16  106.3   10.0  300.3   2.0  9999   0.00   63.  941.
20  1  2   2 16    3.1  0.354  0.318  0.005  347.  507. -1196.5  0.3493   0.02   0.19   2.94   99.6   10.0  298.6   2.0  9999   0.00   69.  942.
20  1  2   2 17    0.3  0.438  0.148  0.005  346.  696. -8888.0  0.3493   0.02   0.31   3.67  151.9   10.0  295.9   2.0  9999   0.00   77.  943.    1
20  1  2   2 18  -64.0  0.629 -9.000 -9.000 -999. 1195.    326.1  0.3493   0.02   1.00   5.16  157.2   10.0  296.1   2.0  9999   0.00   65.  943.
20  1  2   2 19  -64.0  0.592 -9.000 -9.000 -999. 1097.    273.0  0.3493   0.02   1.00   4.89  166.1   10.0  295.8   2.0  9999   0.00   62.  943.
20  1  2   2 20  -64.0  0.561 -9.000 -9.000 -999. 1010.    231.9  0.3493   0.02   1.00   4.67  163.0   10.0  295.6   2.0  9999   0.00   59.  944.
20  1  2   2 21  -64.0  0.677 -9.000 -9.000 -999. 1335.    408.7  0.3493   0.02   1.00   5.52  163.8   10.0  295.7   2.0  9999   0.00   56.  944.
20  1  2   2 22  -64.0  0.751 -9.000 -9.000 -999. 1558.    556.7  0.3493   0.02   1.00   6.07  155.3   10.0  295.6   2.0  9999   0.00   56.  943.
20  1  2   2 23  -64.0  0.816 -9.000 -9.000 -999. 1763.    712.8  0.3493   0.02   1.00   6.56  160.2   10.0  295.3   2.0  9999   0.00   60.  943.
20  1  2   2 24  -64.0  0.790 -9.000 -9.000 -999. 1689.    648.5  0.3493   0.02   1.00   6.37  160.4   10.0  295.3   2.0  9999   0.00   62.  943.
20  1  3   3  1  -64.0  0.753 -9.000 -9.000 -999. 1574.    561.3  0.3493   0.02   1.00   6.09  160.4   10.0  295.3   2.0  9999   0.00   62.  942.
20  1  3   3  2  -64.0  0.693 -9.000 -9.000 -999. 1392.    436.3  0.3493   0.02   1.00   5.63  163.0   10.0  295.3   2.0  9999   0.00   59.  942.
20  1  3   3  3  -64.0  0.725 -9.000 -9.000 -999. 1481.    500.9  0.3493   0.02   1.00   5.88  161.4   10.0  295.5   2.0  9999   0.00   58.  942.
20  1  3   3  4  -64.0  0.752 -9.000 -9.000 -999. 1563.    558.2  0.3493   0.02   1.00   6.07  164.9   10.0  295.5   2.0  9999   0.00   57.  943.
20  1  3   3  5  -64.0  0.705 -9.000 -9.000 -999. 1425.    459.4  0.3493   0.02   1.00   5.72  165.5   10.0  295.5   2.0  9999   0.00   59.  943.
20  1  3   3  6  -64.0  0.644 -9.000 -9.000 -999. 1248.    351.0  0.3493   0.02   1.00   5.27  164.6   10.0  295.5   2.0  9999   0.00   69.  942.
20  1  3   3  7  -22.3  0.639 -9.000 -9.000 -999. 1227.    983.2  0.3493   0.02   0.44   5.13  165.9   10.0  295.8   2.0  9999   0.00   77.  943.    1
20  1  3   3  8    4.1  0.555  0.166  0.005   38. 1002. -3544.5  0.3493   0.02   0.23   4.64  155.3   10.0  297.6   2.0  9999   0.00   64.  944.
20  1  3   3  9    7.4  0.663  0.266  0.005   85. 1293. -3527.8  0.3493   0.02   0.17   5.54  155.3   10.0  298.7   2.0  9999   0.00   60.  943.
20  1  3   3 10    9.6  0.618  0.335  0.005  131. 1171. -2060.3  0.3493   0.02   0.16   5.16  155.8   10.0  299.8   2.0  9999   0.00   47.  942.
20  1  3   3 11   11.0  0.649  0.383  0.005  171. 1253. -2080.0  0.3493   0.02   0.15   5.41  152.1   10.0  300.8   2.0  9999   0.00   42.  941.
20  1  3   3 12   11.4  0.504  0.411  0.005  204.  880.  -943.2  0.3493   0.02   0.15   4.17  138.8   10.0  301.7   2.0  9999   0.00   38.  941.
20  1  3   3 13   10.6  0.499  0.418  0.005  231.  845.  -982.4  0.3493   0.02   0.15   4.13  125.8   10.0  301.6   2.0  9999   0.00   38.  940.
20  1  3   3 14    8.7  0.682  0.406  0.005  250. 1120. -2114.4  0.3493   0.02   0.15   5.02  143.4   10.0  300.6   2.0  9999   0.00   42.  939.
20  1  3   3 15    6.4  0.796  0.378  0.005  282. 1700. -6594.9  0.3493   0.02   0.16   6.66  153.1   10.0  299.0   2.0  9999   0.00   49.  939.
20  1  3   3 16    3.0  0.826  0.298  0.005  291. 1800. -8888.0  0.3493   0.02   0.19   6.93  156.4   10.0  297.1   2.0  9999   0.00   57.  940.
20  1  3   3 17    0.2  0.868  0.116  0.005  291. 1938. -8888.0  0.3493   0.02   0.30   7.28  164.9   10.0  295.8   2.0  9999   0.00   61.  941.    1
20  1  3   3 18  -64.0  0.835 -9.000 -9.000 -999. 1835.    762.4  0.3493   0.02   0.74   6.70  163.0   10.0  295.9   2.0  9999   0.00   59.  941.
20  1  3   3 19  -64.0  0.811 -9.000 -9.000 -999. 1755.    699.1  0.3493   0.02   1.00   6.52  160.9   10.0  295.7   2.0  9999   0.00   61.  942.
20  1  3   3 20  -64.0  0.757 -9.000 -9.000 -999. 1589.    570.0  0.3493   0.02   1.00   6.11  161.4   10.0  295.6   2.0  9999   0.00   67.  943.
20  1  3   3 21  -64.0  0.765 -9.000 -9.000 -999. 1605.    587.7  0.3493   0.02   1.00   6.17  160.4   10.0  296.0   2.0  9999   0.00   70.  942.
20  1  3   3 22  -64.0  0.712 -9.000 -9.000 -999. 1449.    473.5  0.3493   0.02   1.00   5.78  160.1   10.0  296.0   2.0  9999   0.00   71.  941.
20  1  3   3 23  -64.0  0.881 -9.000 -9.000 -999. 1977.    895.4  0.3493   0.02   1.00   7.06  151.0   10.0  295.7   2.0  9999   0.00   77.  941.
20  1  3   3 24  -64.0  0.991 -9.000 -9.000 -999. 2358.   1275.9  0.3493   0.02   1.00   7.91  155.3   10.0  295.8   2.0  9999   0.00   72.  940.
20  1  4   4  1  -64.0  0.843 -9.000 -9.000 -999. 1895.    783.9  0.3493   0.02   1.00   6.77  162.4   10.0  295.8   2.0  9999   0.00   62.  940.
20  1  4   4  2  -64.0  0.800 -9.000 -9.000 -999. 1726.    669.9  0.3493   0.02   1.00   6.44  162.6   10.0  295.8   2.0  9999   0.00   56.  939.
20  1  4   4  3  -64.0  0.780 -9.000 -9.000 -999. 1655.    620.1  0.3493   0.02   1.00   6.29  165.4   10.0  295.9   2.0  9999   0.00   53.  939.
20  1  4   4  4  -64.0  0.696 -9.000 -9.000 -999. 1406.    441.5  0.3493   0.02   1.00   5.65  170.1   10.0  295.9   2.0  9999   0.00   50.  941.
20  1  4   4  5  -64.0  0.519 -9.000 -9.000 -999.  934.    183.5  0.3493   0.02   1.00   4.38  180.0   10.0  295.2   2.0  9999   0.00   51.  941.
20  1  4   4  6  -51.0  0.309 -9.000 -9.000 -999.  460.     48.6  0.3493   0.02   1.00   3.24  178.0   10.0  293.7   2.0  9999   0.00   56.  940.
20  1  4   4  7  -22.6  0.428 -9.000 -9.000 -999.  671.    290.4  0.3493   0.02   0.44   3.57  161.4   10.0  296.2   2.0  9999   0.00   69.  941.    1
20  1  4   4  8    4.1  0.582  0.141  0.005   23. 1064. -4051.4  0.3493   0.02   0.23   4.86  154.1   10.0  297.6   2.0  9999   0.00   76.  942.
20  1  4   4  9    7.3  0.632  0.226  0.005   53. 1203. -2906.8  0.3493   0.02   0.17   5.28  148.5   10.0  298.6   2.0  9999   0.00   72.  941.
20  1  4   4 10    9.8  0.683  0.304  0.005   97. 1126. -1884.8  0.3493   0.02   0.16   5.83  152.6   10.0  299.9   2.0  9999   0.00   50.  940.
```

Profile file

20	1	1	1	2.0	0	999.0	999.00	21.29	99.00	99.00
20	1	1	1	10.0	0	167.4	5.49	22.09	99.00	99.00
20	1	1	1	30.0	0	167.4	8.22	22.98	99.00	99.00
20	1	1	1	60.0	0	164.5	9.76	23.01	99.00	99.00
20	1	1	1	120.0	0	159.2	11.19	23.07	99.00	99.00
20	1	1	1	240.0	0	142.3	9.93	22.99	99.00	99.00
20	1	1	1	480.0	0	113.4	5.93	22.05	99.00	99.00
20	1	1	1	920.0	0	72.9	7.72	19.92	99.00	99.00
20	1	1	1	1600.0	0	74.1	6.38	16.56	99.00	99.00
20	1	1	1	2500.0	0	85.8	5.52	11.68	99.00	99.00
20	1	1	1	3500.0	1	92.6	8.76	5.55	99.00	99.00
20	1	1	2	2.0	0	999.0	999.00	20.86	99.00	99.00
20	1	1	2	10.0	0	168.1	4.97	21.78	99.00	99.00
20	1	1	2	30.0	0	168.1	7.76	22.92	99.00	99.00
20	1	1	2	60.0	0	164.5	9.39	22.96	99.00	99.00
20	1	1	2	120.0	0	159.0	10.96	23.05	99.00	99.00
20	1	1	2	240.0	0	140.9	9.71	23.08	99.00	99.00
20	1	1	2	480.0	0	113.0	5.31	22.18	99.00	99.00
20	1	1	2	920.0	0	73.3	6.89	19.82	99.00	99.00
20	1	1	2	1600.0	0	73.5	6.82	16.62	99.00	99.00
20	1	1	2	2500.0	0	94.6	5.38	11.80	99.00	99.00
20	1	1	2	3500.0	1	94.7	7.98	5.64	99.00	99.00
20	1	1	3	2.0	0	999.0	999.00	21.13	99.00	99.00
20	1	1	3	10.0	0	166.6	5.24	21.94	99.00	99.00
20	1	1	3	30.0	0	166.6	7.94	22.87	99.00	99.00
20	1	1	3	60.0	0	163.3	9.52	23.00	99.00	99.00
20	1	1	3	120.0	0	157.1	10.57	23.17	99.00	99.00
20	1	1	3	240.0	0	139.5	8.42	23.27	99.00	99.00
20	1	1	3	480.0	0	112.8	5.45	21.95	99.00	99.00
20	1	1	3	920.0	0	76.1	6.54	19.16	99.00	99.00
20	1	1	3	1600.0	0	78.6	6.75	16.53	99.00	99.00
20	1	1	3	2500.0	0	88.8	5.62	12.27	99.00	99.00
20	1	1	3	3500.0	1	88.4	7.41	5.85	99.00	99.00
20	1	1	4	2.0	0	999.0	999.00	22.01	99.00	99.00
20	1	1	4	10.0	0	163.3	6.57	22.57	99.00	99.00
20	1	1	4	30.0	0	163.3	9.31	23.13	99.00	99.00
20	1	1	4	60.0	0	161.1	10.78	23.06	99.00	99.00
20	1	1	4	120.0	0	156.9	12.10	22.94	99.00	99.00
20	1	1	4	240.0	0	143.2	10.90	22.64	99.00	99.00
20	1	1	4	480.0	0	111.8	7.47	21.84	99.00	99.00
20	1	1	4	920.0	0	73.3	7.47	19.51	99.00	99.00
20	1	1	4	1600.0	0	80.3	6.40	16.73	99.00	99.00
20	1	1	4	2500.0	0	80.0	5.50	12.26	99.00	99.00
20	1	1	4	3500.0	1	83.9	7.52	5.96	99.00	99.00
20	1	1	5	2.0	0	999.0	999.00	22.32	99.00	99.00
20	1	1	5	10.0	0	163.6	7.42	22.75	99.00	99.00
20	1	1	5	30.0	0	163.6	10.28	23.17	99.00	99.00
20	1	1	5	60.0	0	161.9	11.69	23.06	99.00	99.00
20	1	1	5	120.0	0	158.4	13.05	22.90	99.00	99.00
20	1	1	5	240.0	0	146.3	12.55	22.57	99.00	99.00
20	1	1	5	480.0	0	116.3	8.97	21.75	99.00	99.00
20	1	1	5	920.0	0	76.4	8.98	19.64	99.00	99.00
20	1	1	5	1600.0	0	82.5	7.31	16.91	99.00	99.00
20	1	1	5	2500.0	0	92.8	5.25	12.35	99.00	99.00
20	1	1	5	3500.0	1	87.3	7.55	6.11	99.00	99.00
20	1	1	6	2.0	0	999.0	999.00	22.35	99.00	99.00
20	1	1	6	10.0	0	161.3	8.02	22.72	99.00	99.00
20	1	1	6	30.0	0	161.3	11.00	23.07	99.00	99.00
20	1	1	6	60.0	0	159.4	12.36	22.93	99.00	99.00
20	1	1	6	120.0	0	156.1	13.63	22.76	99.00	99.00
20	1	1	6	240.0	0	144.6	12.88	22.38	99.00	99.00
20	1	1	6	480.0	0	113.0	9.32	21.42	99.00	99.00
20	1	1	6	920.0	0	76.5	8.27	19.31	99.00	99.00
20	1	1	6	1600.0	0	86.1	6.97	17.20	99.00	99.00
20	1	1	6	2500.0	0	86.0	5.43	12.28	99.00	99.00
20	1	1	6	3500.0	1	82.4	7.91	6.07	99.00	99.00
20	1	1	7	2.0	0	999.0	999.00	22.60	99.00	99.00
20	1	1	7	10.0	0	162.0	7.88	23.01	99.00	99.00
20	1	1	7	30.0	0	162.0	10.80	23.40	99.00	99.00
20	1	1	7	60.0	0	159.9	12.08	23.30	99.00	99.00
20	1	1	7	120.0	0	156.3	13.28	23.19	99.00	99.00
20	1	1	7	240.0	0	144.3	12.40	23.05	99.00	99.00
20	1	1	7	480.0	0	113.7	8.97	22.33	99.00	99.00
20	1	1	7	920.0	0	77.8	7.93	20.00	99.00	99.00
20	1	1	7	1600.0	0	85.2	7.49	17.17	99.00	99.00
20	1	1	7	2500.0	0	92.1	5.39	12.02	99.00	99.00
20	1	1	7	3500.0	1	81.2	7.75	5.79	99.00	99.00
20	1	1	8	2.0	0	999.0	999.00	24.27	99.00	99.00
20	1	1	8	10.0	0	155.2	8.45	24.40	99.00	99.00
20	1	1	8	30.0	0	155.2	11.32	24.58	99.00	99.00

Attachment 2. Sample DEM for AERMOD

```
tmpdm1_1.dem : Lakes Environmental Software - DEM Converter
  353   352   352   352   343   347   349   345   342   342   340   338   336   335   334   334   334   333   331   329   327   331   323   317
   15     0     3     3     4     7     9     2     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
    7     7     3     3     4     6     4     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  360   361   362   358   359   357   354   351   348   345   347   344   340   339   336   335   333   332   335   326   320   322   321   316
  545   566   578   585   578   589   613   633   624   599   581   570   565   566   561   564   540   508   488   477   483   489   507   540
    1     7   669     1  4.488240234375000D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  8.850000000000000D+02
    0     0     0     0     0     0     0     0     0     0     0     0     0
    6     5     4     5     9     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  367   365   362   360   359   359   357   357   353   350   349   346   346   346   346   346   344   329   195   180   189   174   166   186
  569   599   600   597   615   622   622   643   644   618   608   591   579   545   515   500   493   507   514   505   522   551   574   580
    1    11   669     1  4.488359985351562D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  8.880000000000000D+02
    0     0     0     0     0     0     0     0     0     0     0     0     0
    6     8     4     6     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  376   373   371   372   369   365   364   362   358   356   355   354   352   349   345   312   303   310   275   187   184   197   247   291
  591   609   617   622   620   623   628   604   595   578   556   531   518   511   518   543   576   571   574   596   617   615   600   580
    1    15   669     1  4.488480010986328D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  9.430000000000000D+02
    0     0     0     0     0     0     0     0     0     0     0     0     0
    4     2     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  367   368   367   366   368   372   371   361   356   335   302   273   285   300   266   201   195   204   207   209   219   260   319   342
  623   643   643   632   635   629   596   572   540   530   536   347   553   571   604   609   612   625   639   633   621   617   592   582
    1    19   668     1  4.488600036621094D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.021000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    3     4     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  378   375   367   366   362   356   356   341   295   239   283   312   298   252   220   220   224   212   200   219   305   345   340   341
  675   664   659   632   604   595   563   547   545   549   553   555   576   613   630   640   640   621   602   596   593   571   582   600
    1    23   668     1  4.488720062255859D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.080000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    7     4     5     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  273   314   313   272   250   254   240   272   328   361   361   360   361   357   354   351   351   351   347   348   345   348   353   352
  688   662   632   602   590   597   572   561   566   590   613   634   649   654   642   618   608   588   609   624   608   621   646   628
    1    27   668     1  4.488840087890625D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.010000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    6     4     1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  381   378   376   377   375   370   370   368   368   366   366   364   363   363   361   358   355   356   355   350   347   346   345   342
  647   630   627   628   614   596   581   575   604   640   653   657   641   628   612   595   619   646   658   659   657   665   650   639
    1    31   668     1  4.488960113525391D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.038000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  391   386   385   382   384   380   378   379   374   370   368   367   363   362   359   361   358   355   355   353   352   349   349   345
  693   681   679   654   610   599   616   665   702   684   666   640   637   642   641   629   636   651   682   698   684   680   688   676
    1    35   668     1  4.489080139160156D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.057000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  389   388   387   383   382   380   379   379   375   372   368   365   364   363   362   364   359   356   355   354   354   354   352   349
  679   638   619   631   669   699   715   716   697   678   678   682   687   680   693   703   702   690   681   675   682   681   667   656
    1    39   668     1  4.489200164794922D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.054000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  387   387   383   380   380   378   376   380   378   376   373   370   368   366   365   360   358   356   350   354   349   348   345   350
  647   636   667   719   751   722   722   719   716   713   709   711   704   694   685   695   683   668   665   664   658   642   646   643
    1    43   668     1  4.489320190429688D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.084000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  382   381   386   387   384   379   376   376   373   370   370   372   363   365   363   360   362   366   364   360   358   359   380   412
  680   696   712   722   733   738   729   724   716   711   712   700   694   702   705   699   681   660   639   634   632   644   648   642
    1    47   668     1  4.489440216064453D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.115000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  382   379   373   369   373   370   368   368   369   378   388   400   415   423   437   458   491   510   495   494   510   511   498   498
  780   796   787   785   775   771   762   755   748   742   738   723   709   695   682   675   666   672   675   687   692   696   712   715
    1    51   668     1  4.489560241699219D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.152000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  461   476   490   503   510   521   522   510   527   533   532   529   531   549   569   592   616   651   633   624   624   606   587   594
  822   823   817   818   807   790   770   757   750   745   748   745   740   733   727   714   702   695   710   728   734   739   732   719
    1    55   668     1  4.489679992675781D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.186000000000000D+03
    0     0     0     0     0     0     0     0     0     0     0     0
    1     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0     0
  606   605   593   584   588   566   552   541   542   553   572   584   580   586   592   599   620   652   691   695   675   670   656   640
  841   841   834   818   811   799   794   792   784   766   752   742   736   734   734   733   731   732   723   709   698   694   678   681
    1    59   668     1  4.489800018310547D+05  2.905800018310547D+04  0.000000000000000D+00  0.000000000000000D+00  1.233000000000000D+03
```

Attachment 3. Sample AERMOD input file (.ami)

```
** BREEZE AERMOD
** Trinity Consultants
** VERSION  10.0

CO STARTING
CO TITLEONE  Sayre only (Section 1) - CO Run 2026
CO MODELOPT  CONC  FASTALL  NODRYDPLT  NOWETDPLT
CO RUNORNOT  RUN
CO AVERTIME  1  8  24
CO POLLUTID  CO
CO FINISHED

SO STARTING
SO ELEVUNIT  METERS
SO LOCATION  SS1_1     VOLUME    692734.4  940179.6  6.23
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_2     VOLUME    692760.5  940146.7  6.69
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_3     VOLUME    692786.6  940113.8  6.96
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_4     VOLUME    692812.7  940080.9  7.22
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_5     VOLUME    692844.3  940062.9  8.06
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_6     VOLUME    692885.6  940071.0  8.82
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_7     VOLUME    692926.8  940079.0  10.47
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_8     VOLUME    692968.0  940087.0  13.34
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_9     VOLUME    693008.8  940096.7  15.72
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_10    VOLUME    693048.2  940111.3  18.98
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_11    VOLUME    693087.6  940125.8  21.41
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_12    VOLUME    693127.0  940140.3  24.59
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_13    VOLUME    693166.4  940154.8  28.3
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_14    VOLUME    693205.8  940169.3  29.81
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_15    VOLUME    693245.2  940183.8  28.95
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_16    VOLUME    693264.6  940171.5  31.61
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_17    VOLUME    693261.8  940129.5  38.26
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_18    VOLUME    693259.0  940087.6  44.21
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_19    VOLUME    693259.6  940046.9  49.19
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_20    VOLUME    693286.6  940014.7  53.43
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_21    VOLUME    693313.7  939982.5  53.63
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_22    VOLUME    693340.7  939950.4  56.59
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_23    VOLUME    693336.3  939927.1  60.53
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_24    VOLUME    693296.5  939913.8  62.06
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_25    VOLUME    693256.6  939900.4  62.11
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_26    VOLUME    693278.9  939865.0  68.17
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_27    VOLUME    693301.4  939829.6  73.76
** SRCDESCR  Sayre Segment 1
SO LOCATION  SS1_28    VOLUME    693323.9  939794.1  80.5
```

Attachment 4. Sample AERMOD Summary file (.sum)

```
*** AERMOD - VERSION 21112  ***   ***  Sayre only (Section 2) -  CO run 2040                          ***        11/02/21
*** AERMET - VERSION  19191 ***   ***                                                                  ***        05:16:15
                                                                                                                  PAGE   1
*** MODELOPTs:    NonDFAULT  CONC  ELEV  FASTALL  NODRYDPLT  NOWETDPLT  RURAL  ADJ_U*  MMIF_Data

                                          ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Model Is Setup For Calculation of Average CONCentration Values.

  --  DEPOSITION LOGIC  --
**NO GAS DEPOSITION Data Provided.
**NO PARTICLE DEPOSITION Data Provided.
**Model Uses NO DRY DEPLETION.  DRYDPLT  =  F
**Model Uses NO WET DEPLETION.  WETDPLT  =  F

**Model Uses RURAL Dispersion Only.

**Model Allows User-Specified Options:
        1. Stack-tip Downwash.
        2. Model Accounts for ELEVated Terrain Effects.
        3. Use Calms Processing Routine.
        4. Use Missing Data Processing Routine.
        5. No Exponential Decay.

**Other Options Specified:
        FASTALL  - Use effective sigma-y to optimize meander for
                   POINT and VOLUME sources, and hybrid approach
                   to optimize AREA sources (formerly TOXICS option)
        ADJ_U*   - Use ADJ_U* option for SBL in AERMET
        MMIFData - Use MMIF met data inputs
                   MMIF VERSION 3.4.1 2019-03-11
        BULKRN   - Use BULKRN Delta-T and SolarRad option for SBL with MMIF
        TEMP_Sub - Meteorological data includes TEMP substitutions

**Model Assumes No FLAGPOLE Receptor Heights.

**The User Specified a Pollutant Type of:  CO

**Model Calculates  2 Short Term Average(s) of:   1-HR   8-HR

**This Run Includes:    309 Source(s);       1 Source Group(s); and    1711 Receptor(s)

               with:      0 POINT(s), including
                          0 POINTCAP(s) and      0 POINTHOR(s)
                 and:   309 VOLUME source(s)
                 and:     0 AREA type source(s)
                 and:     0 LINE source(s)
                 and:     0 RLINE/RLINEXT source(s)
                 and:     0 OPENPIT source(s)
                 and:     0 BUOYANT LINE source(s) with a total of     0 line(s)


**Model Set To Continue RUNning After the Setup Testing.

**The AERMET Input Meteorological Data Version Date:  19191

**Output Options Selected:
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
         Model Outputs Tables of Overall Maximum Short Term Values (MAXTABLE Keyword)
         Model Outputs External File(s) of Concurrent Values for Postprocessing (POSTFILE Keyword)
         Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)
         Model Outputs Separate Summary File of High Ranked Values (SUMMFILE Keyword)

**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                m for Missing Hours
                                                                b for Both Calm and Missing Hours

**Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =   615.00 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                ;  Emission Rate Unit Factor =    1000.0
                 Output Units   = MILLIGRAMS/M**3

**Approximate Storage Requirements of Model =      3.9 MB of RAM.
```

Attachment 5. AERMOD 98th percentile output file (.pco)

```
Percentile Report


Parameters:

  Source group = ALL
  Avg. period  = 1 hour
  Period       = 2020/1/1/1 to 2020/12/31/24
  Avg. periods = 8784
  Percentiles  = 98
  Scaling      = 1
  Translation  = 0
  Units        = Micrograms/m**3


All Receptors:

            Corresponding     Receptor     Receptor        Maximum
Percentile  Highest Value  X-coord (m)  Y-coord (m)  Concentration
----------  -------------  -----------  -----------  -------------
98                    176    701243.38    928936.13     .10144E+03


Individual Receptors:

Receptor     Receptor     Receptor  Percentile > > >
Number    X-coord (m)  Y-coord (m)          98
--------  -----------  -----------  ----------
1           684588.00    893371.00  .22919E-01
2           686588.00    893371.00  .24649E-01
3           688588.00    893371.00  .23859E-01
4           690588.00    893371.00  .24305E-01
5           692588.00    893371.00  .24788E-01
6           694588.00    893371.00  .25434E-01
7           696588.00    893371.00  .27155E-01
8           698588.00    893371.00  .28214E-01
9           700588.00    893371.00  .30026E-01
10          702588.00    893371.00  .36442E-01
11          704588.00    893371.00  .37186E-01
12          706588.00    893371.00  .42165E-01
13          708588.00    893371.00  .44637E-01
14          710588.00    893371.00  .48207E-01
15          712588.00    893371.00  .45656E-01
16          714588.00    893371.00  .50814E-01
17          716588.00    893371.00  .53561E-01
18          718588.00    893371.00  .58677E-01
19          720588.00    893371.00  .61684E-01
20          722588.00    893371.00  .70466E-01
21          724588.00    893371.00  .76222E-01
22          726588.00    893371.00  .81600E-01
23          728588.00    893371.00  .85213E-01
24          730588.00    893371.00  .81161E-01
25          732588.00    893371.00  .74273E-01
26          734588.00    893371.00  .87949E-01
27          736588.00    893371.00  .11420E+00
28          738588.00    893371.00  .10980E+00
29          740588.00    893371.00  .96797E-01
30          742588.00    893371.00  .49419E-01
31          744588.00    893371.00  .41904E-01
32          684588.00    895371.00  .22233E-01
33          686588.00    895371.00  .22340E-01
34          688588.00    895371.00  .25234E-01
35          690588.00    895371.00  .24536E-01
36          692588.00    895371.00  .21436E-01
37          694588.00    895371.00  .24493E-01
38          696588.00    895371.00  .22999E-01
39          698588.00    895371.00  .24843E-01
40          700588.00    895371.00  .31490E-01
41          702588.00    895371.00  .31254E-01
42          704588.00    895371.00  .39807E-01
43          706588.00    895371.00  .38029E-01
44          708588.00    895371.00  .39737E-01
45          710588.00    895371.00  .45576E-01
46          712588.00    895371.00  .46207E-01
47          714588.00    895371.00  .50089E-01
```

Attachment 6. Sample spreadsheet of processing model outputs

JICA- SO2 (98p GLCs at GRID RECEPTORS, ug/ncm)
AT = 1h

<-- CALCULATION CELLS
<-- constant
<-- data from pcp

	2026												2040											
	Sayre						CMH						Sayre						CMH					
	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC
Min	0.00000	0.00000	0.00000	0.00001	0.00000	0.00001	0.00000	0.00000	0.00000	0.00002	0.00004	0.00071	0.00000	0.00000	0.00000	0.00001	0.00002	0.00088	0.00000	0.00000	0.00000	0.00001	0.00006	0.00100
Q1	0.00287	0.01014	0.01269	0.01268	0.02892	0.08637	0.01961	0.02036	0.02344	0.03078	0.02133	0.13971	0.00409	0.01655	0.01804	0.01801	0.01876	0.08410	0.02820	0.02892	0.03352	0.04460	0.03030	0.20025
Median	0.01280	0.02966	0.04409	0.05164	0.07581	0.27936	0.05245	0.05336	0.08830	0.11968	0.06388	0.57385	0.01819	0.04839	0.06267	0.07358	0.05485	0.36650	0.07542	0.07581	0.13829	0.17342	0.09073	0.82092
Q3	0.08144	0.13792	0.12920	0.14830	0.41693	1.45428	0.12152	0.29350	0.33287	0.32703	0.17690	2.69515	0.04468	0.22503	0.18366	0.21070	0.15642	1.62155	0.17474	0.41693	0.47607	0.47386	0.25132	3.85961
Max	27.71700	34.74600	26.80700	17.03500	71.63200	74.07157	68.99200	50.42500	48.88400	38.26800	25.50900	75.91302	39.37800	40.37600	38.10600	24.20200	21.94100	45.33954	99.21300	71.63200	89.91400	55.44900	36.24100	109.05810
CAA Standard	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540
Index (Max/CAA)	0.08152	0.07278	0.07884	0.05010	0.21068	0.21786	0.20292	0.14831	0.14378	0.11255	0.07503	0.22327	0.11582	0.11875	0.11208	0.07118	0.06453	0.13335	0.29180	0.21068	0.20563	0.16309	0.10659	0.32076
# of exceed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% exceed	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
# of recs	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961	961

	UTM Coordinates		2026												2040											
			Sayre						CMH						Sayre						CMH					
#	Ex	Ny	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC	SEC1	SEC2	SEC3	SEC4	SEC5	ALLSEC
1	684588	895371	0.005887	0.008499	0.006046	0.010705	0.025770	0.057887	0.021110	0.018141	0.012394	0.026421	0.014328	0.092394	8.54E-03	0.015498	0.008595	0.015209	0.011310	0.058952	0.030556	0.025770	0.017725	0.038284	2.04E-02	0.132491
2	686588	895371	0.006415	0.010219	0.007129	0.008431	0.027790	0.057980	0.021728	0.018562	0.013785	0.023992	0.018199	0.097266	9.12E-03	0.016667	0.010134	0.009137	0.011413	0.056469	0.031246	0.027790	0.019715	0.034764	2.59E-02	0.138971
3	688588	895371	0.006503	0.009888	0.006324	0.001519	0.026754	0.050987	0.021947	0.018834	0.014046	0.005305	0.001517	0.062050	9.24E-03	0.016133	0.008990	0.002157	0.001053	0.037574	0.032186	0.026754	0.020089	0.007687	2.16E-03	0.088822
4	690588	895371	0.006900	0.010073	0.006027	0.001728	0.026679	0.051407	0.023514	0.018780	0.015041	0.003582	0.000865	0.061380	9.81E-03	0.016435	0.008568	0.002455	0.000649	0.037913	0.033814	0.026679	0.021512	0.004901	9.42E-04	0.087847
5	692588	895371	0.007112	0.010273	0.005418	0.002058	0.028968	0.053829	0.024535	0.020392	0.014740	0.004596	0.000440	0.064703	1.01E-02	0.016762	0.007702	0.002924	0.000372	0.037869	0.035283	0.028968	0.021080	0.006660	6.24E-04	0.092615
6	694588	895371	0.006869	0.010541	0.005210	0.001090	0.029580	0.053289	0.024252	0.020823	0.012209	0.002784	0.000433	0.060500	9.76E-03	0.017198	0.007406	0.001548	0.000322	0.036237	0.034876	0.029580	0.017461	0.004034	8.14E-04	0.086565
7	696588	895371	0.006745	0.011254	0.006266	0.000700	0.030485	0.055448	0.024666	0.021460	0.012262	0.001581	0.000193	0.060163	9.58E-03	0.018362	0.008907	0.000995	0.000160	0.038005	0.035471	0.030485	0.017557	0.002291	2.75E-04	0.086059
8	698588	895371	0.006874	0.011693	0.007123	0.000720	0.031011	0.057520	0.025865	0.021890	0.014134	0.001739	0.000157	0.063729	9.77E-03	0.019078	0.010267	0.001023	0.000158	0.040295	0.037195	0.031011	0.020114	0.002520	2.23E-04	0.091163
9	700588	895371	0.007288	0.012444	0.008165	0.000934	0.032581	0.061391	0.025451	0.022955	0.017521	0.002258	0.000175	0.068320	1.03E-02	0.020504	0.011606	0.001326	0.000152	0.045699	0.038600	0.032581	0.025059	0.003243	2.49E-04	0.097731
10	702588	895371	0.008076	0.015103	0.011438	0.001653	0.038706	0.074976	0.029174	0.027247	0.024581	0.003846	0.000552	0.085400	1.15E-02	0.024642	0.016259	0.002349	0.000551	0.055279	0.041955	0.038706	0.035156	0.005573	7.84E-04	0.121171
11	704588	895371	0.008350	0.015411	0.013451	0.002195	0.042727	0.082132	0.030756	0.030078	0.027984	0.005294	0.000824	0.094957	1.19E-02	0.029145	0.019121	0.003115	0.000774	0.060026	0.044229	0.042727	0.040023	0.007671	1.17E-03	0.135822
12	706588	895371	0.009276	0.017475	0.015680	0.003745	0.045761	0.091937	0.031358	0.032213	0.031756	0.008679	0.001453	0.105459	1.32E-02	0.028512	0.022290	0.005321	0.001375	0.070680	0.045094	0.045761	0.045417	0.012576	2.06E-03	0.150912
13	708588	895371	0.009688	0.018499	0.017326	0.004674	0.049315	0.099502	0.035278	0.034715	0.034698	0.011578	0.002089	0.118358	1.38E-02	0.030184	0.024629	0.006640	0.001950	0.077170	0.050731	0.049315	0.049625	0.016777	2.97E-03	0.169418
14	710588	895371	0.010170	0.019978	0.018593	0.006848	0.052805	0.108391	0.039917	0.037172	0.036383	0.016249	0.002771	0.128472	1.45E-02	0.032597	0.026429	0.009726	0.002826	0.086038	0.055650	0.052805	0.052008	0.023544	3.84E-03	0.183941
15	712588	895371	0.010401	0.018921	0.018416	0.006905	0.051553	0.106196	0.037361	0.036291	0.034636	0.015918	0.002811	0.127017	1.48E-02	0.030873	0.026179	0.009811	0.002834	0.084479	0.053727	0.051553	0.049535	0.023064	3.99E-03	0.181873
16	714588	895371	0.010745	0.021059	0.020610	0.010582	0.053975	0.116969	0.040185	0.037998	0.039601	0.025719	0.005012	0.148513	1.53E-02	0.034361	0.029297	0.015003	0.004742	0.098703	0.057787	0.053975	0.056637	0.037285	7.12E-03	0.212785
17	716588	895371	0.011601	0.022187	0.023061	0.014515	0.058811	0.130185	0.040438	0.041400	0.042728	0.034957	0.007305	0.166828	1.65E-02	0.036218	0.032781	0.020622	0.007185	0.113291	0.058152	0.058811	0.061109	0.050652	1.04E-02	0.239103
18	718588	895371	0.011843	0.024317	0.024643	0.019385	0.060160	0.140348	0.043395	0.042350	0.047266	0.043155	0.011763	0.188029	1.68E-02	0.039677	0.035031	0.027340	0.011508	0.130588	0.063405	0.060160	0.067999	0.061676	1.67E-02	0.269552
19	720588	895371	0.012559	0.025564	0.027140	0.024035	0.065509	0.154607	0.045289	0.046115	0.053845	0.055035	0.021330	0.221614	1.78E-02	0.041711	0.038579	0.034147	0.018919	0.150911	0.065128	0.065509	0.077009	0.079744	3.03E-02	0.317693
20	722588	895371	0.013023	0.029203	0.030480	0.030011	0.071143	0.173860	0.048293	0.050081	0.060416	0.067207	0.031697	0.257694	1.85E-02	0.047649	0.043328	0.042637	0.025808	0.177928	0.069447	0.071143	0.086406	0.097380	4.50E-02	0.369409
21	724588	895371	0.013741	0.031589	0.035713	0.035909	0.074674	0.191628	0.052891	0.052567	0.072008	0.086767	0.047059	0.311292	1.95E-02	0.051542	0.050767	0.051017	0.036365	0.209220	0.076059	0.074674	0.102990	0.125720	6.69E-02	0.446300
22	726588	895371	0.015270	0.033818	0.043560	0.047774	0.078410	0.218842	0.058273	0.055204	0.089604	0.109770	0.066100	0.379951	2.17E-02	0.055178	0.061921	0.067873	0.054695	0.261369	0.085237	0.078410	0.128150	0.159050	9.39E-02	0.544766
23	728588	895371	0.016371	0.035315	0.055776	0.089634	0.079858	0.276954	0.066134	0.056216	0.108850	0.215340	0.207520	0.652160	2.33E-02	0.057621	0.079285	0.127340	0.142450	0.429959	0.095148	0.079858	0.152810	0.312030	2.95E-01	0.934776
24	730588	895371	0.017655	0.038836	0.063337	0.103310	0.074609	0.291547	0.068710	0.051521	0.112930	0.219260	0.234200	0.687621	2.51E-02	0.054681	0.090034	0.145350	0.183260	0.498619	0.098807	0.074609	0.161510	0.317690	3.33E-01	0.985346
25	732588	895371	0.016629	0.030781	0.077298	0.096947	0.084731	0.306386	0.071959	0.059646	0.163120	0.198940	0.247970	0.741635	2.36E-02	0.050224	0.108880	0.137730	0.174920	0.496387	0.103480	0.084731	0.233300	0.288260	3.52E-01	1.062071
26	734588	895371	0.015535	0.058449	0.080766	0.090550	0.103200	0.328500	0.067721	0.072648	0.150450	0.177310	0.255010	0.723139	2.21E-02	0.059472	0.114810	0.128560	0.186280	0.511003	0.097586	0.103200	0.215180	0.256930	3.62E-01	1.034978
27	736588	895371	0.014175	0.047329	0.086886	0.084722	0.118150	0.351261	0.063655	0.083169	0.125000	0.158250	0.221380	0.651454	2.01E-02	0.077224	0.123510	0.120370	0.186540	0.527590	0.091539	0.118150	0.178780	0.229300	3.15E-01	0.932289
28	738588	895371	0.013212	0.045904	0.082198	0.077880	0.104440	0.323235	0.059143	0.073522	0.128610	0.160870	0.212100	0.634245	1.88E-02	0.074246	0.116850	0.110650	0.182050	0.502566	0.085050	0.104440	0.183930	0.233090	3.01E-01	0.907840
29	740588	895371	0.012546	0.040116	0.076573	0.077888	0.093503	0.300406	0.054756	0.065821	0.130080	0.160770	0.186180	0.597587	1.75E-02	0.065454	0.108850	0.110630	0.174800	0.476781	0.078741	0.093503	0.188000	0.232950	2.65E-01	0.855704
30	742588	895371	0.010932	0.020481	0.057958	0.082170	0.055936	0.227077	0.047700	0.039095	0.125630	0.154850	0.176900	0.544175	1.55E-02	0.038417	0.082388	0.116740	0.144430	0.392510	0.068594	0.055936	0.179670	0.224370	2.51E-01	0.779490
31	744588	895371	0.009605	0.017586	0.043758	0.051636	0.036875	0.159238	0.039781	0.025958	0.049848	0.134390	0.147060	0.396837	1.36E-02	0.028555	0.062203	0.075560	0.119360	0.298905	0.057207	0.036875	0.071005	0.194720	2.09E-01	0.568757

Annex 9. Laboratory report of sound measurements

HiAdvance Philippines Incorporated
(formerly RCALABS Phils., Inc.)

HiAdvance Philippines Incorporated
3F Maga Center, San Antonio St., Paseo de Magallanes,
1232 Makati City, Philippines
Office: +632.7729.4327 Fax No: +632.8854.8365
Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

NOISE LEVEL MEASUREMENT REPORT

Company Name	AMET-Asia Inc.
Address	Unit 303, One Corporate Center, Julia Vargas Ave.,cor. Meralco Ave. Pasig
Project Name	**Ambient Air Monitoring**
Project Site(s)	Cagayan De Oro-Bukidnon
Sampling Date	23rd of April to 6th of May, 2021
Project Manager	Ms. Pamella Andrea L. Pomida

1.0 Noise Analysis Background

HiAdvance Philippines, Incorporated (HiAdvance) was contracted by AMET-Asia Inc. to monitor the Noise level at ten (10) sampling locations for twenty-four (24) hours with five (5) Minutes recording interval. Sampling locations are located in the site mentioned above. The noise level monitoring was conducted last April 23 to May 6, 2021.

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities within the work premises. Sound (noise) is described in terms of loudness, frequency and duration. Loudness is the sound pressure level measured on a logarithmic scale in units of decibels (dB).

2.0 Noise Introduction

Noise is measured in terms of sound pressure level and is usually expressed in decibels (dB). The human ear is less sensitive to higher and lower frequencies than it is to mid-range frequencies. To provide a measurement meaningful to humans, a weighting system that reduces the sound level of higher and lower frequency sounds, similar to what the human ear does, was developed. This filtering system is used in virtually all noise ordinances. Measurements taken with this "A weighted" filter are referred to as "dBA" readings.

There are two primary noise measurement descriptors that are used to assess noise impacts from traffic and transit projects, the L_{eq} and the L_{dn}, described below:

L_{eq}: The equivalent sound level (L_{eq}) is the level of a constant sound for a specified period of time that has the same sound energy as an actual fluctuating noise over the same period of time.

The peak-hour L_{eq} is used for all traffic and light rail noise analyses at locations with daytime use, such as schools and libraries.

L_{dn}: The day-night sound level (L_{dn}) is an L_{eq} over a 24-hour period, The L_{dn} is the primary noise-level descriptor for light rail noise at residential land uses.

M21E113 AMET-Asia, Inc./ Ambient Noise Level Measurement Report

HiAdvance Philippines Incorporated
(formerly NCALABS Phils., Inc.)

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1232 Makati City, Philippines
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Email: info@hiadvance.com.ph
Website: www.hiadvance.com.ph

In addition to the L_{eq} and L_{dn}, there is also a descriptor called the L_{max}. The L_{max} is the loudest 1 second over a measurement period and is used in many local and state ordinances for noise coming from private land uses and for construction impact evaluation.

3.0 Noise Evaluation Methodology

For noise level monitoring, sound level frequency characteristics are based upon human hearing, using an A-weighted [dB (A)] frequency filter. The A-weighted filter is used to approximate the way humans hear sound.

EXTECH Model SDL600 with Serial No. H.399668, a digital sound level meter that meets ANSI and IEC Type 2 specifications was used to measure the noise level at the sampling points specified by the client. This measuring device has ±1.5 dB accuracy with 0.1 dB resolution.

Prior to actual noise measurement, the digital sound level meter was calibrated using Extech 407766 Sound level Calibrator set at 94 dB.

4.0 Sampling Location

Station **AQN1- Brgy. Casinglot Purok Zone 2B**

Latitude: 8.515825 N
Longitude: 124.757942 E

Station **AQN2- Brgy. Purok 7 Mambatangan**

Latitude: 8.463833 N
Longitude: 124.800872 E

Station **AQN3- Zone 4 Alae**

Latitude: 8.412193 N
Longitude: 124.804962 E

Station **AQN4- Zone 1 Diclum**

Latitude: 8.371687 N
Longitude: 124.852996 E

Station **AQN5- Brgy. San Roque Purok 4**

Latitude: 8.329792 N

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Longitude: 124.933255 E

Station **AQN6- Brgy. Poblacion**

Latitude: 8.312317 N
Longitude: 124.983626 E

Station **AQN7- Brgy. Lafortuna Zone 7**

Latitude: 8.266137 N
Longitude: 124.996892 E

Station **AQN8- Brgy. Impalutao Zone 3**

Latitude: 8.23260 N
Longitude: 125.028944 E

Station **AQN9- Brgy. Patpat Zone 5**

Latitude: 8.195157 N
Longitude: 125.053188 E

Station **AQN10- Brgy. Kalasungay Zone 1**

Latitude: 8.165801 N
Longitude: 125.113448 E

4.1 Sampling period: TWENTY-FOUR (24) HOURS

- **Five (5) minutes** with ten (10) seconds interval for unattended
- **One (1) minute** with ten (10) seconds interval for attended noise

5.0 Data and Discussion of Results

5.1 Station AQN1- (Start Sampling time @ 1020H, 23rd-24th of April, 2021 (Station AQN1)

Sampling equipment was set up in a grassy ground, beside highway, approximately 1-2 meters away from the road. The sources of noise are the frequent passing of light to heavy vehicles; and animal sounds such frogs croaking, birds chirping, crickets and other insects present at nighttime.

The weather condition during sampling is sunny to rainy with light wind blowing. Traffic situation is moderate since it is near from the highway.

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5.1.1 For Five (5) Minutes with ten (10) seconds interval

Table 1: Hourly Equivalent Sound Level, (Leq (h) – Station AQN1)

HOUR	TIME DURATION	Leq/Hr
1	10:20:04-11:20:04	51.7
2	11:20:04-12:20:04	52.6
3	12:20:04-13:20:04	54.8
4	13:20:04-14:20:04	53.1
5	14:20:04-15:20:04	51.1
6	15:20:04-16:20:04	52.8
7	16:20:04-17:20:04	41.7
8	17:20:04-18:20:04	50.8
9	18:20:04-19:20:04	51.7
10	19:20:04-20:20:04	44.8
11	20:20:04-21:20:04	45.5
12	21:20:04-22:20:04	49.8
13	22:20:04-23:20:04	45.9
14	23:20:04-00:20:04	42.7
15	00:20:04-01:20:04	37.3
16	01:20:04-02:20:04	41.9
17	02:20:04-03:20:04	41.8
18	03:20:04-04:20:04	40.1
19	04:20:04-05:20:04	46.1
20	05:20:04-06:20:04	48.6
21	06:20:04-07:20:04	49.6
22	07:20:04-08:20:04	47.0
23	08:20:04-09:20:04	42.7
24	09:20:04-10:20:04	44.1

5.2 Station AQN2- (Start Sampling time @ 1420H, 24th-25th of April, 2021

Sampling equipment was set up in a rocky and grassy ground, approximately 50 meters away from the residential area, 5-10 meters away from the access road. Noise mainly comes from light vehicles, and animal sounds such as dogs barking, birds chirping, crickets and other insects present at nighttime.

The weather condition during sampling is sunny to cloudy with moderate wind blowing. Traffic situation is light since it is far from the highway.

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5.2.1 For Five (5) Minutes with ten (10) seconds interval

Table 2: Hourly Equivalent Sound Level, (Leq (h) – Station AQN2)

HOUR	TIME DURATION	Leq/Hr
1	14:20:03-15:20:03	32.7
2	15:20:03-16:20:03	26.3
3	16:20:03-17:20:03	27.4
4	17:20:03-18:20:03	24.4
5	18:20:03-19:20:03	28.0
6	19:20:03-20:20:03	23.7
7	20:20:03-21:20:03	23.8
8	21:20:03-22:20:03	25.1
9	22:20:03-23:20:03	23.1
10	23:20:03-00:20:03	23.0
11	00:20:03-01:20:03	22.4
12	01:20:03-02:20:03	19.9
13	02:20:03-03:20:03	20.8
14	03:20:03-04:20:03	24.5
15	04:20:03-05:20:03	27.8
16	05:20:03-06:20:03	25.8
17	06:20:03-07:20:03	27.8
18	07:20:03-08:20:03	32.4
19	08:20:03-09:20:03	30.2
20	09:20:03-10:20:03	25.5
21	10:20:03-11:20:03	27.7
22	11:20:03-12:20:03	32.6
23	12:20:04-13:20:04	34.3
24	13:20:04-14:20:04	32.7

5.3 Station AQN3-(Start Sampling time @ 1509H, 27th-28th of April, 2021

Sampling equipment was placed in a rocky and grassy ground. It is approximately 10-15m away from residential houses, surrounded by trees. The source of noise are the passing of light vehicles such as motorcycles and tricycles; and animal sounds such as dogs barking, birds chirping, chicken noise, crickets and other insects present at nighttime.

The weather condition during sampling is cloudy with moderate wind blowing. No traffic situation because it is far away from the road.

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5.3.1 For Five (5) Minutes with ten (10) seconds interval

Table 3: Hourly Equivalent Sound Level, (Leq (h) – Station AQN3)

HOUR	TIME DURATION	Leq/Hr
1	15:09:18-16:09:18	35.2
2	16:09:18-17:09:18	38.4
3	17:09:18-18:09:18	34.6
4	18:09:18-19:09:18	27.2
5	19:09:18-20:09:18	25.6
6	20:09:18-21:09:18	27.3
7	21:09:18-22:09:18	26.1
8	22:09:18-23:09:18	31.4
9	23:09:18-00:09:18	28.3
10	00:09:18-01:09:18	25.4
11	01:09:18-02:09:18	24.6
12	02:09:18-03:09:18	36.0
13	03:09:18-04:09:18	39.5
14	04:09:18-05:09:18	39.2
15	05:09:18-06:09:18	40.1
16	06:09:18-07:09:18	40.6
17	07:09:18-08:09:18	38.8
18	08:09:18-09:09:18	34.1
19	09:09:18-10:09:18	31.1
20	10:09:18-11:09:18	30.5
21	11:09:18-12:09:18	28.0
22	12:09:18-13:09:18	32.3
23	13:09:18-14:09:18	39.3
24	14:09:18-15:09:18	39.5

5.4 Station AQN4- (Start Sampling time @ 1301H, 26th-27th of April, 2021)

Sampling equipment's set up in a rocky with some grass ground. Noise comes from the passing light to heavy vehicles along the road approximately 3-5 meters away from the sampling point, and insects such as crickets present in the night time.

The weather condition during sampling is sunny with moderate wind blowing. Traffic situation is light to moderate since it is near the highway.

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5.4.1 For Five (5) Minutes with ten (10) seconds interval

Table 4: Hourly Equivalent Sound Level, (Leq (h) – Station AQN4)

HOUR	TIME DURATION	Leq/Hr
1	13:01:08-14:01:08	45.2
2	14:01:08-15:01:08	46.3
3	15:01:08-16:01:08	43.6
4	16:01:08-17:01:08	44.6
5	17:01:08-18:01:08	45.9
6	18:01:08-19:01:08	44.3
7	19:01:08-20:01:08	43.1
8	20:01:08-21:01:08	42.5
9	21:01:08-22:01:08	46.4
10	22:01:08-23:01:08	42.4
11	23:01:08-00:01:08	38.5
12	00:01:08-01:01:08	47.1
13	01:01:08-02:01:08	40.6
14	02:01:08-03:01:08	37.2
15	03:01:08-04:01:08	41.5
16	04:01:08-05:01:08	45.3
17	05:01:08-06:01:08	41.2
18	06:01:08-07:01:08	43.2
19	07:01:08-08:01:08	48.7
20	08:01:08-09:01:08	44.0
21	09:01:08-10:01:08	46.5
22	10:01:08-11:01:08	48.6
23	11:01:08-12:01:08	45.8
24	12:01:08-13:01:08	44.8

5.5 Station AQN5- (Start Sampling time @ 0956H, 30th of April – 01st May, 2021)

Sampling equipment's set up at a grassy ground inside the vicinity of San Roque Elementary school. It is approximately 8 meters away from the access road and 20 meters away from the residential area. The source of noise are the passing of minimal light vehicles along the road and animal sounds such as dogs barking; chicken noise, birds chirping, crickets and other insects present at nighttime.

The weather condition during sampling is fair with light wind blowing. Traffic situation is light to moderate since it is near the main and access road.

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5.5.1For Five (5) Minutes with ten (10) seconds interval

Table 5: Hourly Equivalent Sound Level, (Leq (h) – Station AQN5)

HOUR	TIME DURATION	Leq/Hr
1	09:56:18-10:56:17	27.6
2	10:56:17-11:56:17	22.5
3	11:56:17-12:56:17	32.9
4	12:56:17-13:56:17	29.4
5	13:56:17-14:56:17	26.1
6	14:56:17-15:56:17	33.3
7	15:56:17-16:56:17	32.1
8	16:56:17-17:56:17	30.7
9	17:56:17-18:56:17	42.8
10	18:56:17-19:56:17	43.2
11	19:56:17-20:56:17	43.2
12	20:56:17-21:56:17	43.3
13	21:56:17-22:56:17	43.3
14	22:56:17-23:56:17	43.3
15	23:56:17-00:56:17	43.1
16	00:56:17-01:56:17	43.0
17	01:56:17-02:56:17	43.9
18	02:56:17-03:56:17	44.0
19	03:56:17-04:56:17	43.7
20	04:56:17-05:56:17	43.3
21	05:56:17-06:56:17	41.3
22	06:56:17-07:56:17	35.3
23	07:56:17-08:56:17	36.4
24	08:56:17-09:56:17	35.3

5.6 Station AQN6- (Start Sampling time @ 1730H, 28th-29th of April, 2021)

Sampling equipment's set up at in a grassy and soft soil ground approximately 5 meters away from the road and 5 meters away from the residential area. Noise mainly comes from the passing of light to heavy vehicles passing in the access road; minimal noise contribution from animal sounds such as dogs barking; birds chirping, crickets and other insects present at nighttime.

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The weather condition during sampling is fair with light wind blowing. Traffic situation is light to moderate since it is near the access road.

5.6.1 For Five (5) Minutes with ten (10) seconds interval

Table 6: Hourly Equivalent Sound Level, (Leq (h) – Station AQN6)

HOUR	TIME DURATION	Leq/Hr
1	17:30:37-18:30:36	51.2
2	18:30:36-19:30:36	41.7
3	19:30:37-20:30:36	44.2
4	20:30:37-21:30:36	40.3
5	21:30:37-22:30:36	41.6
6	22:30:37-23:30:36	45.0
7	23:30:37-00:30:36	40.6
8	00:30:37-01:30:36	38.1
9	01:30:37-02:30:36	46.3
10	02:30:37-03:30:36	40.9
11	03:30:37-04:30:36	46.3
12	04:30:37-05:30:36	48.2
13	05:30:37-06:30:36	52.4
14	06:30:37-07:30:36	50.2
15	07:30:37-08:30:36	47.8
16	08:30:37-09:30:36	51.3
17	09:30:37-10:30:36	50.7
18	10:30:37-11:30:36	42.0
19	11:30:37-12:30:36	43.5
20	12:30:37-13:30:36	44.8
21	13:30:37-14:30:36	45.8
22	14:30:37-15:30:36	50.1
23	15:30:37-16:30:36	41.9
24	16:30:37-17:30:36	48.2

5.7 Station AQN7- (Start Sampling time @ 1325H, 01rd-02nd of May, 2021)

Sampling equipment's set up at grassy/soil ground approximately 5 meters away from the access road and 8-10 meters away from the residential. The source of noise are the passing of light vehicles and from animal sounds such as dogs barking, birds chirping, crickets and other insects present at nighttime.

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The weather condition during sampling is fair with light wind blowing. Traffic situation is light since it is far from the highway road.

5.7.1 For Five (5) Minutes with ten (10) seconds interval

Table 7: Hourly Equivalent Sound Level, (Leq (h) – Station AQN7)

HOUR	TIME DURATION	Leq/Hr
1	13:25:06-14:01:06	38.2
2	14:25:06-15:01:06	31.8
3	15:25:06-16:01:06	28.8
4	16:25:06-17:01:06	29.6
5	17:25:06-18:01:06	35.1
6	18:25:06-19:01:06	34.1
7	19:25:06-20:01:06	30.1
8	20:25:06-21:01:06	24.7
9	21:25:06-22:01:06	24.7
10	22:25:06-23:01:06	29.8
11	23:25:06-00:01:06	23.5
12	24:25:06-01:01:06	24.8
13	01:25:06-02:01:06	31.1
14	02:25:06-03:01:06	25.7
15	03:25:06-04:01:06	28.9
16	04:25:06-05:01:06	41.1
17	05:25:06-06:01:06	44.9
18	06:25:06-07:01:06	43.4
19	07:25:06-08:01:06	38.7
20	08:25:06-09:01:06	42.0
21	09:25:06-10:01:06	36.6
22	10:25:06-11:01:06	31.6
23	11:25:06-12:25:06	31.2
24	12:25:06-13:25:06	50.8

5.8 Station AQN8- (Start Sampling time @ 0900H, 03rd-04th of May, 2021)

Sampling equipment's set up in a grassy/soil ground beside the main road, approximately 3-5 meters away from the highway. The source of noise are the passing of various light to heavy vehicles and from animal sounds such as birds chirping, crickets and other insects present at nighttime.

The weather condition during sampling is sunny with strong wind blowing. No Traffic situation since it is far from the highway.

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5.8.1. For Five (5) Minutes with ten (10) seconds interval

Table 8: Hourly Equivalent Sound Level, (Leq (h) – Station AQN8)

HOUR	TIME DURATION	Leq/Hr
1	09:00:36-10:00:36	50.5
2	10:00:36-11:00:36	47.0
3	11:00:36-12:00:36	42.9
4	12:00:36-13:00:36	44.8
5	13:00:36-14:00:36	45.7
6	14:00:36-15:00:36	46.4
7	15:00:36-16:00:36	49.8
8	16:00:36-17:00:36	43.5
9	17:00:36-18:00:36	46.2
10	18:00:36-19:00:36	48.9
11	19:00:36-20:00:36	44.5
12	20:00:36-21:00:36	39.4
13	21:00:36-22:00:36	42.4
14	22:00:36-23:00:36	40.6
15	23:00:36-00:00:36	44.7
16	00:00:36-01:00:36	38.8
17	01:00:36-02:00:36	42.2
18	02:00:36-03:00:36	45.3
19	03:00:36-04:00:36	47.0
20	04:00:36-05:00:36	48.1
21	05:00:36-06:00:36	49.9
22	06:00:36-07:00:36	50.4
23	07:00:36-08:00:36	51.5
24	08:00:36-09:00:36	50.0

5.9 Station AQN9- (Start Sampling time @ 1001H, 04th -05th of May, 2021)

Sampling equipment's set up at in a soft soil surface ground, approximately 1-2 meters away from the 2-lanes highway and 3-5 meters away from the poultry. The sources of noise are the passing of heavy and light vehicles in the highway and from animal sounds such as dogs barking, birds chirping, crickets and other insects present at nighttime.

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The weather condition during sampling is sunny to cloudy. Traffic situation is light to moderate since it is near the highway road.

5.9.1 For Five (5) Minutes with ten (10) seconds interval

Table 9: Hourly Equivalent Sound Level, (Leq (h) – Station AQN9)

HOUR	TIME DURATION	Leq/Hr
1	10:01:17-11:01:17	27.7
2	11:01:17-12:01:17	21.5
3	12:01:17-13:01:17	32.9
4	13:01:17-14:01:17	29.4
5	14:01:17-15:01:17	25.4
6	15:01:17-16:01:17	33.3
7	16:01:17-17:01:17	31.0
8	17:01:17-18:01:17	30.6
9	18:01:17-19:01:17	43.1
10	19:01:17-20:01:17	43.2
11	20:01:17-21:01:17	43.2
12	21:01:17-22:01:17	43.3
13	22:01:17-23:01:17	43.3
14	23:01:17-00:01:17	43.3
15	00:01:17-01:01:17	43.1
16	01:01:17-02:01:17	43.0
17	02:01:17-03:01:17	44.0
18	03:01:17-04:01:17	44.0
19	04:01:17-05:01:17	43.7
20	05:01:17-06:01:17	43.4
21	06:01:17-07:01:17	40.7
22	07:01:17-08:01:17	35.3
23	08:01:17-09:01:17	36.5
24	09:01:17-10:01:17	34.4

5.9 Station AQN10- (Start Sampling time @ 1300H, 05th -06th of May, 2021)

Sampling equipment's set up in a rocky and grassy ground beside the road, 1-2 meters away from the highway and approximately 8-10 meters away from the Birhen sa Lourdes Chapel. The sources of noise are the passing of light vehicles in the highway, blowing of horns and from animal sounds such as dogs barking, birds chirping, crickets and other insects present at nighttime.

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The weather condition during sampling is sunny to cloudy with light wind blowing. Traffic situation is light to moderate since it is near from the highway.

5.10.1 For Five (5) Minutes with ten (10) seconds interval

Table 10: Hourly Equivalent Sound Level, (Leq (h) – Station AQN10)

HOUR	TIME DURATION	Leq/Hr
1	13:00:39-14:00:39	43.8
2	14:00:39-15:00:39	48.1
3	15:00:39-16:00:39	44.0
4	16:00:39-17:00:39	44.5
5	17:00:39-18:00:39	44.0
6	18:00:39-19:00:39	44.7
7	19:00:39-20:00:39	48.2
8	20:00:39-21:00:39	51.4
9	21:00:39-22:00:39	49.3
10	22:00:39-23:00:39	47.7
11	23:00:39-00:00:39	47.9
12	00:00:39-01:00:39	47.9
13	01:00:39-02:00:39	45.2
14	02:00:39-03:00:39	48.6
15	03:00:39-04:00:39	45.5
16	04:00:39-05:00:39	46.5
17	05:00:39-06:00:39	46.3
18	06:00:39-07:00:39	46.8
19	07:00:39-08:00:39	47.9
20	08:00:39-09:00:39	46.9
21	09:00:39-10:00:39	46.5
22	10:00:39-11:00:39	48.3
23	11:00:39-12:00:39	47.9
24	12:00:39-13:00:39	47.6

The table in the next page summarizes the cumulative 24-hours exposure from all events at the ten (10) sampling stations. The highest L_{dn} was computed at Station AQN1 while the lowest computed L_{dn} is from the Station AQN2. These values may be used as a baseline on the impact assessment for the upcoming Project.

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Table 8: Day-Night Sound Level for All Stations

Sampling Point	Leq (Day)	Leq (Day)	L_{dn}
Station AQN1	51.3	45.9	49.0
Station AQN2	30.8	22.1	28.1
Station AQN3	38.6	25.3	35.4
Station AQN4	47.3	40.8	44.7
Station AQN5	43.0	40.3	40.5
Station AQN6	50.0	41.5	47.1
Station AQN7	42.8	27.8	39.5
Station AQN8	49.6	41.5	46.8
Station AQN9	41.5	40.4	40.5
Station AQN10	48.8	45.7	47.0

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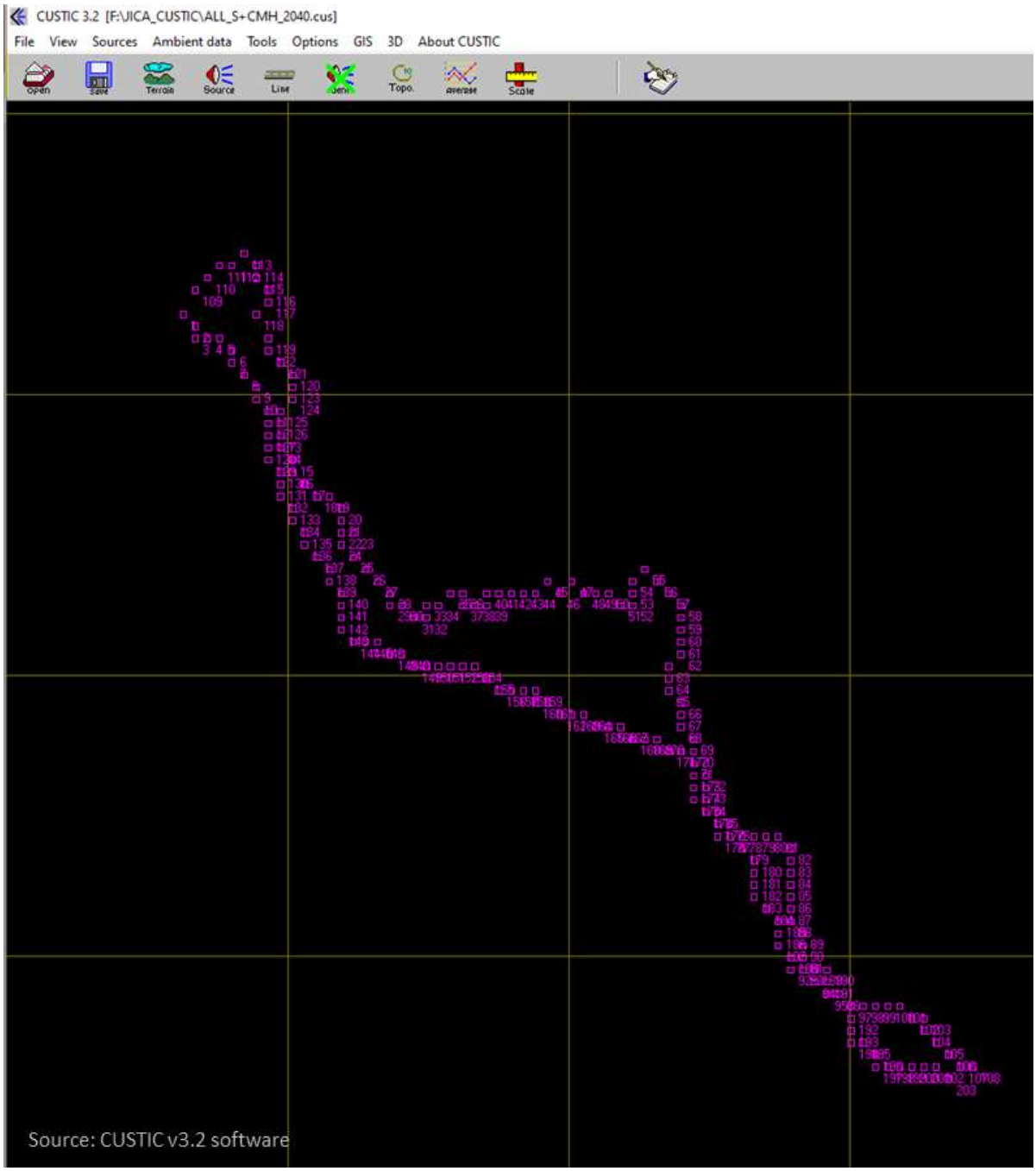
Laboratory Manager

Annex 10. Noise modeling methodology



Sound generators - The "*Equivalent Vehicle*", Ve, is a basic noise source unit that expresses the noise level emitted by heavy and medium trucks in terms of the equivalent noise level emitted by a certain number of automobiles. The *Ve* number is speed dependent. For example, at 88.5 kph one heavy truck produces the same noise level as 13 automobiles and at 56 kph the noise level is that of 31 automobiles. The *Ve* essentially normalizes heavy trucks, medium trucks, and autos to one vehicle group based on their acoustical energy. The automobile is used as a reference (1 auto = 1 Ve) and assumed that speeds of all vehicles at the Sayre Highway and CMH alignment are the same. The average vehicle speeds used were 34.8 (average based on traffic survey) and 80 kph (design) for Sayre Highway and CMH respectively.

The *Ve* is the product of three variables: traffic count, vehicle type and speed based on TNM REMELS and energy ratio correction based on vehicle speeds (**Table 2-11**). The *Ve* and energy ratio for the CMH road are the green cells in **Table 2-11**. The *Ve* (HT=28.11, MT=10.23, Auto=1.0) and energy ratio (0.123) for the Sayre Highway were derived from the regression equations in

Figure 2-6 and **Figure 2-7.**

The adjusted traffic counts used for the noise modelling is shown in **Table 2-12**.

Table 2-11. Number of equivalent vehicles and speed corrections

Speed, kph	Equivalent vehicle			Energy ratio
	HT	MT	Auto	
56	19.1	7.1	1	0.25
64	15.1	5.8	1	0.37
72	12.9	5	1	0.54
80	11.5	4.5	1	0.74
88.5	10.4	4.1	1	1
94	9.6	3.7	1	1.32
105	8.9	3.5	1	1.7
113	8.3	3.2	1	2.19

Source: California DOT, 2009; NOTES: based on TNM Reference Energy Mean Emission Levels; HT – heavy truck; MT – medium truck; AUTO - automobile

Figure 2-6. Regression equation for equivalent vehicles

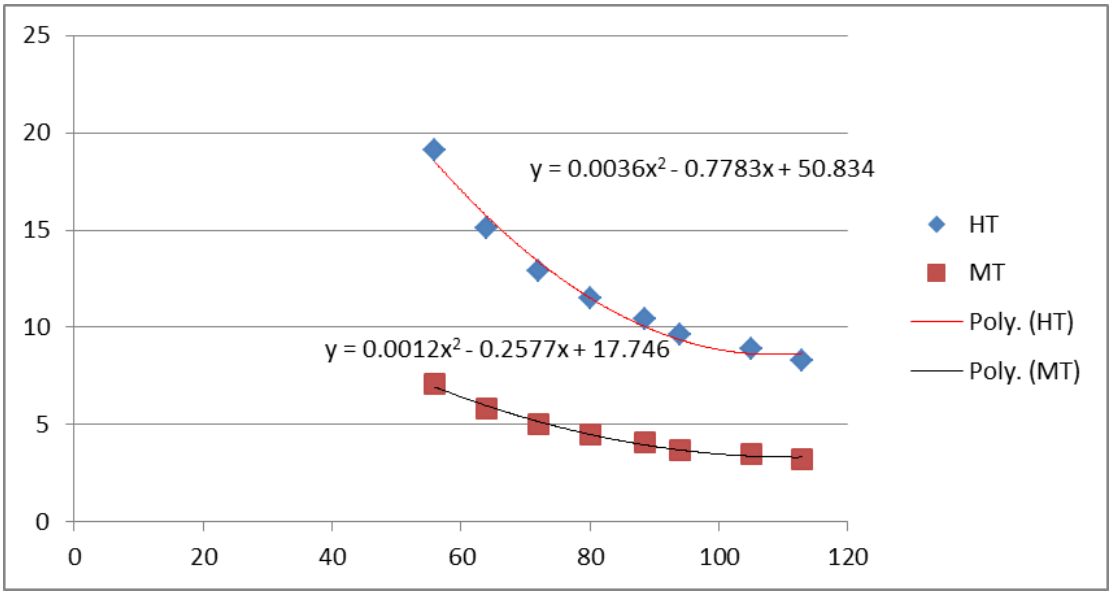


Figure 2-7. Regression equation for speed correction

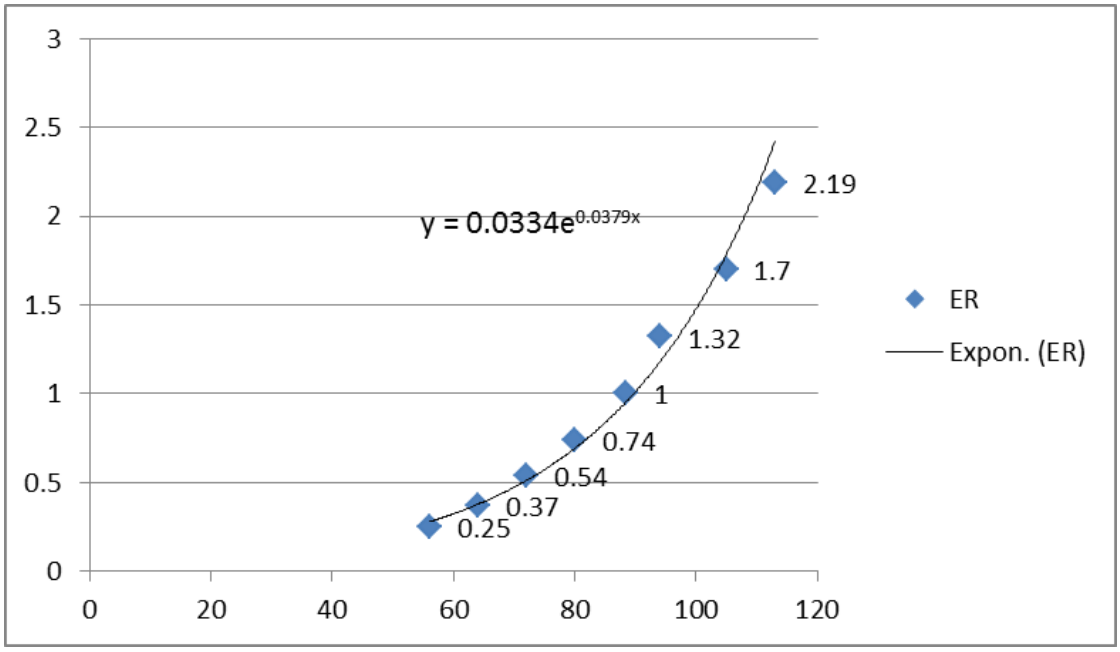


Table 2-12. Adjusted Traffic Counts

		Sayre Highway only								CMH only							
		Year: 2026				Year: 2040				Year: 2026				Year: 2040			
Section	Vehicle type	TC	Ev	ER	Ve	TC	Ev	ER	Ve	TC	Ev	ER	Ve	TC	Ev	ER	Ve
1	CAR	2133	1.00	0.123	263	3031	1.00	0.123	373	6280	1.00	0.671	4213	9030	1.00	0.67	6058
	JPY	126	1.00	0.123	16	179	1.00	0.123	22	985	1.00	0.671	661	1417	1.00	0.67	951
	BUS	55	10.23	0.123	69	78	10.23	0.123	98	278	4.81	0.671	897	399	4.81	0.67	1288
	TRU	1839	28.11	0.123	6367	2613	28.11	0.123	9047	4466	11.61	0.671	34784	6422	11.61	0.67	50019
	OT	0	28.11	0.123	0	0	28.11	0.671	0	609	11.61	0.671	4743	877	11.61	0.67	6831
	TOTAL	**4153**				**5901**				**12618**				**18145**			
2	CAR	2723	1.00	0.123	335	3869	1.00	0.123	477	4804	1.00	0.671	3223	6827	1.00	0.67	4580
	JPY	57	1.00	0.123	7	81	1.00	0.123	10	415	1.00	0.671	278	590	1.00	0.67	396
	BUS	56	10.23	0.123	71	80	10.23	0.123	101	189	4.81	0.671	610	269	4.81	0.67	868
	TRU	2161	28.11	0.123	7482	3070	28.11	0.123	10629	3010	11.61	0.671	23444	4276	11.61	0.67	33304
	OT	0	28.11	0.123	0	0	28.11	0.123	0	163	11.61	0.671	1270	232	11.61	0.67	1807
	TOTAL	**4997**				**7100**				**8581**				**12194**			
3	CAR	1440	1.00	0.123	177	2045	1.00	0.123	252	3197	1.00	0.671	2145	4573	1.00	0.67	3068
	JPY	59	1.00	0.123	7	84	1.00	0.123	10	247	1.00	0.671	166	353	1.00	0.67	237
	BUS	48	10.23	0.123	60	67	10.23	0.123	84	232	4.81	0.671	749	332	4.81	0.67	1071
	TRU	1198	28.11	0.123	4148	1703	28.11	0.123	5896	2922	11.61	0.671	22758	4179	11.61	0.67	32549
	OT	0	28.11	0.123	0	0	28.11	0.123	0	512	11.61	0.671	3988	734	11.61	0.67	5717
	TOTAL	**2745**				**3899**				**7110**				**10171**			
4	CAR	1818	1.00	0.123	224	2583	1.00	0.123	318	3836	1.00	0.671	2573	5559	1.00	0.67	3729
	JPY	37	1.00	0.123	5	52	1.00	0.123	6	717	1.00	0.671	481	1039	1.00	0.67	697
	BUS	73	10.23	0.123	92	103	10.23	0.123	130	240	4.81	0.671	774	347	4.81	0.67	1120
	TRU	1451	28.11	0.123	5024	2062	28.11	0.123	7139	3174	11.61	0.671	24721	4599	11.61	0.67	35820
	OT	0	28.11	0.123	0	0	28.11	0.123	0	678	11.61	0.671	5281	982	11.61	0.67	7648
	TOTAL	**3379**				**4800**				**8645**				**12526**			
5	CAR	1179	1.00	0.123	145	1675	1.00	0.123	206	3459	1.00	0.671	2320	4914	1.00	0.67	3297

	JPY	509	1.00	0.123	63	723	1.00	0.123	89	1136	1.00	0.671	762	1615	1.00	0.67	1083
	BUS	54	10.23	0.123	68	76	10.23	0.123	96	181	4.81	0.671	584	257	4.81	0.67	829
	TRU	1215	28.11	0.123	4207	1726	28.11	0.123	5976	1748	11.61	0.671	13615	2483	11.61	0.67	19339
	OT	0	28.11	0.123	0	0	28.11	0.123	0	1111	11.61	0.671	8653	1578	11.61	0.67	12290
	TOTAL	**2957**				**4200**				**7635**				**10847**			

NOTES: TC – traffic count; Ev - equivalent vehicle; ER – energy ratio; Ve - adjusted traffice count

Reference Energy Mean Emission Levels (REMEL) - The REMEL is generated by a defined vehicle type. Vehicles on a road do not have identical REMELS and dependent on a whole range of characteristics related to vehicles and the highways on which they travel. Among these are vehicle type, engine size, speed, number of wheels and axles, type of tires, as well as pavement type, age, texture, and condition.

The REMELS of the vehicle types at the Sayre Highway and CMH alignment calculated by the equation below is shown in **Table 2-14** and the final input to the noise software is summarized in **Table 2-15**.

$$Ls_i = 10\log_{10}\left[(0.62s_i)^{A/10} + 10^{B/10} + 10^{C/10}\right]$$

where Ls*i* = REMEL for vehicle type *i* at speed s

s*i* = speed of vehicle *i* (kph)

A,B,C – constants (**Table 2-13**)

Table 2-13. Constants for calculation of REMELs

Vehicle type	A	B	C
Auto (A)	41.740807	1.148546	50.128316
Medium truck (MT)	33.918713	20.591046	68.002978
Heavy truck (HT)	35.879850	21.019665	74.298135

Source: California DOT

Table 2-14. Calculated TNM REMELS (dBa) for Sayre Highway and CMH alignment

	Sayre Highway	CMH
Speed, kph	**34.8**	**80**
Auto (CAR)	56.78	70.85
Medium truck (MT)	68.03	68.38
Heavy truck (HT)	74.31	74.49
Bus (2-axle) (B2)	68.45	79.43
Motorcycle (M)	70.06	77.13

Source: Technical Noise Supplement to the Traffic Noise Analysis Protocol, California DOT, 2013; NOTES: TNM – Traffic Noise Model; REMELS - reference energy mean emission levels; HT – heavy trucks; MT – medium trucks; auto - cars

Table 2-15. Final input to the CUSTIC noise software

				Sayre only						CMH only					
		VREMEL		2026			2040			2026			2040		
Timeline	Type	Sayre	CMH	Ve/day	Ve/h	TREMEL	Ve/day	Ve/h	TREMEL	Ve/day	Ve/h	TREMEL	Ve/day	Ve/h	TREMEL
SECTION 1	CAR	56.78	70.85	263	10.95	67.17	373	15.56	68.70	4213	175.54	93.29	6058	252.41	80.80
	JPY	68.03	68.38	16	0.65	66.13	22	0.92	67.66	661	27.53	82.78	951	39.61	84.00
	BUS	68.45	79.43	69	2.89	73.06	98	4.10	74.58	897	37.38	95.15	1288	53.65	85.75
	TRU	75.23	75.44	6367	265.29	99.46	9047	376.94	100.99	34784	1449.34	107.05	50019	2084.11	108.42
	OT	74.31	74.49	0	0.00	#NUM!	0	0.00	#NUM!	4743	197.64	97.45	6831	284.61	98.85
	TOTAL			6714	280	**99.48**	9540	398	**101.00**	45298	1887	**107.92**	65145.3	2714.39	**108.91**
SECTION 2	CAR	56.78	70.85	335	13.97	68.23	477	19.86	69.76	3223	134.28	92.13	4580	190.83	79.59
	JPY	68.03	68.38	7	0.29	62.69	10	0.42	64.21	278	11.60	79.02	396	16.49	80.20
	BUS	68.45	79.43	71	2.94	73.14	101	4.20	74.69	610	25.41	93.48	868	36.17	84.04
	TRU	75.23	75.44	7482	311.74	100.16	10629	442.87	101.69	23444	976.83	105.34	33304	1387.68	106.65
	OT	74.31	74.49	0	0.00	#NUM!	0	0.00	#NUM!	1270	52.90	91.73	1807	75.29	93.08
	TOTAL			7895	329	**100.18**	11216	467	**101.70**	28824.5	1201.01	**105.98**	40955	1706.46	**106.88**
SECTION 3	CAR	56.78	70.85	177	7.39	65.47	3031	126.29	77.79	2145	89.36	90.36	3068	127.83	77.85
	JPY	68.03	68.38	7	0.30	62.84	179	7.46	76.75	166	6.90	76.77	237	9.87	77.97
	BUS	68.45	79.43	60	2.52	72.47	78	3.25	73.57	749	31.19	94.37	1071	44.64	84.95

	TRU	75.23	75.44	4148	172.82	97.60	2613	108.88	95.60	22758	948.27	105.21	32549	1356.20	106.55
	OT	74.31	74.49	0	0.00	#NUM!	0	0.00	#NUM!	3988	166.16	96.70	5717	238.20	98.08
	TOTAL			4393	183	**97.62**	5901	245.875	**95.75**	29805.3	1241.89	**106.21**	42641.6	1776.73	**107.16**
SECTION 4	CAR	56.78	70.85	224	9.33	66.48	318	13.26	68.00	2573	107.23	91.15	3729	155.39	78.69
	JPY	68.03	68.38	5	0.19	60.81	6	0.27	62.29	481	20.04	81.40	697	29.04	82.66
	BUS	68.45	79.43	92	3.83	74.29	130	5.41	75.78	774	32.27	94.52	1120	46.65	85.14
	TRU	75.23	75.44	5024	209.32	98.43	7139	297.46	99.96	24721	1030.05	105.57	35820	1492.50	106.97
	OT	74.31	74.49	0	0.00	#NUM!	0	0.00	#NUM!	5281	220.03	97.92	7648	318.69	99.34
	TOTAL			5344	223	**98.45**	7593.28	316.387	**99.98**	33830.7	1409.61	**106.68**	49014.5	2042.27	**107.70**
SECTION 5	CAR	56.78	70.85	145	6.05	64.60	206	8.60	66.12	2320	96.69	90.70	3297	137.36	78.16
	JPY	68.03	68.38	63	2.61	72.20	89	3.71	73.72	762	31.75	83.39	1083	45.14	84.57
	BUS	68.45	79.43	68	2.84	72.98	96	3.99	74.46	584	24.34	93.29	829	34.55	83.84
	TRU	75.23	75.44	4207	175.27	97.66	5976	248.99	99.19	13615	567.27	102.98	19339	805.80	104.29
	OT	74.31	74.49	0	0.00	#NUM!	0	0.00	#NUM!	8653	360.55	100.06	12290	512.10	101.40
	TOTAL			4482	187	**97.69**	6366.79	265.283	**99.22**	25934.4	1080.59	**105.25**	36839	1534.96	**106.15**

Self-monitoring Plan (AIR MODULE) for the JICA CMH Project

Environmental Component per Project Phase	Potential Impacts Per Envt'l Sector	Parameter to be Monitored	Sampling & Measurement Plan			Lead Person	Annual Estimated Cost	EQPL MANAGEMENT SCHEME					
								EQPL RANGE*			MGT MEASURE		
			Method	Frequency	Location			ALERT	ACTION	LIMIT	ALERT	ACTION	LIMIT
CONSTRUCTION PHASE													
Air component (Ambient air quality)	Particulate air pollution	TSP	(S) 24 hr High Volume- (A) Gravimetric USEPA 40 CFR, Part 50, Appendix B	Quarterly (minimum) or as required	Within 100 meters of active construction sites and temporary facilities	DPWH-appointed PCO	Part of operation cost	155	186	207 ug/ncm	ID pollutant source (construction activity, facility, or equipment)	Implement appropriate corrective action at identified pollutant source	Temporary stoppage of identified construction activity or equipment
Air component (Ambient air quality)	Particulate air pollution	PM10	24-hr High Volume with 10-micron particle-size inlet (A) Gravimetric USEPA 40 CFR, Part 50, Appendix J			DPWH-appointed PCO	Part of operation cost	101	121	135 ug/ncm	ID pollutant source (construction activity, facility, or equipment)	Implement appropriate corrective action at identified pollutant source	Temporary stoppage of identified construction activity or equipment
Air component (Ambient sound levels)	Increase in ambient sound levels in receptor areas	Sound levels	24 hr sound measurements using a sound meter			DPWH-appointed PCO	Part of operation cost	3 dB less than limit	2 dB less than limit	1 dB less than limit	Identification of possible source of noise	- Corrective action on noise equipment source - Re-scheduling of "noisy activities"	Avoid use or replacement of noisy equipment
OPERATION PHASE													
Air component (Ambient air quality)	Particulate air pollution	TSP	(S) 24 hr High Volume- (A) Gravimetric USEPA 40 CFR, Part 50, Appendix B	Quarterly (minimum)	To be determined during the constitution of the MMT	PCO of highway operator	Part of operation cost	155	186	207 ug/ncm	- ID source of pollutant - Monitor ambient levels at stations	- Corrective action project operations emitting the pollutant. - Conduct monitoring after corrective action	Temporary stoppage of polluting source
Air component (Ambient air quality)	Particulate air pollution	PM10	24-hr High Volume with 10-micron particle-size inlet (A) Gravimetric USEPA 40 CFR, Part 50, Appendix J	Quarterly (minimum)	To be determined during the constitution of the MMT	PCO of highway operator	Part of operation cost	101	121	135 ug/ncm	- ID source of pollutant - Monitor ambient levels at stations	- Corrective action project operations emitting the pollutant. - Conduct monitoring after corrective action	Temporary stoppage of polluting source

Air component (Ambient sound levels)	Increase in ambient sound levels	Sound levels	24 hr sound measurements using a sound meter	Quarterly (minimum)	To be determined during the constitution of the MMT	PCO of highway operator	Part of operation cost	3 dB less than limit	2 dB less than limit	1 dB less than limit	- Identification of possible source of noise - Check buffer zones and noise attenuation measures	- Corrective action on noise equipment source - Conduct monitoring after corrective action	Temporary stoppage of noise source

Annex 11. Vibration Report

The **AQ1** observation site is located near a major road in Tagoloan City. The sources of vibration are predominantly cargo trucks, cars and pedestrians. It can also be observed through the graphs that heavy rainfall at the time caused a significant effect on the background vibration levels. Traffic condition was moderate to heavy during the observation period.

Figure 8. The location of the survey site in Google Earth image

Figure 9. Chart depicting the maximum vibration levels in VdB in all three axes at AQ1

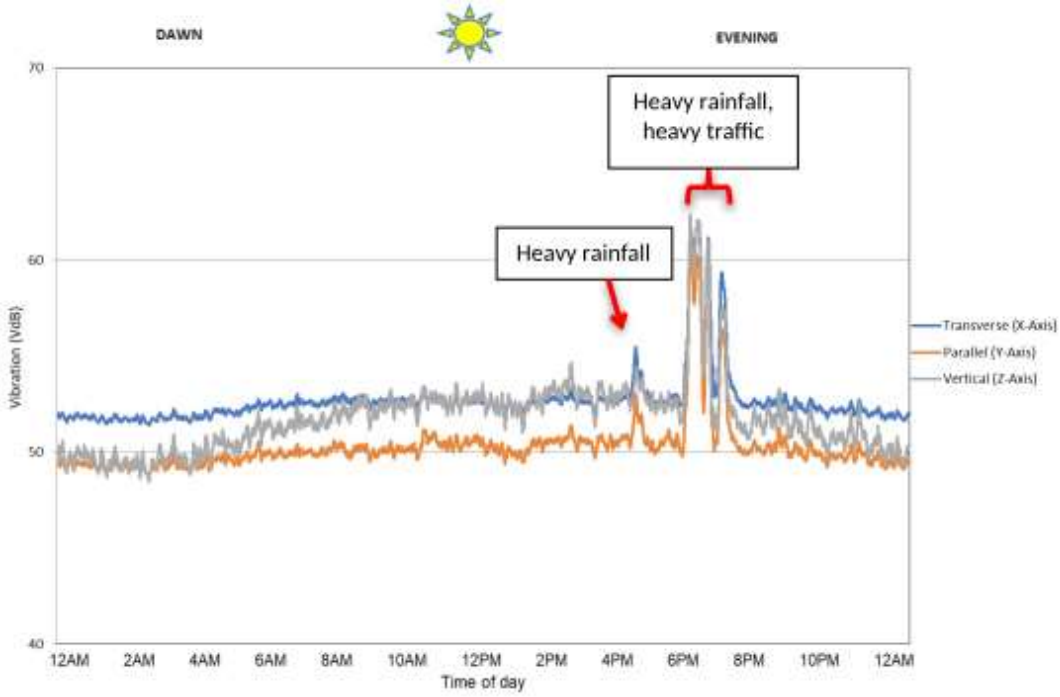


Figure 10. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ1

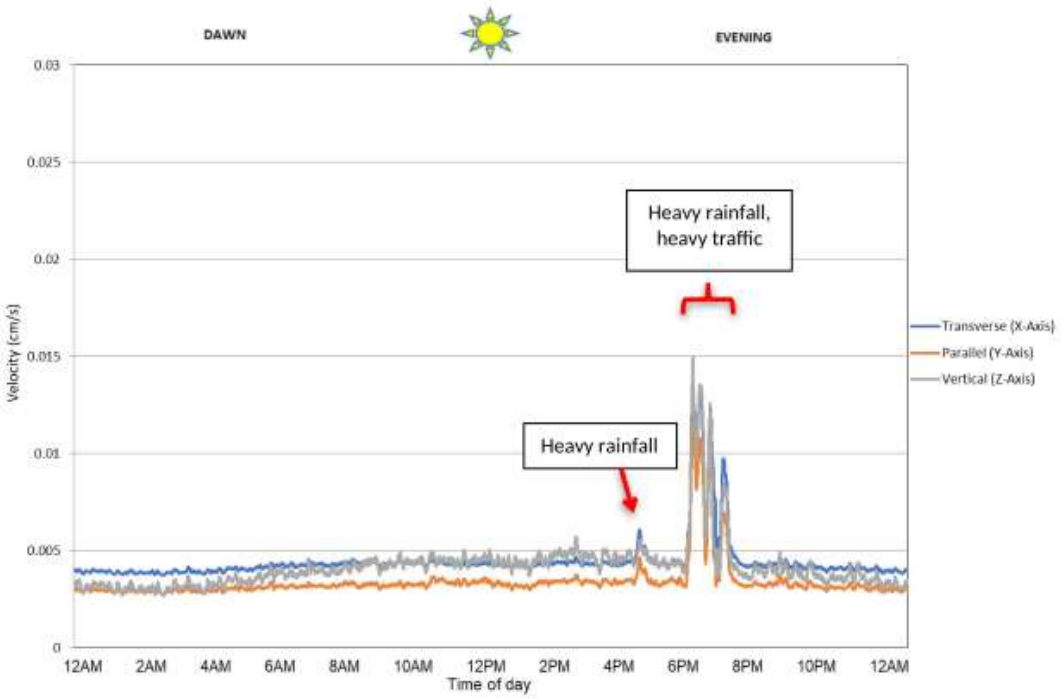


Figure 11. Chart depicting the maximum acceleration levels in cm/s2 in all three axes at AQ1

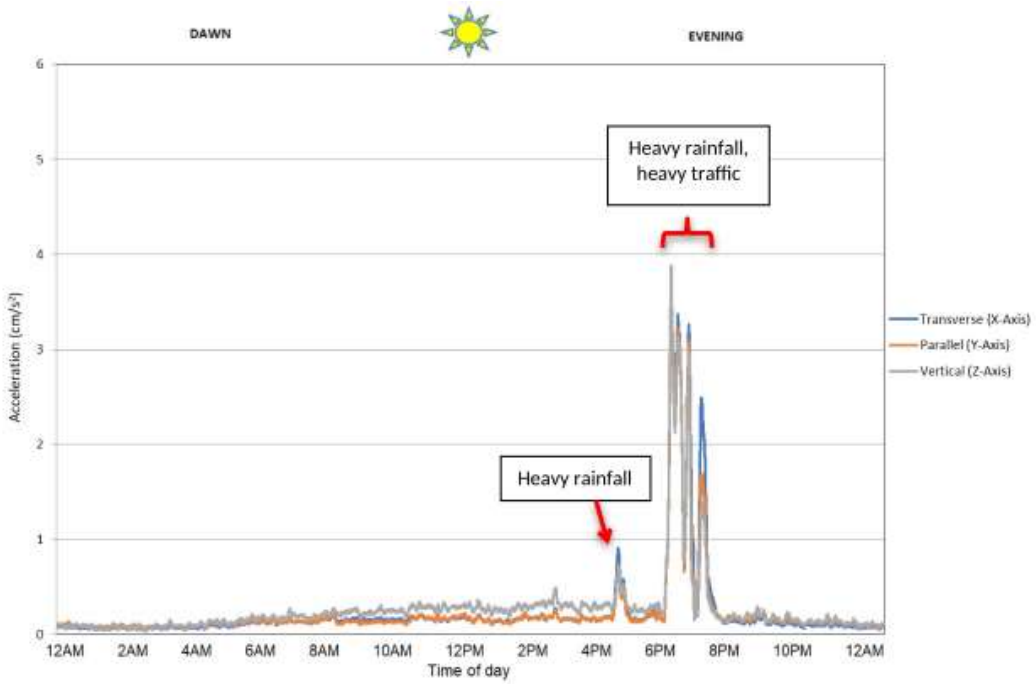


Figure 12. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, parallel axis (X-Axis).

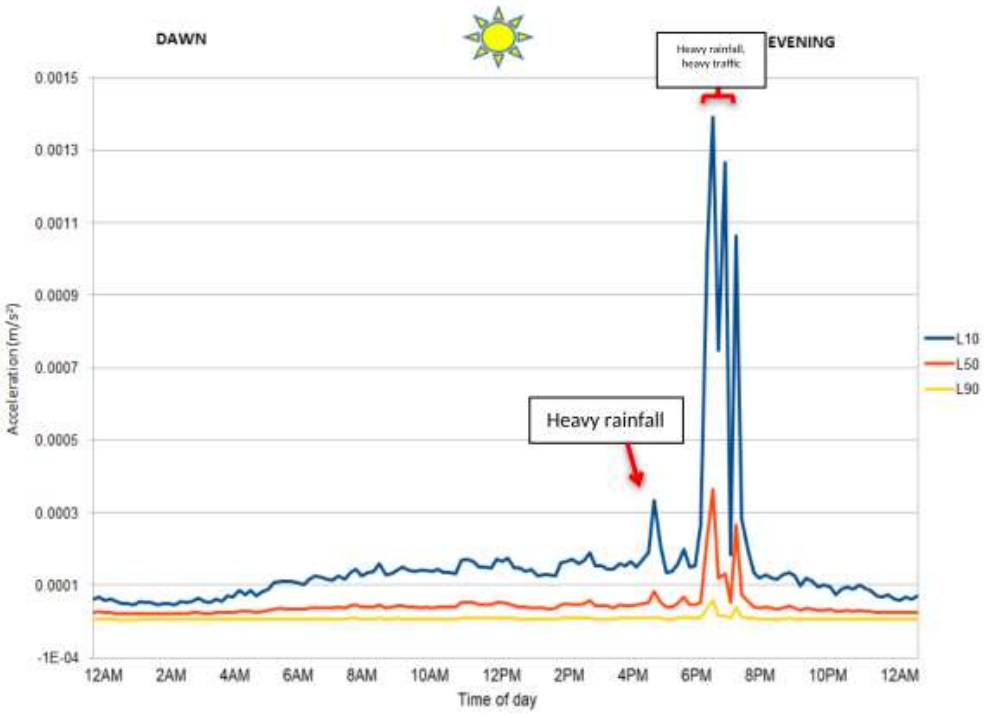


Figure 13. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2 , time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

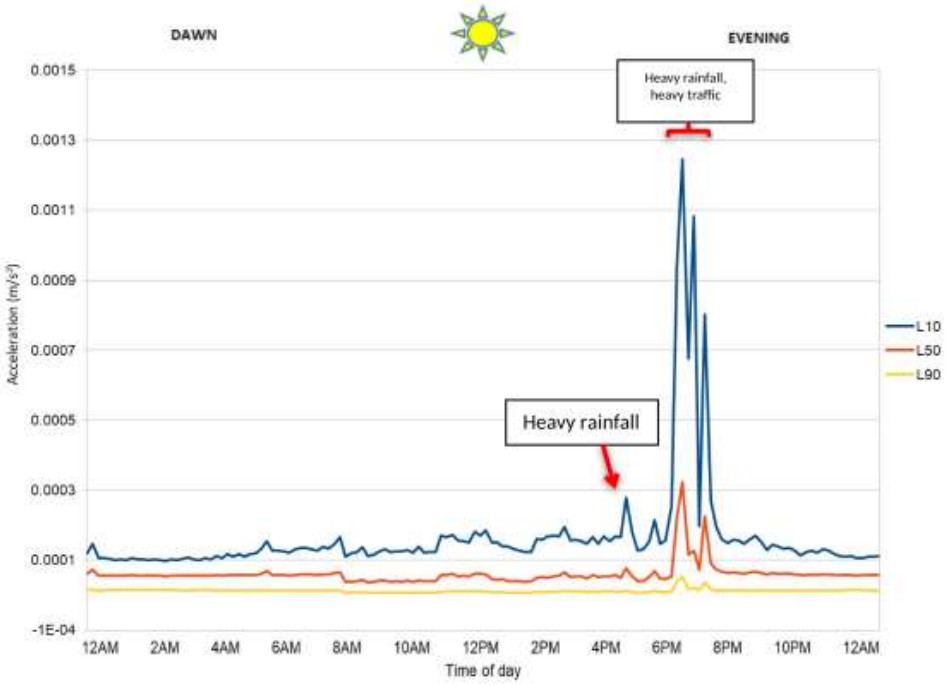
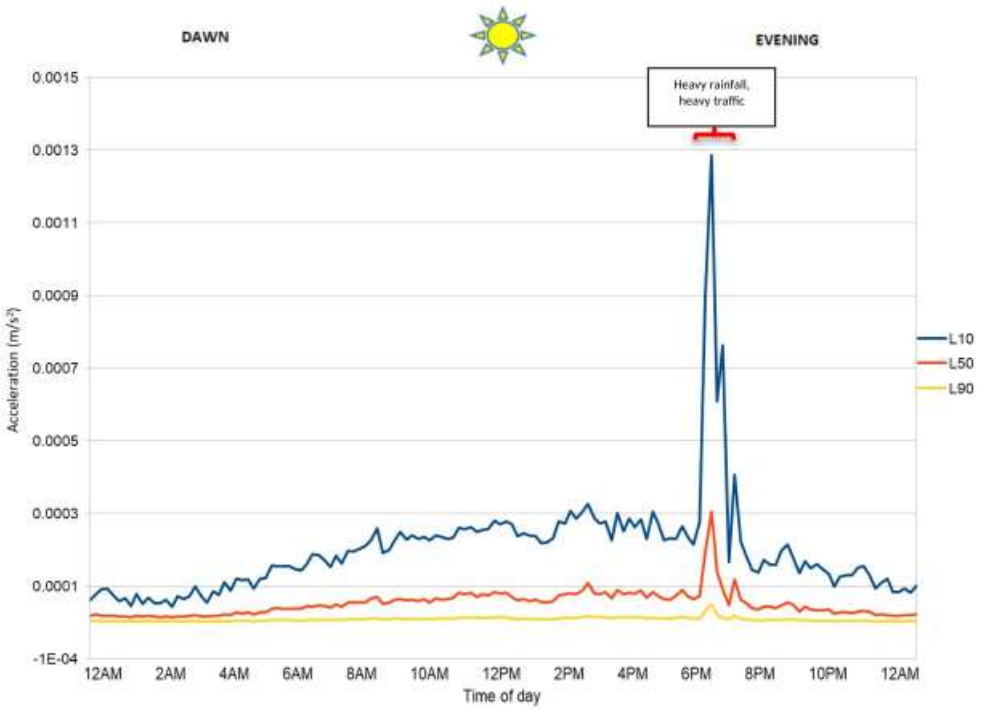


Figure 14. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ2

The **AQ2** observation site is situated in Manolo Fortich, Bukidnon at approximately 200 meters from a farmland and 50 meters from the nearby community. The sources of vibration are predominantly large trucks, motorcycles and pedestrians. It can be observed in the graphs that vibration data display a possible source which may be a machinery operating nearby aside from the vehicles passing by. An image of the raw data is provided. Traffic condition is light to moderate during the observation period.

Figure 15. The location of the survey site in Google Earth image

Figure 16. Chart depicting the maximum vibration levels in VdB f in all three axes at AQ2

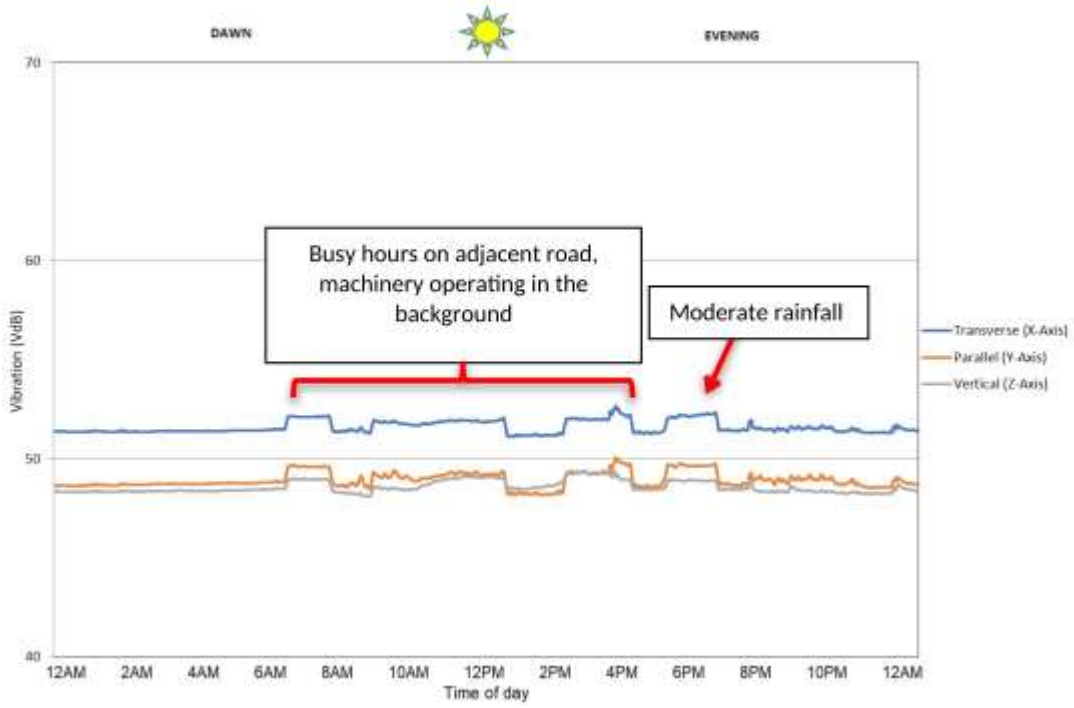


Figure 17. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ2

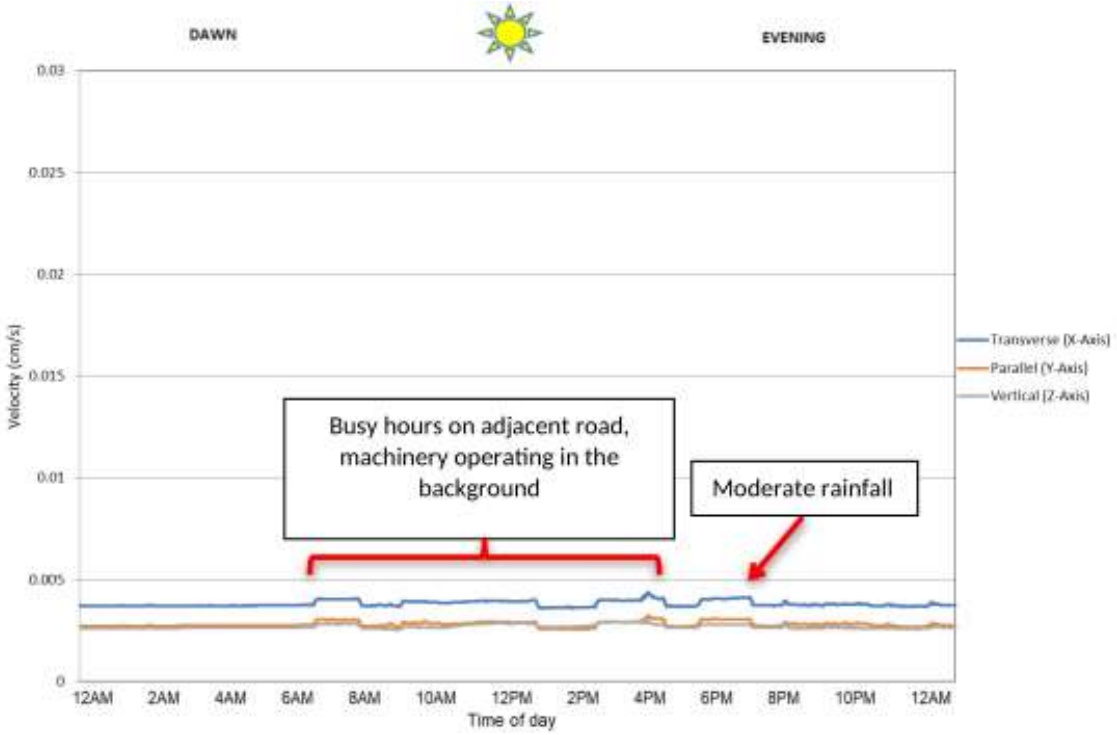


Figure 18. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ2

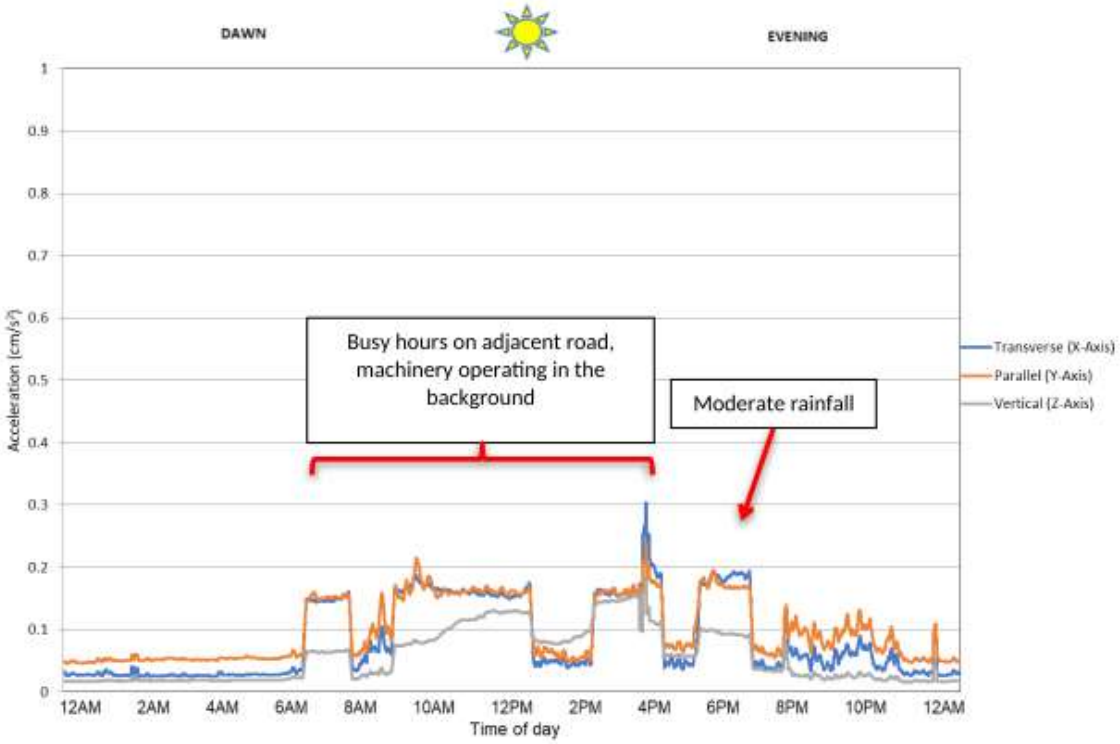


Figure 19. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

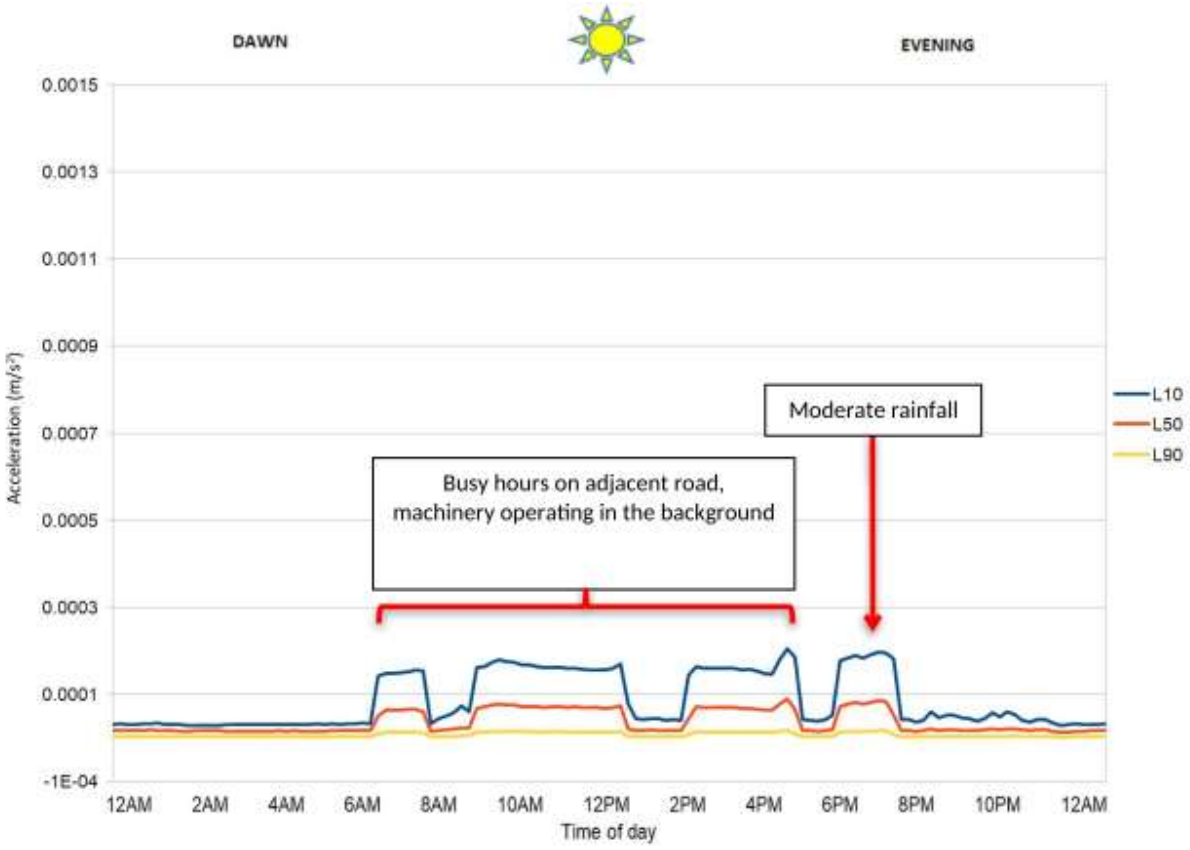


Figure 20. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

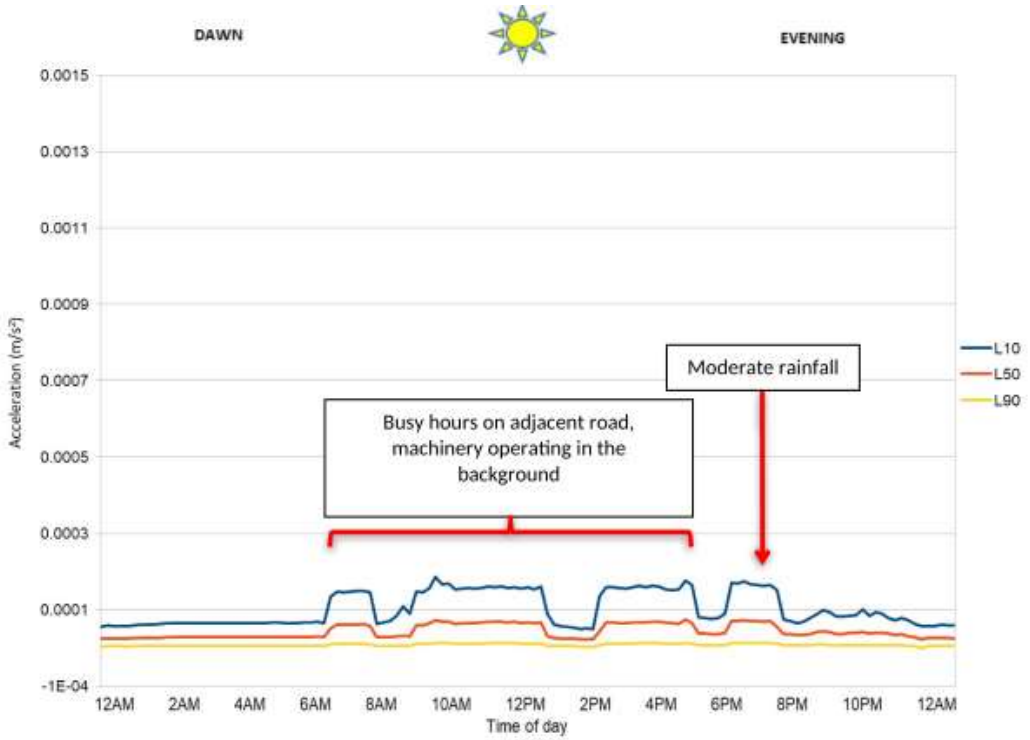


Figure 21: Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the vertical axis (Z-Axis).

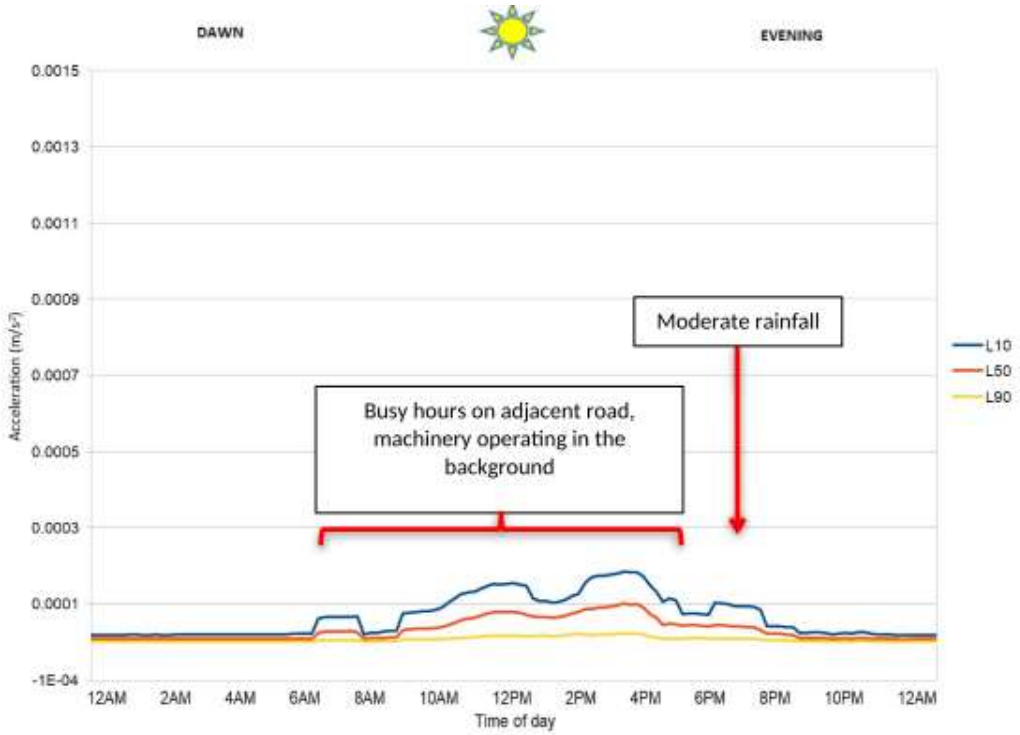
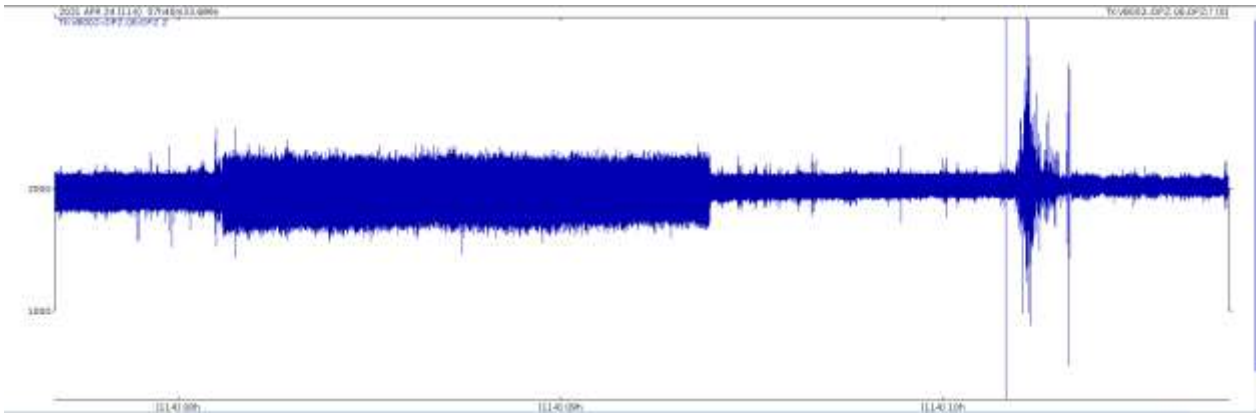


Figure 22. Chart depicting raw data at Site 2 for the Vertical Axis (Z-Axis) with high frequency vibration in the background.



AQ3

The AQN3 observation site is situated near a small community in Brgy. Alae, Manolo Fortich, Bukidnon. The sources of vibration are predominantly cars, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 23. The location of the survey site in Google Earth image

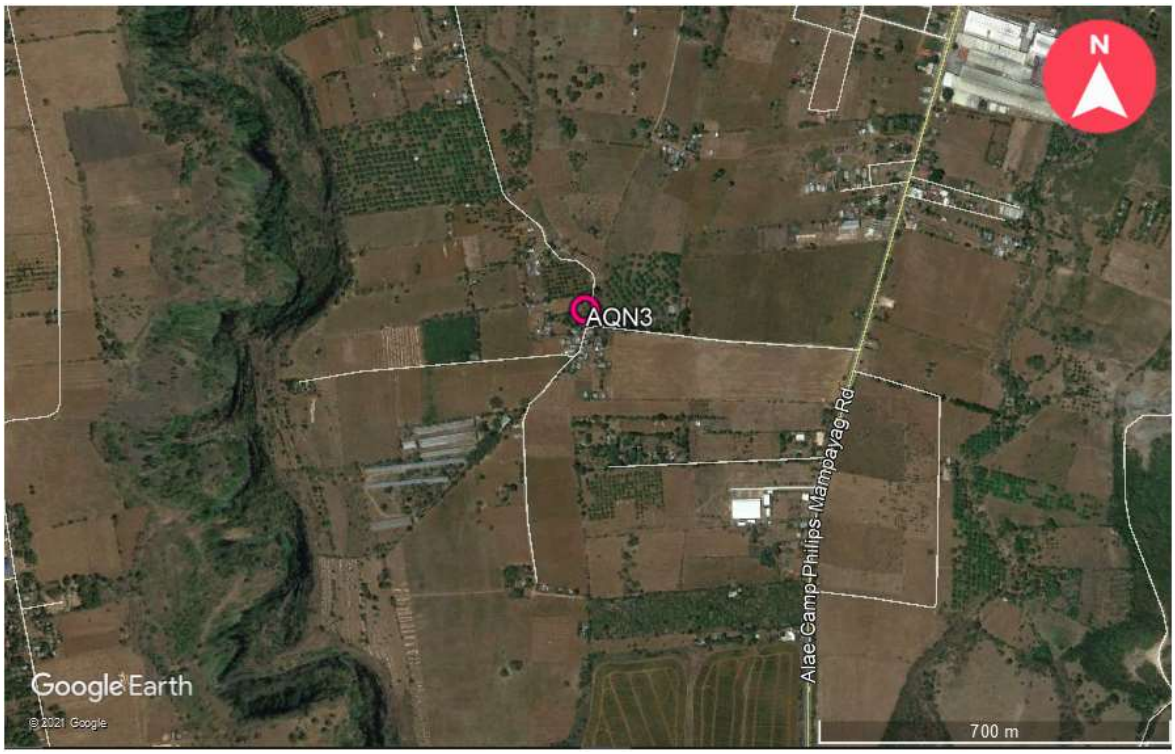


Figure 24. Chart depicting the maximum vibration levels in VdB in all three axes at AQ3

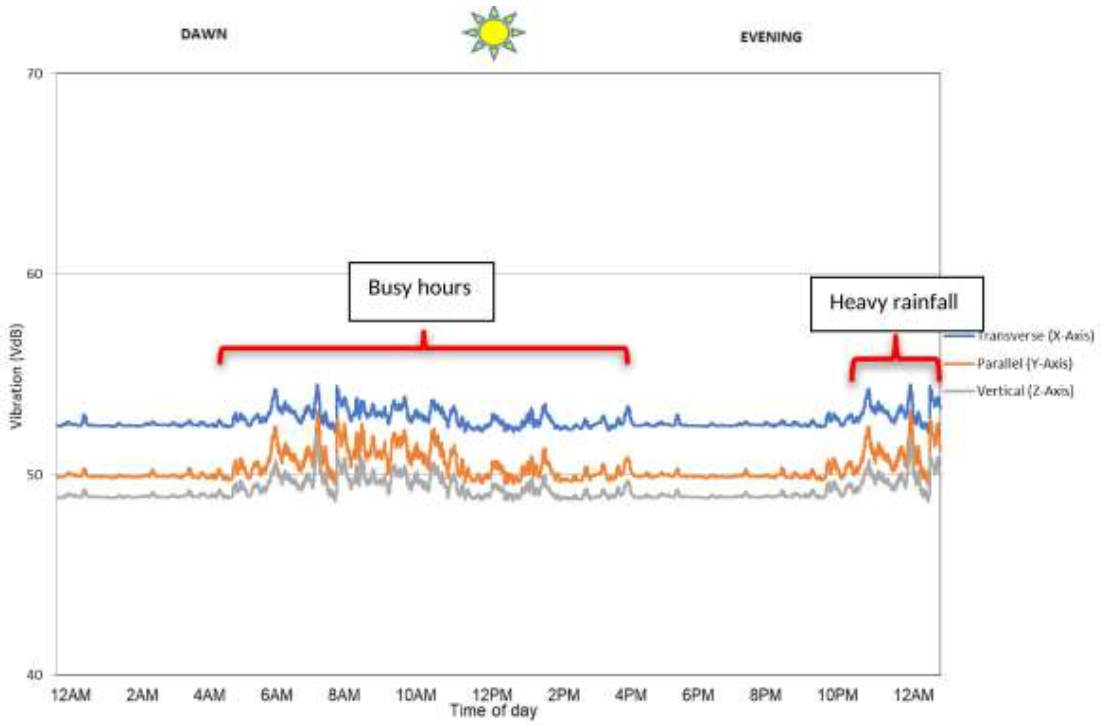


Figure 25. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ3

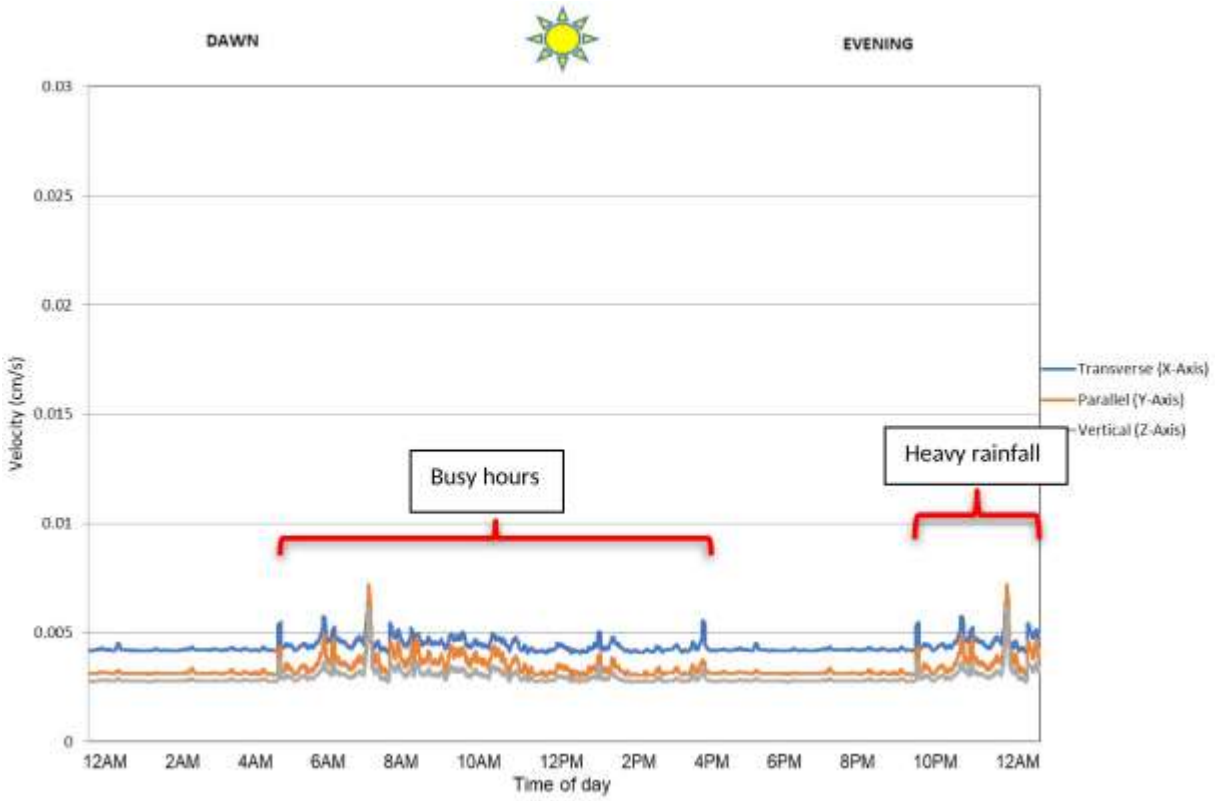


Figure 26. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ3

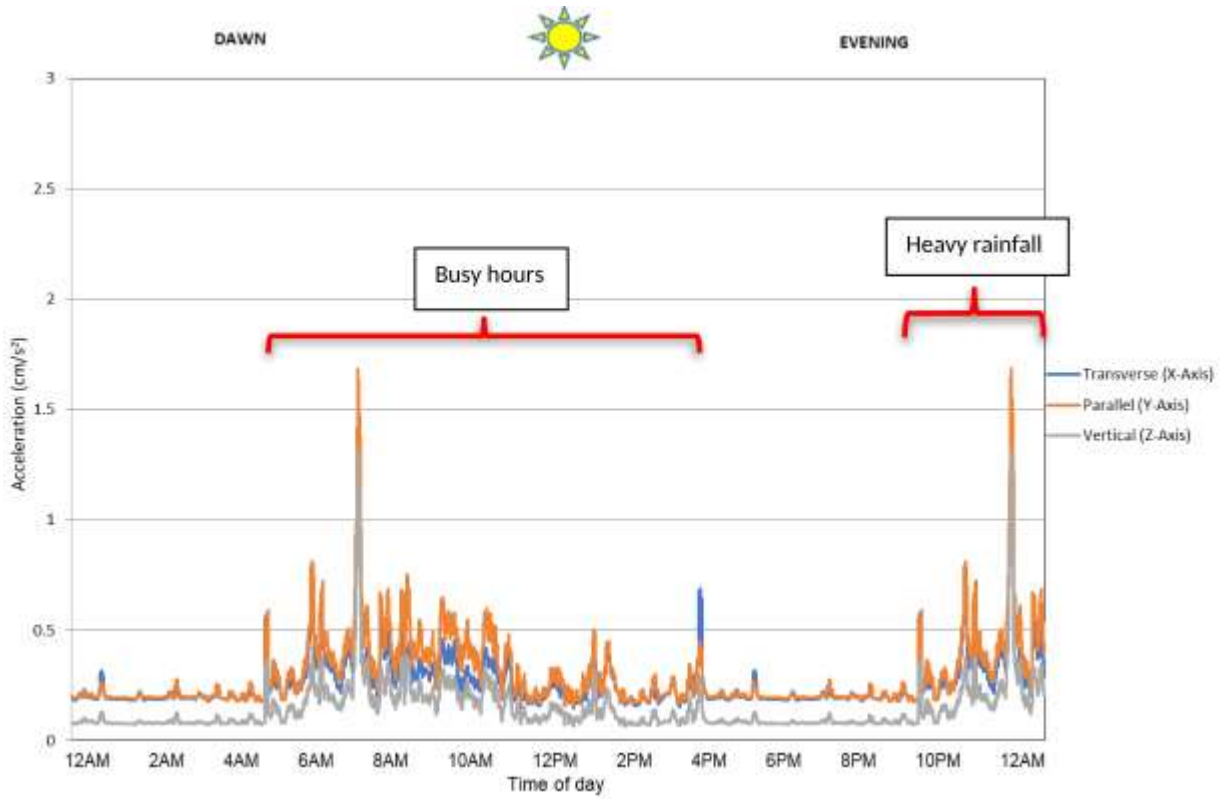


Figure 27. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

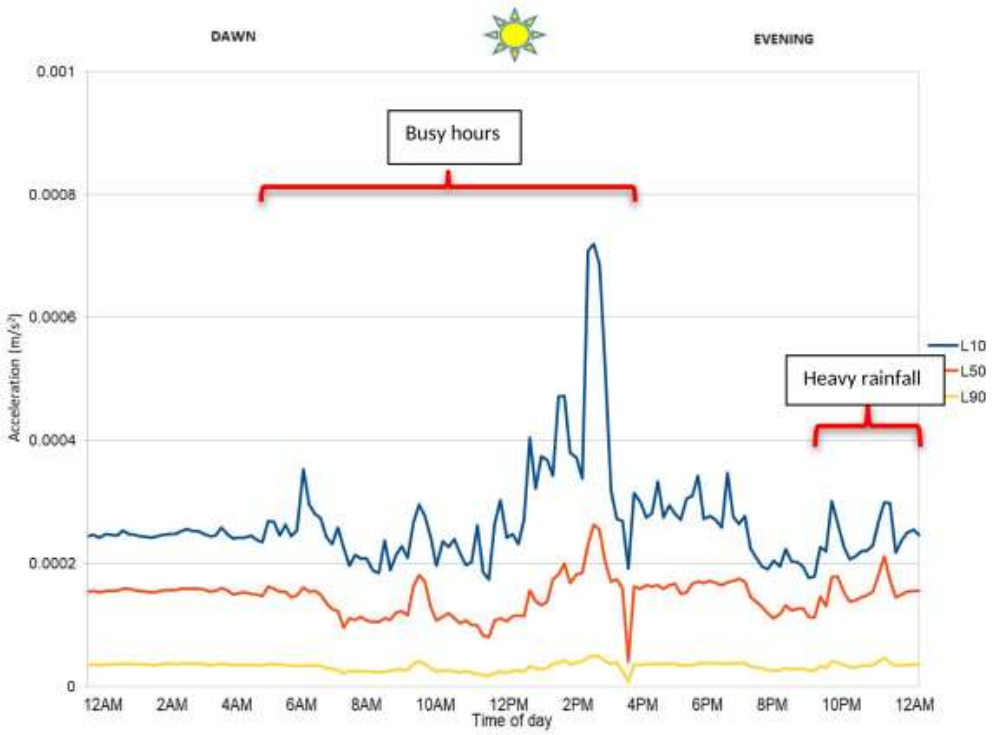


Figure 28. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

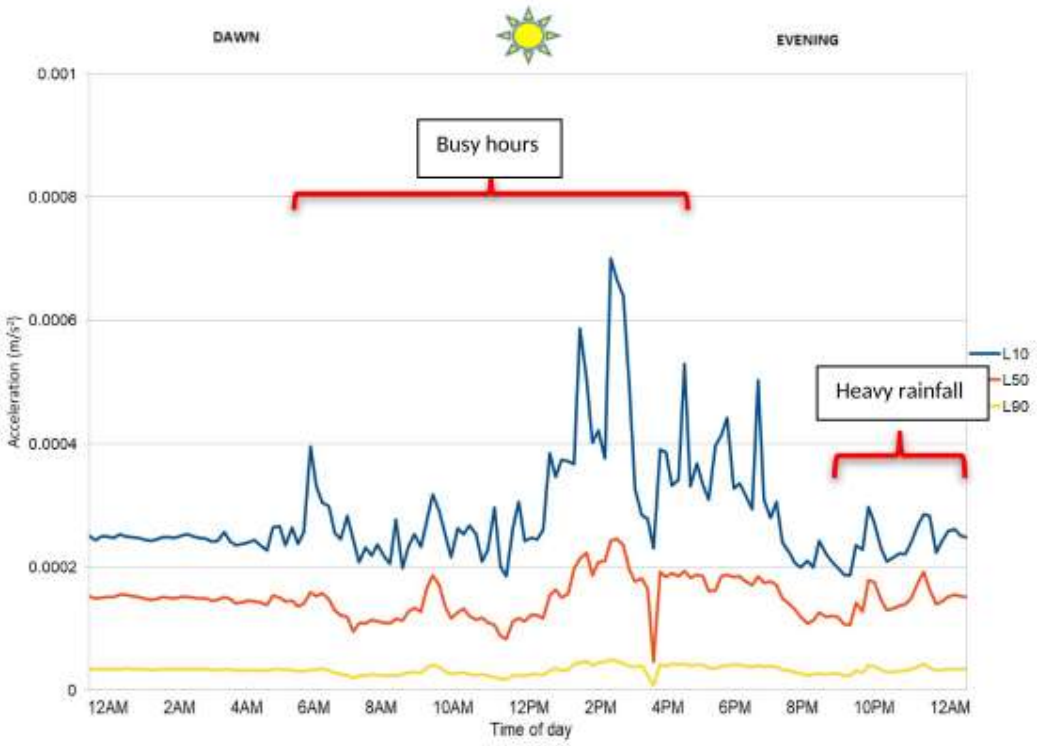
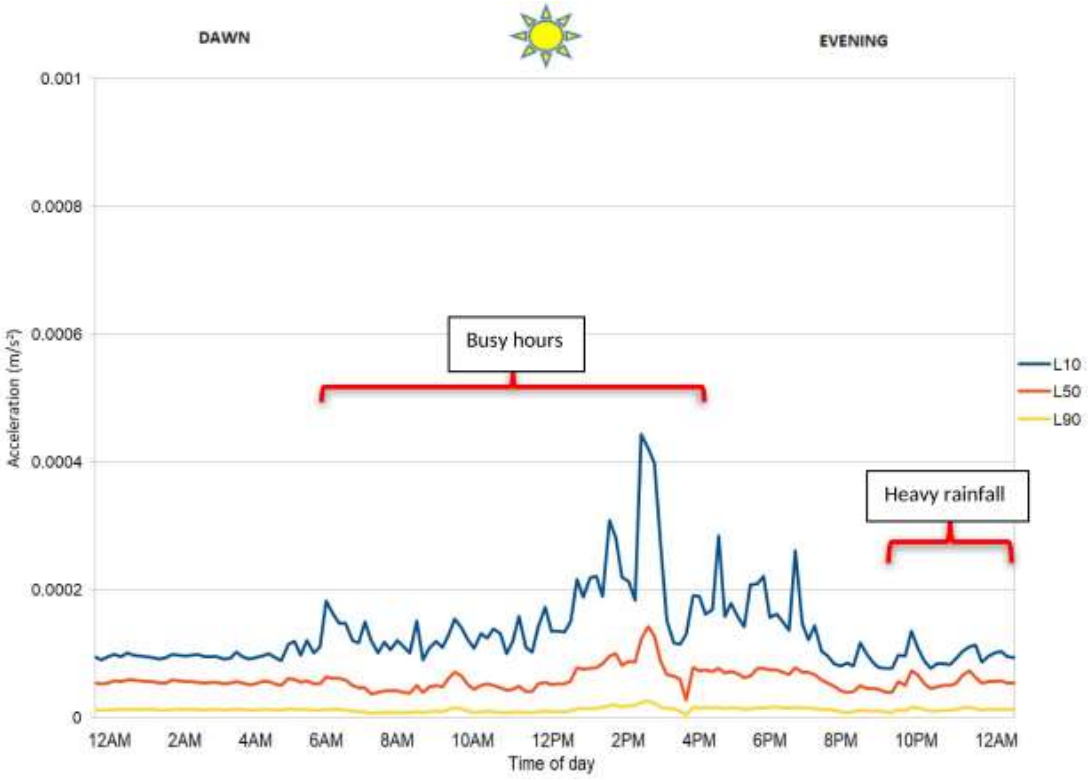


Figure 29. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ4

The AQN4 observation site at a major road in Brgy. Dicklum, Manolo Fortich, Bukidnon. Vibration levels during the observation is constantly above 50 VdB due to its position beside a major highway where cargo trucks, cars and motorcycles are the major sources. Traffic condition is light to moderate during the observation period.

Figure 30. The location of the survey site in Google Earth image

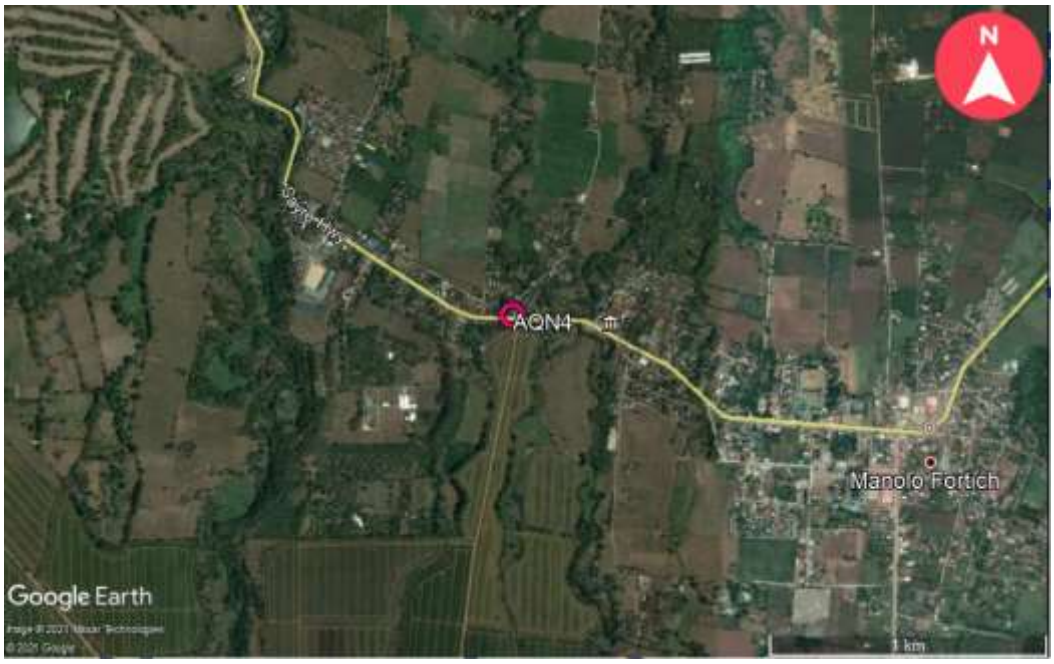


Figure 31. Chart depicting the maximum vibration levels in VdB in all three axes at AQ4

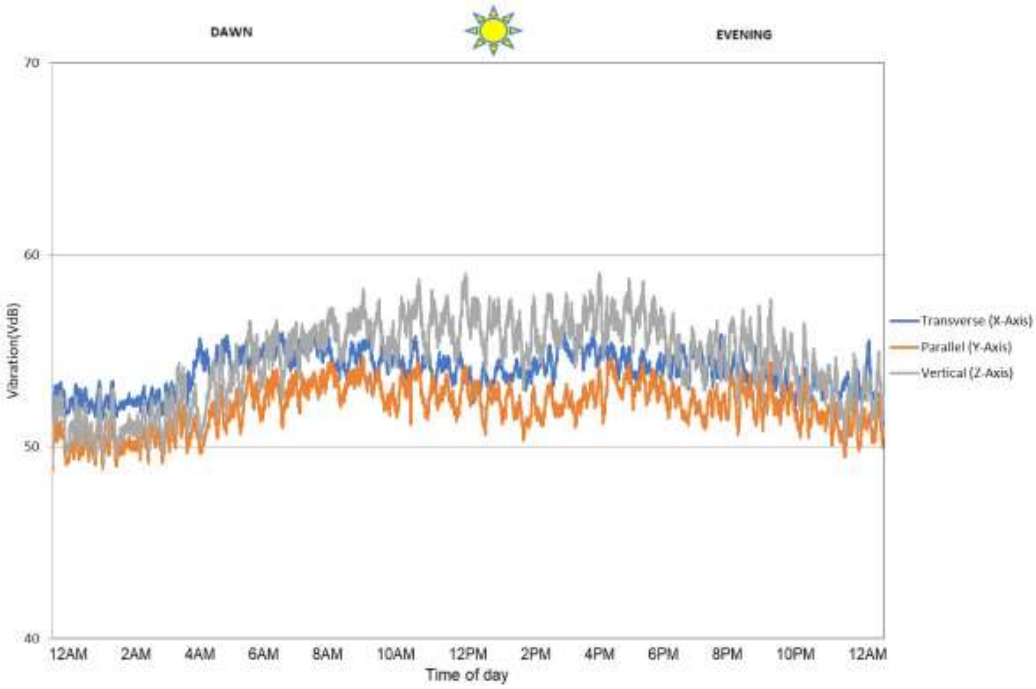


Figure 32. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ4

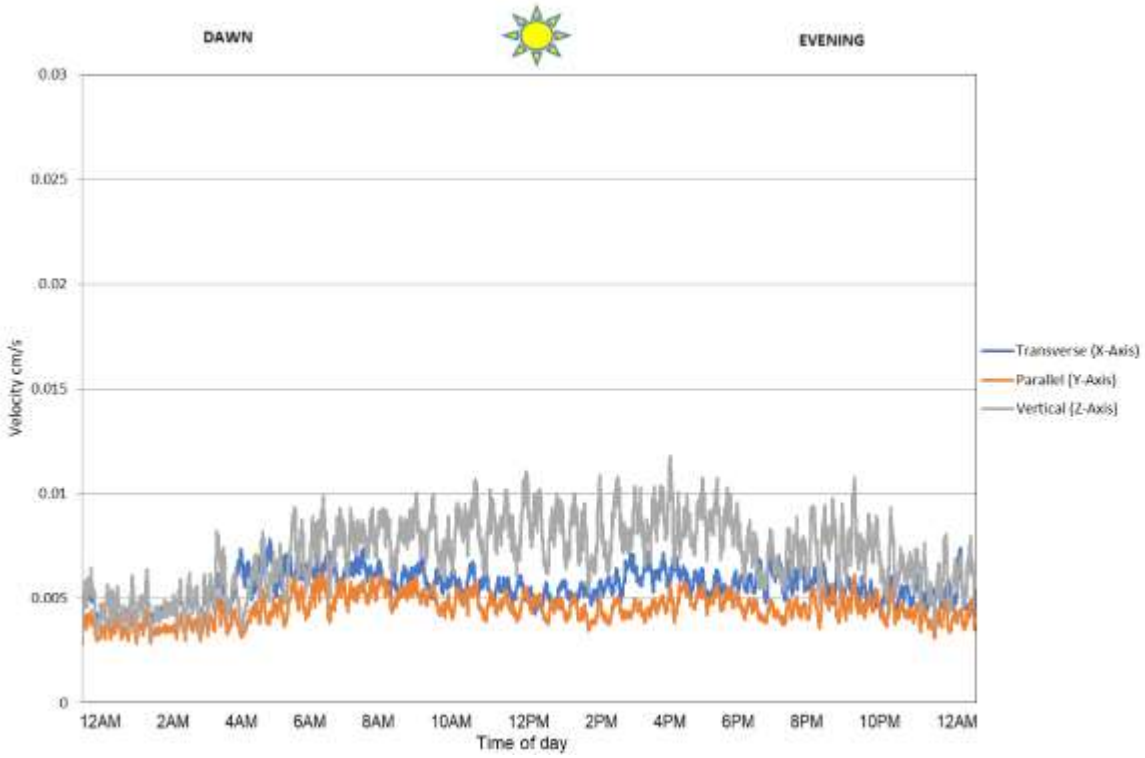


Figure 33: Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ4

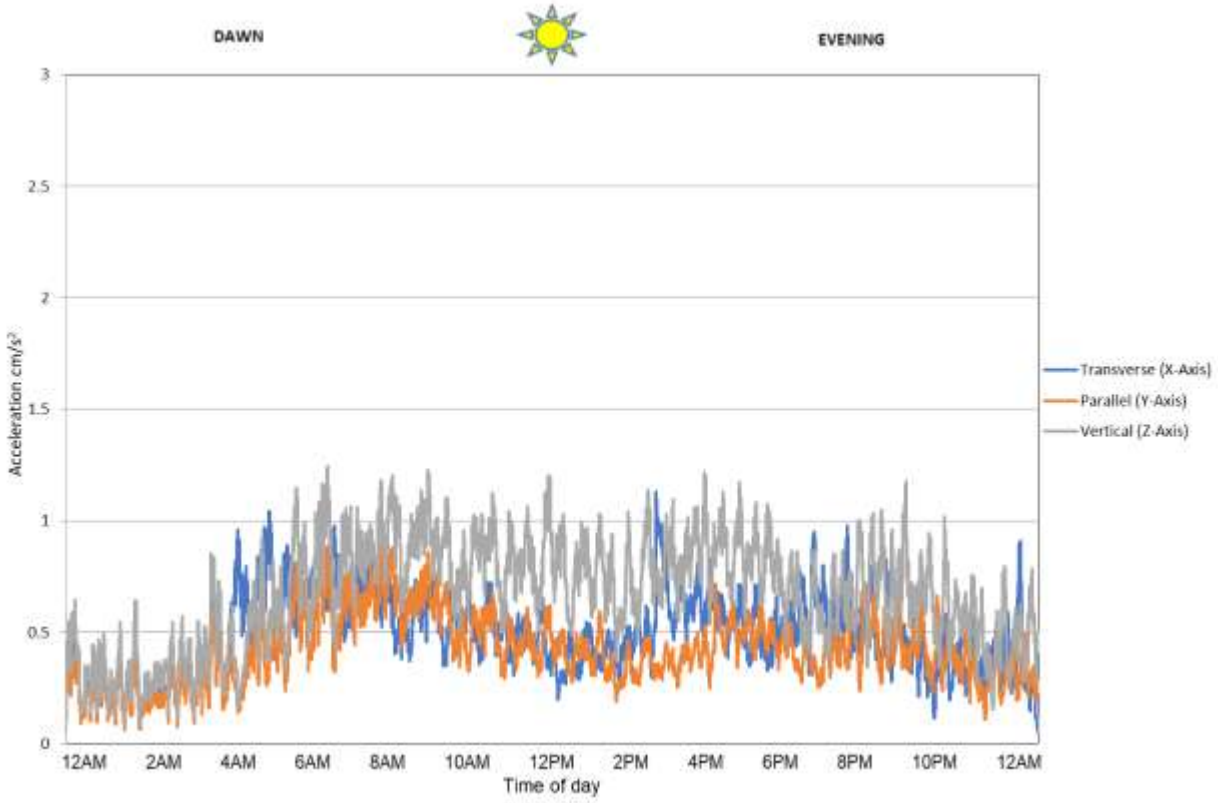


Figure 34. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

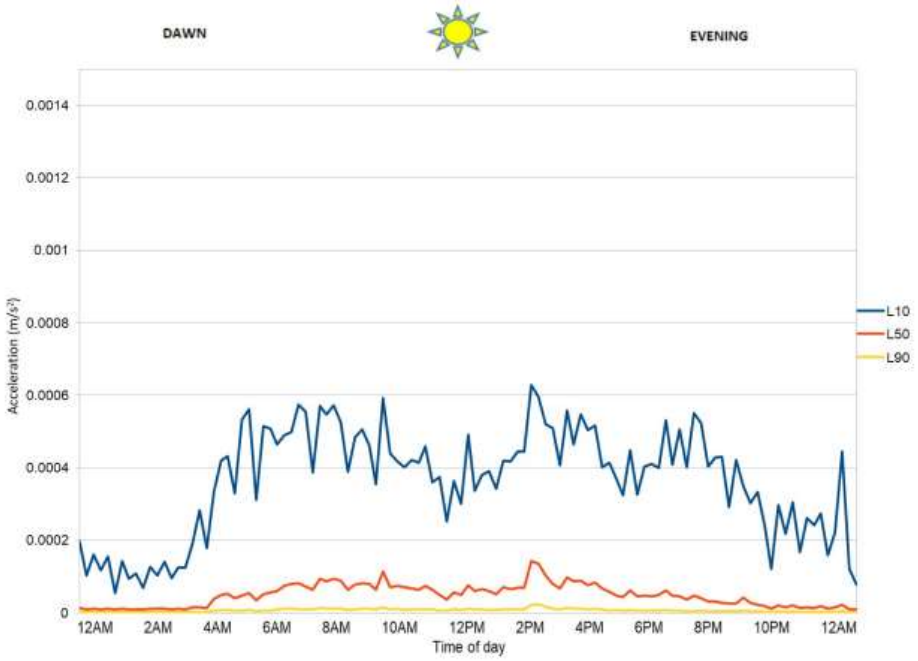


Figure 35. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s 2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

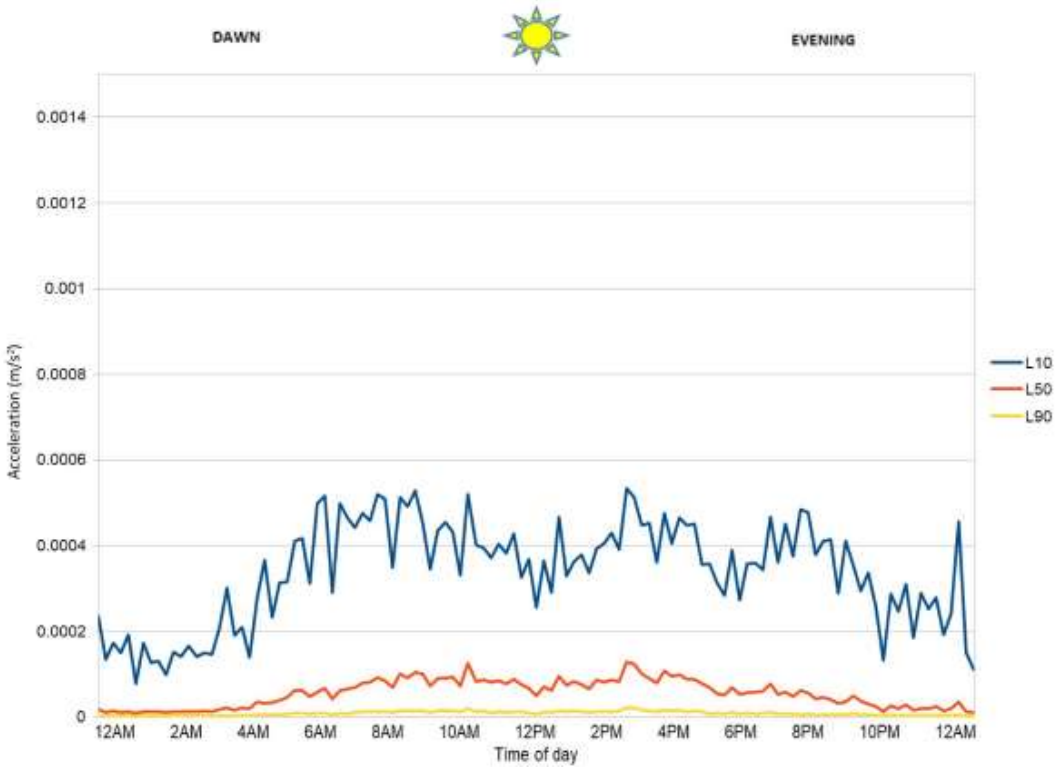
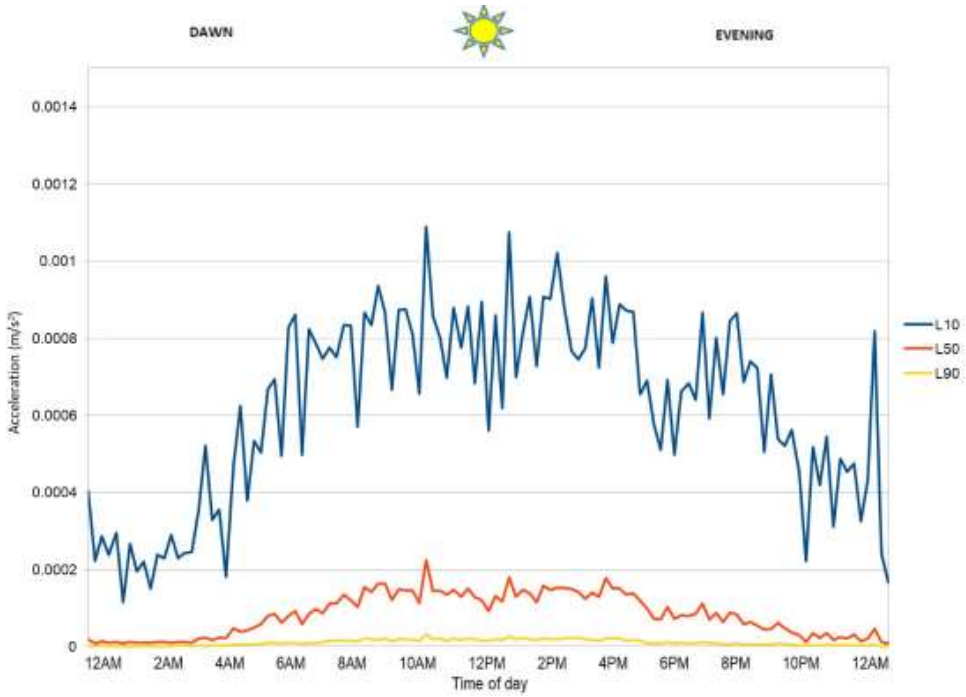


Figure 36. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ5

The AQ5 observation site is situated at a community near farmlands in Brgy. San Roque, Sumilao, Bukidnon. The sources of vibration are predominantly cargo trucks, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 37. The location of the survey site in Google Earth image

Figure 38. Chart depicting the maximum vibration levels in VdB in all three axes at AQ5

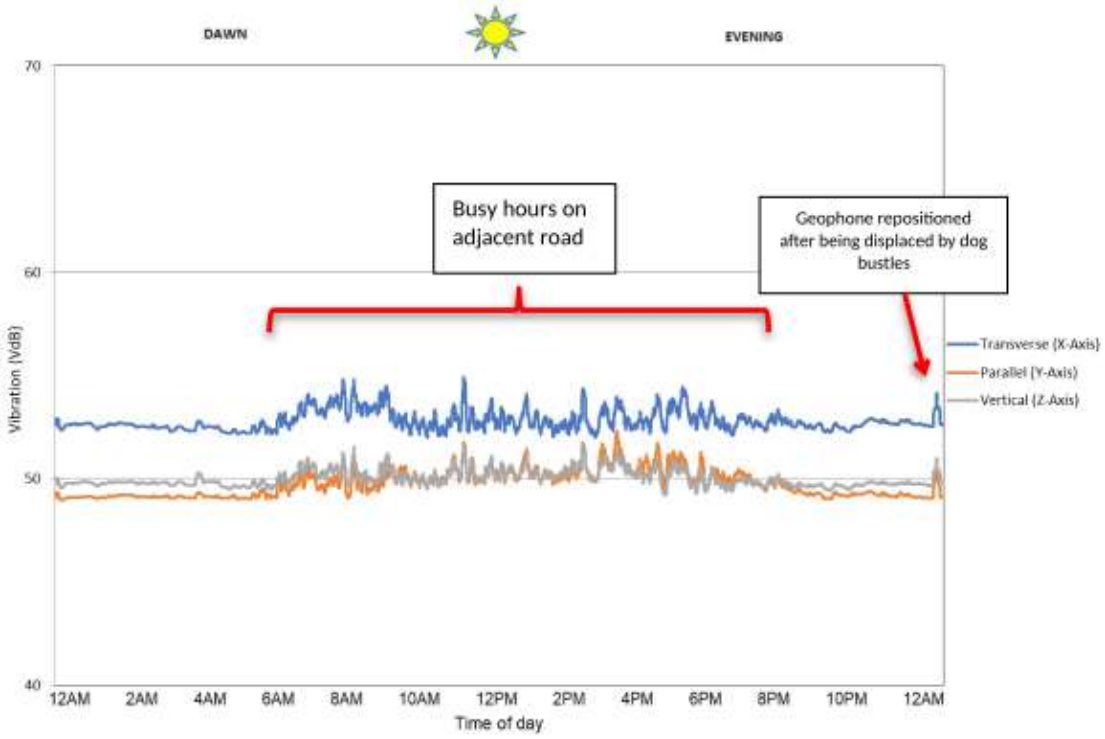


Figure 39. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ5

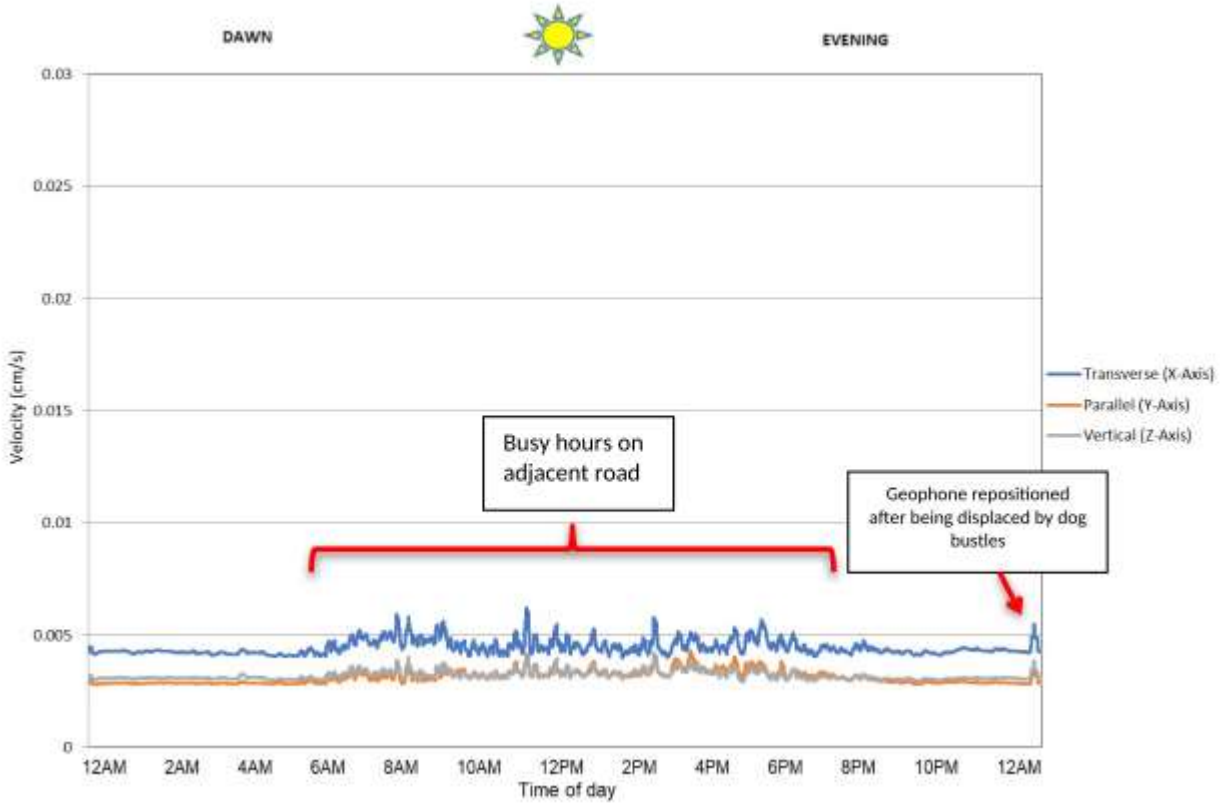


Figure 40. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ5

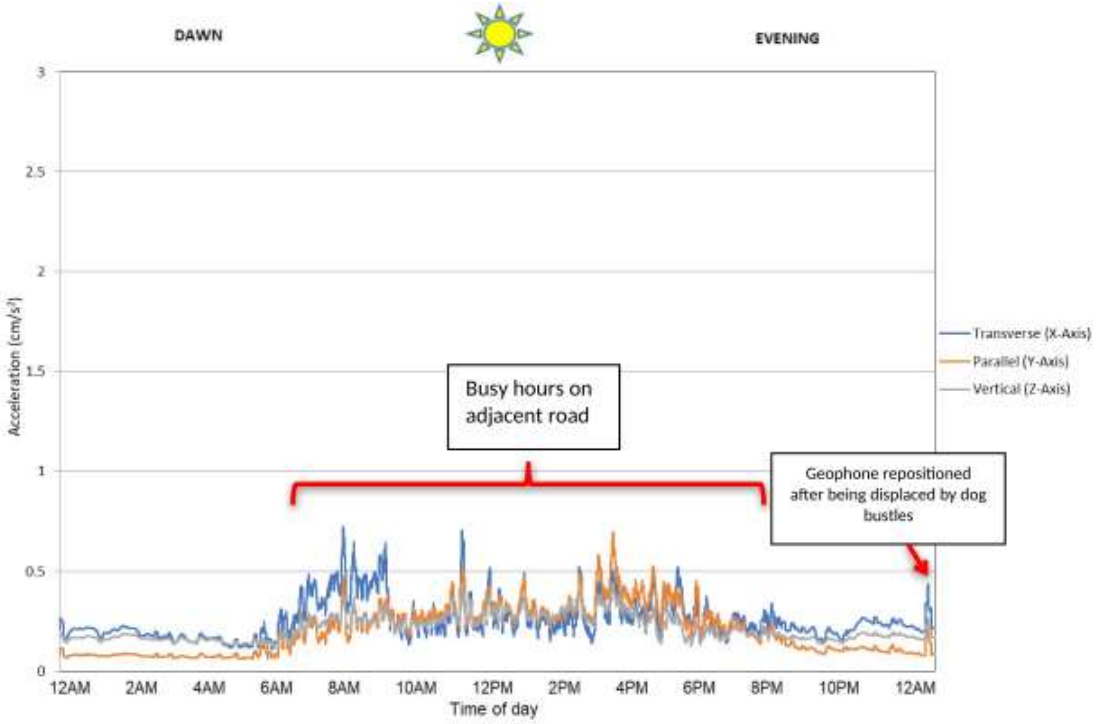


Figure 41. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

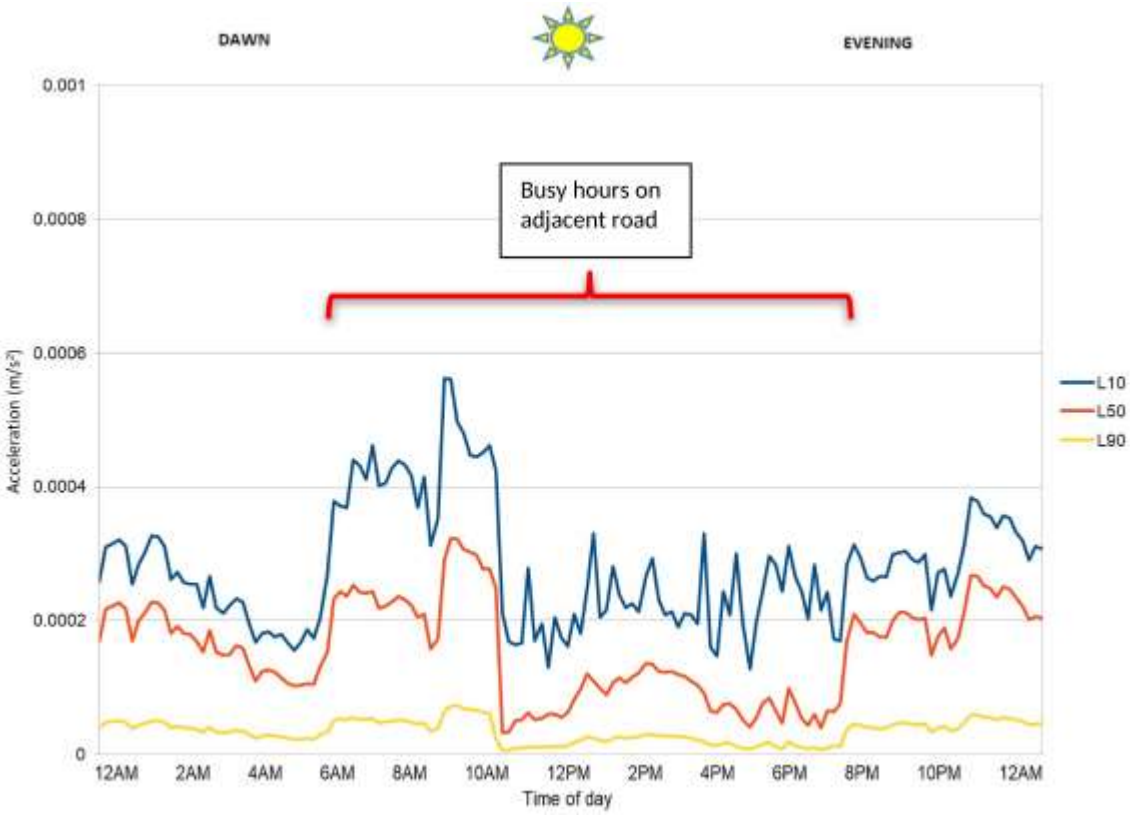


Figure 42. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

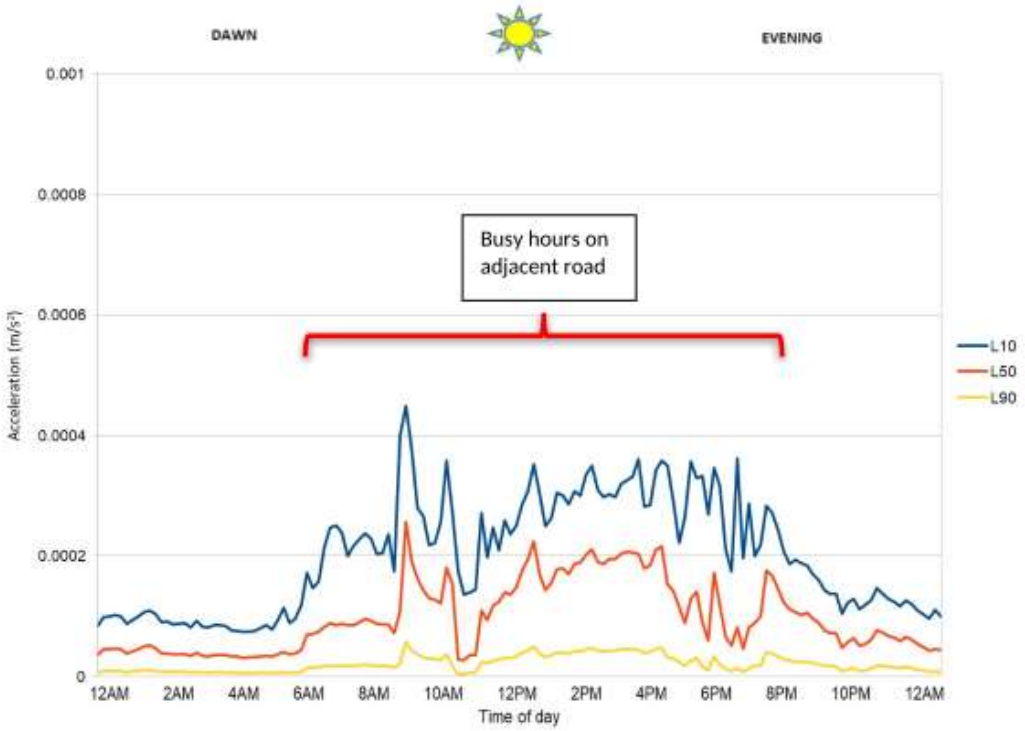
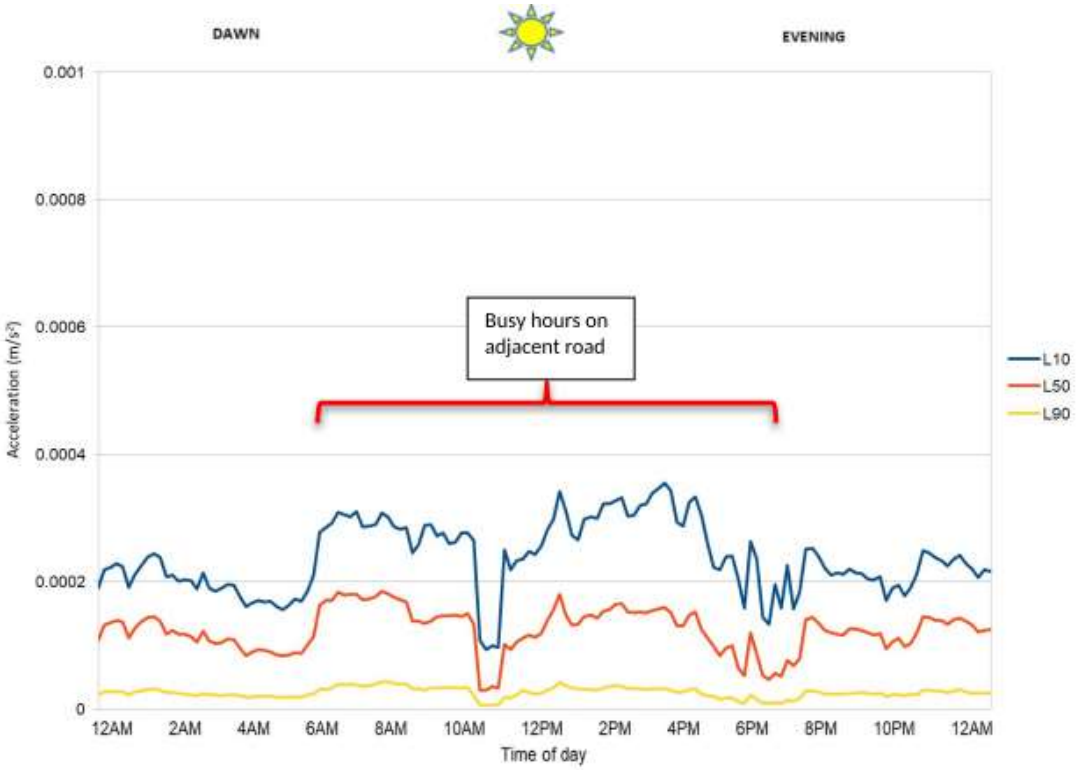


Figure 43.Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ6

The AQ6 observation site is situated near a major road in Brgy. Poblacion, Impasug-ong, Bukidnon. The sources of vibration are predominantly cargo trucks, cars, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 44: The location of the survey site in Google Earth image

Figure 45: Chart depicting the maximum vibration levels in VdB in all three axes at AQ6

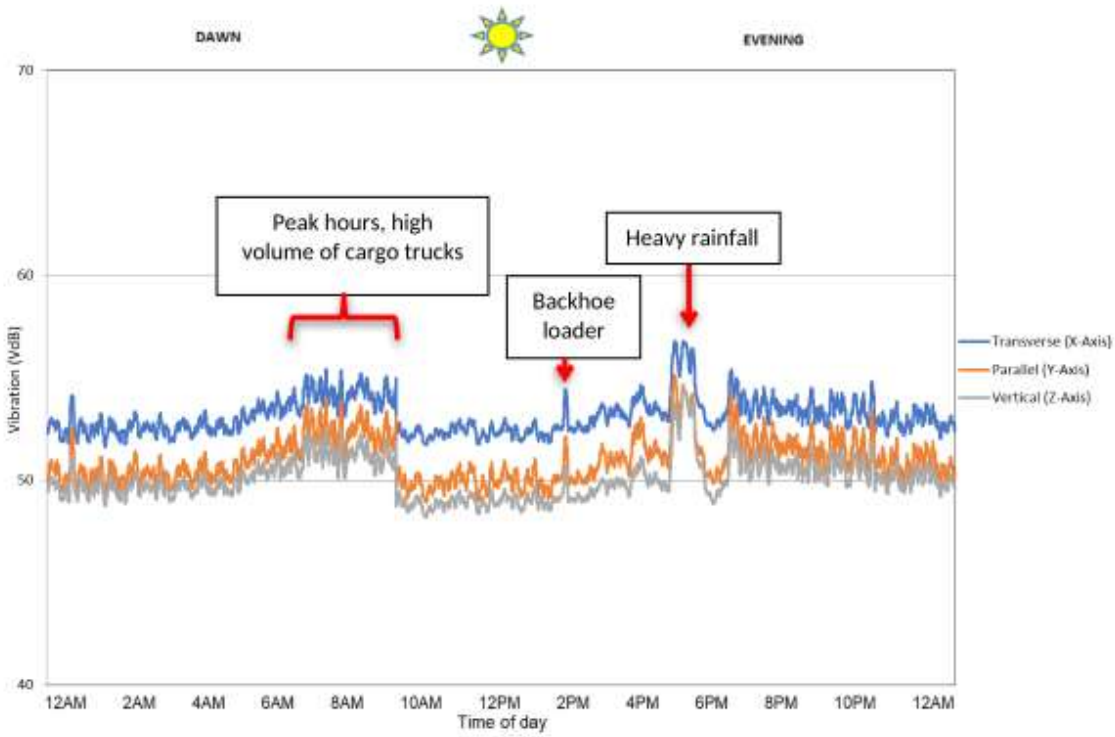


Figure 46. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ6

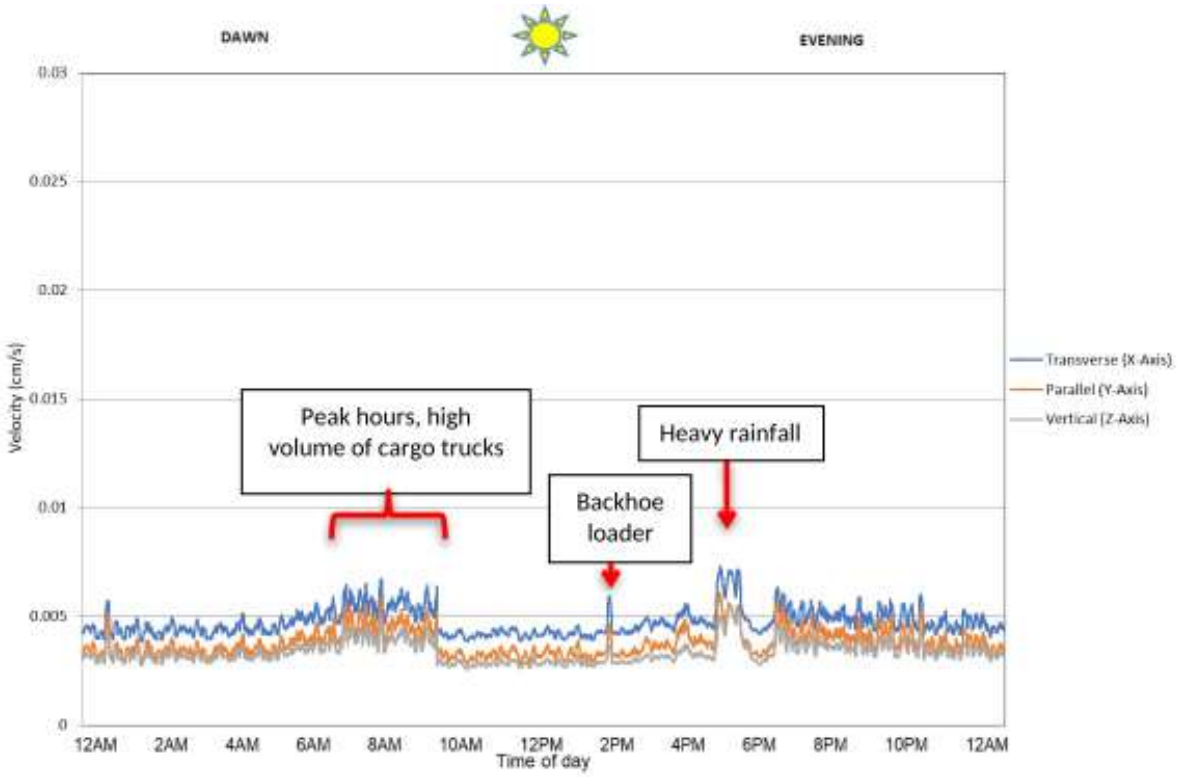


Figure 47. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ6

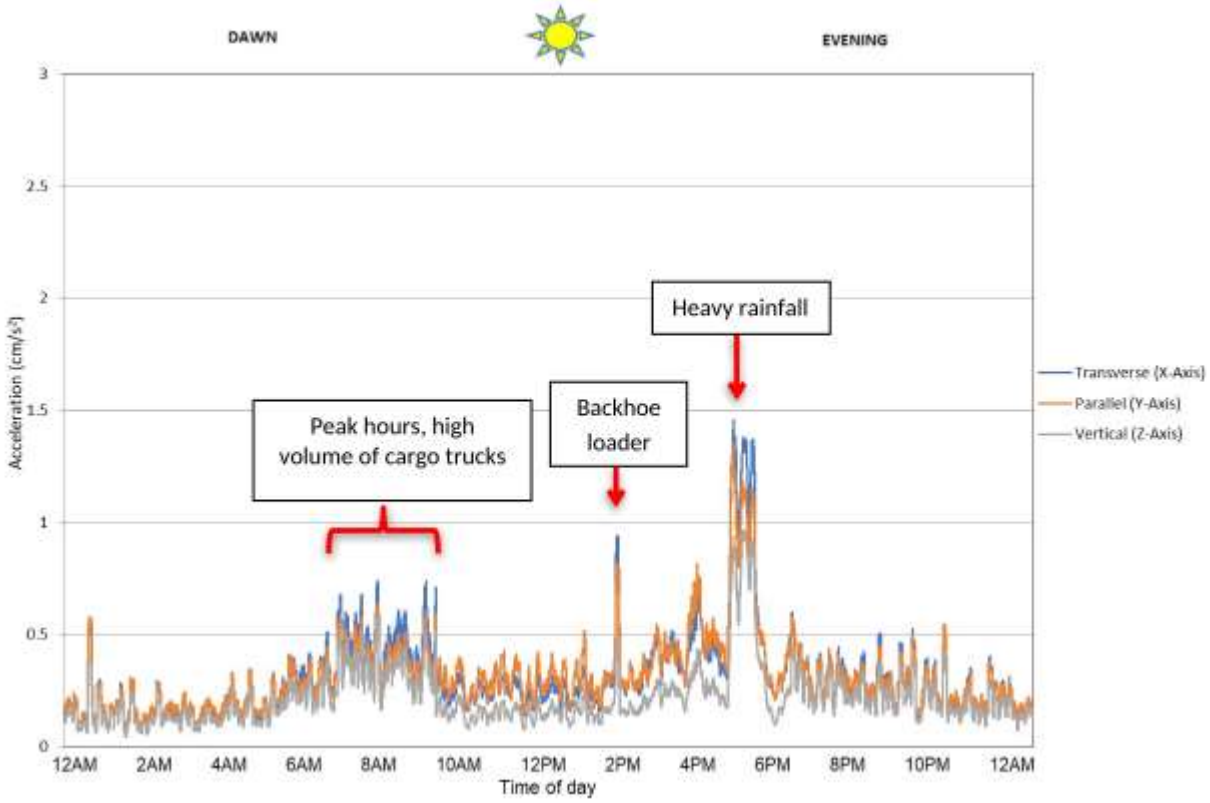


Figure 48. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

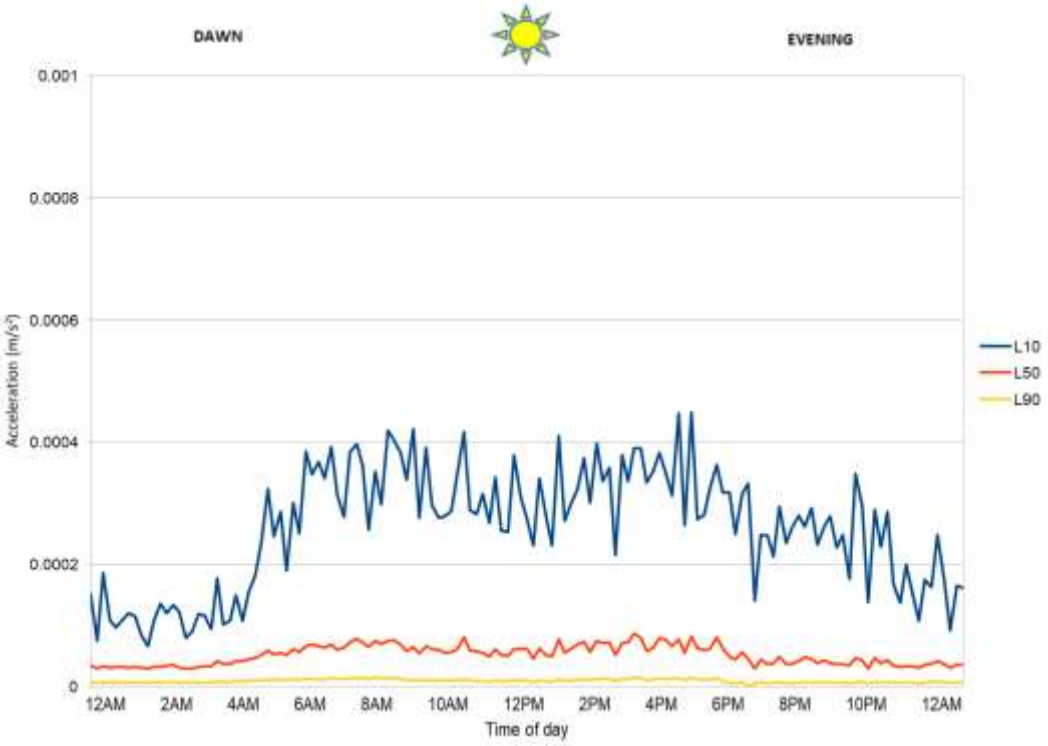


Figure 49. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

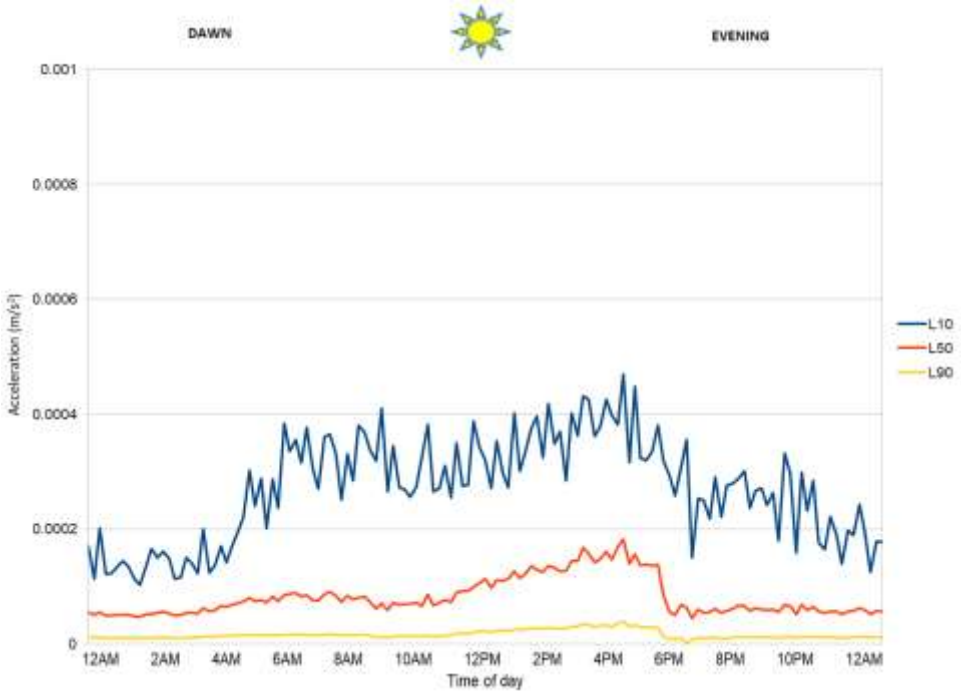
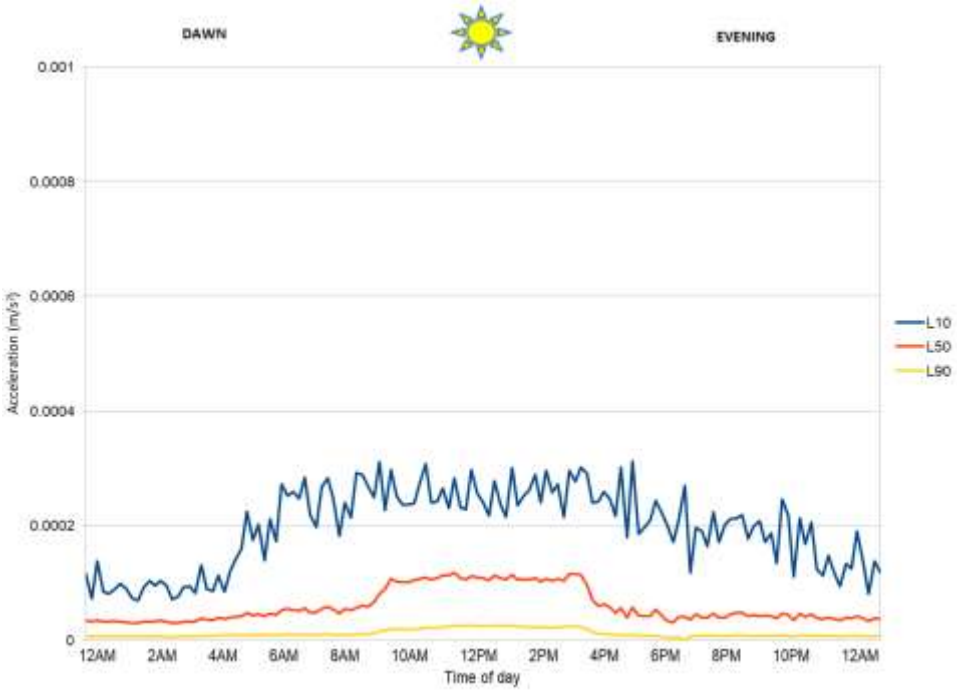


Figure 50. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ7

The AQ7 observation site is situated at a farmland in Brgy. La Fortuna, Impasugong, Bukidnon. The sources of vibration are predominantly motorcycles, cars and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 51. The location of the survey site in Google Earth image

Figure 52. Chart depicting the maximum vibration levels in VdB in all three axes at AQ7

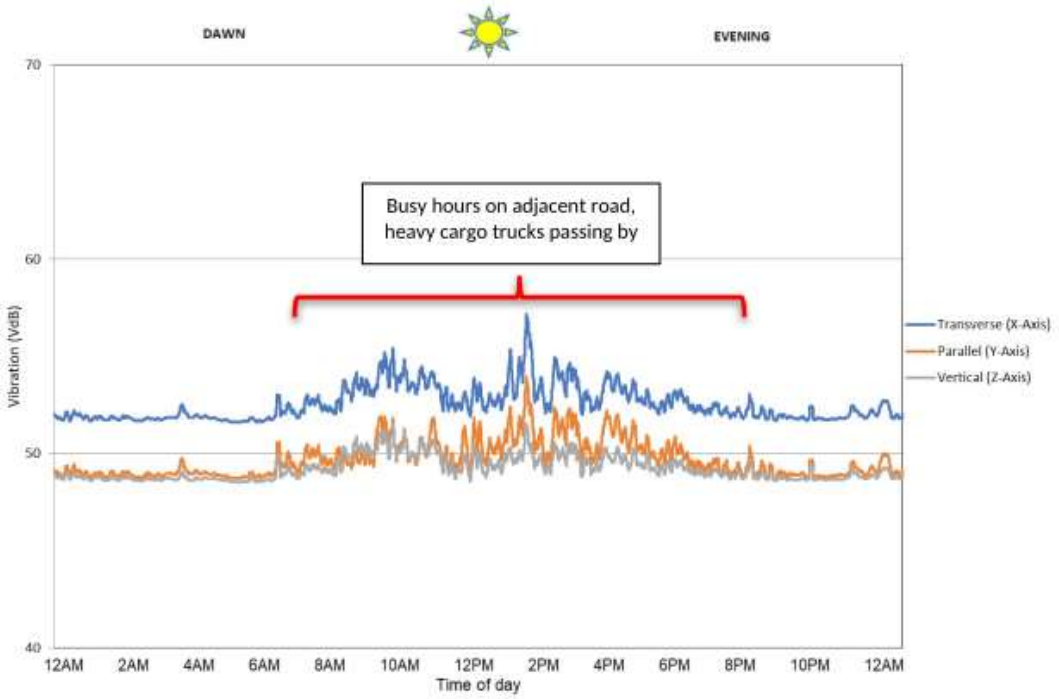


Figure 53. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ7

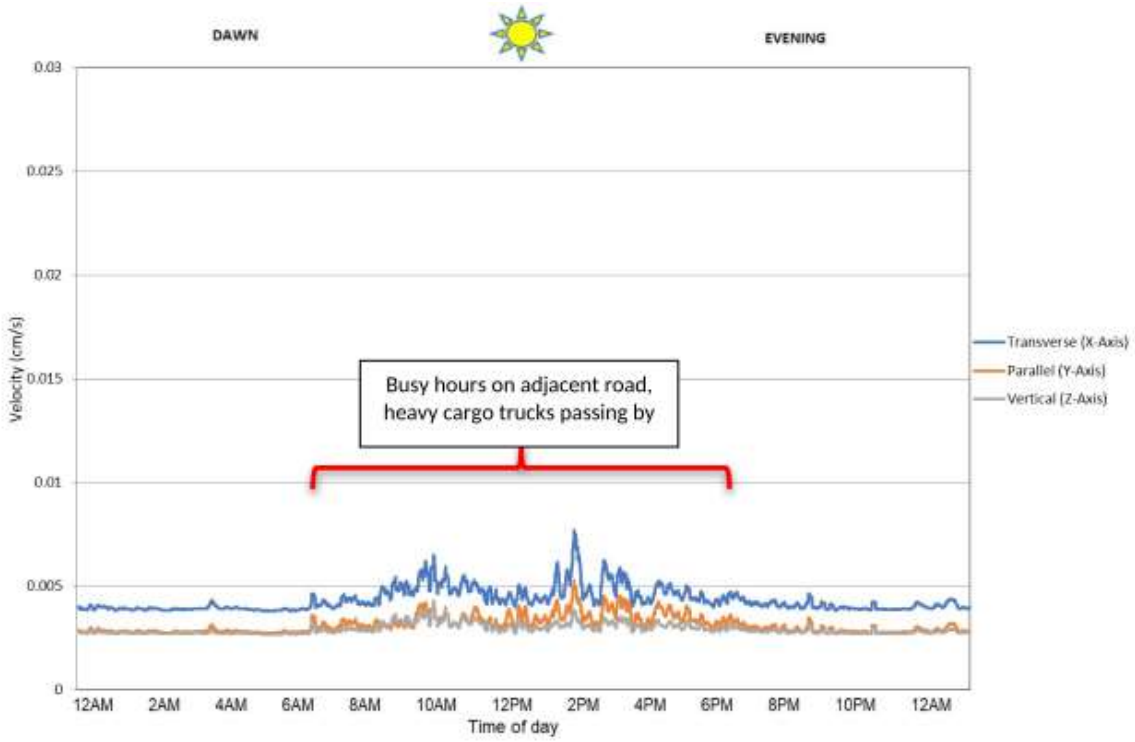


Figure 54. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ7

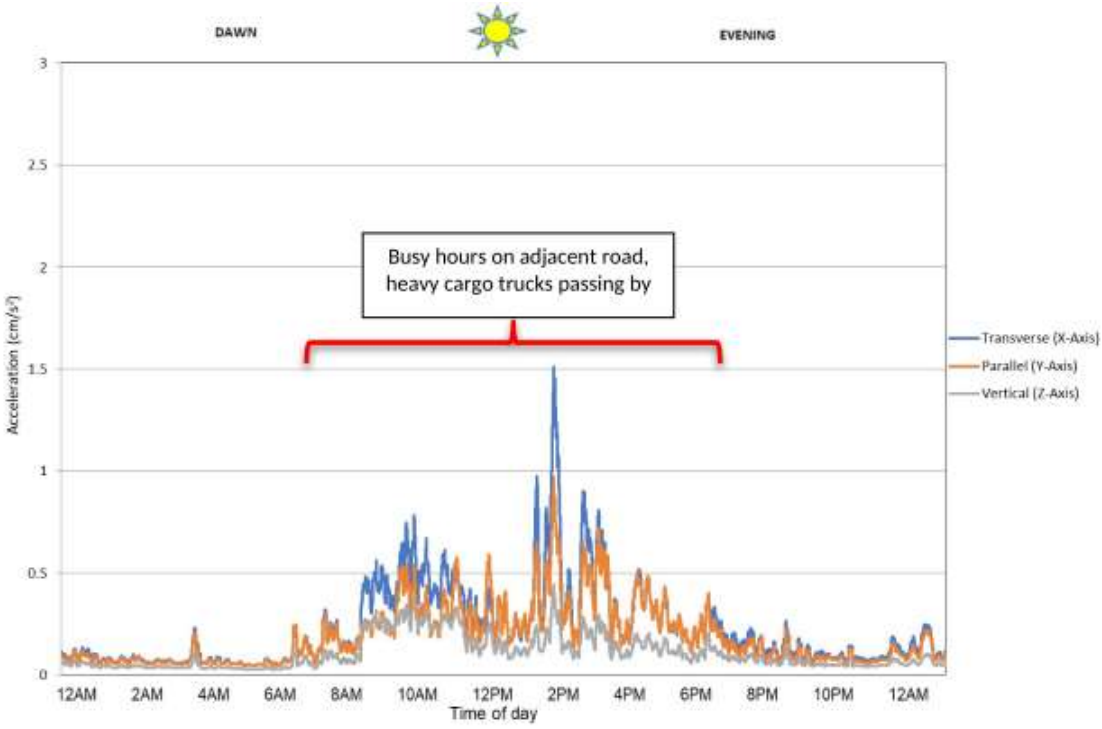


Figure 55. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

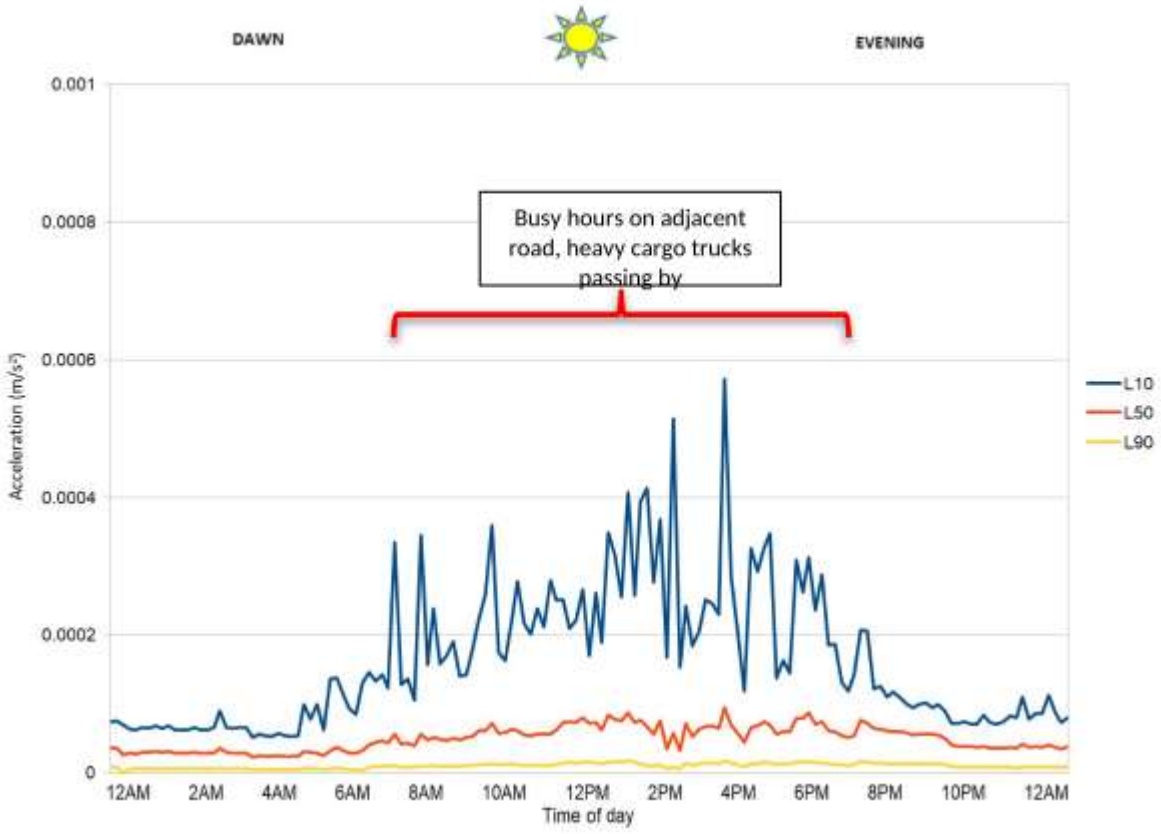


Figure 56. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

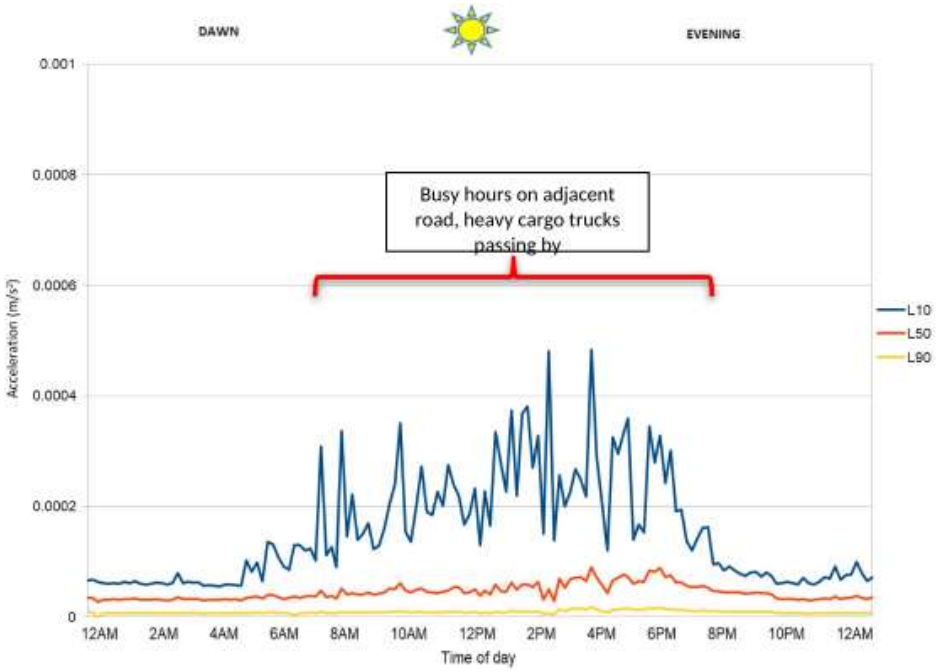
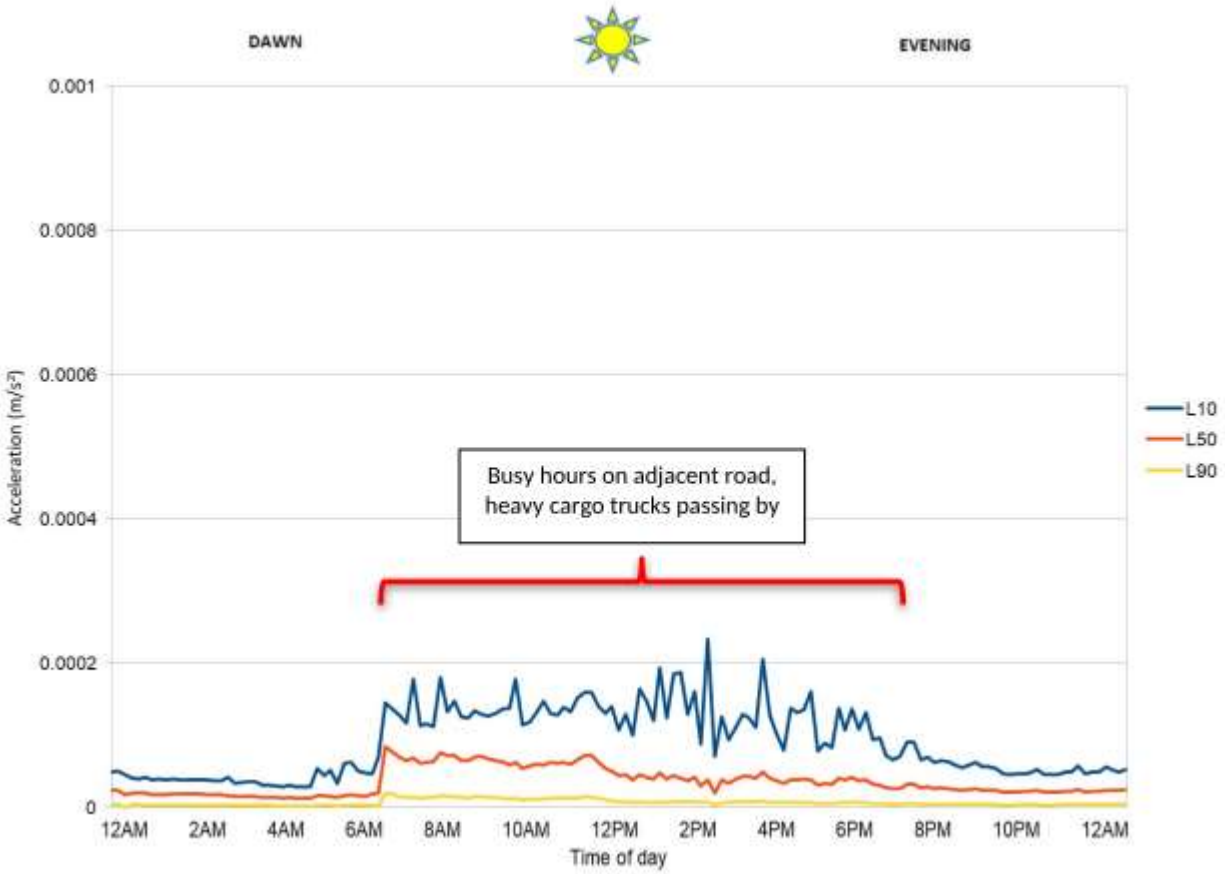


Figure 57. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ8

The **AQ8** observation site is situated at a major road near a farmland in Brgy. Impalutao, Impasug-ong, Bukidnon. The sources of vibration are predominantly cargo trucks, cars, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 58. The location of the survey site in Google Earth image

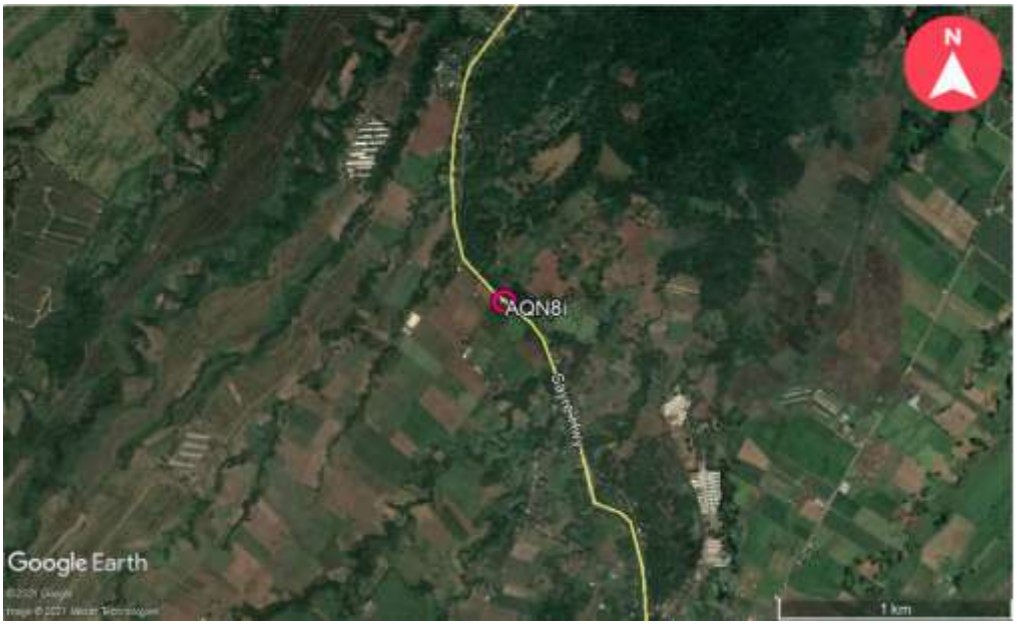


Figure 59. Chart depicting the maximum vibration levels in VdB in all three axes at AQ8.

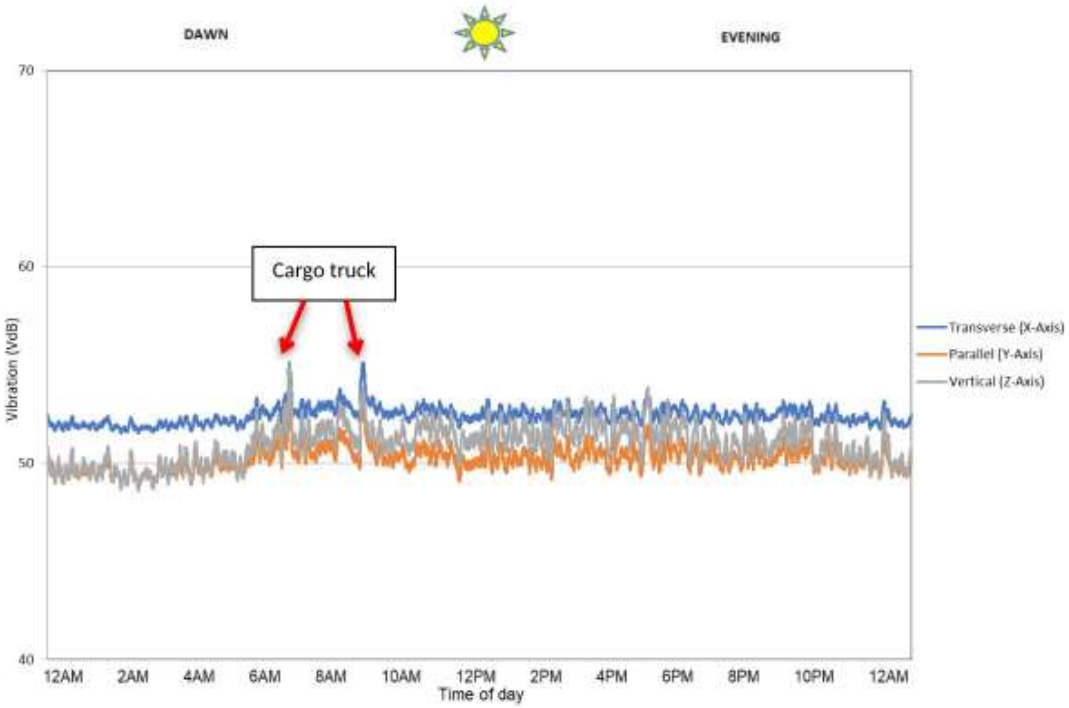


Figure 60. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ8

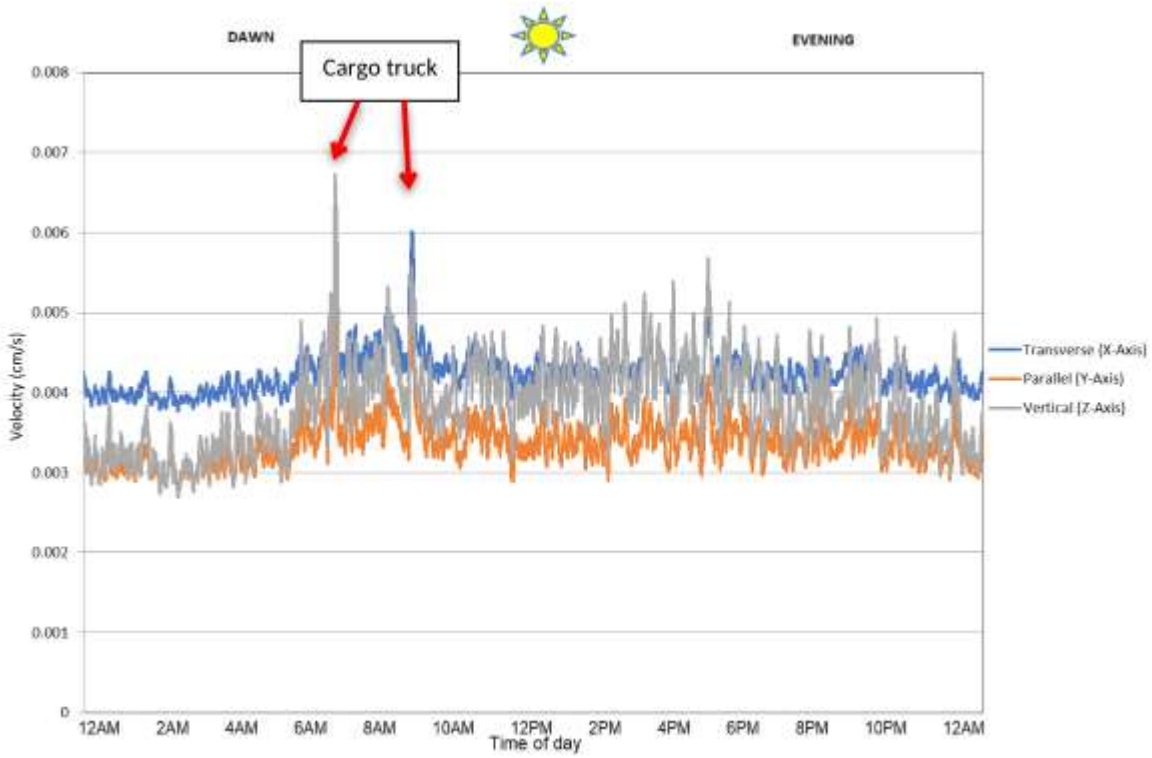


Figure 61. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ8

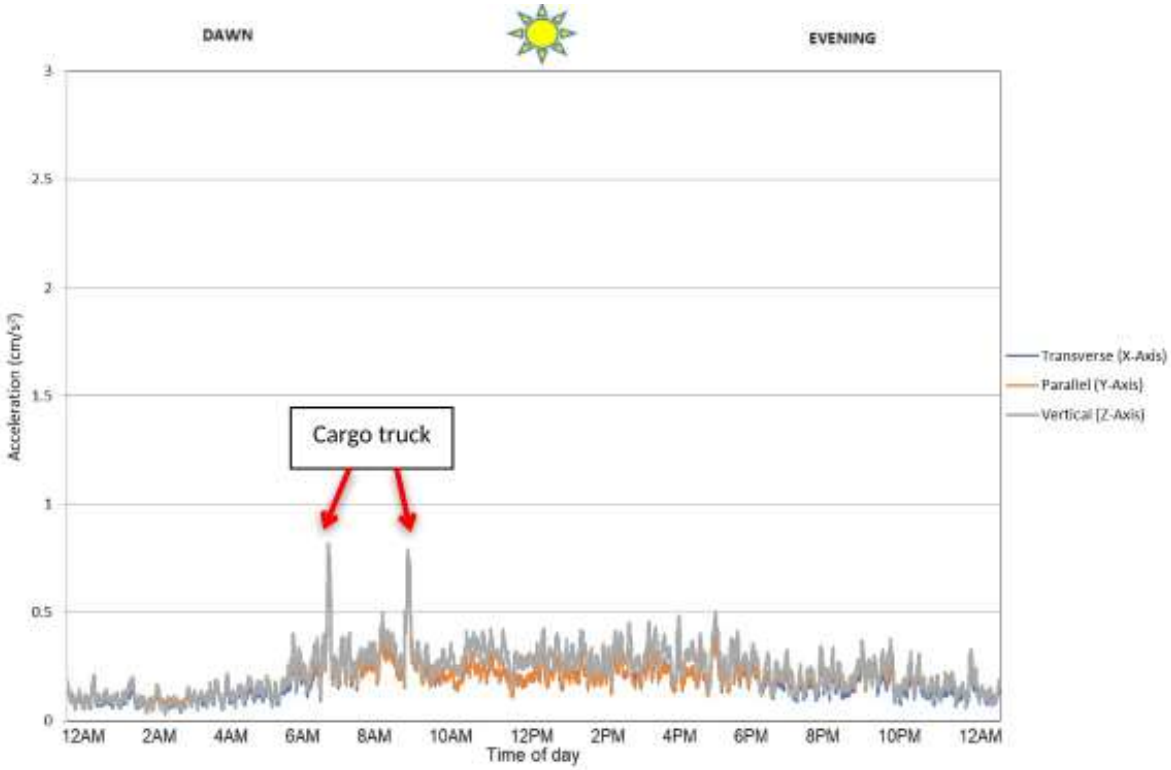


Figure 62. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

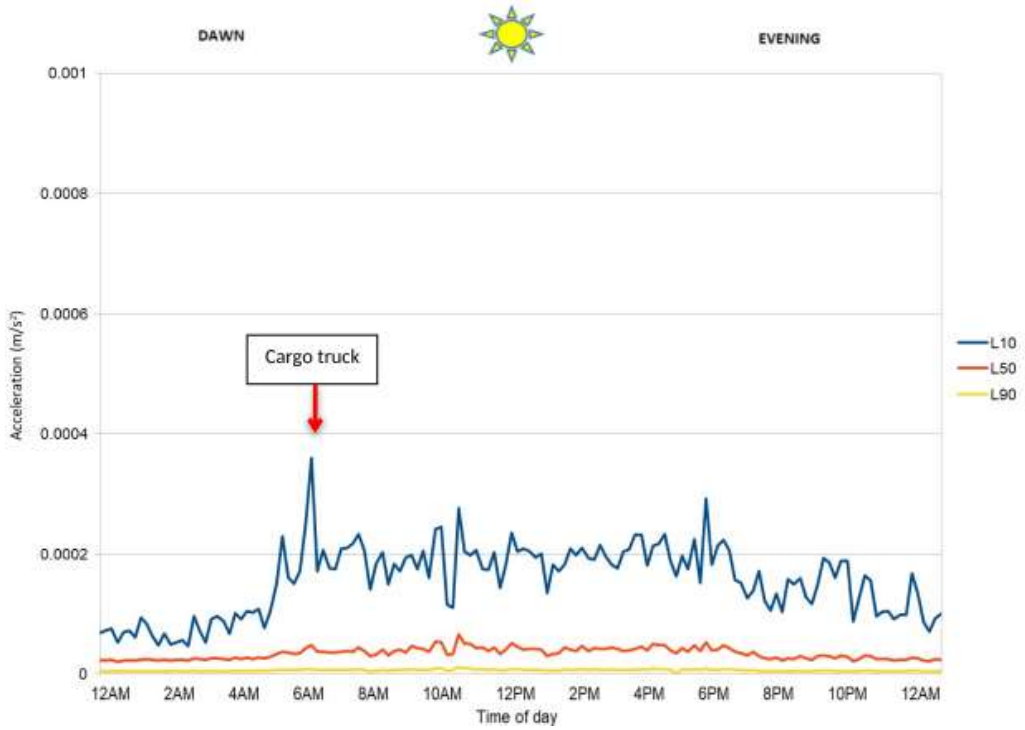


Figure 63. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

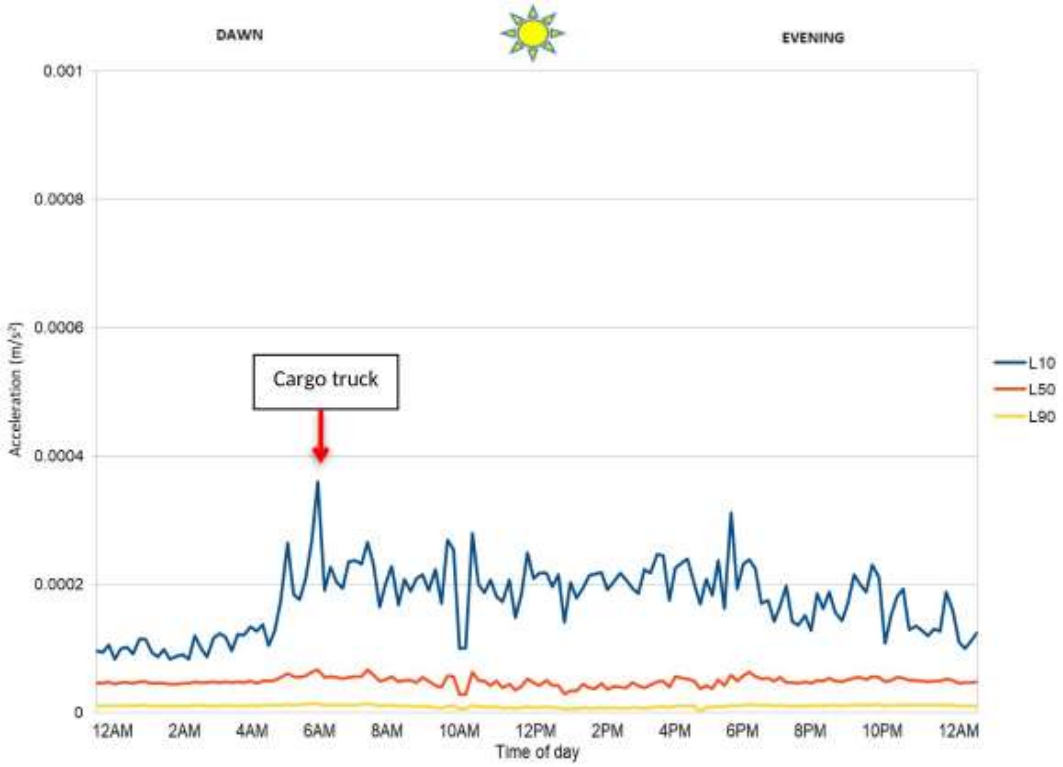
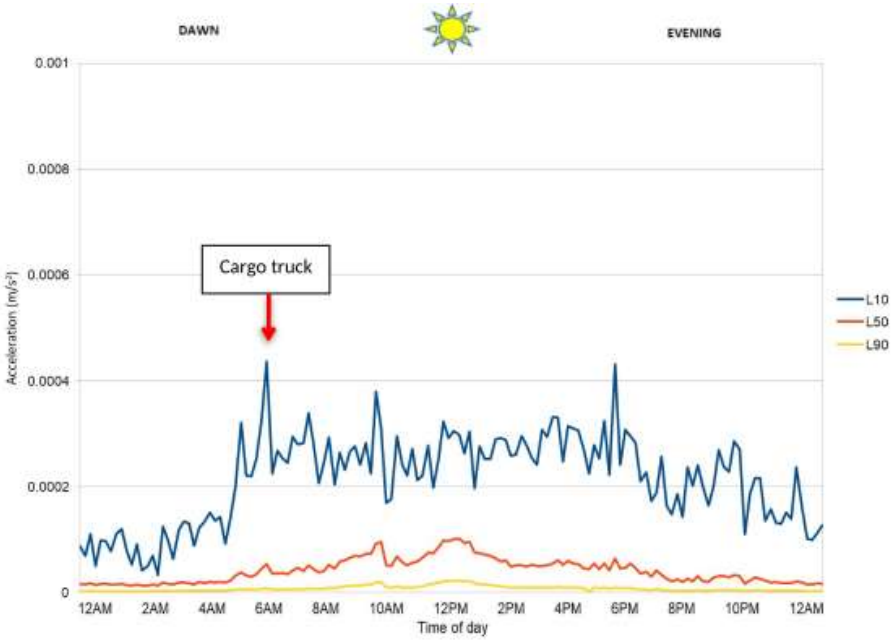


Figure 64. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ9

The **AQ9** observation site is situated at a major road in Brgy. Patpat, Malaybalay City, Bukidnon. The sources of vibration are predominantly cargo trucks, cars, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 65. The location of the survey site in Google Earth image

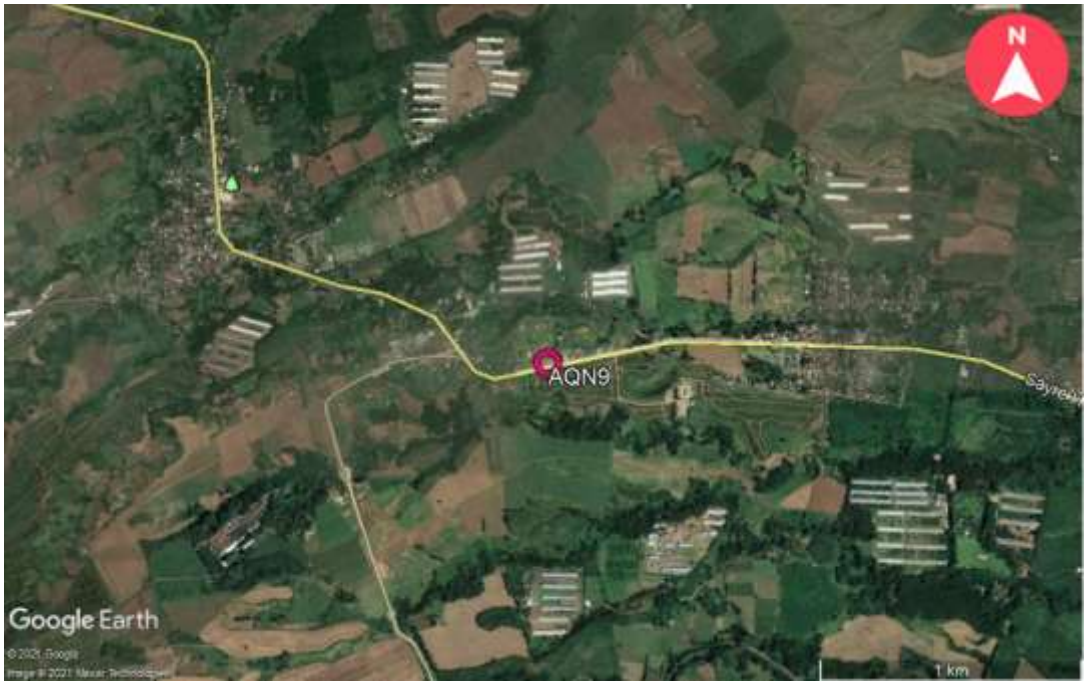


Figure 66. Chart depicting the maximum vibration levels in VdB in all three axes at AQ9

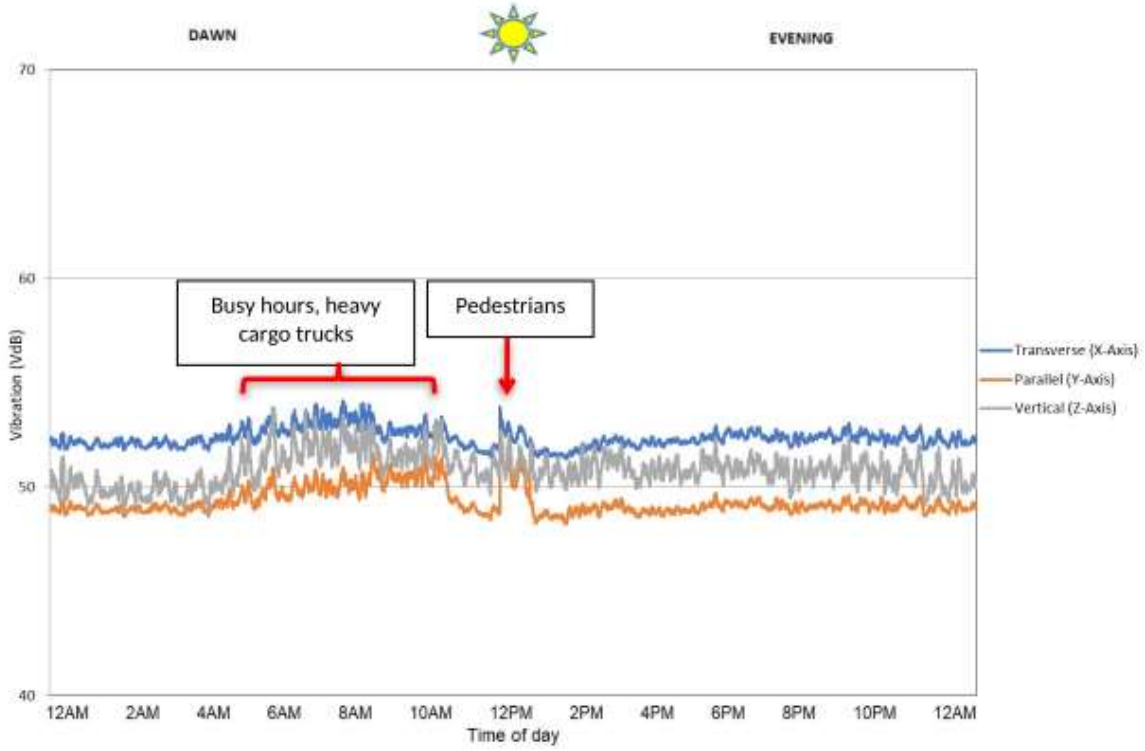


Figure 67. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ9

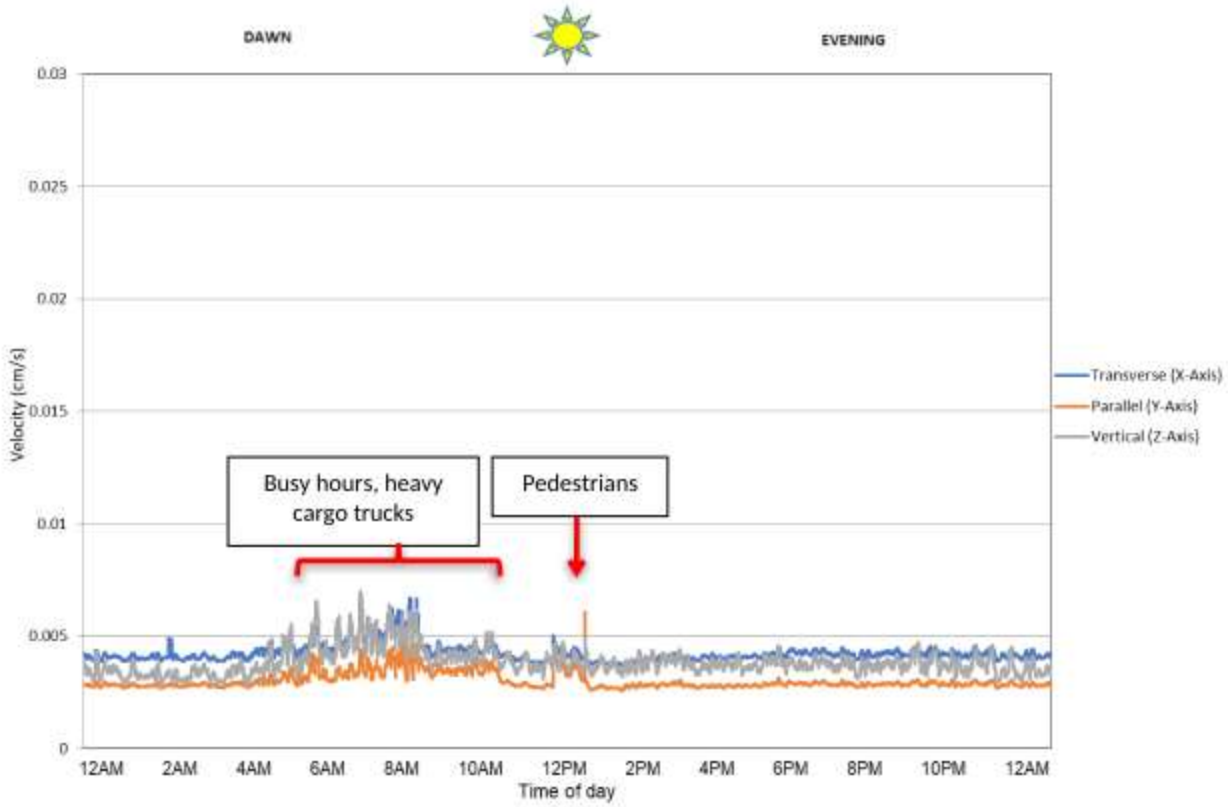


Figure 68. Chart depicting the maximum acceleration levels in cm/s 2 in all three axes at AQ9

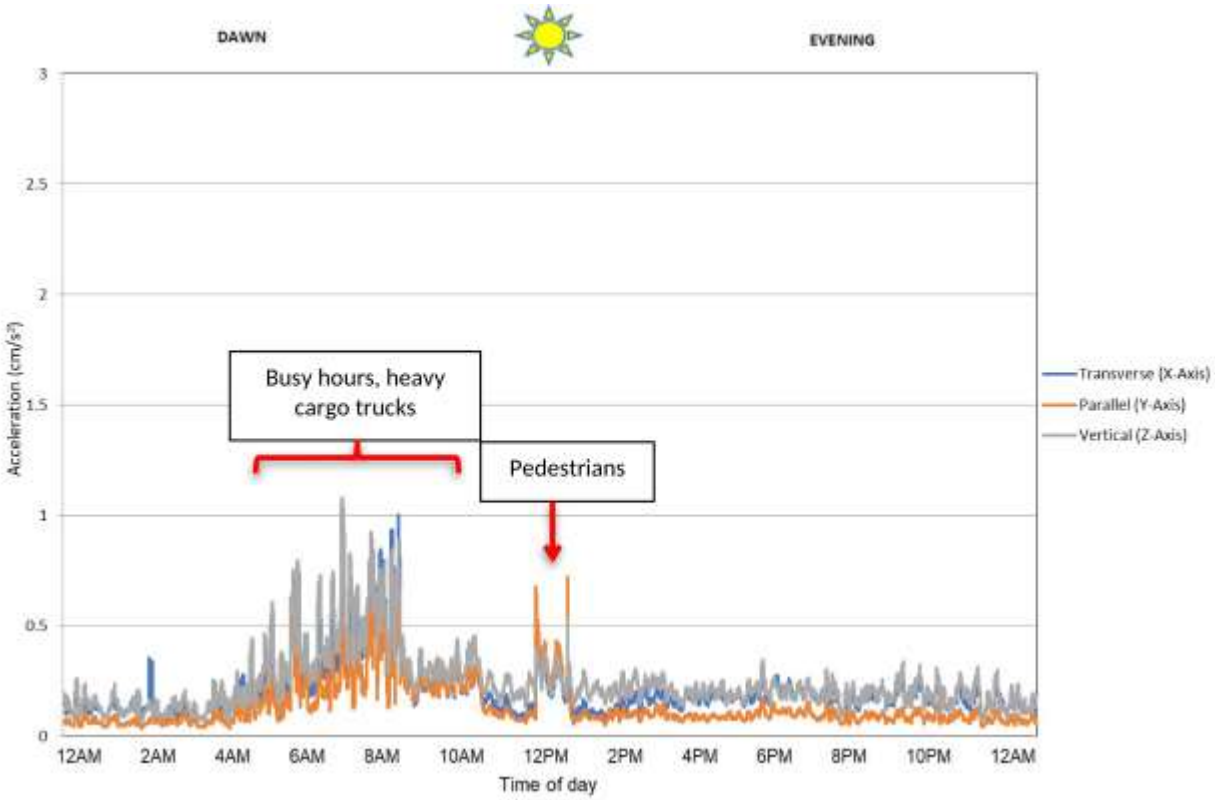


Figure 69. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

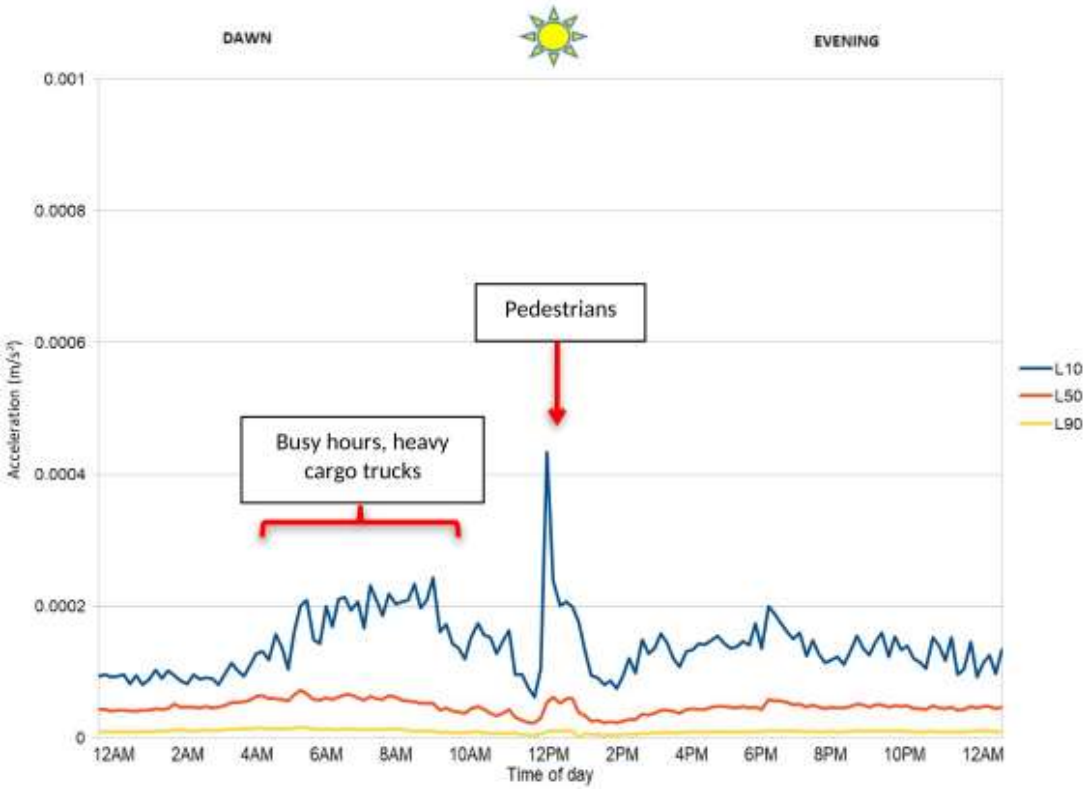


Figure 70. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

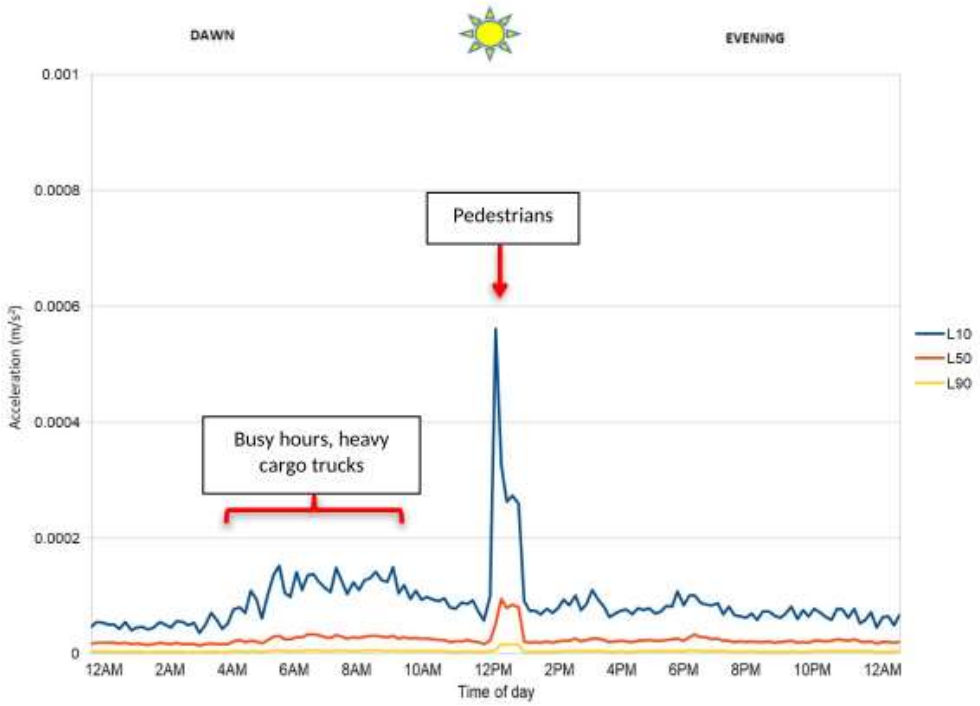
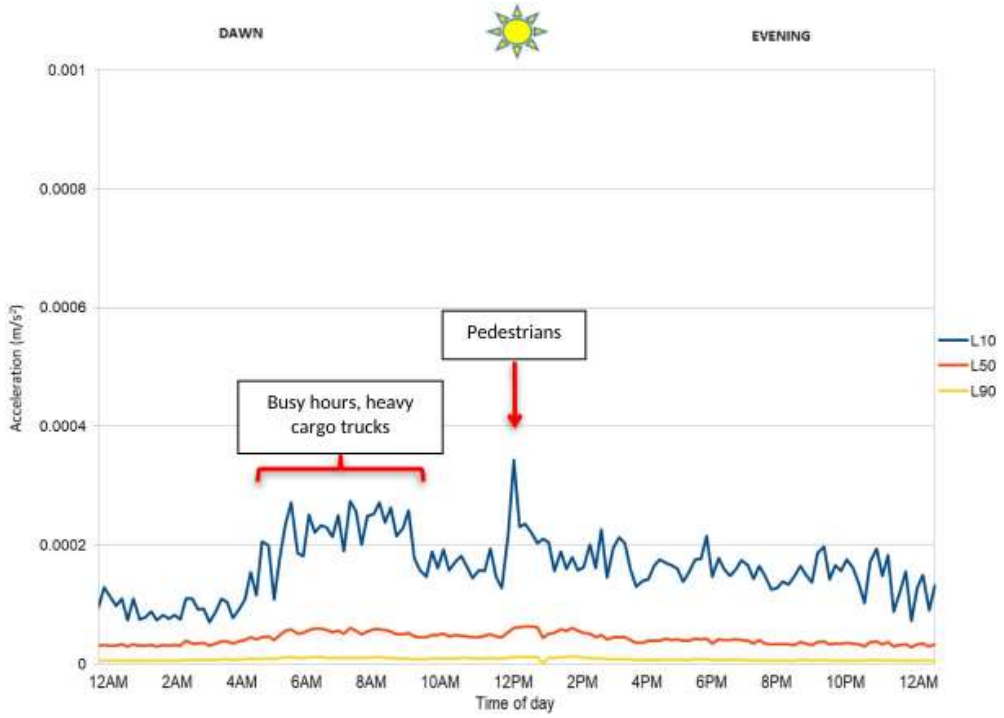


Figure 71. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the vertical axis (Z-Axis).



AQ10

The AQ10 observation site is situated at a major road in Brgy. Kalasungay, Malaybalay City, Bukidnon. The sources of vibration are predominantly cargo trucks, cars, motorcycles and pedestrians. Traffic condition is light to moderate during the observation period.

Figure 72. The location of the survey site in Google Earth image

Figure 73. Chart depicting the maximum vibration levels in VdB in all three axes at AQ 10.

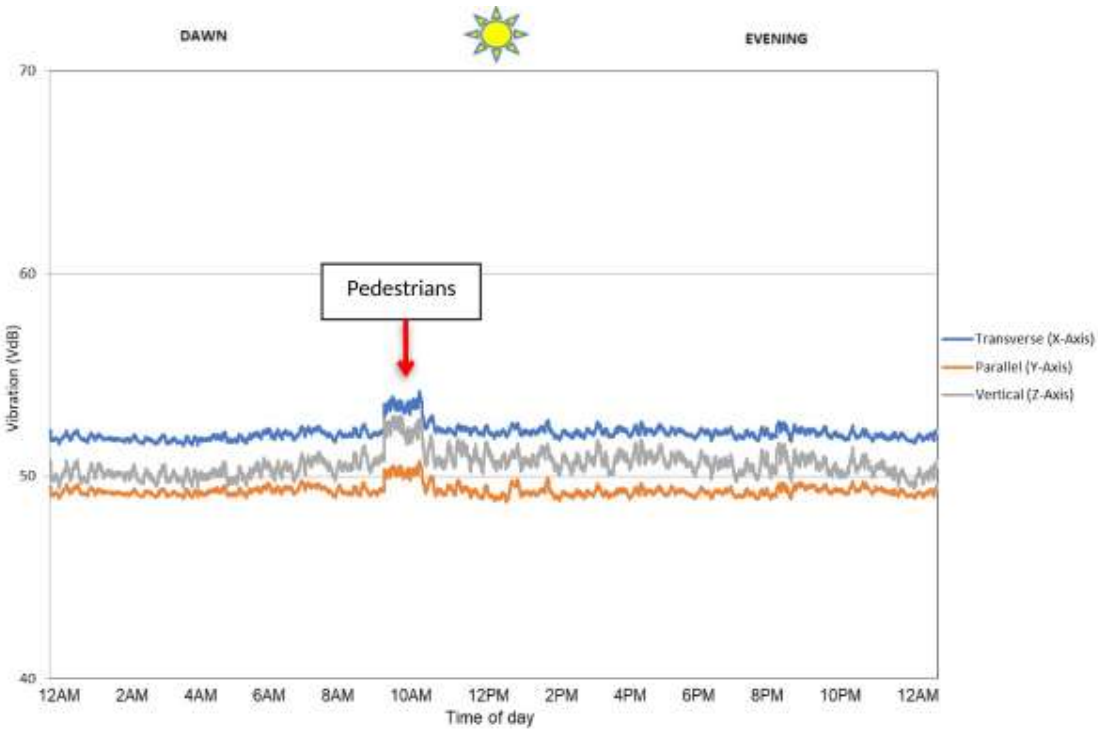


Figure 74. Chart depicting the maximum velocity levels in cm/s in all three axes at AQ10

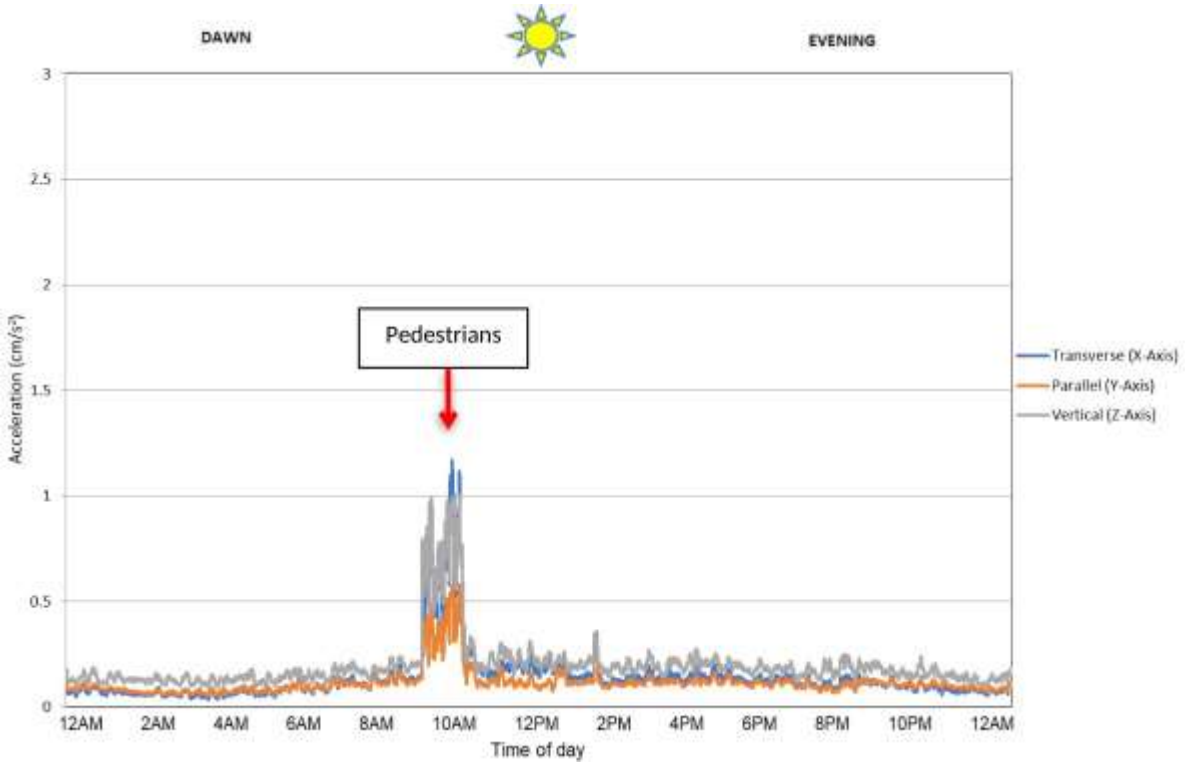


Figure 75. Chart depicting the maximum acceleration levels in cm/s2 in all three axes at AQ10

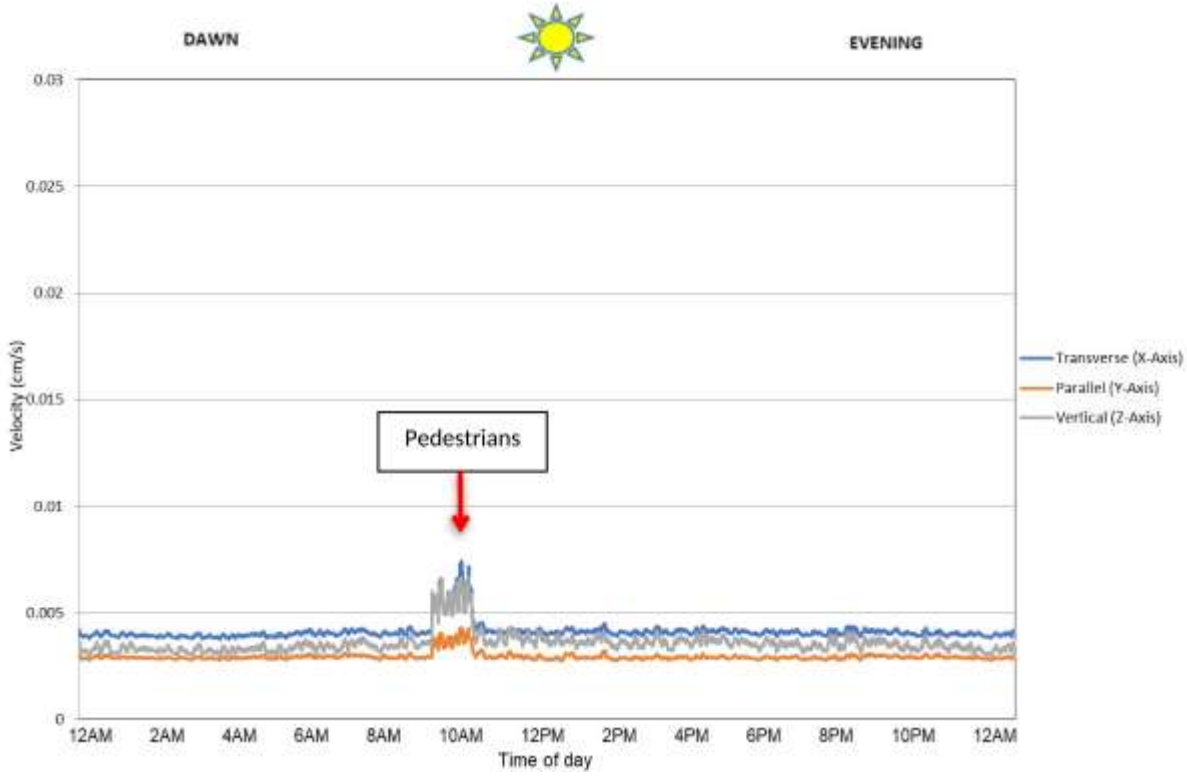


Figure 76. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, transverse axis (X-Axis).

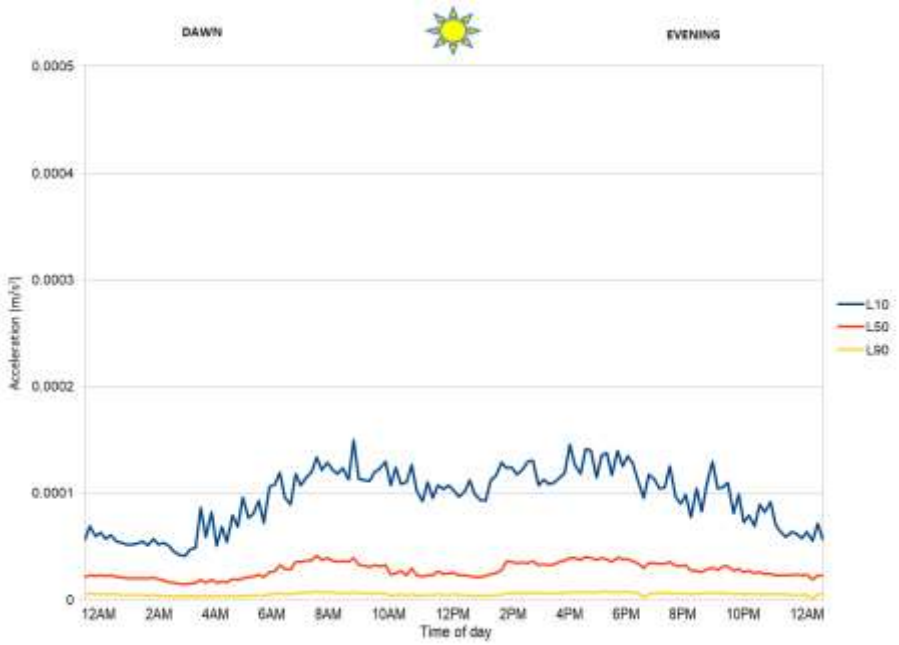


Figure 77. Chart depicting the acceleration values exceeding 10%, 50% and 90% of the time in m/s2, time sliced every 10 minutes for the horizontal, parallel axis (Y-Axis).

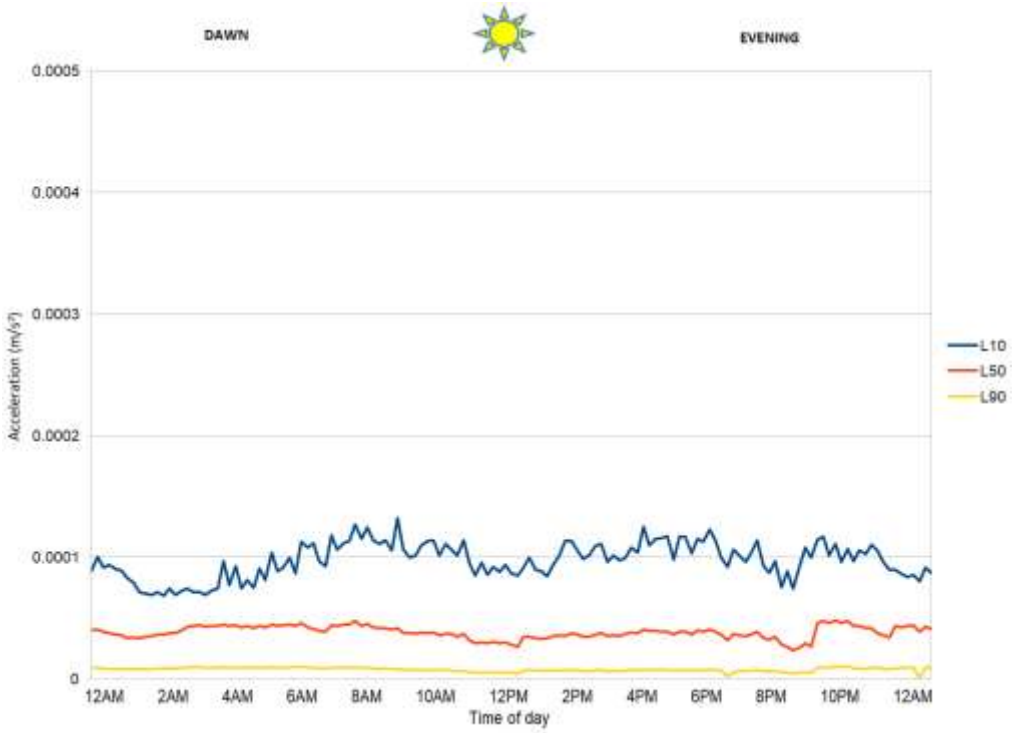


Table 16. Maximum vibration levels (VdB) on all sites during certain periods of the day.

Survey Stations		Vibration (VdB)			
		Morning (5am-9am)	Day (9am-6pm)	Evening (6pm-10pm)	Dawn (10pm-5am)
AQN1S	**X-axis**	**52** VdB	**52** VdB	**52** VdB	**51** VdB
	Y-axis	**50** VdB	**50** VdB	**50** VdB	**49** VdB
	Z-axis	**51** VdB	**51** VdB	**53** VdB	**49** VdB
AQN2i	**X-axis**	**52** VdB	**51** VdB	**51** VdB	**41** VdB
	Y-axis	**48** VdB	**49** VdB	**48** VdB	**48** VdB
	Z-axis	**48** VdB	**49** VdB	**48** VdB	**48** VdB
AQN3	**X-axis**	**52** VdB	**53** VdB	**52** VdB	**52** VdB
	Y-axis	**50** VdB	**52** VdB	**50** VdB	**50** VdB
	Z-axis	**48** VdB	**50** VdB	**49** VdB	**48** VdB
AQN4	**X-axis**	**55** VdB	**54** VdB	**53** VdB	**52** VdB
	Y-axis	**53** VdB	**53** VdB	**52** VdB	**50** VdB
	Z-axis	**56** VdB	**57** VdB	**55** VdB	**51** VdB
AQN5	**X-axis**	**53** VdB	**53** VdB	**52** VdB	**52** VdB
	Y-axis	**49** VdB	**51** VdB	**49** VdB	**49** VdB
	Z-axis	**50** VdB	**50** VdB	**50** VdB	**49** VdB
AQN6i	**X-axis**	**53** VdB	**53** VdB	**53** VdB	**52** VdB
	Y-axis	**51** VdB	**50** VdB	**51** VdB	**50** VdB
	Z-axis	**51** VdB	**49** VdB	**50** VdB	**49** VdB
AQN7	**X-axis**	**49** VdB	**50** VdB	**49** VdB	**49** VdB
	Y-axis	**50** VdB	**51** VdB	**49** VdB	**48** VdB
	Z-axis	**50** VdB	**51** VdB	**49** VdB	**48** VdB
AQN8i	**X-axis**	**53** VdB	**53** VdB	**52** VdB	**51** VdB
	Y-axis	**50** VdB	**50** VdB	**50** VdB	**49** VdB
	Z-axis	**51** VdB	**52** VdB	**51** VdB	**50** VdB
AQN9	**X-axis**	**53** VdB	**52** VdB	**52** VdB	**52** VdB
	Y-axis	**50** VdB	**48** VdB	**48** VdB	**48** VdB
	Z-axis	**52** VdB	**51** VdB	**50** VdB	**50** VdB
AQN10E	**X-axis**	**52** VdB	**52** VdB	**52** VdB	**52** VdB
	Y-axis	**49** VdB	**49** VdB	**49** VdB	**49** VdB
	Z-axis	**50** VdB	**51** VdB	**50** VdB	**50** VdB

Table 17. Maximum acceleration levels (cm/s2) on all sites during certain periods of the day.

Survey Stations		Velocity (cm/s)			
		Morning (5am-9am)	Day (9am-6pm)	Evening (6pm-10pm)	Dawn (10pm-5am)
AQN1S	**X-axis**	**0.004** cm/s	**0.004** cm/s	**0.004** cm/s	**0.003** cm/s
	Y-axis	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s	**0.002** cm/s
	Z-axis	**0.003** cm/s	**0.005** cm/s	**0.004** cm/s	**0.003** cm/s
AQN2i	**X-axis**	**0.003** cm/s	**0.004** cm/s	**0.003** cm/s	**0.003** cm/s
	Y-axis	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s
	Z-axis	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s

AQN3	**X-axis**	**0.004** cm/s	**0.005** cm/s	**0.004** cm/s	**0.003** cm/s
	Y-axis	**0.003** cm/s	**0.004** cm/s	**0.003** cm/s	**0.003** cm/s
	Z-axis	**0.002** cm/s	**0.003** cm/s	**0.002** cm/s	**0.002** cm/s
AQN4	**X-axis**	**0.006** cm/s	**0.006** cm/s	**0.006** cm/s	**0.004** cm/s
	Y-axis	**0.005** cm/s	**0.004** cm/s	**0.004** cm/s	**0.004** cm/s
	Z-axis	**0.009** cm/s	**0.009** cm/s	**0.007** cm/s	**0.005** cm/s
AQN5	**X-axis**	**0.005** cm/s	**0.005** cm/s	**0.004** cm/s	**0.004** cm/s
	Y-axis	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s	**0.002** cm/s
	Z-axis	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s
AQN6i	**X-axis**	**0.005** cm/s	**0.004** cm/s	**0.006** cm/s	**0.004** cm/s
	Y-axis	**0.004** cm/s	**0.003** cm/s	**0.004** cm/s	**0.003** cm/s
	Z-axis	**0.004** cm/s	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s
AQN7	**X-axis**	**0.003** cm/s	**0.004** cm/s	**0.002** cm/s	**0.002** cm/s
	Y-axis	**0.003** cm/s	**0.004** cm/s	**0.003** cm/s	**0.002** cm/s
	Z-axis	**0.003** cm/s	**0.005** cm/s	**0.002** cm/s	**0.002** cm/s
AQN8i	**X-axis**	**0.004** cm/s	**0.005** cm/s	**0.004** cm/s	**0.004** cm/s
	Y-axis	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s
	Z-axis	**0.004** cm/s	**0.004** cm/s	**0.00** cm/s	**0.003** cm/s
AQN9	**X-axis**	**0.005** cm/s	**0.004** cm/s	**0.004** cm/s	**0.003** cm/s
	Y-axis	**0.003** cm/s	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s
	Z-axis	**0.005** cm/s	**0.004** cm/s	**0.004** cm/s	**0.003** cm/s
AQN10E	**X-axis**	**0.004** cm/s	**0.004** cm/s	**0.004** cm/s	**0.004** cm/s
	Y-axis	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s	**0.002** cm/s
	Z-axis	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s	**0.003** cm/s

Table 18. Maximum acceleration levels (cm/s2) on all sites during certain periods of the day.

Survey Stations		Acceleration (cm/s^2)			
		Morning	Day	Evening	Dawn
		(5am-9am)	(9am-6pm)	(6pm-10pm)	(10pm-5am)
AQN1S	**X-axis**	**0.14** cm/s^2	**0.18** cm/s^2	**0.15** cm/s^2	**0.08** cm/s^2
	Y-axis	**0.13** cm/s^2	**0.16** cm/s^2	**0.15** cm/s^2	**0.11** cm/s^2
	Z-axis	**0.17** cm/s^2	**0.30** cm/s^2	**0.21** cm/s^2	**0.09** cm/s^2
AQN2i	**X-axis**	**0.02** cm/s^2	**0.16** cm/s^2	**0.06** cm/s^2	**0.03** cm/s^2
	Y-axis	**0.05** cm/s^2	**0.15** cm/s^2	**0.09** cm/s^2	**0.05** cm/s^2
	Z-axis	**0.02** cm/s^2	**0.12** cm/s^2	**0.02**cm/s^2	**0.02** cm/s^2
AQN3	**X-axis**	**0.21** cm/s^2	**0.41** cm/s^2	**0.23** cm/s^2	**0.19** cm/s^2
	Y-axis	**0.21** cm/s^2	**0.48** cm/s^2	**0.26** cm/s^2	**0.19** cm/s^2
	Z-axis	**0.07** cm/s^2	**0.25** cm/s^2	**0.11** cm/s^2	**0.08** cm/s^2
AQN4	**X-axis**	**0.81** cm/s^2	**0.59** cm/s^2	**0.56** cm/s^2	**0.28** cm/s^2
	Y-axis	**0.75** cm/s^2	**0.48** cm/s^2	**0.50** cm/s^2	**0.34** cm/s^2
	Z-axis	**1.02** cm/s^2	**1.03** cm/s^2	**0.81** cm/s^2	**0.50** cm/s^2
AQN5	**X-axis**	**0.47** cm/s^2	**0.32** cm/s^2	**0.27** cm/s^2	**0.21** cm/s^2
	Y-axis	**0.27** cm/s^2	**0.36** cm/s^2	**0.19** cm/s^2	**0.07** cm/s^2
	Z-axis	**0.28** cm/s^2	**0.30** cm/s^2	**0.16** cm/s^2	**0.14** cm/s^2
AQN6i	**X-axis**	**0.49** cm/s^2	**0.41** cm/s^2	**0.36** cm/s^2	**0.18** cm/s^2
	Y-axis	**0.42** cm/s^2	**0.38** cm/s^2	**0.29** cm/s^2	**0.21** cm/s^2

	Z-axis	**0.40** cm/s^2	**0.21** cm/s^2	**0.25** cm/s^2	**0.14** cm/s^2
AQN7	**X-axis**	**0.29** cm/s^2	**0.39** cm/s^2	**0.11** cm/s^2	**0.06** cm/s^2
	Y-axis	**0.25** cm/s^2	**0.47** cm/s^2	**0.11** cm/s^2	**0.05** cm/s^2
	Z-axis	**0.27** cm/s^2	**0.46** cm/s^2	**0.12** cm/s^2	**0.04** cm/s^2
AQN8i	**X-axis**	**0.29** cm/s^2	**0.25** cm/s^2	**0.18** cm/s^2	**0.09** cm/s^2
	Y-axis	**0.28** cm/s^2	**0.25** cm/s^2	**0.22** cm/s^2	**0.14** cm/s^2
	Z-axis	**0.35** cm/s^2	**0.35** cm/s^2	**0.24** cm/s^2	**0.14** cm/s^2
AQN9	**X-axis**	**0.47** cm/s^2	**0.18** cm/s^2	**0.19** cm/s^2	**0.12** cm/s^2
	Y-axis	**0.30** cm/s^2	**0.12** cm/s^2	**0.10** cm/s^2	**0.07** cm/s^2
	Z-axis	**0.60** cm/s^2	**0.23** cm/s^2	**0.19** cm/s^2	**0.17** cm/s^2
AQN10E	**X-axis**	**0.10** cm/s^2	**0.15** cm/s^2	**0.13** cm/s^2	**0.06** cm/s^2
	Y-axis	**0.11** cm/s^2	**0.12** cm/s^2	**0.11** cm/s^2	**0.06** cm/s^2
	Z-axis	**0.16** cm/s^2	**0.20** cm/s^2	**0.19** cm/s^2	**0.13** cm/s^2

Table 19. The recorded peak vibrations (VdB) at all sites.

Survey Sites	Recorded Peak Vibration (VdB)	Peak Time
AQN1S	**53 VdB, Z-Axis**	Evening (6pm-10pm)
AQN2i	**52 VdB, X-axis**	Morning (5am-9am)
AQN3	**53 VdB, X-Axis**	Day (9am-6pm)
AQN4	**57 VdB, Z-Axis**	Day (9am-6pm)
AQN5	**53 VdB, X-axis**	Morning (5am-9am) Day (9am-6pm)
AQN6i	**53 VdB, X-Axis**	Morning (5am-9am) Day (9am-6pm) Evening (6pm-10pm)
AQN7	**51 VdB, Y-Axis, Z-Axis**	Day (9am-6pm)
AQN8i	**53 VdB, X-axis**	Morning (5am-9am) Day (9am-6pm)
AQN9	**53 VdB, X-Axis**	Morning (5am-9am)
AQN10E	**52 VdB, X-Axis**	Morning (5am-9am) Day (9am-6pm) Evening (6pm-10pm) Dawn (10pm-5am)

Table 20. The recorded peak velocity (cm/s) at all sites.

Survey Sites	Recorded Peak Velocity (cm/s)	Peak Time
AQN1S	**0.005** cm/s, Z-Axis	Day (9am-6pm)

AQN2i	**0.004** cm/s, X-Axis	Day (9am-6pm)
AQN3	**0.005** cm/s, X-Axis	Day (9am-6pm)
AQN4	**0.009** cm/s, Z-Axis	Morning (5am-9am) Day (9am-6pm)
AQN5	**0.005** cm/s, X-Axis	Morning (5am-9am) Day (9am-6pm)
AQN6i	**0.006** cm/s, X-Axis	Evening (6pm-10pm)
AQN7	**0.005** cm/s, Z-Axis	Day (9am-6pm)
AQN8i	**0.005** cm/s, X-Axis	Day (9am-6pm)
AQN9	**0.005** cm/s, X-Axis	Morning (5am-9am)
AQN10E	**0.004** cm/s, X-Axis	Morning (5am-9am) Day (9am-6pm) Evening (6pm-10pm) Dawn (10pm-5am)

Table 21: The recorded peak acceleration (cm/s2) at all sites.

Survey Sites	Recorded Peak Velocity (cm/s)	Peak Time
AQN1S	**0.005** cm/s, Z-Axis	Day (9am-6pm)
AQN2i	**0.004** cm/s, X-Axis	Day (9am-6pm)
AQN3	**0.005** cm/s, X-Axis	Day (9am-6pm)
AQN4	**0.009** cm/s, Z-Axis	Morning (5am-9am) Day (9am-6pm)
AQN5	**0.005** cm/s, X-Axis	Morning (5am-9am) Day (9am-6pm)
AQN6i	**0.006** cm/s, X-Axis	Evening (6pm-10pm)
AQN7	**0.005** cm/s, Z-Axis	Day (9am-6pm)
AQN8i	**0.005** cm/s, X-Axis	Day (9am-6pm)
AQN9	**0.005** cm/s, X-Axis	Morning (5am-9am)
AQN10E	**0.004** cm/s, X-Axis	Morning (5am-9am) Day (9am-6pm) Evening (6pm-10pm) Dawn (10pm-5am)

Table 22. The recorded peak acceleration (cm/s2) at all sites

Survey Sites	Recorded Peak Vibration (VdB)	Peak Time

AQN1S	**0.21** cm/s^2, Z-Axis	Evening (6pm-10pm)
AQN2i	**0.16** cm/s^2, X-Axis	Day (9am-6pm)
AQN3	**0.48** cm/s^2, Y-Axis	Day (9am-6pm)
AQN4	**1.03** cm/s^2, Z-Axis	Day (9am-6pm)
AQN5	**0.47** cm/s^2, X-Axis	Morning (5am-9am)
AQN6i	**0.49** cm/s^2, X-Axis	Morning (5am-9am)
AQN7	**0.47** cm/s^2, Y-Axis	Day (9am-6pm)
AQN8i	**0.35** cm/s^2, Z-Axis	Morning (5am-9am) Day (9am-6pm)
AQN9	**0.60** cm/s^2, Z-Axis	Morning (5am-9am)
AQN10E	**0.20** cm/s^2, Z-Axis	Day (9am-6pm)

Table 23. Maximum vibration levels for the acceleration values (m/s2) exceeding 10%, 50% and 90% of the time, time sliced every 10 minutes for AQ 1 to 5.

Survey Stations			Acceleration (m/s^2)			
			Morning	Day	Evening	Dawn
			(5am-9am)	(9am-6pm)	(6pm-10pm)	(10pm-5am)
AQN1S	**X-axis**	**10%**	**0.00014** m/s^2	**0.00015** m/s^2	**0.00013** m/s^2	**0.00010** m/s^2
		50%	**0.00003** m/s^2	**0.00004** m/s^2	**0.00004** m/s^2	**0.00002** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00013** m/s^2	**0.00015** m/s^2	**0.00015** m/s^2	**0.00010** m/s^2
		50%	**0.00005** m/s^2	**0.00007** m/s^2	**0.00006** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00019** m/s^2	**0.00027** m/s^2	**0.00016** m/s^2	**0.00007** m/s^2
		50%	**0.00003** m/s^2	**0.00006** m/s^2	**0.00003** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN2i	**X-axis**	**10%**	**0.00016** m/s^2	**0.00016** m/s^2	**0.00005** m/s^2	**0.00002** m/s^2
		50%	**0.00007** m/s^2	**0.00007**m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00014** m/s^2	**0.00015** m/s^2	**0.00008** m/s^2	**0.00006** m/s^2
		50%	**0.00006** m/s^2	**0.00006** m/s^2	**0.00003** m/s^2	**0.00002** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00006** m/s^2	**0.00011** m/s^2	**0.00004** m/s^2	**0.00002** m/s^2
		50%	**0.00003** m/s^2	**0.00005** m/s^2	**0.00003** m/s^2	**0.00001** m/s^2
		90%	**0.00001** m/s^2	**0.00002** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN3	**X-axis**	**10%**	**0.00024** m/s^2	**0.00026** m/s^2	**0.00023** m/s^2	**0.00023** m/s^2
		50%	**0.00015** m/s^2	**0.00016** m/s^2	**0.00011** m/s^2	**0.00011** m/s^2
		90%	**0.00003** m/s^2	**0.00005** m/s^2	**0.00003** m/s^2	**0.00003** m/s^2
	Y-axis	**10%**	**0.00026** m/s^2	**0.00038** m/s^2	**0.00023** m/s^2	**0.00023** m/s^2
		50%	**0.00011** m/s^2	**0.00019** m/s^2	**0.00016** m/s^2	**0.00014** m/s^2
		90%	**0.00002** m/s^2	**0.00003** m/s^2	**0.00002** m/s^2	**0.00002** m/s^2
	Z-axis	**10%**	**0.00015** m/s^2	**0.00017** m/s^2	**0.00010** m/s^2	**0.00009** m/s^2

		50%	**0.00005** m/s^2	**0.00007** m/s^2	**0.00005** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN4	**X-axis**	**10%**	**0.00057** m/s^2	**0.00054** m/s^2	**0.00042** m/s^2	**0.00013** m/s^2
		50%	**0.00008** m/s^2	**0.00007** m/s^2	**0.00006** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00051** m/s^2	**0.00046** m/s^2	**0.00041** m/s^2	**0.00020** m/s^2
		50%	**0.00009** m/s^2	**0.00011** m/s^2	**0.00006** m/s^2	**0.00002** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00086** m/s^2	**0.00087** m/s^2	**0.00070** m/s^2	**0.00052** m/s^2
		50%	**0.00016** m/s^2	**0.00018** m/s^2	**0.00017** m/s^2	**0.00004**m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN5	**X-axis**	**10%**	**0.00043** m/s^2	**0.00029** m/s^2	**0.00030** m/s^2	**0.00027** m/s^2
		50%	**0.00024** m/s^2	**0.00014** m/s^2	**0.00021** m/s^2	**0.00022** m/s^2
		90%	**0.00005** m/s^2	**0.00003** m/s^2	**0.00005** m/s^2	**0.00005** m/s^2
	Y-axis	**10%**	**0.00023** m/s^2	**0.00035** m/s^2	**0.00018** m/s^2	**0.00008** m/s^2
		50%	**0.00009** m/s^2	**0.00022** m/s^2	**0.00017** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00005** m/s^2	**0.00003** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00029** m/s^2	**0.00033** m/s^2	**0.00022** m/s^2	**0.00021** m/s^2
		50%	**0.00017** m/s^2	**0.00016** m/s^2	**0.00015** m/s^2	**0.00017** m/s^2
		90%	**0.00003** m/s^2	**0.00003** m/s^2	**0.00003** m/s^2	**0.00003** m/s^2

Table 24. Maximum vibration levels for the acceleration values (m/s2) exceeding 10%, 50% and 90% of the time, time sliced every 10 minutes for AQ 6 to 10.

Survey Stations			Acceleration (m/s^2)			
			Morning (5am-9am)	Day (9am-6pm)	Evening (6pm-10pm)	Dawn (10pm-5am)
AQN6i	**X-axis**	**10%**	**0.00039** m/s^2	**0.00038** m/s^2	**0.00022** m/s^2	**0.00013** m/s^2
		50%	**0.00007** m/s^2	**0.00008** m/s^2	**0.00005** m/s^2	**0.00004** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00038** m/s^2	**0.00040** m/s^2	**0.00030** m/s^2	**0.00020** m/s^2
		50%	**0.00009** m/s^2	**0.00014** m/s^2	**0.00006** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00004** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00025** m/s^2	**0.00029** m/s^2	**0.00017** m/s^2	**0.00013** m/s^2
		50%	**0.00006** m/s^2	**0.00011** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00004** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN7	**X-axis**	**10%**	**0.00027** m/s^2	**0.00034** m/s^2	**0.00011** m/s^2	**0.00006** m/s^2
		50%	**0.00005** m/s^2	**0.00008** m/s^2	**0.00007** m/s^2	**0.00002** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00022** m/s^2	**0.00035** m/s^2	**0.00009** m/s^2	**0.00006** m/s^2
		50%	**0.00005** m/s^2	**0.00008** m/s^2	**0.00005** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00014** m/s^2	**0.00016** m/s^2	**0.00006** m/s^2	**0.00004** m/s^2
		50%	**0.00006** m/s^2	**0.00004** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00003** m/s^2	**0.00002** m/s^2	**0.00001** m/s^2
AQN8i	**X-axis**	**10%**	**0.00020** m/s^2	**0.00022** m/s^2	**0.00017** m/s^2	**0.00010** m/s^2

		50%	**0.00004** m/s^2	**0.00005** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00022** m/s^2	**0.00021** m/s^2	**0.00018** m/s^2	**0.00012** m/s^2
		50%	**0.00005** m/s^2	**0.00004** m/s^2	**0.00005** m/s^2	**0.00005** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00015** m/s^2	**0.00015** m/s^2	**0.00010** m/s^2	**0.00006** m/s^2
		50%	**0.00006** m/s^2	**0.00007** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN9	**X-axis**	**10%**	**0.00023** m/s^2	**0.00015** m/s^2	**0.00015** m/s^2	**0.00011** m/s^2
		50%	**0.00006** m/s^2	**0.00004** m/s^2	**0.00005** m/s^2	**0.00004** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00026** m/s^2	**0.00019** m/s^2	**0.00016** m/s^2	**0.00010** m/s^2
		50%	**0.00006** m/s^2	**0.00004** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00025** m/s^2	**0.00018** m/s^2	**0.00016** m/s^2	**0.00011** m/s^2
		50%	**0.00005** m/s^2	**0.00005** m/s^2	**0.00004** m/s^2	**0.00003** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
AQN10	**X-axis**	**10%**	**0.00013** m/s^2	**0.00018** m/s^2	**0.00017** m/s^2	**0.00014** m/s^2
		50%	**0.00005** m/s^2	**0.00007** m/s^2	**0.00007** m/s^2	**0.00004** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Y-axis	**10%**	**0.00011** m/s^2	**0.00011** m/s^2	**0.00011** m/s^2	**0.00009** m/s^2
		50%	**0.00004** m/s^2	**0.00004** m/s^2	**0.00004** m/s^2	**0.00004** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2
	Z-axis	**10%**	**0.00018** m/s^2	**0.00019** m/s^2	**0.00017** m/s^2	**0.00013** m/s^2
		50%	**0.00005** m/s^2	**0.00005** m/s^2	**0.00006** m/s^2	**0.00004** m/s^2
		90%	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2	**0.00001** m/s^2

Annex 12 Meeting with IPs Primary Data

Minutes of the Meeting (FGD with the IP Leaders)

Activity : Meeting wuth the Tribal Leaders for Central Mindanao High Standard Highway Construction Project (EIS)
Client/Agency : Japan International Cooperation Agency (JICA)
Date : April 27-28, 2021
Venue : Tankulan Covered Court, Manolo Fortich (April 27, 2021)
Tulugan Ta Sumilao, Kisolon, Sumilao (April 27, 2021)
Municipal Tree Park, Impasug-ong (April 28, 2021)
Old City Hall, Malaybalay City (April 28, 2021)

Online meeting thru Zoom

Attendees:

Host City/Municipality	Male		Female		Total Participants
	No.	%	No.	%	
Manolo Fortich, Bukidnon	12	18.75	20	21.51	32
Sumilao, Bukidnon	18	28.13	26	27.96	44
Impasug-ong, Bukidnon	16	25.00	25	26.88	41
Malaybalay City, Bukidnon	18	28.13	22	23.66	40
TOTAL	**64**	100.00	**93**	100.00	**157**

Programme

1. Registration
2. First part of the ritual (IP Ritualist)
3. Introduction of participants (Marie Superales – NCIP R10)
4. Welcome Remarks and Overview of the Objectives (Marie Superales – NCIP R10)
5. Presentation of the Project (Amabelle Embornas – Amet-Asia)
6. Open Forum
7. Drafting of Resolution
8. Closing Remarks (Marie Superales – NCIP R10)
9. Ritual

Annexes

MEETING HIGHLIGHTS

I. **Important notes:**

- Amet-Asia discussed to the IP Leaders the proposed project, the road alignment and the activities involved in the EIA Study
- NCIP and IP leaders commented that the activities involved in the EIA study are non-extractive, thus there is no need for a free and Prior Consent before the conduct of the survey
- Amet-Asia has been allowed to conduct the field survey as long as consent from the IPs must be sought prior to the actual conduct of the field survey
- Malaybalay Municipal Indigenous People Mandatory Representative (IPMR) stated that based on the maps presented there are no Ancestral Domain that will be traversed by the alignment in Malaybalay
- IP leaders advised that area-specific rituals shall be conducted, as part of IP tradition. Thru NCIP, Amet-Asia requested to limit the participation in the rituals to at the municipal level (Manolo Fortich, Sumilao, Malaybalay City, and Impasug-ong) and 1 at the barangay level: (Brgy. Ticala in Manolo Fortich - as special required by Datu Iwag of Ticala).

II. Summary of Questions and Answers:

Attendee who raised question/concern	Question	Answer
Datu Iway Sawag and Datu Alex Payangga (Manolo Fortich)	Clarification on the purpose of consent. It is a resolution or MOA for FPIC?	***NCIP Mia Superales*** • The acquisition of the consent is to allow Amet-Asia to only to conduct the study in the area
Datu Alex Payangga (Manolo Fortich) and Datu Casinabe (Malaybalay)	Provision of copies of the resolution, schedules and maps.	***Amet Amabelle Embornas*** • This will be provided
Datu Iway Sawag	Provision of compensation to the tour guides	***NCIP Mia Superales*** • Tour guides will be compensated in accordance to the salary range in the area
Datu Carlo Dahinao (Sumilao)	Head of DPWH will attend the meetings so they can give full response	***NCIP Mia Superales*** • This will be noted
Barangay Captain (Poblacion, Impasug-ong)	When is the payment for the affected land?	***Amet Amabelle Embornas*** • The RAP team will conduct the study on the affected land and its proper compensation
Participant (Bae) (Impasug-ong)	What are the reasons for constructing this new highway?	***Amet Amabelle Embornas*** • Sayre highway is not fit for fast moving vehicles because the slope is prone to landslides and prone to accidents. • Cagayan to Malaybalay area has a high possibility for development of the people, crops, and farm to market

		access, easier travel for vehicles and transport of products to the market
Participant (Bae) (Impasug-ong)	Compensation for land with no titles	***Amet Amabelle Embornas*** • This will be compensation based on National Housing Authority, DPWH and JICA guidelines
City IPMR (Malaybalay)	Looking at the map, it seems that the affected areas are private lands. Our CADTs are not affected.	***NCIP Mia Superales*** • We will still overlay the NCIP CADT maps and the DPWH project map to confirm if there are affected CADTs
City IPMR (Malaybalay)	this project is different from the DPWH circumferential road	***NCIP Mia Superales*** • Yes, this is different. The circumferential road is already implemented to Kalasungay

III. Major decisions made:

- Output of the study should be presented to the affected communities
- Local guide must be a member of IP groups recommended by the IP leaders to avoid crossing prohibited sacred places, and the guide must be paid in accordance to the labor code
- Rituals in the barangays must be made if required by the barangay IPMR

IV. Next steps/responsible party/target date:

- Amet-Asia must coordinate with the brgy IPMRs prior to the conduct of the field survey
- Amet-Asia must provide an itinerary of the activities prior to the field survey

V. **Sacred Places, Water sources, Hunting Grounds and Livelihood of the Indigenous People**

List of sacred places (based on the Focus Group Discussion with the IP leaders and interviews with the Indigenous People Mandatory Representatives)

Sacred Places

Municipality/Barangay	Sacred Places	Type
Manolo Fortich		
Alae	Alae Creek	Surface water
Dicklum	Dicklum Creek	Surface water
Mambatangan	Imbado Area	Ritual Site
	Mambatangan creek	Surface water
Sankanan	Burial Ground near Dicklum	Burial Grounds
	Kihare creek	
	Maninit creek	
San Miguel	Pulog Hill	Clubhouse/ritual site
Tangkulan	Susohon Creek	Surface water
	Balete tree	
	Pagbayuhan stone	
	Mangima river	Surface water
	Kalanawan Creek	Surface water

Ticala	Basag river	Surface water
	Kumaykay River	Surface water
	Inlapay River	Surface water
	Sisimon Stone	Rock
	Tungtungan	Burial Ground
Sumilao		
Puntian	Inigsinulan	Ritual Site
Vista Villa	Basag Falls and Basag Cave	Surface water and Cave
Poblacion	Humuhulyaw creek	Surface Water
Kisolon	Alalum Falls	Surface Water
	Ilihan Cave	Cave
San Roque	Mt. Palaopao	Mountain/Cave
	Taryaki	Ritual site
Impasug-ong		
La Fortuna	Mt. Kitanglad (San Vicente, Baungon)	Mountain
	Danao cave	Cave
Capt. Bayong	Inkalumad	Ridge
	Lirupan	Ritual area
Malaybalay		
Kalasungay	Ilihan cave	Cave
	Segaba and kabakahan creek	Surface Water
Sumpong	Lumayaga and bag-as creek	Surface Water
Dalwangan	Ipoon creek	Creek
	Mt. Dapitan (Victory lantapan)	Ritual area

Water Source of IPs

Municipality/Barangay	Water Sources
Manolo Fortich	
Mambatangan	Balanban spring
Tankulan	Balanban spring
Alae	Balanban spring
Damilag	Balamban spring and Miranda deep well
San Miguel	Cawayanon deep well
Dicklum	Balanban spring and Cawayanon Spring
Sankanan	Sanda spring
Ticala	Balanban spring
Sumilao	
Puntian	Unahon Spring
Vista Villa	Basag falls
Poblacion	Molokbolok spring
San Roque	Unahon Spring, Palaopao Spring
Kisolon	Binoong spring
Impasug-ong	
La Fortuna	Inlero Spring
Cawayan	Sagumata spring

Kibenton	Sagumata spring
Malaybalay	
Kalasungay	Water district, Lumayagana and Bag-as creek
Dalwangan	, Sawaga river
Sumpong	Ibalabag spring
Patpat	Yumayaban Spring

Hunting grounds of IPs

Municipality/Barangay	Sacred Places
Manolo Fortich	No more hunting grounds
Sumilao	Malabagyo and Matampay forest, Sayaw cave, Old Culasi, Kulaman river, Tigulutuan
Impasug-ong	No more hunting grounds
Malaybalay	Mt. Taraguya, MT. Ulang-ulang, Mt. Tagabnglo

Livelihood IPs

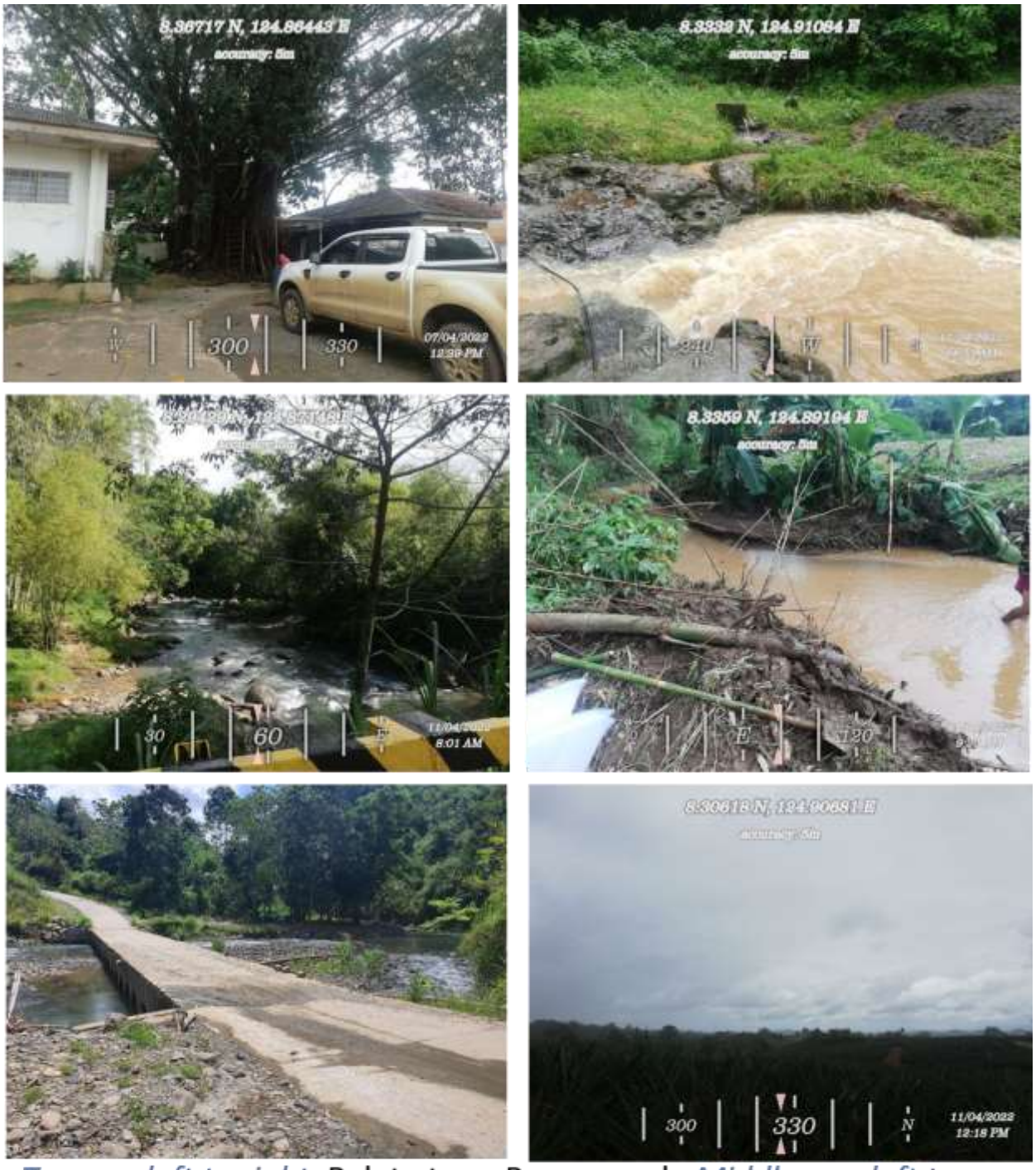
Municipality/Barangay	Sacred Places
Manolo Fortich	Farmer, laborer, employees, fruit vendors, abaca weaver
Sumilao	Farming, Animal husbandry, Abaca weaving, Bead making
Impasug-ong	Cash crop farming, employees
Malaybalay	Farming, employees, resort

Photos of sacred areas

Annexes

Top row left to right: Alae Creek, Dicklum Creek, *Middle row left to right:* Burial ground near Dicklum, Kihare creek, *Bottom row left to right:* Manitnit creek, Susohon creek Manolo Fortich Bukidnon

Annexes



Top row left to right: Balete tree, Basag creek, *Middle row left to right:* Kumaykay river, Inlapay river, Manolo Fortich *Bottom row left to right:* Mangima River, Manolo Fortich and Inigsinulan creek, Sumilao

Annexes

Top row left to right: alalum Falls, Taryaki, Sumilao *Middle row left to right:* Mt. Palaopao, Sumilao inkalumad, Impasug-ong *Bottom row left to right:* Lirupan, Impasug-ong and Sebaga and Danao Cave

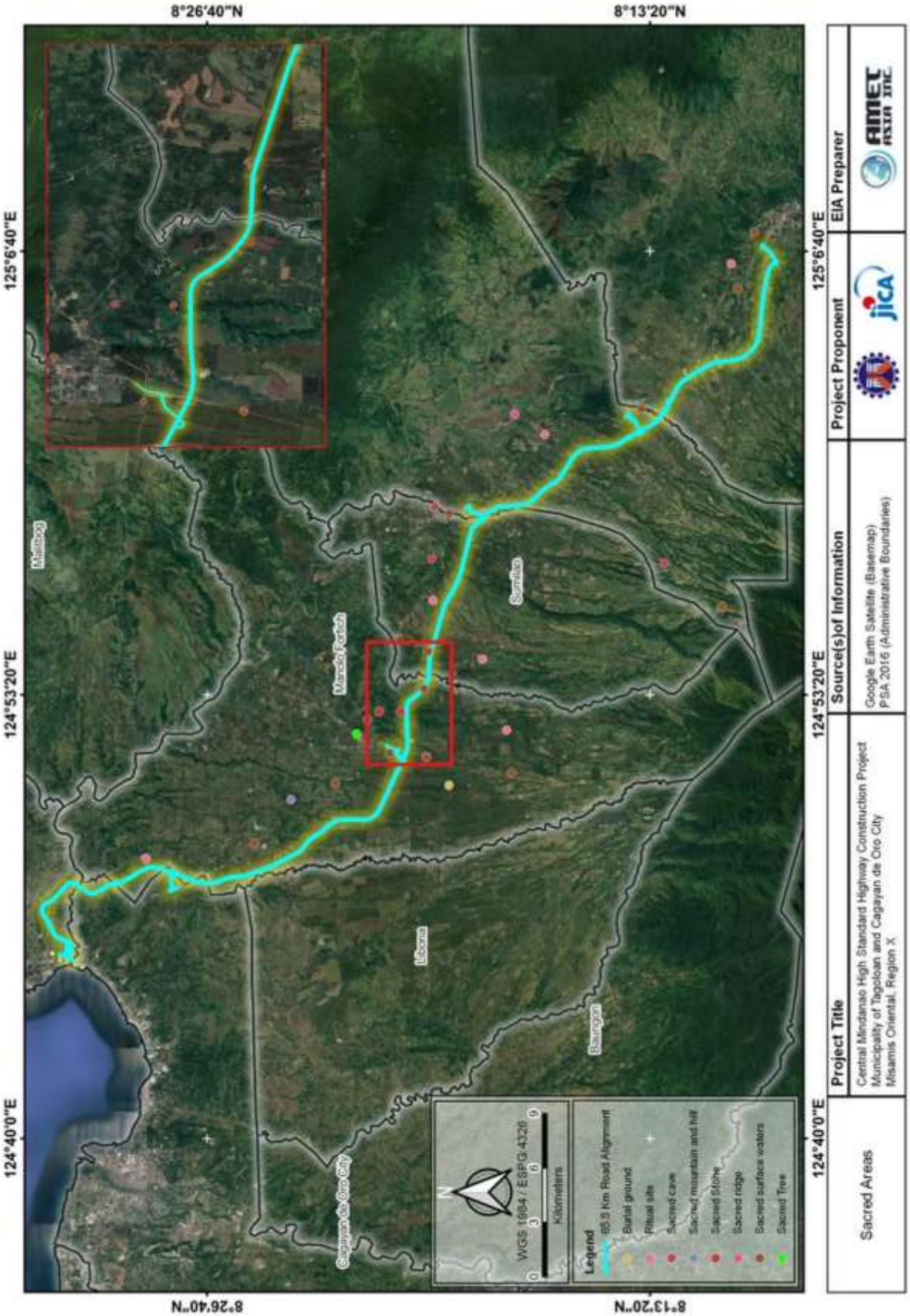
Annexes

Top row left to right: Sebaga and Kabakahan, and Diguman Malaybalay *Middle row left:* Ipoon Creek, Malaybalay

Water supply sources of the IPs

Top row left to right: Tuburan spring and Karan spring, Manolo Fortich *Middle row left to right:* Inlerop spring and Sanda spring and Manolo Fortich

Annexes


8°26'40"N
8°13'20"N
125°6'40"E
124°53'20"E
124°40'0"E
Malaybay
Manolo Fortich
Sumilao
Libona
Baungon
Cagayan de Oro City
N
WGS 1984 / EPSG:4326
0 3 6 9
Kilometers
Legend
85.5 Km Road Alignment
Burial ground
Ritual site
Sacred cave
Sacred mountain and hill
Sacred Stone
Sacred ridge
Sacred surface waters
Sacred Tree
Project Title
Central Mindanao High Standard Highway Construction Project
Municipality of Tagoloan and Cagayan de Oro City
Misamis Oriental, Region X
Source(s)of Information
Google Earth Satellite (Basemap)
PSA 2016 (Administrative Boundaries)
Project Proponent
EIA Preparer
Sacred Areas

Annexes

8°24'0"N
8°6'0"N
125°24'0"E
125°6'0"E
124°48'0"E
124°30'0"E
Basag falls
Basag creek
Malitbog
Manolo Fortich
Sumilao
City of Malaybalay
Cabanglasan
Lantapan
Impasug-ong
Talakag
Baungon
Libona
Cagayan de Oro City
Tagoloan
Villanueva
City of El Salvador
Opol
WGS 1984 / ESPG-4326
0 3 6 9 12
Kilometers
Legend
85.5 Km Road Alignment
Water Sources
Water Source for IPs
Project Title
Central Mindanao High Standard Highway Construction Project
Municipality of Tagoloan and Cagayan de Oro City
Misamis Oriental, Region X
Source(s)of Information
Google Earth Satellite (Basemap)
PSA 2016 (Administrative Boundaries)
Project Proponent
EIA Preparer
AMET ASIA INC

Annex 13. Impact study on the Sayre roadside business

Department of Public Works and Highways in cooperation with JICA

IMPACT STUDY OF CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CMH) ON THE SAYRE ROADSIDE BUSINESS

CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT
(CDO – MALAYBALAY SECTION)
Cagayan de Oro City to Malaybalay City

Submitted by:

Amet-Asia, Inc.
#7 Pioneer St, cor. Sheridan,
Mandaluyong, Metro Manila

September 2021

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EXECUTIVE SUMMARY

The objectives of the proposed Central Mindanao High Standard Highway (CMH) project were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area. Although the CMH project has many perceived long-term benefits to a community, transportation improvements also cause changes in traffic flow, thereby posing challenges to surrounding local businesses along the Sayre Highway.

To determine the potential impact of the CMH to Sayre roadside businesses, Amet Asia conducted a quantitative survey with a standardized survey instrument from May 28 – June 4, 2021. The questionnaire aimed to obtain data on the business, drivers, and traveler representatives, their mode of transportation, problems encountered, and perceptions on the proposed CMH.

Results of the survey showed that the proposed CMH is not likely to have any significant negative impact on the existing business establishments along Sayre Highway, due to the following factors:

- most of the customers are locals or travelers who travel on foot or by motorcycle, signifying that these customers are coming from within the vicinity or municipality
- the usual destination of the respondents when using Sayre is within the municipality/city, stating that the respondents are residing near the area
- all of the businesses are small enterprises mostly focused on merchandising, with few workers, and can accommodate few customers per day, most likely patrons or loyal customers

The findings suggest that Sayre roadside businesses' customer base is within their immediate communities, whose buying patterns are not likely to be affected by the establishment of a new highway. The only concern raised about the CMH Project is if there will be relocation of affected Sayre properties, if any. A common situational problem raised was traffic, of which the respondents perceived road widening and construction of a new road as solutions. Thus, the respondents are in favor of the CMH project in order to address the traffic concerns.

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1.0 INTRODUCTION

The proposed Central Mindanao High Standard Highway Project (Cagayan de Oro - Malaybalay Section) ("***Project***", "***alignment***") is part of the Phase II of the Master Plan on High Standard Highway Network Development. The objectives of the new alignment were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area.

Although new road alignment has many long-term benefits to a community, they can pose serious challenges especially on entrepreneurs and their employees who operate businesses along the existing road. The new road may potentially disrupt patrons' accessibility to businesses, and produce negative impacts on sales revenues especially if the main customers of existing roadside businesses are travelers or drivers.

This report presents data on existing businesses along Sayre, along with the respondents' mode of transportation, problems encountered, and perceptions on the proposed CMH, in order to determine the possibility and scale of negative impact on the existing roadside business due to the change of traffic flow during the operation of proposed highway.

2.0 METHODOLOGY

A quantitative survey with a standardized survey instrument is employed to elicit data on the existing businesses along Sayre. The study employed a stratified random sampling method. The respondents covered by the survey is limited to the business establishments, public transportation drivers, and travelers within the Direct Impact Barangays along Sayre Highway.

The utilization of Sayre Highway served as the strata of the sampling method. The total number of respondents was 65, representing twenty percent (20%) of the estimated number of business establishments (310 establishments) along the Sayre Highway. The approximate number of business establishments (310 establishments) along Sayre was obtained through desktop research, and 20% of the total size was utilized based on the JICA Study Team's recommendation in reference to ADB's safeguard policy on socioeconomic survey.

The data gathering was conducted from May 28 – June 4, 2021, during which the Province of Bukidnon was under Modified General Community Quarantine (MGCQ) and Cagayan de Oro is under Modified Enhance Community Quarantine (MECQ) as stated under the Inter-Agency Task Force (IATF) Resolution 118-A series of 2021. Thus, the flow of traffic, number of people outside, and opened establishments did not represent the normal situation in the area but were under the "new normal" situation.

To supplement the survey data, insights from interviews with the respondents (centering on follow-up questions or clarifications, conducted during the survey), and Consultants' observations during fieldworks (conducted in April to May and July – August 2021 for the Environmental Impact Assessment) were incorporated in this report.

3.0 RESULTS OF THE SURVEY

3.1 Profile of the Respondents

Table 1 shows the respondents' category of which more than half of them are business representatives (61.54%), followed by public transportation drivers (35.38%), and travelers with 3.08%. It was also noted that all of the driver respondents are *habal-habal* (motorcycle) drivers.

Table 1. Category of the respondents

Respondent's Category	Number	Percentage
Drivers	23	35.38%
Business representatives	40	61.54%
Travelers	2	3.08%
Total	**65**	**100%**

3.2 Mode of Transportation

The major mode of transportation of the respondents is in the form of *habal-habal* (motorcycle) with 57.5%, followed by private cars with 26.25%, and public transportation with 12.50%. The least form of transportation is by the use of bicycle with 3.75% as represented in the yellow cells below.

Motorcycle as a form of transportation is the most common and convenient since it can easily access unpaved, narrow and muddy roads which is always present in the area. Based on the observations during fieldworks (April to May and July – August 2021) and interview with the locals during the survey, there are four (4) forms of public transportation along Sayre: *habal-habal*, multi-cab, jeepney, and provincial bus. *Habal-habal* is usually used in the unpaved roads far from Sayre, while multi-cab route is only along Sayre to town proper or nearby areas. Normal routes of jeepneys are within 2 to 3 municipalities while provincial buses pass the highway to go to Lanao del Norte, Lanao del Sur, South Cotabato, and Valencia, Bukidnon.

Table 2. Mode of Transportation

Transportation Category	Frequency of Responses*	Percentage
Bicycle	3	3.75%
Motorcycle	46	57.50%
Private Car	21	26.25%
Public Transportation	10	12.50%
Total	**80**	**100%**

*Multiple responses are enabled Note: Answers to Driver's Travelers and/or Business Owners Q1

3.2 Number of travel usual destination when passing Sayre

Majority of the respondents are frequent travelers along Sayre of which most of them utilized the existing high way either daily (63.08%) or twice a week (20%) (yellow dells in **Table *3***), since Sayre is the only highway in the area. Half of the respondents utilized Sayre to go to places within their respective cities and municipalities, while 31 respondents travel along Sayre to go to Cagayan de Oro to buy products for their business and personal use.

Table 3. Frequency of travel

Category	Frequency of Responses	Percentage
Daily	41	63.08%
Twice a week	13	20.00%
Weekly	7	10.77%
Twice a month	2	3.08%
Monthly	2	3.08%
Total	**65**	**100%**
Usual destination	**Frequency of Responses**	**Percentage**
Within the city/municipality	33	50.77%
To Cagayan de Oro City	31	47.69%
To Valencia, Bukidnon	1	1.54%
Total	**65**	**100%**

Note: Answers to Driver's Travelers and/or Business Owners Q2

3.3 Problems encountered when passing Sayre

As **Table 4** shows, most of the respondents encountered traffic (55.93%), accident (16.95%) and damaged roads (16.95%) when passing along Sayre. These problems are also confirmed by the team during fieldworks and interview by the team with their local drivers. With the problems encountered, the respondents' perceived solutions are road widening (32.39%), establishment of new road (25.35%), putting up traffic signals (21.13%) and fixing the damaged roads (15.49%) and fixing damaged roads (15.49%).

Table 4. Problems encountered when passing Sayre highway

Problems encountered	Frequency of Responses*	Percentage
Traffic	66	55.93%
Accident	20	16.95%
Damaged road	20	16.95%
Over speeding	5	4.24%
Wrong parking	3	2.54%
Checkpoints	4	3.39%
Total	**118**	**100%**
Perceived solution	**Frequency of Responses***	**Percentage**
Traffic signals	15	21.13%
Fix road damages	11	15.49%
Road widening	23	32.39%
Construction of roundabout	1	1.41%
New road	18	25.35%
Motorcycle lane establishment	2	2.82%
Drive Safely	1	1.41%
Total	**71**	**100%**

*Multiple responses are enabled; Note: Answers to Driver's Travelers and/or Business Owners Q4 AND Q5

3.4 Attitude towards the proposed Project

Positive response has been observed with the respondents, as 72.31% (Business representative – 32, Driver – 13, Traveler – 2) are favorable towards the project while 24.62% (Driver – 9, Business representative – 7) are neutral and 3.08% are unfavorable (1 driver and 1 business owner). In line with their attitude on the Project, the topmost reasons are as follows: less traffic (24.62%), more convenient travel (18.46%), less accidents (16.92%), easier accessibility (10.77%) and fast delivery of products (9.23%) (yellow cells in **Table 5**).

Based on the interviews during the survey, the respondents who were favorable of the new road perceived an improved traffic flow, and believed that the project will help them in transporting their products and in promoting community growth. Their only concern about the Project is if their properties will be affected and relocated. Both group of respondents who are unfavorable (3.08%) and who answered neutral were hesitant to state their reason.

This is also in line with the interviews conducted with the locals within all the Direct Impact Barangays (Key Informant Interviews for the Environmental Impact Assessment conducted in May to June 2021), wherein the top five reasons for a positive attitude towards the project are: accessibility of transportation, accessibility of farm-to-market roads for products, improvement in economic status, road improvement, and the younger generation's enjoyment of the benefits. On the other hand, for those who are unfavorable towards the project, their reasons include: accidents may happen, air pollution produced by more vehicles, might have an impact on the environment, inconvenience during construction, and if land affected will not be compensated justly.

Table 5. Attitude towards the proposed Project

Attitude to the CMH	Number	Percentage
Favorable	47	72.31%
Unfavorable	2	3.08%
Neutral	16	24.62%
Total	**65**	**100%**
Reason	**Number**	**Percentage**
Less accident	11	16.92%
Convenient travel	12	18.46%
Less traffic	16	24.62%
Easy accessibility	7	10.77%
Improvement to the community	3	4.62%
Fast delivery of products	6	9.23%
More customer	2	3.08%
Hopefully business will not be relocated	1	1.54%
No answer	7	10.77%
Total	**65**	**100%**

*Multiple responses are enabled; Note: Answers to Driver's Travelers and/or Business Owners Q6

4.0 BUSINESS OWNERS

An additional set of questions were employed strictly to the business establishments in order to determine the necessary data about their type, nature, location and duration of business, and about their customers.

4.1 Type of Operations and Business Category

Yellow cells in **Table 6** entails that all of the respondents under business establishments are operating in full time and belong to the micro-enterprise business category with an estimated annual sale of less than Php. 250,000.

Table 6. Type of operations, business category and annual sales

Type of Operations	Number	Percentage
Full time	40	100%
Part time	0	0.00%
Total	**40**	**100%**
Business Category	**Number**	**Percentage**
Micro-enterprise (<10 workers)	40	100%
Small to medium enterprise (<200 workers)	0	0.00%
Large enterprise (>200 workers)	0	0.00%
Total	**40**	**100%**
Estimated Annual Sales	**Number**	**Percentage**
Less than Php 250,000	40	100%
Php. 250,001 - 500, 000	0	0.00%
Php. 500,001 and above	0	0.00%
Over 10 years	0	0.00%
Total	**40**	**100%**

Note: Answers to Business Owners Q1 TO Q4

4.2 Nature of Business

Based on the survey conducted, almost all of the establishments covered are in the form of merchandising business of which the owners buy the products in wholesale and sell them at the retail price. The specific business type is shown in **Table 7.**

Table 7. Nature of businesses along Sayre

Nature of Business	Number	Percentage
Pharmacy	1	2.5%
Market Vendors	5	12.5%
Tailor shop	1	2.5%
Thrift shop	4	10%
Sari-sari store	7	17.5%
Water refilling station	1	2.5%
Eatery	2	5%
Motorcycle shop	4	10%
Internet café	1	2.5%
Grocery store	3	7.5%
Hardware store	2	5%
Cell phone shop	3	7.5%
Ambulant vendor	1	2.5%
Bakery	3	7.5%
Clothing shop	1	2.5%
Agricultural supplies	1	2.5%

Nature of Business	Number	Percentage
Total	**40**	**100%**

Note: Answers to Business Owners Q3

4.3 Location and Duration of Business

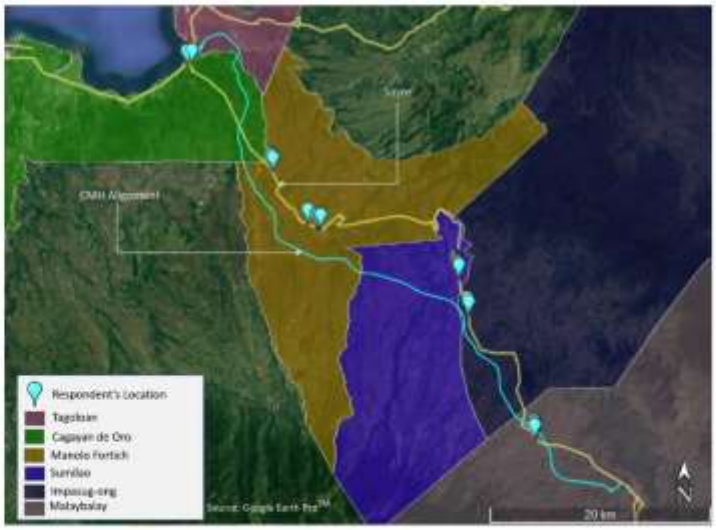
Majority of the respondent's businesses are located in Manolo Fortich and Sumilao with 35% and 30% respectively (**Figure 1**). This is due to the fact that the town proper of these municipalities are located along Sayre Highway, thus business establishments are also located along the area. Most of the business along Sayre are within one (1) to five (5) years in operation (40%), followed by five (5) to ten (10) years (32.50%), and less than one (1) year (22.50%). Two of the respondents or 5% are operating for more than 10 years (**Table 8**).

Table 8. Location and duration of business

Location of Business	Number	Percentage
Manolo Fortich	14	35.00%
Sumilao	12	30.00%
Impasug-ong	3	7.50%
Cagayan de Oro	4	10.00%
Malaybalay	7	17.50%
Total	**40**	**100%**
Years of business	**Number**	**Percentage**
Less than 1 year	9	22.50%
1-5 years	16	40.00%
5-10 years	13	32.50%
10 years and above	2	5.00%
Total	**40**	**100%**

Note: Answers to Business Owners Q2 amd Q4

Figure 1. Location of business representatives



4.4 Number and Type of Customers

All of the business establishment respondents can accommodate less than 50 customers per day. Of which 77.50% have both local and traveler customers and 22.50% have local customers only. (**Table 9**)

Table 9. Number and type of customer

No. of customers per day	Number	Percentage
< 50 persons	40	100%
50-100 persons	0	0.00%
100 persons and above	0	0.00%
Total	**40**	**100%**
Type of customers	**Number**	**Percentage**
Locals	9	22.50%
Travelers	0	0.00%
Both	31	77.50%
Total	**40**	**100%**

Note: Answers to Business Owners Q6, Q7 and Q8

4.5 Mode of Transportation of customers

As observed by the business representatives, majority of their customers go to their stores on foot (39.56%), through motorcycle (24.18%) and private cars (21.98%) (yellow cells in **Table *10***). This indicated that most of the customers of these establishments are located or residing nearby.

Furthermore, this proximity to the vendors suggests that a *suki* (patron or loyal customer) mentality, which is common in the Philippines, is also at work here, wherein a customer regularly purchases products from the same vendor, who in turn offers discounts and other perks for such loyalty. This builds a relationship between the vendor and the customer, strengthening the conclusion that the customers are likely to stay, even with the construction of a new road in the future.

Table 10. Customer's mode of transportation

Customer's Mode of Transportation	Frequency of responses*	Percentage
On foot	36	39.56%
Bike	3	3.30%
Motorcycle	22	24.18%
Private car	20	21.98%
Public transportation	10	10.99%
Total	**91**	**100%**

*Multiple responses are enabled; Note: Answers to Business Owners Q8

5.0 CONCLUSION

Results of the survey showed that a new road is not likely to have any significant negative impact on the business establishments along Sayre Highway, since most of the customers are also within their vicinity or

municipality as most of them are traveled by foot or motorcycle. The usual destination of the respondents when using Sayre is within the municipality, also indicating that most of their destination is within their vicinity. All of the businesses are small enterprises mostly focused on merchandising, with few workers, and can accommodate few customers per day.

These findings indicate that the Sayre businesses' customer base, who are mostly within their immediate communities and are probable loyal customers, are likely to have the same buying patterns even with the establishment of a new highway.

Furthermore, the interchanges strategically located on community central business districts of Sayre will serve as a positive factor since Sayre highway will be still accessible through CMH.

Most respondents looked forward to the possible improved traffic flow of traffic, and believed that the bypass road will help them in transporting their products and promote growth in the community as long as their establishments will not be relocated.

The summary of the survey is enumerated below:

1. Majority of the respondents are frequent user of Sayre Highway of which they mostly use motorcycle as a form of transportation.
2. All of the business representatives are small type of businesses mostly focused on merchandizing with few workers and can accommodate few customers per day. Their customers are perceived as locals and travelers who traveled mostly by foot and motorcycle
3. Common problems encountered is traffic of which they perceived road widening as the solution followed by establishment of new road. Thus, the respondents are in favor of the CMH in order to lessen the traffic.
4. The only concern raised about the CMH Project is if there will be affected Sayre establishments and if they will be relocated.

ATTACHMENTS

Attachment 1. Survey Instrument on the Sayre Roadside Business
Attachment 2. Photodocumentation
Attachment 3. Public transportation in Sayre
Attachment 4. Observed closed establishments during the survey
Attachment 5. Traffic observations and road development along Sayre observed during fieldworks

Attachment 1. Survey Instrument on the Sayre Roadside Business

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS

Central Mindanao High Standard Highway Project
Cagayan de Oro - Malaybalay Section

SUPPLEMENTAL QUESTIONS FOR SAYRE BUSINESSOWNERS/TRAVELERS/DRIVERS

RESPONDENT'S PROFILE

Category: ☐ Businessowner ☐ Traveler ☐ Driver

I. For Drivers, Travelers and/or Business Owners

1. What is your usual mode of transportation Sayre Hi-way?

   ☐ Bike ☐ Motorcycle ☐ Private Car ☐ Public transportation

2. How many times you travel along Sayre Hi-way?

   ☐ Daily ☐ __ times a week ☐ Weekly ☐ __times a month ☐ Monthly

3. What is your usual destination of travel when passing Sayre Hi-way? _____

4. What are the usual problems you encounter when travelling along Sayre Hi-way?

   ☐ Traffic ☐ Accidents ☐ Others (please specify) _____

5. What do you think is the best solution to the problems encountered above?

   _____

6. What are your insights/attitude about the proposed Central Mindanao High Standard highway in relation to your business? __ Favorable ___ Unfavorable ___ Neutral

   Why? _____

II. For Business Owners

1. Operations: ☐ Full time ☐ Part-time
2. Business category: ☐ Micro-enterprise (<10 workers)

   ☐ Small to Medium Enterprise (SME) (<200 workers) ☐ Large Enterprise (>200 workers)

   Nature of business _____ 3. Business address: _____

4. How long have you been in business in the area?

   ☐ < 1 year ☐ 1 to 5 years ☐ > 5 to 10 years ☐ Over 10 years

5. Estimated annual sales: __ <₱250,000 __ ₱250 to ₱500,000 __ Over ₱500,000
6. How many customers can your business accommodate per day? ___ <50 __ 50-100 __ >100
7. What is the usual type of customers? __ Locals ____Travelers ___ Both
8. Usual mode of transportation of customers? ☐ On foot ☐ Bike

   ☐ Motorcycle ☐ Private Car ☐ Public transportation

Attachment 4. Observed closed establishments during the survey

Some of closed establishments during the survey

Attachment 3. Public transportation in Sayre

Top row, left to right: habal-habal; *Second row, left to right:* multi-cabs; *Third row, left to right:* jeepneys; *Last row:* provincial buses

Attachment 2. Photodocumentation

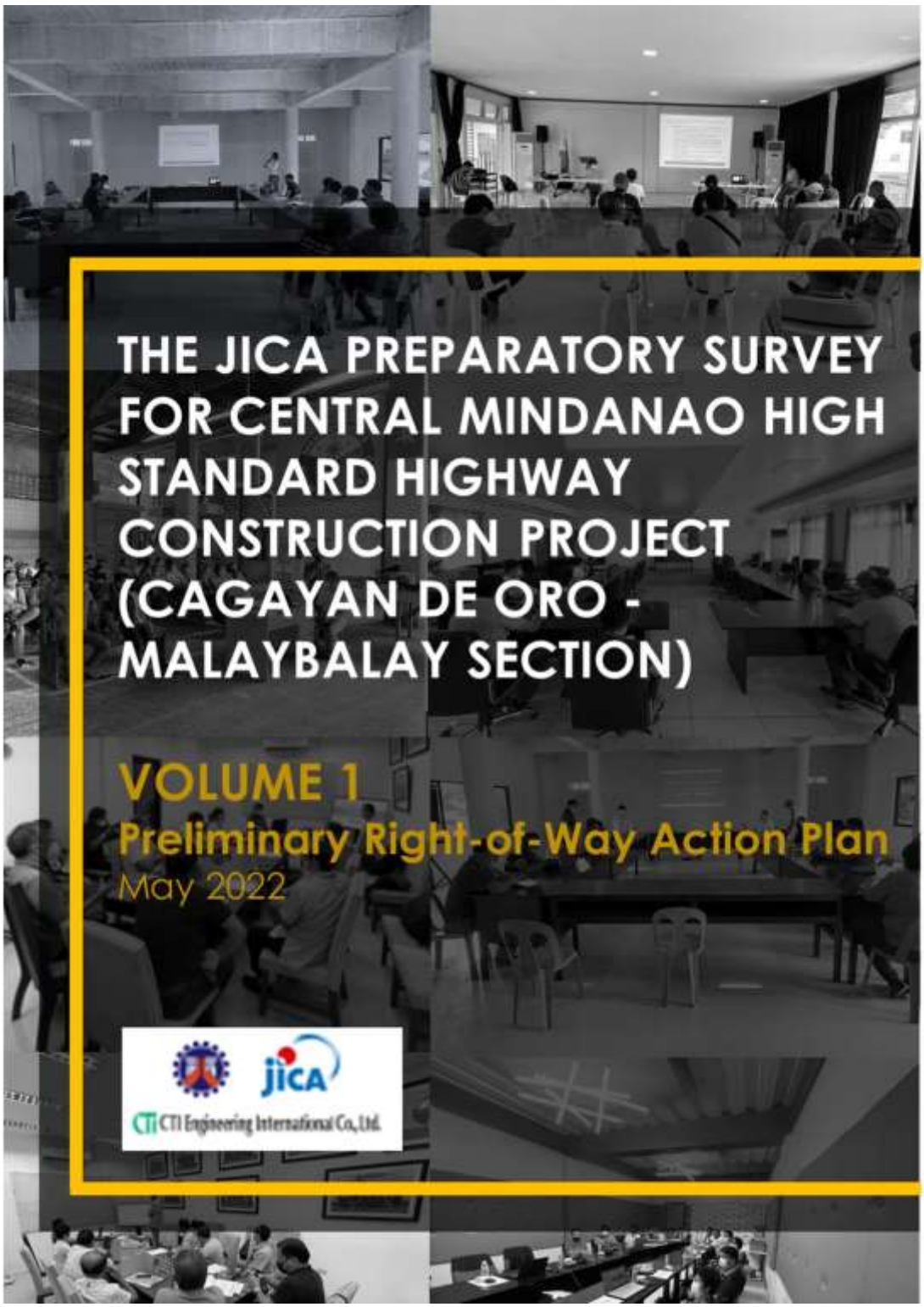
Top row, left to right: fruit vendor, sari-sari store, thrift shop; *Second row, left to right:* clothing shop, eatery, mini-market; *Third row, left to right:* motorcycle parts and accessories, rice dealer, cellphone repair and accessories; *Last row:* bakery, cakes and pastries shop, tailoring shop

Travelers

Attachment 5. Traffic observations and road development along Sayre observed during fieldworks

Top row, left to right: Traffic on Sayre along Impasug-ong and Sumilao; *Bottom row, left to right*: on going construction on Sayre along Sumilao and Manolo Fortich

Annex 14. Preliminary Right-of-Way-Action Plan



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List of Abbreviations

AD	Ancestral Domain
BIR	Bureau of Internal Revenue
CMHSHCP	Central Mindanao High Standard Highway Construction Project
CLOA	Certificate of Land Ownership Award
DEO	District Engineering Office
DPWH	Department of Public Works and Highways
DMS	Detailed Measurement Survey
DDR	Due Diligence Report
EA	Executing Agency
EMA	External Monitoring Agents
EO	Executive Order
ESSD	Environmental and Social Safeguards Division
FPIC	Free and Prior Informed Consent
GOP	Government of the Philippines
GRDP	Gross Domestic Product
GRM	Grievance Redress Mechanism
IMA	Internal Monitoring Agent
IPA	Independent Property Appraiser
IOL	Inventory of Loss
IP/ICC	Indigenous People/Indigenous Cultural Community
IPP	Indigenous People Plan
IPRA	Indigenous People's Rights Act
JICA	Japan International Cooperation Agency
LARR	Land Acquisition, Resettlement and Rehabilitation
LARRIPP	Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples Policy
LGU	Local Government Unit
LRP	Livelihood Restoration Program
NCIP	National Commission on Indigenous Peoples
NEDA	National Economic and Development Authority
NGO	Non-Government Organization
PAF	Project Affected Family
PAP	Project Affected Person
PhP	Philippine Peso
PIB	Project Information Booklet
PPTA	Project Preparatory Technical Assistance
RA	Republic Act
RAP	Right-of-Way Action Plan
RCS	Replacement Cost Study
RIC	Resettlement Implementation Committee
RIPF	Resettlement and Indigenous Peoples Framework
ROW	Right-of-Way
SES	Socioeconomic Survey
SIA	Social Impact Assessment
SPS	Safeguard Policy Statement
TCT	Transfer Certificate of Title
UPMO-RMC1	Unified Project Management Office-Road Management Cluster 1 (Bilateral)

Definition of Terms

Abbreviated Resettlement Action Plan (ARAP) -- The Resettlement Action Plan (RAP) refers to the planning document that describes what will be done to address the direct social and economic impacts associated with involuntary taking of land or land acquisition. The ARAP is acceptable if fewer than 200 people are affected. It is also acceptable if more than 200 people are affected so long as all land acquisition is minor (10 percent or less of all holdings is taken) and no physical relocation is required.

Affected Family (AF) -- It consists of all members of a household residing under one roof and operating as a single economic unit, who will be adversely affected by the project. For resettlement purposes, Project Affected Persons (PAPs) will be dealt with as members of Project Affected Families (PAFs).

Affected Person (AP) -- It includes any person or persons, household, a firm, or a private or public institution who, on account of the execution of the project, would have their right, title or interest in all or any part of a house, land (e.g., residential, agricultural or pasture), annual or perennial crops and trees, or any other fixed or moveable asset acquired or possessed, in full or in part, permanently or temporarily.

Ancestral Domain -- As defined in R.A. 8371 (IPRA), refers to all areas generally belonging to ICCs/IPs comprising lands, inland waters, coastal areas, and natural resources therein, held under a claim of ownership, occupied or possessed by ICCs/IPs, themselves or through their ancestors, communally or individually since time immemorial, continuously to the present except when interrupted by war, force majeure or displacement by force, deceit, stealth or as a consequence of government projects or any other voluntary dealings entered into by government and private individuals, corporations, and which are necessary to ensure their economic, social, and cultural welfare. It includes land, forests, pasture, residential, agricultural, and other lands individually owned whether inalienable and disposable or otherwise, hunting grounds, burial grounds, worship areas, bodies of water, mineral and other natural resources, and lands which may no longer be exclusively occupied by ICCs/IPs but from which they traditionally had access to for their subsistence and traditional activities, particularly the home ranges of ICCs/IPs who are still nomadic and/or who practice shifting cultivation. As clarified in Section 4 of R.A. 8371, ancestral domains cover not only the physical environment but the total environment including the spiritual and cultural bonds to the area which the ICCs/IPs possess, occupy, and use and to which they have claims of ownership.

Ancestral Lands -- As defined in R.A. 8371 refers to land occupied, possessed and utilized by individuals, families and clans who are members of the ICCs/IPs since time immemorial, by themselves or through their predecessors-in-interest, under claims of individual or traditional group ownership, continuously, to the present except when interrupted by war, force majeure or displacement by force, deceit, stealth, or as a consequence of government projects and other voluntary dealings entered into by government and private individuals/corporations, including, but not limited to, residential lots, rice terraces or paddies, private forests, swidden farms and tree lots.

Appraised Value -- means the market value of a property as estimated by an Independent Property Appraiser or Government Financial Institution.

BIR Zonal Valuation -- is an approved zonal schedule of fair market values on real property set by the Bureau of Internal Revenue (BIR) as basis for computation of internal revenue taxes.

Certificate of Land Ownership Award (CLOA) -- It refers to a certificate issued to grantees of the comprehensive agrarian reform program. The provisions of CA 141 shall govern in the CLOAs awarded under the Public Land Act.

Compensation -- This means payment in cash or in kind at replacement cost for an asset to be acquired or affected by an infrastructure project.

Cut-off Date -- It is the date of commencement of the census of affected families within the project boundaries. Persons not covered at the time of census-taking will not be eligible for claims of compensation entitlements. Cut-off date for land-taking will be set on the date that the parcellary survey was conducted but the value of the land will be based on the agreed values of the land at the time of taking.

Customary Law -- It refers to a body of written and/or unwritten rules, usages, customs and practices traditionally and continually recognized, accepted, and observed by respective ICCs/IPs.

Disturbance Compensation -- It is the compensation amount for lessees of agricultural land severely affected (i.e., >20% of the land or when the land is no longer economically viable) by the project, equivalent to five times the average gross harvest during the last five years (RA 6389 and EO 1035, series of 1985).

External Monitoring Agent (EMA) -- It is an independent entity or individual designated by the Department to monitor the implementation of the RAP and the IPAP.

Financial Assistance -- It is the cash amount paid to agricultural tenants/settlers/ occupants severely affected by the project, equivalent to the average gross harvest for the last three years and not less than PhP15, 000 per ha (EO 1035), in addition to the cash payment/compensation for their crops damaged by the project.

Free and Prior Informed Consent -- As defined in R.A. 8371, it means the consensus of all members of the ICCs/IPs to be determined in accordance with their respective customary laws and practices, free from any external manipulation, interference, and coercion, and obtained after fully disclosing the intent and scope of the activity, in a language and process understandable and appropriate to the community.

Free and Prior Informed Consent Guidelines of 2006 -- It is also known as National Commission on Indigenous Peoples' Administrative Order No. 1, Series of 2006 implementing Sections 44 (m), 46(a), 57, 58, 59, and 7 of Republic Act 8371 or the Indigenous Peoples' Rights Act.

Government Financial Institution or GFI – refers to a national government owned or controlled corporation that the Implementing Office may engage to provide property appraisal services, including estimates of the market values of the property, affected by the ROW for a project.

Implementing Agency or IA -- refers to any department, bureau, office, commission, authority, or agency of the national government, including any government-owned or - controlled corporation or state college or university, authorized by law or its respective charter to undertake national government projects. The DPWH is an IA.

Inconvenience Allowance -- It is the compensation amount given to each PAP who holds full title to or a legalizable tax declaration over the land and structures severely affected by the project, and who consequently must move elsewhere.

Independent Property Appraiser or IPA -- refers to an individual or firm that may be engaged by the Implementing Office to provide property appraisal services, including estimates of the market values of the property, affected by the ROW for a project.

Indigenous Cultural Community/Indigenous People -- As defined in R.A. 8371, it refers to a group of people or homogenous societies identified by self-ascription and ascription by other, who have continuously lived as organized community on communally bounded and defined territory, and who have, under claims of ownership since time immemorial, occupied, possessed customs, tradition and other distinctive cultural traits, or who have, through resistance to political, social and cultural inroads of colonization, non-indigenous religions and culture, became historically differentiated from the majority of Filipinos. ICCs/IPs shall likewise include peoples who are regarded as indigenous on account of their descent from the populations which inhabited the country, at the time of conquest or colonization, or at the time of inroads of non-indigenous religions or cultures, or the establishment of present state boundaries, who retain some or all of their own social, economic, cultural and political institutions, but who may have been displaced from their traditional domains or who may have resettled outside their ancestral domains.

Indigenous Peoples' Action Plan (IPAP) -- An IPAP is written when an infrastructure project has been found through the social assessment to have potentially adverse effects on Indigenous Peoples. The IPAP sets out measures through which the DPWH and other government agencies will ensure that Indigenous Peoples affected by the project receive culturally appropriate social and economic benefits. It also specifies ways that the identified adverse effects are avoided, minimized, mitigated, or compensated. The formulation of the IPAP is mandated by DPWH Department Order No. 327 series of 2003.

Informal Settler -- refer to households living in a lot, whether private or public, without the consent of the property owner; or those without legal claim over the property they are occupying; or those living in danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, and waterways.

Land Acquisition -- It is the process of acquiring land from the current owners pursuant to the provisions of RA 8974 modes of acquisition. The modes of land acquisition are Donation, Barter or Exchange, Purchase, Quit Claim or Expropriation.

Market Value -- means the price of what a willing buyer would pay a willing seller for a given property or asset if both have a reasonable knowledge of the worth of the property.

Older People/ Elderly/ Senior Citizens -- Individuals belonging to the age group 60 years and over

Parcellary Survey -- refers to the activities undertaken as part of the Detailed Engineering Design of a project to define the proposed ROW alignment and limits, the affected lots showing the name of the owners/claimants, lot numbers, and areas, and technical descriptions, and all improvements within the ROW limits.

Poor -- The Philippine Statistics Authority (PSA) said the poverty threshold per family amounted to PhP 12,082 a month. An income below this amount would categorize a family as being poor and an income above this would mean a family is nonpoor.

Prescription Period -- As stipulated in Article 1141 of Civil Code, real actions over immovables prescribe after thirty (30) years. This provision is without prejudice to what is established for the acquisition of ownership and other real rights by prescription (1963).

Production Cost (palay, vegetable and corn) -- This includes among others, land preparation, transportation, seedling, and fertilizer. The amount may vary depending on the location, type of seedling, etc.

Project Affected Family (PAF) – synonymous with the term "Affected Family"

Project Affected Person (PAP) -- synonymous with the term "Affected Person"

Project Boundaries -- It may be defined as the project construction limits, or it may refer to the Right-of-Way limits, whose width varies from 20 to 60 meters as prescribed in the special laws such as Commonwealth Act 141 (Public Land Act), PD 635, EO 113 (1955), EO 621 (1980), etc.

Project Implementation Office -- It refers to the duly designated Management Office (for foreign-funded projects) within the DPWH Central Office and to Regional and District Offices (for locally funded projects)

Rehabilitation Assistance -- It refers to assistance provided to PAFs seriously affected due to the loss of productive assets, incomes, employment, or sources of living, as supplement compensation for acquired assets in order to achieve full restoration of living standards and quality of life.

Relocation -- This refers to the physical displacement of a PAF from his/her pre- project place of residence and his/her transfer to another place.

Replacement Cost -- This is the amount necessary to replace the structure or improvements based on the current market prices for materials, equipment, labor, contractor's profit and overhead, and all other costs associated with the acquisition and installation in place of the affected improvements/installation.

Resettlement -- This is a generic term that covers all measures taken to mitigate all adverse social impacts of a project on the PAFs, including compensation and relocation.

Right-of-Way (ROW) -- means a part or the entirety of a property, site, or location, with defined physical boundaries, used or required by a government infrastructure project.

Right-of Way Action Plan (RAP) -- refers to the document that defines the extent of the ROW to be acquired for a project, including, among other things, cost estimates for acquiring land, structures/improvements, crops/trees, relocation of informal settlers, and recommended compensation and entitlement package for owners and project-affected persons (PAPs), implementation schedule, and impact and mitigating measures for the ROW acquisition.

Social Impact Assessment or Social Assessment -- It is a framework for incorporating social or stakeholders' analysis and participatory processes in project design and implementation.

Time of Taking -- This refers to the time when both parties, the landowner, and the proponent, agreed on the true value of the land being purchased.

EXECUTIVE SUMMARY

1. **Project Description** – The proposed Central Mindanao High Standard Highway Project (CMHSHCP) ("Project", "alignment") is part of the Phase II of the Master Plan on High Standard Highway Network Development. The objectives of the plan were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area.

2. **Necessity of Land Acquisition And Resettlement Objectives of RAP** - The preparation of the RAP for land, structures and improvements, and crops and trees was in accordance with the Republic Act 10752, and as prescribed in the Land Acquisition, Resettlement, Rehabilitation and Indigenous People's Policy (LARRIP), the JICA Environmental and Social Safeguards Guidelines and other related social safeguards policies/issuances of the Department, such as Department Order (DO) Nos. 5 Series of 2003, DO 327 series of 2003, DO 34 series of 2007, DO 152: DPWH ROW Acquisition Manual series of 2017.

3. **Legal Framework** – The policy framework within which this Preliminary Right-of-Way Action Plan for land, structures, other improvements, and crops and trees will operate was derived from the Philippine Constitution, Republic Act 10752, DPWH LARRIP Policy, and other social safeguards issuances, and JICA Environmental and Social Safeguard Guidelines, relative to the ROW acquisition.

4. **Summary of Project Impacts** – The CMHSHCP will involve road construction and improvements to include widening, slope protection and drainage that will require the road right-of-way acquisition of public land and private land. Land acquisition will cause physical and economic displacement such as (i) permanent loss of land along the required minimum of 60-m ROW, (ii) loss/damage to structures and improvement, (iii) loss of crops and trees, and (iv) loss of income/business.

   A total of 379 PAPs with affected assets and properties within the road right-of-way, consists a total area of 3,943,800 m^2 of land which traverse 27 barangays in two (2) cities and four (4) municipalities.

5. **Grievance Redress Mechanism** – A project level GRM was developed to receive and resolve project related concerns, complaints, and grievances. Conflicts within affected communities will be addressed within the community itself through dispute resolution process and mechanisms.

6. **Compensation Policy** – Compensation and entitlements are designed to enhance or at least restore the livelihoods of all displaced persons in real terms relative to pre-project levels and to improve the standards of living of the displaced poor and other vulnerable groups. DPWH will offer to the property owner concerned, as compensation price, the sum of 1) replacement cost of land based on the current market value of land, free of taxes; 2) the replacement cost of structures and improvements; and 3) the current market value of crops and trees.

7. **Livelihood Restoration Program** –The LRP provides the PAPs assistance whose livelihoods are directly adversely affected by the Project by restoring their income generating capacity to at least pre-project levels. For vulnerable PAPs, the LRP is also aimed at improving their living standards.

8. **Institutional Framework** – The DPWH is the implementing agency for the Project. The overall direction and leadership for implementing the RAP will be exercised by the Secretary, supported by the Undersecretary of UPMO Operations and other members of the Executive Committee (EXECOM) of the DPWH composed of the Undersecretaries and Assistant Secretaries of the Department. The Roads Management Cluster I, Bilateral, Unified Project Management Office of DPWH is the overall project management unit. Land acquisition activities will be carried out in close coordination with the DPWH Planning Service through its ESSD, RO, DEO, LGUs, NCIP, RIC and all other pertinent agencies and instrumentalities of the government to fully address the impacts of involuntary resettlement.

9. **Possible Resettlement Site** – There are 96 PAFs (379 persons) whose houses and houses-cum-shops will be fully affected. If relocation is necessary to be undertaken during the implementation of the project, the Municipality of Sumilao committed to provide a land dedicated to affected families. The other LGUs are still determining the location of their relocation sites.

10. **Implementation Schedule** – DPWH is expected to initiate the process of land acquisition and compensation for structures, crops and trees starting July 2023 to secure the project's ROW prior to construction. The DPWH shall ensure that ROW acquisition proceeds in close parallel with the construction schedule, making sure that land and structure owners are adequately compensated and re-established away from the construction site months ahead of the civil works implementation. The implementation of the RAP is expected to be completed by February 2023.

11. **Budgetary Requirement** – The total budget for RAP Implementation of CMHSHCP, (Cagayan De Oro – Malaybalay Section) is **PhP 1,361,812,550 (USD 25,944,228).** The budget items cover (i) compensation for loss of land, structures, trees, crops and other entitlements (ii) livelihood restoration program (iii) transitional allowance; (iv) administrative cost; (v) external monitoring; and (vi) contingencies. Table below shows the details of the budget to implement this RAP.

Summary of Budgetary Requirement

Kind of affected assets	Amount (PhP)	Amount (USD)
1. Land	847,966,900	16,154,828
2. Structures	53,789,139	1,024,750
3. Crops *(agricultural crops/coconut)*	23,072,305	439,556
	8,499,121	161,919
4. Trees *(including seedling replacement)*	120,051,751	2,287,136

5. Livelihood Restoration Program	1,440,000	27,434
6. Relocation and Resettlement	50,904,000	969,785
7. Other Entitlements	5,280,000	100,591
8. Other Assistance	84,158,852	1,603,331
Administrative Costs (5% of Direct Costs: 1-7)	55,550,161	1,058,300
Cost contingencies (10% of Direct Costs: 1-7)	111,100,322	2,116,600
TOTAL	**1,361,812,550**	**25,944,228**

Note: 1 USD = PhP 52.49

12. **Monitoring and Evaluation** – There will be two types of monitoring, the internal and external monitoring. The UPMO in coordination with the ESSD shall conduct the supervision and in-house monitoring of RAP implementation. An External Monitoring Agent (EMA) shall do the external monitoring and evaluation. The EMA for this Projects is a consultancy firm with qualified and experienced staff with Terms of Reference acceptable to the Bank.

13. **Public Consultation** – The Coordination and Public Consultations Meetings for CMHSHCP were undertaken to inform the primary and secondary stakeholders about the project information such as background, scope, objectives, benefits, updates, basic resettlement policies (GOP and JICA), cut-off-date and announcement of succeeding resettlement activities such as conduct of socioeconomic survey and detailed measurement and inventory of affected assets and properties. The Coordination and Public Consultations for CMHSHCP were conducted on March 22 – May 19, 2021.

1 PROJECT DESCRIPTION

1.1 Project Area

The Central Mindanao High Standard Highway Construction Project (CMHSHCP) having a length of **65.73** kilometers will traverse **27** barangays of four (4) municipalities and two (2) cities in the Provinces of Misamis Oriental and Bukidnon in Region X (Northern Mindanao). The host barangays and general location and jurisdiction maps are shown in Table 1-1 and Figure 1-1, respectively.

Table 1-1. Jurisdictions of the Project alignment

Province	City/Municipality	Barangay
Misamis Oriental	Cagayan de Oro City	Casinglot
		Natumolan
		Bugo
	Tagoloan	Balubal
		Puerto
Bukidnon	Manolo Fortich	Mambatangan
		Alae
		San Miguel
		Damilag
		Diclum
		Tankulan (Poblacion)
		Sankanan
		Ticala
	Sumilao	Puntian
		Villa Vista
		San Roque
		Culasi
		Poblacion
		Kisolon
	Impasug-ong	Poblacion
		La Fortuna
		Capitan Bayong
		Cawayan
		Impalutao
	Malaybalay	Dalwangan
		Patpat (Lapu-Lapu)
		Kalasungay

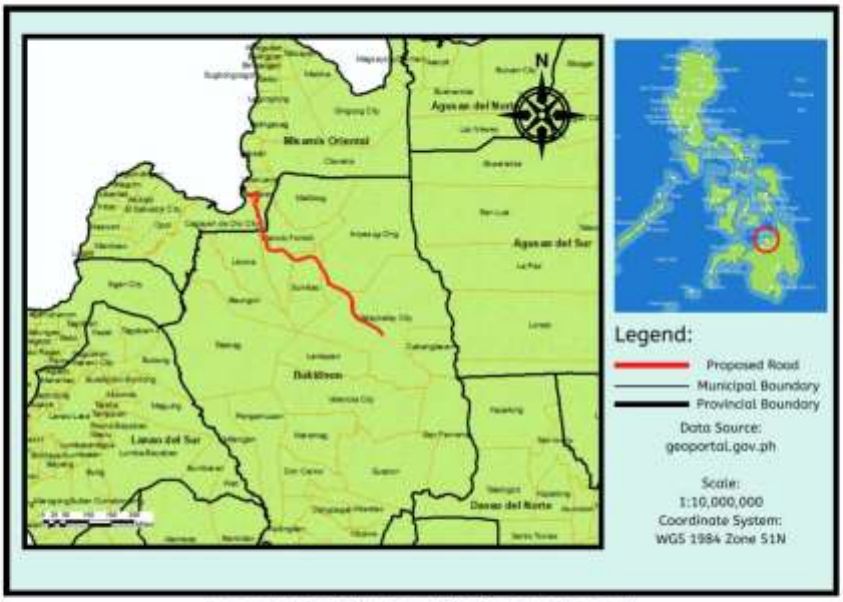


Figure 1-1. Jurisdictions of the Project alignment

1.2 Project Description

The proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro - Malaybalay Section) is part of the Phase II of the Master Plan on High Standard Highway Network Development. The objectives of the plan were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area.

The proposed Project will be spearheaded by the Department of Public Works and Highways (DPWH) with the assistance of the Japan International Cooperation Agency (JICA).

1.3 Project Design

The project design is summarized below.

1.3.1 Geometric design standard

The standard references used for the Central Mindanao High Standard Highway are a) Policy on Geometric Design of Highways and Streets, AASHTO 2011, 6th Edition, b) Design Guidelines, Criteria & Standards, volume 4 Highway Design, 2015, DPWH, and c) Japan Road Association, Road Structure Ordinance, 2019.

1.3.2 Design speed

The recommended design speed of 80 kph taken from the previous pre-feasibility study (HSH MP Phase-2 report) was used for the main alignment. The design speed was selected considering moderate topographic conditions at the proposed alignment and traffic safety.

1.3.3 Interchange ramps

The interchange ramp design speed is 40 kph which is half of the highway design speed. It is also the identified minimum design speed in AASHTO 2011.

1.3.4 High Standard Highway geometry

The geometry applied to the design of main alignment and ramp is summarized in Table 1-2 and Table 1-3.

Table 1-2 Road geometric design standard for main alignment (80kph design speed)

Item	Unit	Standard	Absolute minimum
Design Speed	kph	80	
Design Vehicle	-	WB-19	
Stopping Sight Distance	m	130	
Passing Sight Distance	m	245	
ROW	m	60	
Terrain Condition		Rolling	
Cross Section Elements			
Pavement			
Lane Width	m	3.65	
Median Width	m	3	
Inner shoulder Strip	m	0.75	
Outer shoulder Strip	m	3	2.5
Number of Lanes	Nos	4	
Normal Cross Slope	%	2	
Horizontal Alignment			
Minimum Radius	m	252	
Min. Transition Curve Length	m	70	
Min. Radius not requiring Transition Curve	m	379	
Min. Radius not requiring Super elevation	m	3,500	
	m	2,000	
Max. Relative Slope		1/200	

The JICA Preparatory Survey on Central Mindanao High Standard Highway Construction Project
(Cagayan De Oro – Malaybalay Section)

Item		Unit	Standard	Absolute minimum
Vertical Alignment				
Maximum Vertical Gradient		%	4	5
Minimum K value	Sag		30	
	Crest		26	
Minimum Radius	Sag	m	2,000	
	Crest	m	3,000	
Min Vertical Curve Length		m	70	
Max. Composition Grade		m	10.5	
Vertical Clearance				
Road		m	5.2	

Source: JICA Study Team

Table 1-3 Road geometric design standard for ramp (40kph design speed)

Item	Unit	Standard	Absolute minimum
Design Speed	kph	40	
Design Vehicle	-	WB-15	
Stopping Sight Distance	m	50	
Passing Sight Distance	m	140	
ROW	m	60	
Terrain Condition		Rolling	
Cross Section Elements			
Pavement			
Lane Width	m	4.5	
Median Width	m	0	
Inner shoulder Strip	m	0.75	
Outer shoulder Strip	m	3	2.5
Number of Lanes	Nos	1	
Normal Cross Slope	%	2	
Horizontal Alignment			
Minimum Radius	m	43	
Min. Transition Curve Length	m	50	
Min. Radius not requiring Transition Curve	m	95	
Superelevation Runoff		1/143	
Vertical Alignment			
Maximum Vertical Gradient	%	6	8

Item		Unit	Standard	Absolute minimum
Minimum K value	Sag		9	
	Crest		4	
Min Vertical Curve Length		m	35	
Max. Composition Grade		m	11.5	
Vertical Clearance				
Road		m	5.2	

Source: JICA Study Team

1.3.5 Vertical clearance

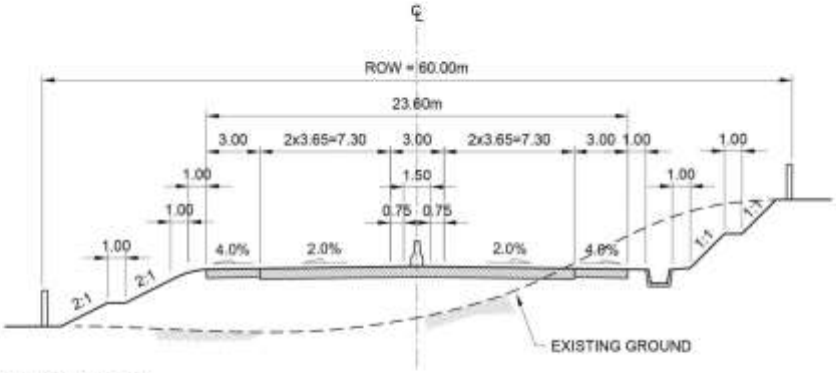
The design vertical clearances of the highway and crossing road is 4.0 to 5.2 meters.

1.3.6 Number of lanes

The alignment is a dual 2-lane (2x2) road in accordance with the traffic demand.

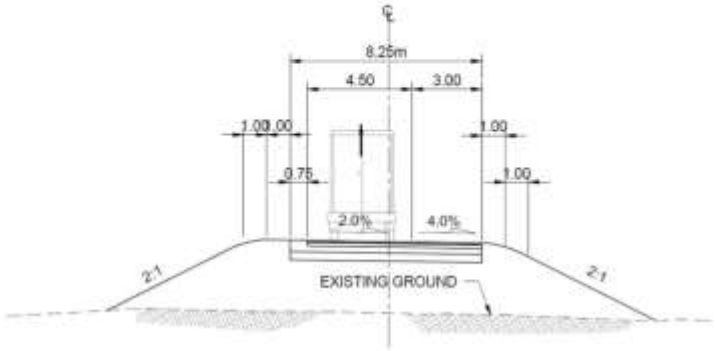
1.3.7 Carriageway, Shoulder, and Median widths

The recommended cross-section configurations are presented in the succeeding paragraphs.



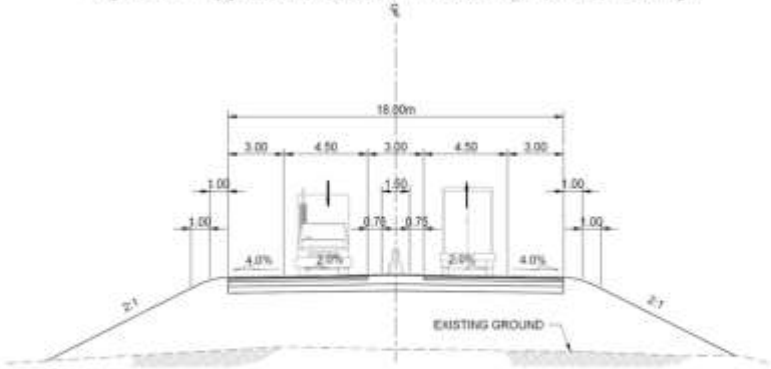
Source: JICA Study Team

Figure 1-1-2 Typical Cross Section Embankment and Cut: Row=60m



Source: JICA Study Team

Figure 1-1-3 Typical Cross Section at Interchange: One-Lane Ramp



Source: JICA Study Team

Figure 1-1-4 Typical Cross Section at Interchange: Two-Lane, Two-Direction Ramp

1.4 Project Targets

In the preparation of this preliminary RAP, the targets were identified to determine the type of assistance that will be included in the report. Below shows the summary of the project targets.

Table 1-4. Project Targets

Summary of Project Targets	Total
No. of Affected Families (AFs)[1]	96
No. of Affected Persons (APs)[2] by Loosing Residential, Residential-Commercial & Commercial Structures	379

[1] For this Preliminary RAP, the terms affected families (AFs) and project affected families (PAFs) are synonymous
[2] For this Preliminary RAP, the terms affected persons (APs) and project affected persons (PAPs) are synonymous

The JICA Preparatory Survey on Central Mindanao High Standard Highway Construction Project
(Cagayan De Oro – Malaybalay Section)

Summary of Project Targets	Total
Number of Affected Families who will be displaced	96
No. of Affected Parcels of Land	405
Total Affected Land Area (m^2)	3,943,800
Land Area of Affected Agricultural Crops (m^2)	2,571,526
No. of Affected Coconut	2,552
No. of Affected Forest / Fruit Trees / Other Forest Products	9,815
Estimated Budgetary Requirement (PhP)	1,374,405,713

Draft Preliminary Right-of-Way Action Plan | 7

2 NECESSITY OF LAND ACQUISITION AND OBJECTIVES OF RAP

2.1 Scale of Land Acquisition and Resettlement

The preparation of the RAP for land, structures and improvements, and crops and trees was in accordance with the Republic Act 10752, (An Act Facilitating the Acquisition of Right-of-Way Site or Location for National Government Infrastructure projects) and as prescribed in the Land Acquisition, Resettlement, Rehabilitation and Indigenous People's (LARRIP) Policy, the JICA Environmental and Social Safeguards Guidelines and other related social safeguards policies/issuances of the Department, such as Department Order (DO) Nos. 5 Series of 2003, DO 327 series of 2003, DO 34 series of 2007, DO 152: DPWH ROW Acquisition Manual series of 2017.

The preparation of this Preliminary RAP covers a length of **65.73** kilometers including the affected assets and properties within the ROW width required for the project. Twenty-seven barangays will be traversed by the project.

2.2 Objectives of the Study

The objectives of the Preliminary Right-of-Way Action Plan are as follow:

1) To determine the number of Project Affected Persons (PAPs) and properties/assets affected by the project based on the road alignment in the feasibility study;
2) To identify the extent of impacts of the project on their properties/assets and the measures to mitigate these impacts;
3) To determine the compensation and entitlements to the PAPs for their affected properties/assets for inclusion in the Medium-Term Infrastructure Program (MTIP); and
4) To ensure public participation in the implementation and monitoring of the RAP.

3 LEGAL FRAMEWORK

3.1 Legal Framework Policy on Eligibility for Compensation and Entitlement

The policy framework within which this Right-of-Way Action Plan for land, structures, other improvements, and crops and trees will operate was derived from the Philippine Constitution, Republic Act 10752, DPWH LARRIP Policy, and other social safeguards issuances, and JICA Environmental and Social Safeguard Guidelines, relative to the ROW acquisition.

3.1.1 Basic National Policy

The overall objective of this RAP Policy is anchored on the Bill of Rights of the Constitution of the Republic of the Philippines.

1) Article III, Bill of Rights, Section 1: "No person shall be deprived of life, liberty, or property without due process of law, nor shall any person be denied the equal protection of the laws."
2) Article III, Bill of Rights, Section 9: Private property shall not be taken for public use without "just compensation".
3) Article XII, Section 5: "The State…shall protect the rights of indigenous cultural communities to their ancestral lands to ensure their economic, social, and cultural well-being "By act of Congress, customary laws governing property rights or relations can be applied in determining the ownership and extent of ancestral domains.
4) Article XIII, Urban Land Reform and Housing, Section 10: "Urban or rural poor dwellers shall not be evicted, nor their dwelling demolished, except in accordance with law and in a just and humane manner. No resettlement of urban or rural dwellers shall be undertaken without adequate consultation with them and the communities where they are to be relocated."

3.1.2 RA 10752 "The Right-of-Way Act"

RA 10752- An Act Facilitating the Acquisition of Right-of-Way (ROW), Site or Location for National Government Infrastructure Projects, a law that was signed and took effect in March 2016 and its IRR. The RA 10752 provides the different bases for land valuation for the following modes of acquisition: negotiated sale and expropriation.

The law states that the Implementing Agency (IA) shall negotiate with the owner for the purchase of the property by offering the current market value issued by the Government Financing Institution (GFI) for the area where the affected property is located, or appraised market value identified by the private independent property appraiser (IPA) accredited by the Central Bank of the Philippines.

The law also states that valuation of the improvements and/or structures on the land to be acquired shall be based on the replacement cost which is defined as the amount necessary to replace the structure or improvement based on the current market prices for materials,

equipment, labor, contractor's profit and overhead, and all other attendant costs associated with the acquisition and installation in place of the affected improvements/installation.

Methods of Negotiation - Under the law, RA 10752 specifies the following methods: Donation, Quit Claim, Exchange or Barter, Negotiated Sale or Purchase, Expropriation and any other modes of acquisition authorized by law.

Market Value - Standards to determine market value. Negotiated sale between DPWH and the property owner based on the following standards to determine the market value:

1) The classification and use for which the property is suited;
2) The development costs for improving the land;
3) The value declared by the owners;
4) The current selling price of similar lands in the vicinity;
5) The reasonable disturbance compensation for the removal and/or demolition of certain improvements on the land and for the value for improvements thereon;
6) The size, shape and location, tax declaration and zonal valuation of the land;
7) The price of the land as manifested in the ocular findings, oral as well as documentary evidence presented; and
8) Such facts and events as to enable the affected property owners to have sufficient funds to acquire similarly-situated lands of approximate areas as those required from them by the government, and thereby rehabilitate themselves as early as possible.

Payment Mode - DPWH shall pay the property owner (i) fifty percent (50%) of the negotiated price of the affected land, exclusive of the payment of unpaid taxes remitted to the LGU concerned and (ii) seventy percent (70%) of the negotiated price of the affected structures. improvements, crops, and trees, exclusive of unpaid taxes remitted to the LGU concerned. DPWH shall pay the property owner the remaining fifty percent (50%) of the negotiated price of the affected land after the transfer of title in the name of the Republic of the Philippines, in cases where the land is wholly affected and at the time of the annotation of a deed of in cases where the land is partially affected. DPWH shall pay the remaining thirty percent (30%) of the affected structures, improvements, crops, and trees, exclusive of unpaid taxes remitted to the LGU concerned after the land is already completely cleared of structures, improvements, crops, and trees.

Quit Claim - A quit claim instrument is required to be executed by owners of lands acquired under the Public Land Act (Commonwealth Act 141) because of the reservation made in the issuance of patents or titles thereto. Even if the title or free patent describes the whole area as owned by the patentee or title holders, by operation of the law, a strip of 20 or 60 meters, as the case maybe, of that area described is not absolutely owned by him/her, because it is reserved by the government for public use. Hence, if the government should exercise its right to use the area reserved by it for public use, the owner shall be required to execute a Quit Claim over such area reserved and taken by the government for public use. This mode can be availed if the landowner is the original patent holder or the acquisition of the land from the original patent holder is through a gratuitous title, subject for the provision of CA 141 "Public Land Act" or PD 635. No payment shall be made for land acquired under the quit claim mode except for damages to improvements. However, if the landowner is not the

original patent holder and any previous acquisition of said land is not through gratuitous title, then this land is subject to other mode of acquisition as enumerated in RA 10752.

In case PAPs are qualified for compensation but with arrears on land tax. To facilitate the processing of payment on land acquired from the PAPs with tax arrears, the DPWH upon request by the property owner, will pay the arrears and deduct the amount to the total compensation cost provided that the amount is not more than the negotiated price.

In case the PAPs are qualified but already dead and the heirs have not undergone extra-judicial partition, the PAPs will be given a grace period to meet the requirement within the validity period of allotment for two (2) years. Beyond two years that the PAPs cannot comply with the requirement they have to settle the case in court.

In case of expropriation, the following will be followed:

1) For Structures: If the PAP rejects the compensation for structures at replacement cost offered by DPWH, the Department or the PAP may take the matter to court. When court cases are resorted to either by DPWH through expropriation or by the PAPs through legal complaints, the DPWH will deposit the replacement cost at current market value of structures and improvements.
2) For Land: If the owner contests the Department's offered value for compensation for land, the PAP or the DPWH may take the matter to court. DPWH shall immediately deposit to the court in favor of the owner the amount equivalent to a 100% of the value of the property based on the BIR zonal valuation. The court shall determine the just compensation, considering the standards for the assessment of the value of the land (Sec.7, RA 10752).

3.1.3 Other Applicable laws and Policies

DPWH Land Acquisition, Resettlement, Rehabilitation, and Indigenous Peoples Policy (LARRIPP) (March 2007) - To ensure uniformity of standards in the Resettlement Planning, a revised LARR Policy, 3rd edition, was formulated, now contains the Departments Indigenous People's policy in accordance with the Indigenous People Right Acts (IPRA) law, called the LARRIPP.

This policy includes the principles and objectives of the involuntary resettlement policy, the legal framework, eligibility, compensation and entitlements, the indigenous peoples' policy framework, implementation procedures that ensure complaints are processed, public support and participation, and the provision of internal and external monitoring of the implementation of the RAP and safeguard instrument for IPs.

Commonwealth Act 141 Section 112 or Public Land Act - prescribes a 20-meter strip of land reserved by the government for public use, with damages being paid for improvements only.

Presidential Decree 635 amended Section 112 of CA 141 increasing the width of the reserved strip of 20 meters to 60 meters.

EO 113 (1955) and EO 621 (1980)

1) National Roads shall have a ROW width of at least 20 meters in rural areas which may be reduced to 15 meters in highly urbanized areas.
2) ROW shall be at least 60 meters in unpatented public land.
3) ROW shall be at least 120 meters through natural forested areas of aesthetic or scientific value.

EO 1035

1) Financial assistance to displaced tenants, cultural minorities, and settlers equivalent to the annual gross harvest for the last 3 years and not less than PhP15, 000 per ha.
2) Compensation for improvements on land acquired under Commonwealth Act 141.
3) Government has the power to expropriate in case agreement is not reached.

MO 65, Series of 1983

1) Easement of ROW where the owner is paid the land value for the Government to use the land, but the owner still retains ownership over the land.
2) Quit claim where the Government has the right to acquire a 20 to 60 m width of the land acquired through CA 141. Only improvements will be compensated.

Republic Act 6389. Provides for disturbance compensation to agricultural lessees equivalent to 5 times the average gross harvest in the last 5 years.

Article 141, Civil Code. Real actions over immovable prescribe after thirty (30) years. This provision is without prejudice to what is established for the acquisition of ownership and other real rights by prescription (1963).

The Comprehensive Agrarian Reform Law Republic Act 6657 (1988). Section 28 provides that landowner shall retain his share of any standing crop un-harvested at the time the DAR shall take possession of the land under Section 16 of this Act and shall be given a reasonable time to harvest.

DPWH Department Order No. 34 s. 2007 to streamline and standardize its operating procedures DPWH issued the department order was issued to simplify the guidelines for the validation and evaluation of Infrastructure right-of-way claims. The Guidelines is in line with the provisions of the DPWH ROW Procedural Manual adopted under Department Order No.5, s. 2003, as amended, particularly in the validation and evaluation of claims for ROW acquisitions.

DPWH Department Order No.5 s. 2003 this order was issued to identify, acquire, and manage right-of-way (ROW) efficiently and in a timely manner for the implementation of infrastructure projects, an improved ROW process was adopted, among others, (i) it shall be applicable to all foreign-assisted and locally funded projects. (ii)The Implementing Office (IO)

shall ensure that ROW costs are always included in project budgets. (iii) All ROW must be fully acquired and cleared before the issuance before the Notice of Award for the project.

DPWH Department Order No. 130 Series of 2016 provides the guidelines for the Implementation of the Provisions of Republic Act No. 6685 and Republic Act 9710 or the Magna Carta of Women. The Implementing Rules and Regulations mandates that contractors to hire a minimum percentage of 50% of unskilled and 30% skilled manpower requirement from the unemployed bona fide residents of the locality and shall be equally accessible to both women and men.

DPWH Department Order No. 152 Series of 2017 Directing the Use of DPWH Right-of-Way Acquisition Manual (DRAM) by All Concerned DPWH offices. The Manual provides a clear, uniform, and user-friendly guide on the rules and procedures for the acquisition of DPWH ROW for its infrastructure projects.

Indigenous People. The Indigenous Peoples' Rights Act (IPRA) of 1997. IPRA sets conditions, requirements, and safeguards for plans, programs, and projects affecting IPs. The important provisions of IPRA are:

1) Right to their ancestral domains. (Chapter III, Section 11);
2) Right to an informed and intelligent participation in the formulation and implementation of any project, government or private, that will impact upon their ancestral domains; (Chapter III, Section 7b);
3) Right to participate fully, if they so choose, at all levels of decision-making in matters which may affect their rights, lives and destinies through procedures determined by them; (Chapter IV, Section 16);
4) Right to receive just and fair compensation for any damages inflicted by or as a result of any project, government or private; (Chapter III, Section 7b);
5) Right to stay in their territory and not be removed from that territory. If relocation is necessary as an exceptional measure, it can only take place with the free and prior informed consent of the IPs and indigenous cultural communities (ICC) concerned; (Chapter III, Section 7c);
6) Right to be secure in the lands to which they have been resettled; (Chapter III, Section 7d);
7) Right to determine and decide their own priorities for the lands they own, occupy, or use; (Chapter IV, Section 17);
8) Right to maintain, protect, and have access to their religious and cultural sites; (Chapter IV, Section 33)

NCIP has issued number of administrative orders (AO) that put into operation the provisions of IPRA. The most important AO for purposes of this RAP is NCIP AO No. 3 or the Revised Guidelines on FPIC and Related Processes of 2012.

Republic Act 7279 is an act to provide for a comprehensive and continuing urban development and housing program, establish the mechanism for its implementation, and for other purposes. The law also provides that local government units in coordination with the National Housing Authority (NHA), shall implement the relocation and resettlement of persons living

in danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, waterways, and in other public places as sidewalks, roads, parks, and playgrounds. The local government unit, in coordination with the National Housing Authority, shall provide relocation or resettlement sites with basic services and facilities and access to employment and livelihood opportunities sufficient to meet the basic needs of the affected families. s and estate management.

3.2 Objectives and Principles of the Involuntary Resettlement Policy

1) Involuntary resettlement should be avoided where feasible.
2) Where population displacement is unavoidable, it should be minimized by exploring all viable project options.
3) People unavoidably displaced should be compensated and assisted, so that their economic and social future would be generally as favorable as it would have been in the absence of the project.
4) People affected should be fully informed and consulted on resettlement and compensation options.
5) As far as possible, involuntary resettlement should be conceived and executed as part of the project.

3.3 JICA Policies

The key policies and principles governing involuntary resettlement prescribed in the Japan International Cooperation Agency (JICA) Guidelines on Social and Environmental Considerations (2010) are as follow:

1) Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
2) When, after such an examination, avoidance is proved unfeasible, effective measures to minimize impact and to compensate for losses must be agreed upon with the people who will be affected.
3) People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported by project proponents in a timely manner.
4) Prior compensation, at full replacement cost, must be provided as much as possible.
5) Host countries must make efforts to enable people affected by projects and to improve their standard of living, income opportunities, and production levels, or at least to restore these to pre-project levels. Measures to achieve this may include providing land and monetary compensation for losses (to cover land and property losses), supporting means for an alternative sustainable livelihood, and providing the expenses necessary for the relocation and re-establishment of communities at resettlement sites.
6) Meaningful participation of affected people and their communities must be promoted in the planning, implementation, and monitoring of resettlement action plans and measures to prevent the loss of their means of livelihood.
7) In addition, appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

8) For projects that will result in large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.
9) In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.
10) When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.

3.4 Gap Analysis and Project Principles

To ensure compliance and consistency with JICA Guidelines on Social and Environmental Considerations (2010), the review of JICA guidelines to compare to existing laws and policies on the road right-of-way acquisition has been conducted.

Table 3-1 present the results of the Gap Analysis.

Table 3-1. Gap Analysis and Gap Filling Measures

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	No person shall be deprived of life, liberty, or property without due process of law, nor shall any person be denied the equal protection of the laws (Article III, Bill of Rights, Section 1) Private property shall not be taken for public use without "just compensation (Article III, Bill of Rights, Section 9). Involuntary resettlement should be avoided where possible. Where population displacement is unavoidable, it should be minimized by exploring all viable project options (LARRIPP, 2007, Chapter II)	While there is no specific law in the Philippines, there is no notable gap.	The project will compare and analyze different project alternatives considering the economic, environmental, and social impacts with priority given to the option that minimizes the scale of involuntary resettlement.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Provides compensation and entitlements for affected assets and properties within road right-of-way (LARRIPP, 2007, Chapter III) RA 10752 – provide just compensation for affected assets and properties within road right-of-way	There is no notable gap.	The impact on the PAPs will be analyzed in view of the land, structure, crops, trees. Once the impacts have been identified, efforts to minimize such impacts would be undertaken and an appropriate level of compensation would be considered and described in the RAP for implementation.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently	Monetary compensation will be made to people that legally own the land and structures affected by the project (RA10752, Article 5). The government will, in coordination with DHSUD and NHA, discuss with LGUs about	LARRIPP covers compensation against lost livelihood including loss attributed to impact on business activities and	Compensation policy and package will be formulated based on the census, lost-asset inventory, and socioeconomic surveys

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
	compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	identifying the resettlement site and developing them (RA10752 No.9) Government shall provide adequate appropriations that will allow Implementing Agencies to acquire ROW for national government projects. These appropriations include cost of development and implementation of resettlement projects including planning, and social preparation. Where necessary, this may include land development and housing construction, provision of basic services and community facilities, livelihood restoration and improvement (RA10752 Section 15). Among other types of entitlements that may be afforded to the PAFs/PAPs as compensation for lost livelihood is income loss and rehabilitation assistance (LARRIPP, 2007, Chapter III) For illegal residents, LGUs and NHA will collaborate to provide low-cost housings or a resettlement site to the PAPs (RA7279).	therefore, there is no notable gap while there are limitations for the compensation amount.	and will consider the project impact on livelihood including that caused by project impact on business activities based on their socioeconomic status, the laws, and regulations in the Philippines and JICA Guidelines. Impact on business activities will be avoided as much as possible.
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	In negotiating the level of compensation, project proponents must pay to the owner: 1) Current market price of land; 2) For negotiated sale, payment of capital gains tax (CGT) is shouldered by the IA. 3) Replacement cost for structure and other assets; and	For expropriation, CGT shall be paid by owner because the compensation is determined by the courts; hence, IA cannot offer an additional compensation outside the court's decision.	Compensation will be provided to the PAPs based on the full replacement cost measured based on the current market value.

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
		4) Current market value of the crops and trees (RA 10752 No.5, No.6).		
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	Under R.A. 10752, PAPs will be paid only 50% of the negotiated price of the affected land and 70% of the negotiated price of the affected structures, improvements, crops, and trees upon the execution of a deed of sale. The balance of payment is paid as stated below provided that the land is already completely cleared of structures, improvements, crops, and trees. (1) At the time of the transfer of title in the name of the Republic of the Philippines, in cases where the land is wholly affected; or (2) At the time of the annotation of a deed of sale on the title, in cases where the land is partially affected.	Compensation and other support to the PAPs are not provided fully prior to displacement	All compensation and support will be provided to the PAPs prior to displacement.
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public during the validation of the IA. (JICA GL)	National Economic and Development Authority (NEDA) ICC Policy requires the project proponent to acquire the ROW and to prepare and submit a resettlement action plan. DPWH ROW Manual states that the RAP will be disclosed at the validation stage.	LARRIPP 2007 requires the RAP to be disclosed at the validation stage so there is no notable gap.	RAP will be prepared and be made available on DPWH's webpage under this project.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities	No resettlement of urban or rural dwellers shall be undertaken without adequate consultation with them and the communities where they are to be relocated. (Philippine Constitution: Section 10).	There is no notable gap.	PAPs will be invited to attend the stakeholder meetings from the early stage of the project to implementation stage.

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
	based on sufficient information made available to them in advance. (JICA GL)	Adequate consultations on the matter of resettlement with the duly designated representatives of the families to be resettled and the affected communities in the areas where they are to be relocated shall be mandatory (RA 7279 Section 28). Conduct barangay Public Consultation Meetings (PCMs). PCMs must be held in each barangay that will be traversed by the project. (DPWH DO 152 2017)		
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	All information on the project must be made public in a language and form easily understandable to the people (DENR Administrative Order No. 96-37 Article 2).	While the laws in the Philippines do not clearly mention affected people (*instead they use the word beneficiaries), there appears to be no notable gap in essence.	Stakeholder meetings and public consultations will be held in a language widely used in the local area with visual aids.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	No. 23 of RA 7279 states that the beneficiaries of the project must, in coordination with the Presidential Commission for the Urban Poor (PCUP) and relevant government bodies, participate in the decision-making process concerned with protecting and promoting legal collective interest. Public Consultation Meetings (PCMs) must be held in each barangay that will be traversed by the project. Venues for PCMs must be neutral grounds such as barangay halls, day care centers, public schools, and the like (DPWH ROW Acquisition Manual	There is no notable gap.	Participation of the PAPs will be promoted by having discussions with the PAPs from early stage of RAP preparation at the scoping stage throughout the survey. Their livelihood will be monitored continuously into the implementation stage of the project.

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
		Section 2.4 and 2.5). With regards to monitoring, Chapter VIII of LARRIPP 2007 stipulates the objective, scope, monitoring mechanism, stages and frequency of monitoring, schedule of implementation, reporting and monitoring indicators		
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	RA9285 (Alternative Dispute Resolution (ADR) Act of 2004) recommends that disputes be resolved through an alternative dispute resolution (ADR). A grievance redress procedure is described in Chapter VI of the LARRIPP that if the complaint is not satisfactorily resolved in 15 days or the PAP does not receive any response from the RIC, the PAP can forward the complaint to or file an appeal at the DPWH Regional Office (RO) and if the complaint is not satisfactorily resolved in 15 days or the PAP does not receive any response from the DPWH RO, the PAP can file a legal complaint in any appropriate Court of Law.	There is no notable gap.	A grievance redress mechanism (i.e. municipal and city RAP implementation committee/ M/CRIC) will be formed based on LARRIPP prior to implementation of the RAP and finalized in consultation with DPWH and other relevant government bodies.
11	Affected people are to be identified and recorded as early as possible to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and	LGUs must prepare an inventory of informal settler families (ISFs) (RA7279). According to Article 4 of the rules for registers of welfare housing: • Under each LGU, the city/town will be responsible for registering socially vulnerable and homeless people; and • Registration will take place at the barangay level in the barangay	There is no notable gap.	Affected people will be identified at an early stage of the study as part of the RAP survey, which consists of census, lost-asset inventory, and socioeconomic surveys. A cut-off date will be set at the commencement day of the census survey and announced at the

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
	socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	registration committee with the barangay captain taking responsibility		first stakeholder meeting and/or through other appropriate means.
		DRAM stipulates the procedures of preparing a RAP, which mentions carrying out census and socioeconomic surveys as well as tagging of affected structures.		
		DRAM stipulates that PAPs shall be determined based on the cut-off date.		
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Compensation of structures and improvements - among the non-regular residents of the public land, those eligible for relocation based on RA 10752 Section 5 (b) are those: • having Filipino nationality; • be a homeless citizen below the poverty level; • do not own real estate in urban and rural areas; and • not a member of a professional squatter or squatter syndicate.	Many informal settlers that do not meet the requirements may occupy the site of the government but unless they: (a) meet the requirements set forth in RA10752 and RA7279; or (b) have a certificate that shows the consent of the owner, they cannot receive compensation for their structure.	Based on the findings of socioeconomic survey, an entitlement matrix will be prepared for both formal and informal settlers.
		According to RA Implementation Rule 10 of 10752, informal settlers of private land is: those that do not meet the above four requirements but have proof of ownership of the structure (such as a disclaimer certificate issued by the owner or a local government) and have the right to compensation.		
		The government, through the Housing and Urban Development Coordinating Council (HUDGC) and the National Housing Authority (NHA), in coordination with the		

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
		LGUs and implementing agencies concerned, shall establish, and develop resettlement sites for informal settlers. Eligible Residents (RA 7279) who are informal settlers are: • having Filipino nationality; • be a homeless citizen below the poverty level; • do not own real estate in urban and rural areas; and • not a member of a professional squatter or squatter syndicate.		
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	According to Chapter III A-4-d of LARRIPP 2007, Land swapping if feasible, 'land for land', will be provided in terms of a new parcel of land of equivalent market value, at a location acceptable under zoning laws, or a plot of equivalent value, whichever is larger, in a nearby resettlement area with adequate physical and social infrastructure.	There is no legal rule that prioritize land-based resettlement strategies.	Preference would be given to the extent possible, subject to availability of land and other circumstances, to land-based resettlement strategies for displaced persons whose livelihoods are land-based. FGDs will be held based on the socioeconomic survey to ensure that there is no negative change when compared with the affected people's income before relocation (land-based livelihoods etc.).
14	Provide support for the transition period (between displacement	DO 327 ANNEX B Guideline for Infra project stipulates the "Transitional allowance" for house tenants: equivalent to one month rent	There is no notable gap.	Support for the transition period will be offered to the dislocated

No	JICA Guidelines and World Bank OP 4.12	Legislation of Philippines	Major Gaps	Proposed Gap Filling Measures
	and livelihood restoration). (WB OP4.12 Para.6)	and shop owners: income loss during demolition and reconstruction of their shop maximum one month.		PAPs under this project.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	RA 8381 section II declare that the states shall recognize and promote all the rights of Indigenous Cultural Communities /Indigenous Peoples. DO 327 ANNEX B Guideline for Infra project stipulates the "Rehabilitation Assistance" in the form of special skill trainings for severely affected PAPs. LARRIPP 2007 Chapter II stipulated the provision of appropriate assistance to the vulnerable group.	There is no notable gap.	During the public consultation, the socially vulnerable groups will be invited to know their needs and solicit comments and suggestions on what assistance they need. In addition to this, they will be identified during the RAP survey and necessary support will be provided.
16	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	The Resettlement Action Plan (RAP) refers to the planning document that describes what will be done to address the direct social and economic impacts associated with involuntary taking of land or land acquisition. The ARAP is acceptable if fewer than 200 people are affected. It is also acceptable if more than 200 people are affected so long as all land acquisition is minor (10 percent or less of all holdings is taken) and no physical relocation is required (LARRIPP, 2007).	There is no notable gap.	

4 SCOPE OF LAND ACQUISITION AND RESETTLEMENT

4.1 Summary of Project Impacts

The feasibility study aimed to identify the road alignment option that would result in minimal disturbance to the community especially in terms of involuntary displacement. However, the study showed that complete avoidance of existing properties was not possible, and displacement will still occur.

Project impacts are classified into three (3) main types, namely: impacts on land, impacts on structure and improvements, and impacts on crops and trees.

A total of 379 project affected persons (PAPs) will be affected by the project. In terms of number of project affected families, there are 96 PAFs comprising of 92 owners, two (2) co-owners, and two (2) sharers/rent-free occupant.

Based on Table 4-1, a total of 298 structures will be affected by the project. These structures are distributed as residential structures (99 units); residential-commercial structures (1 unit); commercial structures (3 units); institutional structures (4 units); community structures (52 units); and other structures (139 units)

In terms of land acquisition, a total of 3,943,800 m² will be acquired which traverses the 27 barangays. The project affected area has a total of 352 parcels of land. In terms of loss of crops and trees, agricultural crops covering an area of 2,571,526 m² & 2,552 coconuts and 9,815 productive trees will lose, respectively.

A summary of the project impacts is shown in Table 4-1.

Table 4-1. Summary of Project Impacts

Summary of Project Impacts		Total
Loss of Main Structures (Residential, Residential-Commercial & Commercial)	No. of Affected Families	96
	No. of Affected Persons by Loosing Residential, Residential-Commercial & Commercial Structures	379
	No. of Affected Residential Structures	99
	No. of Affected Residential-Commercial Structures	1
	No. of Affected Commercial Structures	3
Loss of Institutional Structures	No. of Affected Institutional Structures	4
Loss of Community Structures	No. of Affected Community Structures	52
Loss of Other Structures	No. of Affected Other Structures	139
Loss of Land	No. of Affected Parcels of Land	405

Summary of Project Impacts		Total
	No. of Affected Persons by Losing Parcel of Land	352
	Total Affected Land Area (m²)	3,943,800
Loss of Crops	Land Area of Affected Agricultural Crops (m²) No. of Affected Coconut	2,571,526 2,552
Loss of Trees	No. of Affected Forest / Fruit Trees / Other Forest Products	9,815

4.2 Project Affected Families (PAFs)

In the conduct of the socioeconomic survey, the study team considered the households and business owners occupying the project area. These PAFs are either have structures for residential, residential-commercial, and commercial purposes and were surveyed to determine their socioeconomic profile. A total of **96 PAFs** with **103 structures** were classified further as **99 residential**, one **(1) residential-commercial**, and three **(3) commercial structures**. These were considered in the survey (excluding under-construction and secondary structures) but only **71 PAFs** were interviewed since the 15 PAFs were out during the survey, two (2) PAFs refused to be interviewed and eight (8) absentee house owners. The two households who did not participate in the survey were not supportive of the project since their properties will be affected and they are requesting for realignment.

Moreover, of the total PAFs, there were 22 IP PAFs who occupied land inside ROW they belong to Higaonon (15), Talaandig (6), and Bukidnon-Tagoloanon (1) tribes. The breakdown of the households is shown in Table 4-2.

Table 4-2. Total Project Affected Families (PAFs)

Tenurial Status	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Interviewed	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**74%**
Owner	*2*	*13*	*19*	*10*	*15*	*8*	*67*	
Co-owner	*0*	*0*	*0*	*1*	*0*	*1*	*2*	
Sharer/ Rent-Free Occupant	*0*	*0*	*2*	*0*	*0*	*0*	*2*	
Not Interviewed	**1**	**6**	**11**	**1**	**3**	**3**	**25**	**26%**
Out During Census	*1*	*5*	*6*	*0*	*1*	*2*	*15*	
Refused to be Interviewed	*0*	*0*	*2*	*0*	*0*	*0*	*2*	
Absentee House Owner	*0*	*1*	*3*	*1*	*2*	*1*	*8*	
Total	**3**	**19**	**32**	**12**	**18**	**12**	**96**	***100 %***

4.3 Asset Inventory

The CMHSHCP will involve road construction and improvements to include widening, slope protection and drainage that will require the road right-of-way acquisition of public land and private land. Land acquisition will cause physical and economic displacement such as (i) permanent loss of land along the required 60-m ROW, (ii) loss/damage to structures and improvement, (iii) loss of crops and trees, (iv) loss of income/business, (v) increase vulnerability, and (vi) temporary loss or disruption of land use or other assets during construction works, specifically the nature of movement of construction materials to and from work sites is also anticipated.

4.3.1 Impacts on Land

The CMHSHCP measures 65.73 km long and will require a total land area of 3,943,800 m^2 of land. Since no complete/updated land use plan was provided by the LGUs, the RAP team delineated using GPS. The road traverses 27 affected barangays of the six (6) affected LGUs. Based on research data the land use classification of project area is agricultural land.

On the other hand, there are 405 parcels of land owned by 352 PAPs, of which 129 were identified based on the official land ownership documents provided by the LGUs and DENR. The remaining 223 PAPs will be determined during the conduct of parcellary survey under the DED stage. All land parcel owners live outside ROW.

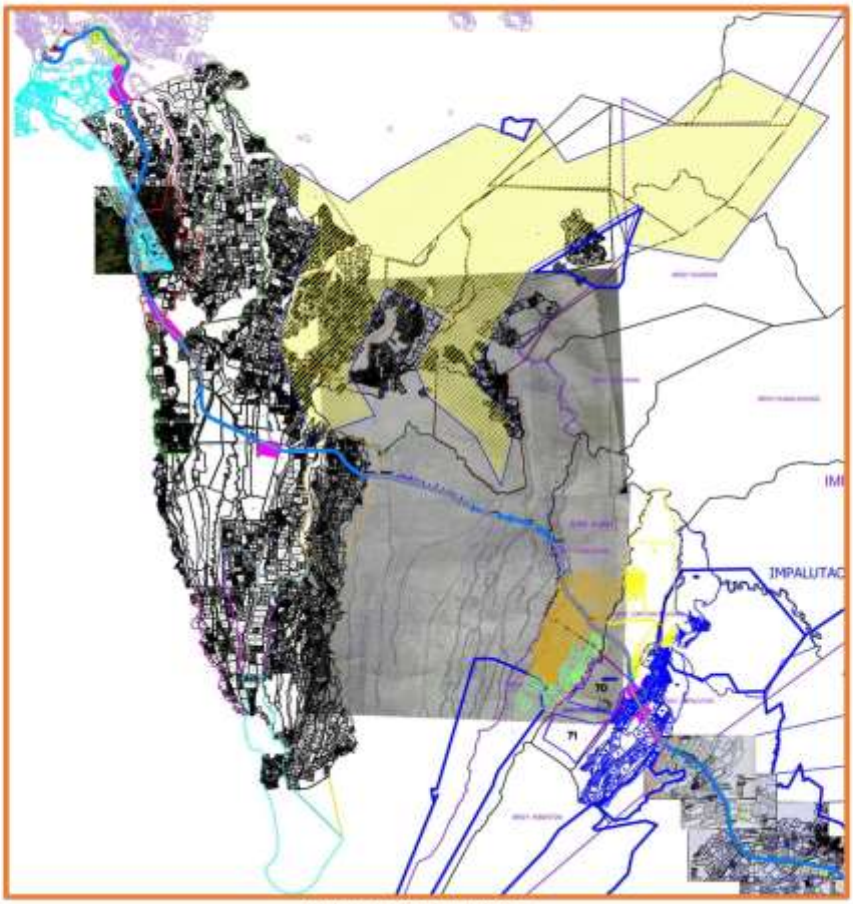


Figure 4-1 Cadastral Map

Table 4-3 provides details of the project components requiring land acquisition and bridge approaches (Appendix 1 – Impacts on Land).

Table 4-3. Loss of Land

Affected LGUs	No. of Parcel of Land*	Total No. of Affected Landowner			Loss of Land (sq.m.)					Total (sq.m.)
		Identified Landowner	To be identified during DED	Total No. of Affected Landowners	Agricultural	Others				
						Canyon	Creek	River	Road	
Misamis Oriental	**80**	**37**	**20**	**57**	**598,418**	**-**	**-**	**-**	**2,506**	**600,924**
Tagoloan	*23*	*7*	*16*	*23*	*369,425*	*-*	*-*	*-*	*1,280*	*370,705*
City of Cagayan de Oro	*57*	*30*	*4*	*34*	*228,993*	*-*	*-*	*-*	*1,226*	*230,219*
Bukidnon	**325**	**92**	**203**	**295**	**3,035,932**	**26,853**	**89,418**	**152,646**	**38,027**	**3,342,876**
Manolo Fortich	*129*	*-*	*129*	*129*	*1,329,240*	*-*	*1,596*	*37,645*	*1,622*	*1,370,103*
Sumilao	*44*	*-*	*44*	*44*	*536,084*	*26,853*	*7,785*	*82,034*	*21,704*	*674,460*
Impasug-ong	*84*	*45*	*14*	*59*	*506,381*	*-*	*38,368*	*32,967*	*5,715*	*583,431*
City of Malaybalay	*68*	*47*	*16*	*63*	*664,227*	*-*	*41,669*	*-*	*8,986*	*714,882*
Total	**405**	**129**	**223**	**352**	**3,634,350**	**26,853**	**89,418**	**152,646**	**40,533**	**3,943,800**
%		*36.6%*	*63.4%*	*100%*	*92.2%*	*0.7%*	*2.3%*	*3.9%*	*1.0%*	*100%*

*Including canyon, creek, river and road

4.3.2 Impacts on Structures

Interviews conducted with structure owners revealed that all the affected structures are situated on private lands. Table 4-4 shows a list of these structures per LGU. Details such as the valuation of each structure based on replacement cost as defined in Section 10 of the IRR of R.A. 10752 are in Appendix 2 - Impacts on Structure.

Table 4-4 shows that out of the total 298 structures, 103 are considered main structures of which 99 are residential, one (1) residential-commercial, and three (3) commercial structures. There are also institutional and community facilities affected such as basketball court, chapel, stage, and electrical post. Other structures such as comfort rooms, kitchens, fences, storage, etc. account for almost half (139) of the total affected structures.

Table 4-4. Loss of Structures

Affected LGUs	Loss of Structures						Total
	Residential	Residential Commercial	Commercial	Institutional	Community	Others	
Misamis Oriental	**24**	**1**	**0**	**0**	**8**	**30**	**63**
Tagoloan	*3*	*0*	*0*	*0*	*6*	*7*	*16*
City of Cagayan de Oro	*21*	*1*	*0*	*0*	*2*	*23*	*47*
Bukidnon	**75**	**0**	**3**	**4**	**44**	**109**	**235**
Manolo Fortich	*31*	*0*	*1*	*3*	*17*	*50*	*102*
Sumilao	*13*	*0*	*0*	*0*	*3*	*17*	*33*
Impasug-ong	*19*	*0*	*1*	*1*	*11*	*19*	*51*
City of Malaybalay	*12*	*0*	*1*	*0*	*13*	*23*	*49*
Total	**99**	**1**	**3**	**4**	**52**	**139**	**298**
%	33.2%	0.3%	1.0%	1.3%	17.4%	46.6%	100%

Affected structures used for residential purposes are tabulated below. The 99 severely affected structures have an area of 4,059 m² and this translates to 98% severity.

Table 4-5. Loss of Residential Structures

Affected LGUs	No. of Residential Structures	Affected Residential Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**24**	**721**	**721**	**100%**	**0**	**24**
Tagoloan	*3*	*101*	*101*	*100%*	*0*	*3*
City of Cagayan de Oro	*21*	*620*	*620*	*100%*	*0*	*21*
Bukidnon	**75**	**3,443**	**3,339**	**97%**	**0**	**75**
Manolo Fortich	*31*	*1,478*	*1,417*	*96%*	*0*	*31*
Sumilao	*13*	*573*	*530*	*92%*	*0*	*13*
Impasug-ong	*19*	*844*	*844*	*100%*	*0*	*19*

Affected LGUs	No. of Residential Structures	Affected Residential Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
City of Malaybalay	*12*	*549*	*549*	*100%*	*0*	*12*
Total	**99**	**4,163**	**4,059**	**98%**	**0**	**99**

For residential-commercial use, one (1) severely affected structure was identified during the socioeconomic survey covering an area of 22 m².

Table 4-6. Loss of Residential-Commercial Structures

Affected LGUs	No. of Residential-Commercial Structures	Affected Residential-Commercial Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**1**	**22**	**22**	**100%**	**0**	**1**
Tagoloan	*0*	*0*	*0*	*0%*	*0*	*0*
City of Cagayan de Oro	*1*	*22*	*22*	*100%*	*0*	*1*
Bukidnon	**0**	**0**	**0**	**0%**	**0**	**0**
Manolo Fortich	*0*	*0*	*0*	*0%*	*0*	*0*
Sumilao	*0*	*0*	*0*	*0%*	*0*	*0*
Impasug-ong	*0*	*0*	*0*	*0%*	*0*	*0*
City of Malaybalay	*0*	*0*	*0*	*0%*	*0*	*0*
Total	**1**	**22**	**22**	**100%**	**0**	**1**

For the loss of commercial structure, it shows that there are three (3) severely affected structures with an area of 108 m².

Table 4-7. Loss of Commercial Structures

Affected LGUs	No. of Commercial Structures	Affected Commercial Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**0**	**0**	**0**	**0%**	**0**	**0**
Tagoloan	*0*	*0*	*0*	*0%*	*0*	*0*
City of Cagayan de Oro	*0*	*0*	*0*	*0%*	*0*	*0*
Bukidnon	**3**	**108**	**108**	**100%**	**0**	**3**
Manolo Fortich	*1*	*8*	*8*	*100%*	*0*	*1*
Sumilao	*0*	*0*	*0*	*0%*	*0*	*0*
Impasug-ong	*1*	*70*	*70*	*100%*	*0*	*1*
City of Malaybalay	*1*	*30*	*30*	*100%*	*0*	*1*
Total	**3**	**108**	**108**	**100%**	**0**	**3**

For the loss of institutional structures such as basketball court, chapels and stage, it shows that the four (4) severely affected structures have an area of 458 m².

Table 4-8. Loss of Institutional Structures

Affected LGUs	No. of Institutional Structures	Affected Institutional Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**0**	**0**	**0**	**0%**	**0**	**0**
Tagoloan	*0*	*0*	*0*	*0%*	*0*	*0*
City of Cagayan de Oro	*0*	*0*	*0*	*0%*	*0*	*0*
Bukidnon	**4**	**496**	**458**	**92%**	**0**	**4**
Manolo Fortich	*3*	*447*	*409*	*92%*	*0*	*3*
Sumilao	*0*	*0*	*0*	*0%*	*0*	*0*
Impasug-ong	*1*	*49*	*49*	*100%*	*0*	*1*
City of Malaybalay	*0*	*0*	*0*	*0%*	*0*	*0*
Total	**4**	**496**	**458**	**92%**	**0**	**4**

For the loss of community structures such as electric post, waiting shed, water tank, etc., it shows that all of them are severely affected structures.

Table 4-9. Loss of Community Structures

Affected LGUs	No. of Community Structures	Affected Community Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**8**	**9**	**9**	**100%**	**0**	**8**
Tagoloan	*6*	*0*	*0*	*0%*	*0*	*6*
City of Cagayan de Oro	*2*	*9*	*9*	*100%*	*0*	*2*
Bukidnon	**44**	**267**	**267**	**100%**	**0**	**44**
Manolo Fortich	*17*	*30*	*30*	*100%*	*0*	*17*
Sumilao	*3*	*36*	*36*	*100%*	*0*	*3*
Impasug-ong	*11*	*201*	*201*	*100%*	*0*	*11*
City of Malaybalay	*13*	*0*	*0*	*0%*	*0*	*13*
Total	**52**	**276**	**276**	**100%**	**0**	**52**

Majority of the other structures are comfort room, dirty kitchen, extensions, fences, etc. are severely affected by the project.

Table 4-10. Loss of Other Structures

Affected LGUs	No. of Other Structures	Affected Other Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Misamis Oriental	**30**	**5,710**	**3,550**	**62%**	**1**	**29**
Tagoloan	*7*	*1,851*	*1,851*	*100%*	*0*	*7*
City of Cagayan de Oro	*23*	*3,859*	*1,699*	*44%*	*1*	*22*
Bukidnon	**109**	**18,486**	**11,117**	**60%**	**4**	**105**
Manolo Fortich	*50*	*10,073*	*4,323*	*43%*	*3*	*47*

Affected LGUs	No. of Other Structures	Affected Other Structures				
		Total Area	Affected Area	Severity		
				% Severity	Marginally-Affected	Severely-Affected
Sumilao	*17*	*1,023*	*1,023*	*100%*	*0*	*17*
Impasug-ong	*19*	*2,377*	*777*	*33%*	*1*	*18*
City of Malaybalay	*23*	*5,013*	*4,995*	*100%*	*0*	*23*
Total	**139**	**24,196**	**14,667**	**61%**	**5**	**134**

Majority of the structures are made up of light materials (51%) followed by concrete/permanent (38%) and semi-permanent materials (11%).

Table 4-11. Type of Structures

Affected LGUs	Type of Structure			Total
	Concrete/ Permanent	Semi-Permanent	Light	
Misamis Oriental	**15**	**10**	**38**	**63**
Tagoloan	*6*	*3*	*7*	*16*
City of Cagayan de Oro	*9*	*7*	*31*	*47*
Bukidnon	**99**	**22**	**114**	**235**
Manolo Fortich	*51*	*10*	*41*	*102*
Sumilao	*11*	*2*	*20*	*33*
Impasug-ong	*17*	*4*	*30*	*51*
City of Malaybalay	*20*	*6*	*23*	*49*
Total	**114**	**32**	**152**	**298**
%	*38%*	*11%*	*51%*	*100%*

4.3.3 Summary of Affected Crops

The project is also seen to impact livelihood as crops that provide income to affected persons will be displaced. As discussed during the public consultation meetings, production of agricultural products such as banana, corn, rice, and other crops play a vital role as sources of income of the residents and farm workers in the locality (Appendix 3 – Impacts on Crops).

The estimated number of affected agricultural crops and number of affected coconuts is shown in Table 4-12.

Table 4-12. Loss of Crops

Affected LGUs	Total Number of Coconut	Agricultural Crops (sq. m.)						
		Pineapple	Corn	Banana	Sugarcane	Cassava	Others*	Total Agricultural Crops (sq.m.)
Misamis Oriental	**2,143**	**0**	**9,600**	**7,866**	**3,600**	**21,600**	**16,200**	**58,866**
Tagoloan	*1,037*	*0*	*0*	*4,866*	*3,600*	*0*	*5,400*	*13,866*

Affected LGUs	Total Number of Coconut	Agricultural Crops (sq. m.)						
		Pineapple	Corn	Banana	Sugarcane	Cassava	Others*	Total Agricultural Crops (sq.m.)
City of Cagayan de Oro	*1,106*	*0*	*9,600*	*3,000*	*0*	*21,600*	*10,800*	*45,000*
Bukidnon	**409**	**1,434,000**	**453,800**	**215,210**	**168,000**	**121,150**	**120,500**	**2,512,660**
Manolo Fortich	*333*	*677,400*	*84,000*	*9,460*	*0*	*83,850*	*26,400*	*881,110*
Sumilao	*40*	*285,000*	*48,000*	*5,200*	*1,200*	*32,500*	*8,400*	*380,300*
Impasug-ong	*21*	*305,400*	*189,000*	*88,950*	*51,600*	*4,800*	*44,800*	*684,550*
City of Malaybalay	*15*	*166,200*	*132,800*	*111,600*	*115,200*	*0*	*40,900*	*566,700*
Total	**2,552**	**1,434,000**	**463,400**	**223,076**	**171,600**	**142,750**	**136,700**	**2,571,526**

*Others include: squash, rice, dragon fruit, calamansi, baguio beans, etc.

4.3.4 Summary of Affected Trees

The affected number of trees is 9,815. Data on the number, type and valuation of rubber plant, gmelina, falcata, african tulip, mango, lansones, and others are provided in Appendix 4 – Impacts on Trees.

Table 4-13. Loss of Trees (No.)

Affected LGUs	Forest / Fruit Trees / Other Forest Products (n)							Total**
	Rubber Tree	Gmelina	Falcata	African Tulip	Mango	Lansones	Others*	
Misamis Oriental	**0**	**197**	**12**	**8**	**195**	**34**	**683**	**1,129**
Tagoloan	*0*	*86*	*12*	*4*	*169*	*0*	*508*	*779*
City of Cagayan de Oro	*0*	*111*	*0*	*4*	*26*	*34*	*175*	*350*
Bukidnon	**2,296**	**892**	**697**	**633**	**341**	**490**	**3,337**	**8,686**
Manolo Fortich	*635*	*345*	*53*	*329*	*302*	*203*	*1,640*	*3,507*
Sumilao	*1*	*103*	*58*	*110*	*11*	*91*	*606*	*980*
Impasug-ong	*417*	*250*	*121*	*87*	*15*	*118*	*635*	*1,643*
City of Malaybalay	*1,243*	*194*	*465*	*107*	*13*	*78*	*456*	*2,556*
Total	**2,296**	**1,089**	**709**	**641**	**536**	**524**	**4,020**	**9,815**

*Others include: mahogany, antipolo, agoho, marang, nangka, etc.
**One of the affected landowner (Magic Farm and Ranch) did not allow the survey team to conduct the IOL for Crops and Trees.

5 CENSUS, ASSET INVENTORY AND SOCIOECONOMIC STUDY

5.1 Socioeconomic Profile

In determining the extent of impacts on the loss of land, structures, crops, and tress, only the households occupying the affected project areas were considered during the conduct of the socioeconomic survey (SES).

The SES includes information on gender, age, civil status, educational attainment, religion, place of origin, length of stay, primary occupation/source of income of household heads, estimated income from primary source for the last 12 months, secondary occupation/income source, total income for the last 12 months, estimated total monthly household expenditures, and average monthly expenses. The results provide the socioeconomic profiles of the directly affected families.

5.1.1 Affected Local Government Units (LGUs)

Table 5-1 shows the population of Bukidnon and Misamis Oriental in the 2020 census. For Misamis Oriental, it has a population of 1,685,302 with a density of 519 inhabitants per square kilometer. Almost half of the inhabitants in Misamis Oriental live in Cagayan de Oro City with a total of 728,402 or 43.22% of the province population while the municipality of Tagoloan has a population of 80,319 (4.77%). Both the population densities of the two LGUs are higher compared to the province as shown in Table 5-1. The City of Cagayan de Oro has 1,765 persons per km square while Tagoloan has 682 inhabitants per square kilometer. In terms of number of barangays, the province has a total of 504 barangays, 10 of which are in Tagoloan and 80 barangays are in City of Cagayan de Oro.

The other province that will be affected by the proposed project is Bukidnon with four (4) affected LGUs, namely: Manolo Fortich, Sumilao, Impasug-ong, and City of Malaybalay. Based on the 2020 PSA data, the province has a population of 1,541,308. The City of Malaybalay has the highest population of 190,712 (12.37%) followed by Manolo Fortich with population of 113,200 (7.34%) while the third is Impasug-ong having a population of 53,863 (3.49%) and lastly is Sumilao with population of 29,531 (1.92%). Manolo Fortich (274), City of Malaybalay (197), and Sumilao (150) all have higher population density as compared to Bukidnon (147) while Impasug-ong (51) has the lowest population density. The total number of barangays in Bukidon is 464, 22 of which are in Manolo Fortich, 10 barangays in Sumilao, 13 barangays in Impasug-ong, and 46 barangays are in City of Malaybalay.

Table 5-1. Provincial Statistics by Affected City/Municipality

Affected LGUs	Population		Area (km²)		Density (Persons/ km²)	No. of Barangays
	Total	% from Province	km²	% from Province		
Misamis Oriental	1,685,302	100.00%	3,249.25	100.00%	519	504
Tagoloan	80,319	4.77%	117.73	3.62%	682	10
City of Cagayan de Oro	728,402	43.22%	412.80	12.70%	1765	80
Bukidnon	1,541,308	100.00%	10,498.59	100.00%	147	464

Affected LGUs	Population		Area (km²)		Density (Persons/ km²)	No. of Barangays
	Total	% from Province	km²	% from Province		
Manolo Fortich	113,200	7.34%	413.60	3.94%	274	22
Sumilao	29,531	1.92%	196.95	1.88%	150	10
Impasug-ong	53,863	3.49%	1,051.17	10.01%	51	13
City of Malaybalay	190,712	12.37%	969.19	9.23%	197	46

Population, Land Area, Population Density, and Percent Change in Population Density of the Philippines by Region, Province/Highly Urbanized City, and City/Municipality: 2010, 2015, and 2020. PSA

Table 5-2 to Table 5-7 shows the population of affected LGUs and affected barangays.

Table 5-2. 2020 Population of Affected Barangay in Tagoloan

Location	Population	
	Total	% from Municipality
Tagoloan	80,319	100%
Casinglot	10,207	13%
Natumolan	10,878	14%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020. PSA

Table 5-3. 2020 Population of Affected Barangay in the City of Cagayan de Oro

Location	Population	
	Total	% from City
City of Cagayan de Oro	728,402	100%
Bugo	31,229	4%
Balubal	7,013	1%
Puerto	13,174	2%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020. PSA

Table 5-4. 2020 Population of Affected Barangay in the Manolo Fortich

Location	Population	
	Total	% from Municipality
Manolo Fortich	113,200	100%
Mambatangan	5,332	5%
Alae	11,913	11%
San Miguel	5,515	5%
Damilag	16,303	14%
Dicium	4,507	4%
Tankulan (Pob.)	8,954	8%
Sankanan	3,776	3%
Ticala	1,353	1%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020. PSA

Table 5-5. 2020 Population of Affected Barangay in the Sumilao

Location	Population	
	Total	% from Municipality
Sumilao	29,531	100%

Location	Population	
	Total	% from Municipality
Puntian	1,642	6%
Villa Vista	2,669	9%
San Roque	1,380	5%
Culasi	617	2%
Poblacion	4,927	17%
Kisolon	12,306	42%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020, PSA

Table 5-6. 2020 Population of Affected Barangay in the Impasug-ong

Location	Population	
	Total	% from Municipality
Impasug-ong	53,863	100%
Poblacion	12,693	24%
La Fortuna	4,812	9%
Capitan Bayong	3,751	7%
Cawayan	2,315	4%
Impalutao	7,081	13%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020, PSA

Table 5-7. 2020 Population of Affected Barangay in the City of Malaybalay

Location	Population	
	Total	% from City
City of Malaybalay	190,712	100%
Dalwangan	7,785	4%
Patpat (Lapu-lapu)	4,366	2%
Kalasungay	9,961	5%

Total Population by Province, City, Municipality, and Barangay as of May 1, 2020, PSA

The male population[3] of the affected LGUs is slightly higher (51.5%) than the number of females (48.5%). In terms of age, the less than 15 years old population constitutes 34%, while the productive or 15 – 64 years of age is 62%. The elderly or 65 years and above is 4%. This places the dependency ratio or the number of dependents 0-14 years and 65 years and over for every 100% in the productive age 15-64 at 60.7.

Affected LGUs regular income are derived from taxes, licenses, fees and the Internal Revenue Allotment (IRA). According to the Bureau of Local Government Finance[4], the combined annual regular income of affected LGUs for the fiscal year of 2018 was PHP 5,452,920,235.35. Looking at the involvement of employed males and females in the area, almost half of the employed workers are those performing simple and routine tasks which may require the use of handheld tools and considerable physical effort (elementary occupation) and service and sales workers.

[3] Total Population by Age Group, Sex, and City/Municipality, PSA (https://psa.gov.ph/population-and-housing/statistical-tables)
[4] Annual Regular Income, DOF – Bureau f Local Government Finance (https://blgf.gov.ph/lgu-fiscal-data/)

According to the Municipal and City Level Small Area Poverty Estimates[5], the average poverty incidence in the affected LGUs is 33.7, which is 30.4 lower than the previous estimates. Majority of the gainful workers (15 years old and over) are elementary occupations and service & sales workers.

In terms of the gainful worker's occupational groups[6], major group occupations in the affected LGUs are elementary occupations (27.1%), service and sales workers (18.7%), managers (9.3%), craft and related trades workers (8.9%), skilled agricultural forestry and fishery workers (8.8%), plant and machine operators and assemblers (8.3%), professionals (6.7%), clerical support workers (6.6%), technicians and associate professionals (5.1%), armed forces occupations (0.4%), and those did not report any occupation(0.1%)

From the population of ten (10) years old and over, the literacy rate is 98.9%[7]. Highest educational attainment of five (5) years old and over by highest grade/year completed are the following: pre-school (2.91%), elementary undergraduate (21%), elementary graduate (9.39%), high school undergraduate (14.81%), high school graduate (21.41%), post-secondary undergraduate (0.04%), post-secondary graduate (1.21%), college undergraduate (12.81%), academic degree holder (13.39%), post-baccalaureate (0.20%) and those with special education, not stated/no grade completed are (2.83%).

There are also various health and wellness facilities like hospitals, medical clinics, lying-in clinics/birthing within the affected LGUs, and nearby provinces that provide essential health services to the residents that can administer first aid treatment for emergency cases and perform minor/major surgical operations.

5.1.2 Project Affected Families (PAFs)

A total of **96 PAFs** were considered in the survey including 22 IP PAFs but only **71 PAFs** were interviewed since the 15 PAFs were out during the survey, two (2) PAFs refused to be interviewed and eight (8) absentee house owners the average household size is 3.94. The breakdown of the PAFs and household size is shown in Table 5-8 and Table 5-8.

Table 5-8. Total Project Affected Families (PAFs)

Tenurial Status	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Interviewed	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**74%**

[5] Municipal and City Level Small Area Poverty Estimates, PSA (https://psa.gov.ph/content/psa-releases-2015-municipal-and-city-level-poverty-estimates)
[6] Gainful Workers 15 Years Old and Over by Major Occupation Group, Age Group, Sex, and City/Municipality, PSA (https://psa.gov.ph/population-and-housing/statistical-tables)
[7] Literacy of the Household Population 10 Years Old and Over by Age Group, Sex, and City/Municipality, PSA (https://psa.gov.ph/population-and-housing/statistical-tables)

Tenurial Status	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Not Interviewed	**1**	**5**	**11**	**1**	**4**	**3**	**25**	**26%**
Total	**3**	**18**	**32**	**12**	**19**	**12**	**96**	**100%**

Table 5-9. Household Size

Household Size	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
One (1)	0	0	3	0	3	0	**6**	**8%**
Two (2)	1	1	7	0	3	2	**14**	**20%**
Three (3)	0	5	3	0	1	1	**10**	**14%**
Four (4)	1	4	3	4	2	2	**16**	**23%**
Five (5)	0	1	2	3	2	2	**10**	**14%**
Six (6)	0	1	0	4	3	2	**10**	**14%**
Seven (7)	0	0	1	0	1	0	**2**	**3%**
Eight (8)	0	0	1	0	0	0	**1**	**1%**
Ten (10)	0	1	1	0	0	0	**2**	**3%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.1 Gender of Household Heads

Based on the 71 household heads that were interviewed, 61 or 86% are male-headed households while the remaining 10 or 14% are female-headed households. The households headed by women are also included in the vulnerable groups.

Table 5-10. Sex of Household Heads

Sex	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Male	2	10	19	11	12	7	**61**	**86%**
Female	0	3	2	0	3	2	**10**	**14%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.2 Age of Household Heads

In terms of age, 77% of the household heads are 20-59 years old, while the remaining 23% are considered senior citizens.

Table 5-11. Age of Household Heads

Age	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
20 - 24	0	0	0	1	1	0	**2**	**3%**
25 - 29	0	0	1	1	1	0	**3**	**4%**
30 - 34	0	3	2	0	1	0	**6**	**8%**
35 - 39	0	1	0	1	4	1	**7**	**10%**
40 - 44	0	1	2	5	1	1	**10**	**14%**
45 - 49	1	3	5	1	2	3	**15**	**21%**
50 - 54	0	1	0	0	2	1	**4**	**6%**
55 - 59	0	1	4	2	0	1	**8**	**11%**
60 - 64	1	2	1	0	1	0	**5**	**7%**
65 - 69	0	1	2	0	0	1	**4**	**6%**
70 - 74	0	0	2	0	0	0	**2**	**3%**
75 - 79	0	0	2	0	2	0	**4**	**6%**
No Response	0	0	0	0	0	1	**1**	**1%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.3 Civil Status of Household Heads

The majority of the affected household heads are married (55%) followed by with common-law partner/cohabitating (21%), widow/er (15%), single (7%) and one (1) separated (1%).

Table 5-12. Civil Status of Household Heads

Civil Status	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Single	0	0	1	0	4	0	**5**	**7%**
With Common-Law Partner/ Cohabitating	0	5	3	3	3	1	**15**	**21%**
Married	2	5	12	8	5	7	**39**	**55%**
Separated	0	0	0	0	0	1	**1**	**1%**
Widow/er	0	3	5	0	3	0	**11**	**15%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.4 Educational Attainment of Household Heads

Of the 71 affected household heads, 32% are elementary graduates, 28% are high school graduates, and 1% are college graduates while some are undergraduates of elementary (17%), high school (14%), and college (1%). Among the AHs only three percent completed a

vocation/technical course. The remaining two (2) AHs are with no education while another AH did not provide any response.

Table 5-13. Educational Attainment of Household Heads

Educational Attainment	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Elementary Undergraduate	1	4	3	2	1	1	**12**	**17%**
Elementary Graduate	0	4	6	2	7	4	**23**	**32%**
High School Undergraduate	0	2	2	1	3	2	**10**	**14%**
High School Graduate	1	2	7	5	4	1	**20**	**28%**
Vocational/ Technical	0	1	1	0	0	0	**2**	**3%**
College Undergraduate	0	0	1	0	0	0	**1**	**1%**
College Graduate	0	0	0	1	0	0	**1**	**1%**
No Education	0	0	1	0	0	0	**1**	**1%**
No Response	0	0	0	0	0	1	**1**	**1%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.5 Religion of Household Heads

Seventy-seven percent (77%) of the affected household heads are Roman Catholic and the rest are called Protestant/Evangelical (8%), Born-again (6%), Baptist/Seventh Day Adventist (4%), Iglesia Ni Cristo (3%), and Islam (1%).

Table 5-14. Religion

Religion	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Roman Catholic	0	12	16	7	13	7	**55**	**77%**
Born-Again	1	1	0	1	0	1	**4**	**6%**
Iglesia Ni Cristo	0	0	0	2	0	0	**2**	**3%**
Protestant/Evangelical	0	0	4	1	1	0	**6**	**8%**
Islam	0	0	0	0	0	1	**1**	**1%**
Others (Baptist & Seventh Day Adventist)	1	0	1	0	1	0	**3**	**4%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.6 Place of Origin of Household Heads

Before residing in their current location, 82% of the affected families said they lived within the same LGU. Only 3% came from the other LGUs but within the province of Bukidnon and Misamis Oriental. A significant 8% resided outside the province but within Mindanao and Visayas.

Table 5-15. Place of Origin

Place of Origin	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Within LGU	2	11	14	10	14	7	**58**	**82%**
Outside LGU, but within the Province	0	0	2	0	0	0	**2**	**3%**
Outside the Province	0	2	3	1	1	1	**8**	**11%**
Visayas	*0*	*0*	*1*	*0*	*0*	*0*	*1*	
Mindanao	*0*	*2*	*2*	*1*	*1*	*1*	*7*	
No Response	0	0	2	0	0	1	**3**	**4%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.7 Length of Residence of Household Heads

Survey results also indicated that 45% have lived in the area for more ta 20 years, while 21% have been in the area for 1-5 years. Thirty percent (30%) of the households have been living in their residences for 6-20 years. Only 4% of the households did not respond to the question.

Table 5-16. Length of Residence

Length of Residence	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
1-5 years	1	4	1	2	4	3	**15**	**21%**
6-10 years	0	3	3	1	1	0	**8**	**11%**
11-15 years	0	1	2	1	3	2	**9**	**13%**
16-20 years	0	1	0	1	1	1	**4**	**6%**
More than 20 years	1	4	13	5	6	3	**32**	**45%**
No Response	0	0	2	1	0	0	**3**	**4%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.8 Employment Status and Occupation of Household Heads.

Out of the total 71 interviewed, 59 or 83% are employed while the remaining 12 or 17% are unemployed and the occupation of the employed household head is shown in Table 5-8.

Table 5-17. Employment Status

Employed vs Unemployed	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Employed	2	13	13	11	11	9	**59**	**83%**
Unemployed	0	0	8	0	4	0	**12**	**17%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

Table 5-18. Occupation

Occupation	Misamis Oriental		Bukidnon				Total*	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Barangay Kagawad	1	0	0	0	0	0	**1**	**2%**
Bgy. Health Worker	0	1	0	0	0	0	**1**	**2%**
Businessman	0	1	0	0	0	0	**1**	**2%**
Caretaker	0	1	1	0	2	0	**4**	**7%**
Carpenter	0	1	0	0	0	0	**1**	**2%**
Construction Worker	0	1	0	1	1	0	**3**	**5%**
Driver	0	0	1	2	0	2	**5**	**8%**
Electrician	0	1	0	0	0	0	**1**	**2%**
Farmer	1	4	5	2	2	3	**17**	**29%**
OFW	0	2	4	5	6	3	**20**	**34%**
Security Guard	0	0	1	0	0	0	**1**	**2%**
Team Leader	0	0	0	1	0	0	**1**	**2%**
Vendor	0	1	0	0	0	0	**1**	**2%**
Watchman	0	0	0	0	0	1	**1**	**2%**
Welder	0	0	1	0	0	0	**1**	**2%**
Total	**2**	**13**	**13**	**11**	**11**	**9**	**59**	**100%**

*Based on employed household head

On employment status, 64% are self-employed or employees in the family business, 8% contractual, 3% are casuals or have temporary jobs while the remaining 25% are not employed.

Table 5-19. Employment Status of Household Heads

Employment Status	Misamis Oriental		Bukidnon				Total*	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Permanent	1	5	2	2	1	0	**11**	**19%**
Temporary/Casual	0	2	3	3	5	1	**14**	**24%**
Contractual	0	3	3	3	3	2	**14**	**24%**

Employment Status	Misamis Oriental		Bukidnon				Total*	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Seasonal	1	1	5	3	1	5	**16**	**27%**
For self - employed workers/ Employee in family business	0	2	0	0	0	0	**2**	**3%**
No Response	0	0	0	0	1	1	**2**	**3%**
Total	**2**	**13**	**13**	**11**	**11**	**9**	**59**	**100%**

*based on employed household head

5.1.2.9 Household Income

The survey results revealed that 70% of the AHs have monthly household incomes of PhP15,999 and below. On the other hand, about 26% of the total AHs earn PhP16,000 – PhP49,999, and the remaining 4% earn PhP50,000 and above. While for their monthly expenditures, majority (73%) have a monthly expense of below 10,000.

Table 5-20. Monthly Household Income

Total Monthly Household Income	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
PhP 2,000-3,999	0	1	2	0	2	0	***5***	***7%***
PhP 4,000-5,999	0	2	4	3	0	0	***9***	***13%***
PhP 6,000-7,999	0	1	1	1	0	2	***5***	***7%***
PhP 8,000-9,999	0	0	2	2	8	0	***12***	***17%***
PhP 10,000-11,999	0	3	3	1	1	2	***10***	***14%***
PhP 12,000-15,999	0	2	4	0	1	2	***9***	***13%***
PhP 16,000-19,999	0	1	3	0	0	2	***6***	***8%***
PhP 20,000-24,999	0	1	1	0	2	0	***4***	***6%***
PhP 25,000-29,999	0	0	0	1	0	0	***1***	***1%***
PhP 30,000-49,999	1	2	1	2	0	1	***7***	***10%***
PhP 50,000-above	1	0	0	1	1	0	***3***	***4%***
Total	**2**	**13**	**21**	**11**	**15**	**9**	***71***	***100%***

5.1.2.10 Household Expenditure

The monthly expenditure of the AHs are as follows: PhP10,000 and below (71%), PhP10,001 – PhP20,000 (32%), and PhP20,001 – PhP30,000 (4%).

Table 5-21. Monthly Household Expenditure

Total Monthly Household Expenditure	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
PhP 1,000-1,999	0	0	1	0	1	0	2	3%
PhP 2,000-3,999	0	1	5	3	1	1	11	15%
PhP 4,000-5,999	0	5	3	2	4	3	17	24%
PhP 6,000-7,999	0	2	4	2	5	2	15	21%
PhP 8,000-9,999	0	2	2	1	1	1	7	10%
PhP 10,000-11,999	0	2	2	0	0	0	4	6%
PhP 12,000-15,999	1	0	3	0	2	0	6	8%
PhP 16,000-19,999	0	1	1	2	1	1	6	8%
PhP 20,000-24,999	1	0	0	1	0	1	3	4%
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.11 Housing

Majority (92%) of the affected families used G.I. sheets while 8% used mixed materials as roofing for their houses. The various wall materials used are wood (42%), concrete (39%), bamboo (7%), and 11% of the affected families used mixed materials.

Table 5-22. Roof Material

Construction Materials of the Roof	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
G.I. Sheets	2	13	21	11	12	6	65	92%
Others (mixed)	0	0	0	0	3	3	6	8%
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

Table 5-23. Wall Material

Construction Materials of the Outer Wall	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Concrete	1	4	11	5	4	3	28	39%
Wood	1	8	8	3	6	4	30	42%
Bamboo	0	0	1	2	2	0	5	7%
Others (mixed)	0	1	1	1	3	2	8	11%
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.12 Electricity

Most of the affected families use Electricity (66%) as their main source of light while some (6%) use mixed sources of electricity. A significant 27% do not have electricity. Only one (1%) use Coleman as their light source.

Table 5-24. Light Source

Source/s of Power/Lighting	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Electric	1	12	15	10	3	6	**47**	**66%**
Coleman	0	0	0	0	1	0	**1**	**1%**
Others (mixed)	1	1	1	0	1	0	**4**	**6%**
None	0	0	5	1	10	3	**19**	**27%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.13 Water Source

Households rely on the following sources of water: piped water (56%), spring/river (23%), open well (8%), pump well (4%) and some (2%) rely on rainwater and artisan well while six percent (6%) use mixed sources of water. The survey on water sources implies an underdeveloped water service system.

Table 5-25. Water Source

Main Source/s of Drinking Water	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Rain water	0	0	0	0	0	1	**1**	**1%**
Spring/river	0	2	3	1	10	0	**16**	**23%**
Open well	0	0	3	1	0	2	**6**	**8%**
Artisan well	0	0	1	0	0	0	**1**	**1%**
Pump well	0	0	1	0	0	2	**3**	**4%**
Piped water	2	11	13	8	4	2	**40**	**56%**
Others (mixed)	0	0	0	1	1	2	**4**	**6%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.14 Fuel source for cooking

Seventy-six percent (76%) of the AHs used wood as the primary means of fuel for cooking some (15%) use an LPG while 8% use a mixed fuel source for cooking.

Table 5-26. Fuel Source for Cooking

Fuel for Cooking	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Wood	0	11	16	9	9	9	**54**	**76%**
LPG	1	1	4	2	3	0	**11**	**15%**
Others (combination of the above)	1	1	1	0	3	0	**6**	**8%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.2.15 Toilet

Two of every three affected families use a semi-flush as their toilet. Others use open pits (14%) and a flush (7%) in their homes, while 1% have more than one type of toilet facility. Only seven percent (7%) of the respondents do not have a toilet.

Table 5-27. Toilet

Kind of Toilet Facilities	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Open pit	0	3	4	1	2	0	**10**	**14%**
Semi-flush	2	8	12	10	11	7	**50**	**70%**
Flush	0	2	3	0	0	0	**5**	**7%**
Others (combination of the above)	0	0	0	0	1	0	**1**	**1%**
None	0	0	2	0	1	2	**5**	**7%**
Total	**2**	**13**	**21**	**11**	**15**	**9**	**71**	**100%**

5.1.3 Vulnerable Project Affected Families/Persons

This Preliminary RAP extends the compensation and assistance to the vulnerable AHs of the project. Following the definition of the Philippine Statistics Authority (PSA) regarding vulnerable groups which includes (i) households with elderly (aged 60 years old and above); (ii) indigenous people (IP); (iii) poor households whose income fall below the poverty threshold; (iv) households with member who has disability (PWD); (v) solo parent; and (vi) women-headed households (WHH). Further, regardless of number of vulnerabilities of one household, there will be only one unit of assistance for vulnerability for that household.

As shown in Table 5-28, there are 92 instances of vulnerability affecting 53 AHs. Majority of the instances were profiled from IP (29%), Elderly, ages 60 and up (21%) and Poor households were derived from the combined monthly income of the household heads and employed

household members (21%). This is followed by WHH (11%), Solo Parent (3%) and PWDs with 2%.

Table 5-28. Vulnerability of PAFs/PAPs

Affected LGUs	No. of Vulnerable Households	Vulnerabilities						Total Instances
		Elderly	IP	Poor	PWD	Solo Parent	WHH	
Misamis Oriental	**12**	**4**	**5**	**5**	**1**	**1**	**3**	**31**
Tagoloan	*2*	*1*	*1*	*0*	*0*	*0*	*0*	*4*
City of Cagayan de Oro	*10*	*3*	*4*	*5*	*1*	*1*	*3*	*27*
Bukidnon	**41**	**15**	**22**	**14**	**1**	**2**	**7**	**61**
Manolo Fortich	*16*	*9*	*6*	*4*	*1*	*0*	*2*	*38*
Sumilao	*9*	*0*	*7*	*6*	*0*	*0*	*0*	*22*
Impasug-ong	*10*	*4*	*8*	*3*	*0*	*1*	*3*	*29*
City of Malaybalay	*6*	*2*	*1*	*1*	*0*	*1*	*2*	*13*
Total	**53**	**19**	**27**	**19**	**2**	**3**	**10**	**92**
%		*21%*	*29%*	*21%*	*2%*	*3%*	*11%*	*100%*

The Philippine Statistics Authority (PSA) said the poverty threshold per family amounted to PhP 12,082 a month. An income below this amount would categorize a family as being poor and an income above this would mean a family is nonpoor. In determining the poverty threshold, the PSA uses the formula below:

$$PT = FT / (FE / TBE)$$

Where:

PT is poverty threshold
FT is food threshold
FE is actual food expenditure families within the +/- 10 percentile of the food threshold
TBE is total basic food expenditure families within the +/- 10 percentile of the food threshold

5.1.3.1 On Indigenous Peoples (IPs)

During the conduct of socioeconomic survey, the team learned from the local officials that there are Higaonon, Talaandig, and Bukidnon-Tagoloan tribes located in the project area.

The Higaonon is one of the least known ethnolinguistic groups that inhabit North-Central Mindanao. They occupy the mountainous regions of Misamis Oriental, Bukidnon plateau, the mountain borders of the provinces of Agusan and Lanao in the east and west, respectively. The word Higaonon is derived from the native words higa (living), goan (mountains), and onon (people), or literally people of the living mountains or people of the wilderness.

On the other hand, the Talaandig are one of the indigenous groups in the province of Bukidnon, Mindanao Philippines who has continued to preserve and promote its indigenous

customs, beliefs and practices despite the strong influx of modernization and change. The members of the group are found in barangays and municipalities surrounding the mountain of Kitanglad, the historic domain of the Talaandig people.

Lastly, the Bukidnon-Tagoloan who mostly resides in Malabaybalay City. But these IP communities are not living in a declared ancestral domain/land.

The National Commission on Indigenous People (NCIP) Region X issued a Certificate of No Overlap (CNO) (Appendix 6) for both Misamis Oriental and Bukidnon. However, NCIP Region X issued Work Order No. 429-A, dated June 16, 2022, requiring the proponent to conduct a Free and Prior Informed Consent (FPIC) (Appendix 6).

There are also six (6) Lumads who are yet to be identified which IP group they belong. The term "Lumads" is a local term meaning "native" or "indigenous. It is usually used by ethnic groups in Mindanao. The breakdown of the affected IPs is shown in Table 5-29.

Table 5-29. Ethnicity/ Ethnic Group

Ethnicity/ Ethnic Group	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan De Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Higaonon	0	1	4	6	6	1	*18*	*72%*
Lumad	0	0	4	1	1	0	*6*	*24%*
Talaandig	0	0	1	0	0	0	*1*	*4%*
Total	**0**	**1**	**9**	**7**	**7**	**1**	*25*	*100%*

5.1.3.2 On Informal Settler Families

Republic Act No. 11201 (An Act Creating the Department of Human Settlements and Urban Development) defines Informal Settler Families (ISFs) as:

1. households living in a lot, whether private or public, without the consent of the property owner; or
2. those without legal claim over the property they are occupying; or
3. those living in danger areas such as esteros, railroad tracks, garbage dumps, riverbanks, shorelines, and waterways.

The government, through the Housing and Department of Human Settlements and Urban Development and the National Housing Authority (NHA), in coordination with the LGUs and implementing agencies concerned, shall establish and develop resettlement sites for informal settlers, including the provision of adequate basic services and community facilities, in anticipation of informal settlers that have to be removed from the right-of-way site, pursuant to the provisions of Republic Act No. 7279, otherwise known as the "Urban Development and Housing Act of 1992". Whenever applicable, the concerned LGUs shall provide and administer the resettlement sites.

Replacement cost of structures and improvement shall also apply to all owners of structures and improvements who do not have legally recognized rights to the land, and who meet all of the following criteria:

1. Must be a Filipino citizen;
2. Must not own any real property or any other housing facility, whether in an urban or rural area;
3. Must not be a professional squatter or a member of a squatting syndicate, as defined in Republic Act No. 7279, otherwise known as the "Urban Development and Housing Act of 1992"; and
4. Must not occupy an existing government ROW.

Land ownership can be a form of economic security among AHs, business owners, and landowner/claimants. During the conduct of the census, the AHs stated that they have no legal ownership on the land since no documents were shown to determine the proof of ownership. Therefore, all the AHs are considered ISF.

The budget for the livelihood restoration program and relocation and resettlement are shown in Table 12-1.

6 INDIGENOUS PEOPLES

6.1 Brief Background

The Inventory of Losses (IOL) and census were initially conducted from November 5, 2021 – February 4, 2022, based on the project design of 65.6-km and 60m road right-of-way. A supplementary survey was undertaken on June 15-18, 27-28, 2022 to gather additional information pertaining to the IPs' traditions, way of life, sacred places, etc. A total of 22 IP PAFs who occupied land inside ROW are Higaonon (15), Talaandig (6), and Bukidnon-Tagoloanon (1) with an average household size of 4.95. All of the affected IP PAFs who are considered vulnerable are entitled to compensation and inclusion in the livelihood restoration program.

6.2 IP Project Affected Families

A total of **22 IP PAFs** who occupied land inside ROW were interviewed from November 5, 2021 to February 4, 2022, of which 15 are Higaonon, six (6) are Talaandig, and one (1) Bukidnon-Tagoloanon the average household size is 4.95.

The breakdown of the IP PAFs and household sizes is shown below.

Ethnicity/ Ethnic Group	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Higaonon	1	2	0	7	5	0	*15*	*68%*
Talaandig	0	0	6	0	0	0	*6*	*27%*
Bukidnon-Tagoloanon	0	0	0	0	0	1	*1*	*5%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	22	*100 %*

Household Size	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
One (1)	0	0	1	0	0	0	*1*	*4.5%*
Three (3)	0	0	2	0	0	0	*2*	*9.1%*
Four (4)	1	1	1	3	1	0	*7*	*31.8%*
Five (5)	0	0	0	2	2	1	*5*	*22.7%*
Six (6)	0	1	0	2	1	0	*4*	*18.2%*
Seven (7)	0	0	0	0	1	0	*1*	*4.5%*
Eight (8)	0	0	1	0	0	0	*1*	*4.5%*

Ten (10)	0	0	1	0	0	0	*1*	*4.5%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***
Average Household Size	*4.00*	*5.00*	*4.83*	*4.86*	*5.40*	*5.00*	*4.95*	

6.2.1 Gender of Household Heads

Based on the 22 household heads that were interviewed, 21 or 95% are male-headed households while the remaining one (1) or 5% are female-headed households. The households headed by women are also included in the vulnerable groups.

Sex	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Male	1	2	6	7	4	1	*21*	*95%*
Female	0	0	0	0	1	0	*1*	*5%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.2.2 Age of Household Heads

In terms of age, 91% of the household heads are 20-59 years old, while the remaining 9% are considered senior citizens.

Age	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
20 - 24	0	0	0	1	1	0	*2*	*9.1%*
25 - 29	0	0	1	0	0	0	*1*	*4.5%*
30 - 34	0	1	0	0	1	0	*2*	*9.1%*
35 - 39	0	0	0	1	2	0	*3*	*13.6%*
40 - 44	0	0	1	4	0	0	*5*	*22.7%*
45 - 49	1	1	1	0	1	0	*4*	*18.2%*
55 - 59	0	0	1	1	0	1	*3*	*13.6%*
60 - 64	0	0	1	0	0	0	*1*	*4.5%*
75 - 79	0	0	1	0	0	0	*1*	*4.5%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.2.3 Civil Status of Household Heads

The majority of the affected household heads are married (68.2%) followed by common-law partner/cohabitating (22.8%), widow/er (4.5%), and single (4.5%).

Civil Status	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Single	0	0	0	0	1	0	1	4.5%
With Common - Law Partner/ Cohabitating	0	2	1	2	0	0	5	22.8%
Married	1	0	4	5	4	1	15	68.2%
Widow/er	0	0	1	0	0	0	1	4.5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.2.4 Educational Attainment of Household Heads

Of the 22 affected household heads, 22.8% are elementary graduates, 31.8% are high school graduates, and 4.5% are college graduates while some are undergraduates of elementary (9.1%), high school (22.8%), and college (4.5%). Among the AHs only three percent completed a vocation/technical course. The remaining two (2) AHs are with no education while another AH did not provide any response.

Educational Attainment	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Elementary Undergraduate	1	0	1	0	0	0	2	9.1%
Elementary Graduate	0	0	3	1	1	0	5	22.8%
High School Undergraduate	0	1	1	1	2	0	5	22.8%
High School Graduate	0	1	0	4	2	0	7	31.8%
College Graduate	0	0	0	1	0	0	1	4.5%
No Education	0	0	1	0	0	0	1	4.5%
No Response	0	0	0	0	0	1	1	4.5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.2.5 Religion of Household Heads

Seventy-seven percent (68%) of the affected household heads are Roman Catholic and the rest are called Protestant/Evangelical (9%), Iglesia Ni Cristo (9%), Born-again (5%), and Others (Baptist/Seventh Day Adventist (9%).

Religion	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Roman Catholic	0	2	4	4	4	1	15	68%
Born-Again	0	0	0	1	0	0	1	5%
Iglesia ni Cristo	0	0	0	2	0	0	2	9%
Protestant/Evangelical	0	0	1	0	1	0	2	9%
Others (Baptist & Seventh Day Adventist)	1	0	1	0	0	0	2	9%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100 %**

6.2.6 Place of Origin of Household Heads

Before residing in their current location, 91% of the affected families said they lived within the same LGU. A significant 4.5% resided outside the province but within Mindanao and one (1) household head did not provide any response.

Place of Origin	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Within LGU	1	1	6	7	5	0	20	91%
Outside the Province	0	1	0	0	0	0	1	4.5%
No Response	0	0	0	0	0	1	1	4.5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.2.7 Length of Residence of Household Heads

Survey results also indicated that 59.1% have lived in the area for more than 20 years, while 22.8% have been in the area for 1-5 years. On the other hand, 18.1% of the households have been living in their residences for 6-20 years.

Length of Residence	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%

1-5 years	0	1	0	2	1	1	5	22.8%
6-10 years	0	0	0	0	1	0	1	4.5%
11-15 years	0	0	0	1	1	0	2	9.1%
16-20 years	0	0	0	0	1	0	1	4.5%
More than 20 years	1	1	6	4	1	0	13	59.1%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.2.8 Employment Status and Occupation of Household Heads.

Out of the total 22 interviewed, 21 or 95% are employed while the remaining one (1) or 5% are unemployed and the occupation of the employed household head is shown in Table 5-8.

Employed vs Unemployed	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Employed	1	2	5	7	5	1	21	95%
Unemployed	0	0	1	0	0	0	1	5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

Occupation	Misamis Oriental		Bukidnon				Total*	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Caretaker	0	0	0	0	1	0	1	4.8%
Construction Worker	0	0	0	1	0	0	1	4.8%
Driver	0	0	0	2	0	0	2	9.4%
Farmer	1	0	3	2	1	0	7	33.3%
Laborer	0	1	1	2	3	0	7	33.3%
Security Guard	0	0	1	0	0	0	1	4.8%
Vendor	0	1	0	0	0	0	1	4.8%
Watchman	0	0	0	0	0	1	1	4.8%
Total	**1**	**2**	**5**	**7**	**5**	**1**	**21**	**100%**

**based on employed household head*

On employment status, 38% work on a seasonal basis, 24% contractual, 19% temporary/casual, 14% are permanent while 5% are self-employed or employees in the family business

Employment Status	Misamis Oriental		Bukidnon				Total*	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Permanent	0	1	0	1	1	0	3	14%
Temporary/Casual	0	0	1	1	2	0	4	19%

Contractual	0	0	1	2	1	1	5	24%
Seasonal	1	0	3	3	1	0	8	38%
For self - employed workers/ Employee in family business	0	1	0	0	0	0	1	5%
Total	**1**	**2**	**5**	**7**	**5**	**1**	**21**	**100%**

**based on employed household head*

6.2.9 PAFs Household Income & Expenditures

The survey results revealed that 68.2% of the PAFs have monthly household income of PhP20,000 and below. On the other hand, about 18.2% of the total PAFs earn PhP20,000 – PhP49,999, and the remaining 13.6% earn PhP50,000 and above. While for their monthly expenditures, the majority (68.3%) have a monthly expense of below 10,000.

Total Monthly Household Income	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
PhP 4,000-5,999	0	0	1	1	0	0	2	9.1%
PhP 6,000-7,999	0	0	0	1	0	0	1	4.5%
PhP 8,000-9,999	0	0	0	2	2	0	4	18.2%
PhP 10,000-11,999	0	1	3	1	0	0	5	22.8%
PhP 12,000-15,999	0	0	0	0	1	0	1	4.5%
PhP 16,000-19,999	0	0	1	0	0	1	2	9.1%
PhP 20,000-24,999	0	0	1	0	1	0	2	9.1%
PhP 30,000-49,999	0	1	0	1	0	0	2	9.1%
PhP 50,000-above	1	0	0	1	1	0	3	13.6%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

Total Monthly Household Expenditure	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
PhP 2,000-3,999	0	0	1	2	0	0	3	13.6%
PhP 4,000-5,999	0	0	0	1	0	0	1	4.5%
PhP 6,000-7,999	0	0	2	2	2	0	6	27.5%
PhP 8,000-9,999	0	1	1	1	1	1	5	22.7%
PhP 10,000-11,999	0	1	0	0	0	0	1	4.5%
PhP 12,000-15,999	0	0	1	0	1	0	2	9.1%
PhP 16,000-19,999	0	0	1	1	1	0	3	13.6%
PhP 20,000-24,999	1	0	0	0	0	0	1	4.5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.2.10 Housing

Majority (95%) of the PAFs used G.I. sheets while 5% used mixed materials as roofing for their houses. Fifty percent (50%) use wood, 32% are concrete, 8% are bamboo while 9% use a combination of materials for their outer wall.

Construction Materials of the Roof	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
G.I. Sheets	1	2	6	7	5	0	21	95%
Others (combination of materials)	0	0	0	0	0	1	1	5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

Construction Materials of the Outer Wall	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Concrete	0	0	2	3	2	0	7	32%
Wood	1	2	3	3	2	0	11	50%
Bamboo	0	0	1	0	1	0	2	9%
Others (combination of materials)	0	0	0	1	0	1	2	9%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.2.11 Electricity

Most of the PAFs use Electricity (55%) as their main source of light while some (4.5%) use coleman and (4.5%) use mixed sources of electricity. A significant 36% do not have electricity.

Source/s of Power/Lighting	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Electric	1	2	1	7	0	1	12	55%

Coleman	0	0	0	0	1	0	*1*	*4.5 %*
Others (combination of sources)	0	0	1	0	0	0	*1*	*4.5 %*
None	0	0	4	0	4	0	*8*	*36%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100 %***

6.2.12 Water Source

PAFs rely on the following sources of water: piped water (50%), spring/river (27%), open well (14%), artisan well (4.5%) and some (4.5%) rely on multiple sources of water. The survey on water sources implies an underdeveloped water service system.

Main Source/s of Drinking Water	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Spring/river	0	0	3	0	3	0	*6*	*27%*
Open well	0	0	2	0	0	1	*3*	*14%*
Artisan well	0	0	1	0	0	0	*1*	*4.5%*
Piped water	1	2	0	6	2	0	*11*	*50%*
Others (combination of sources)	0	0	0	1	0	0	*1*	*4.5%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.2.13 Fuel source for cooking

Eighty-two percent (81.8%) of the PAFs used wood as the primary means of fuel for cooking some (4.5%) use an LPG while 13.7% use a mixed fuel source for cooking.

Fuel for Cooking	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Wood	0	2	5	7	3	1	*18*	*81.8%*
LPG	0	0	0	0	1	0	*1*	*4.5%*
Others (combination of type)	1	0	1	0	1	0	*3*	*13.7%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.2.14 Toilet

Two of every three PAFs use a semi-flush as their toilet. Others use open pits (9%) and a flush (5%) in their homes, while (9%) of the respondents do not have a toilet.

Kind of Toilet Facilities	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Open pit	0	0	2	0	0	0	2	9%
Semi-flush	1	1	2	7	5	1	17	77%
Flush	0	1	0	0	0	0	1	5%
None	0	0	2	0	0	0	2	9%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

6.3 Additional Information about the IP Project Affected Families

Based on the supplementary survey which was undertaken on June 15-18, 27-28, 2022, presented below is the additional information gathered during the survey as follows:

Provide an official certificate of your ethnicity and/or any organization/entity.	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
None	1	2	6	7	5	1	22	100%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

Are there laws and policies or paid special attention by NCIP or others concerning regulations in the ROW?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Yes	1	0	2	3	2	1	9	41%
Don't Know	0	2	4	4	3	0	13	59%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

Is there any traditional life when you have any special event such as rituals or festivals, including daily life?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%

Yes	1	1	6	6	5	1	20	91%
None	0	1	0	1	0	0	2	9%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

What is your unique/ethnic language?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Nitibo	1	1	6	6	5	1	20	91%
Nitibo/Binukid	0	1	0	1	0	0	2	9%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

What is your ability of unique/ethnic language?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Conversant	1	2	5	7	5	1	21	95%
Fluent	0	0	1	0	0	0	1	5%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

How often and on which occasions do you use it?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Not practicing the language	0	0	0	1	0	0	1	5%
Only with tribe gatherings/ tribe members	0	0	6	4	5	1	16	73%
Only with tribe members	1	2	0	2	0	0	5	23%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

Do you have special connectivity/control with natural resources and also places traditionally and/or religiously important?	Misamis Oriental		Bukidnon				Total	
	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	No	%
Yes	0	0	5	4	3	0	12	55%
No	1	2	1	3	2	1	10	45%
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	**100%**

	Misamis Oriental		Bukidnon				Total	

In the ROW, do you consider important places and IP Leaders considered?	Tagoloan	City of Cagayan de Oro	Manolo Fortich	Sumilao	Impasug-ong	City of Malaybalay	*No*	*%*
None	1	2	6	7	5	1	22	*100%*
Total	**1**	**2**	**6**	**7**	**5**	**1**	**22**	***100%***

6.3.1 Geolocation of the 22 IP PAFs

GERRY TOLOTAN

DANTE LENTICAN
JUVY AYUMBO

ALLINO TAYAMAN

ARSENIO LUNAYAO

MARLON ALINEBOG

EFREN PONGASI
HENRICH VILLAROS

JOVANIE ROSALES
LEPIDO SERANTE

REY NERI

ROGER PAILIS
JUNREY GALARITTA

ELMER TINOBALE

CARLITO JR. AVENIDO

ANGELICA HUMAYWON
REYNALDO AGUIRAN
JEROME GOMINTONG

ROLANDO QUINIT

7 COMPENSATION POLICY

Compensation and entitlements are designed to enhance or at least restore the livelihoods of all displaced persons in real terms relative to pre-project levels and to improve the standards of living of the displaced poor and other vulnerable groups[8].

DPWH will offer to the property owner concerned, as compensation price, the sum of:

1) replacement cost of land based on the current market value of land, free of taxes[9];
2) the replacement cost of structures and improvements; and
3) the current market value of crops and trees.

Replacement cost refers to the cost necessary to replace the affected structure or improvement with a similar asset based on current market prices. The replacement structure must perform the same functions and meet the performance of specifications as original structure.

To determine the appropriate price offer for the acquisition of ROW through negotiated sale, DPWH will engage the services of a government financial institution (GFI) with adequate experience in property appraisal or an independent property appraiser (IPA) accredited by: (1) the Bangko Sentral ng Pilipinas (BSP) or (2) a professional association of appraisers recognized by BSP.

In terms of entitlements and compensation, these are determined according to the nature of the impacts. Compensation, transitional allowances[10], and resettlement assistance will be provided in full to affected persons prior to displacement, land clearance and commencement of works in any affected areas.

If PAPs are unable or unwilling to receive their entitlements due to contested ownership, PAPs being absent and unreachable, or PAPs contest the compensation offered, and following reasonable efforts to identify owners, and adjudicate resolution of disputes as required under RA10752, DPWH will deposit the full amount of compensation and allowances due in an escrow account until such time as the money can be released to the affected persons.

7.1 Project Affected Persons and Eligibilities

Project Affected Persons (PAPs) are those who stand to lose, as a consequence of the project, all or part of their physical and non-physical assets, including homes, communities, productive lands, and resources such as forests, range lands, fishing areas, or important cultural sites, commercial properties, tenancy, income-earning opportunities, social and

[8] Vulnerable groups include (i) households with elderly (aged 60 years old and above); (ii) indigenous people (IP); (iii) poor households whose income fall below the poverty threshold; (iv) households with member who has disability (PWD); (v) solo parent; and (vi) women-headed households (WHH).
[9] Free of taxes, including capital gains tax, documentary stamps tax, transfer tax, and registration fees, except Real Property Tax (RPT) arrears
[10] They will also be provided with compensation for loss of business incomes and transport cost during the transition period. Transitional allowance shall not exceed PhP 5,000 per household/per month for three months.

cultural networks and activities. Such impacts may be permanent or temporary. To sum up, PAPs are:

1) Persons with formal legal rights to land and structures lost in its entirety or in part;
2) Persons who have no formal legal rights to such land and/or structures wholly or in part but who have claims to such lands that are recognized or recognizable under national laws; and
3) Persons who lost the land they occupy in entirety or in part who have neither legal rights nor recognized or recognizable claims to such land.

Specific to the project, the following types of PAPs are qualified:

1. Landowners and Land Users.
   a) Legal owners (e.g. agricultural, residential, commercial and institutional) who have full title, tax declaration, or who are covered by customary law (e.g. possessory rights, usufruct, etc.) or other acceptable proof of ownership over the affected land.
   b) Users or occupants that have no land title or tax declaration over the affected land.
   c) Renters of the affected land.

2. PAPs with Structures
   a) Owners of structures who have full title, tax declaration, or other acceptable proof of ownership (e.g. possessory rights, usufruct, etc.)
   b) Owners of structures, including shanty dwellers, who have no land title or tax declaration or other acceptable proof of ownership
   c) Renters

3. PAPs with Crops, Fruit Trees, and other Perennials
   a) Owners of affected crops, fruit trees and perennials who have full title, tax declaration, or other acceptable proof of ownership (e.g. possessory rights, usufruct, etc.)
   b) Owners of affected crops, fruit trees and perennials who have no land title or tax declaration or other acceptable proof of ownership.

4. PAPs Affected by the Loss of Livelihood and Sources of Income
   a) Owners of registered or unregistered shops, regardless of land tenure status, whose business operation will be disrupted temporarily or permanently due to the project.
   b) Hired-labor (e.g., farm worker, house help, and store helper) who will lose their job temporarily or permanently due to the project.

In this Project, the cut-off date of eligibility for structures and entitlements is the date of commencement of the census of affected families within the project boundaries which was done on November 5, 2021. Persons not covered at the time of census-taking will not be eligible for claims of compensation entitlements.

7.2 Compensation and Entitlement Matrix

A range of entitlements is provided in Table 7-1.

Table 7-1: Compensation and Entitlement Matrix

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
Loss of Land (352 PAPs)			
Land (Classified as Agricultural, Residential, Commercial, or Institutional)	PAPs with Original Certificate of Title (OCT), Transfer Certificate of Title (TCT), emancipation patents (EP), or Certificates of Land Ownership Award (CLOA) granted under Comprehensive Agrarian Reform Act. PAPs who are not original patent holders of lands granted through CA 141 (i.e. those who have bought the patent for land previously granted through CA 141 and where any previous acquisition is not through gratuitous title (e.g. donation or succession) For untitled land, PAPs with a) Tax Declaration showing 30 or more years of continuous possession; b) DENR certification showing that land is alienable and disposable; or c) other documents that show proof of ownership PAPs who were formerly ISFs but now hold title of land because of social government housing program.	[Severely Affected[11]] Cash compensation for the loss of entire land based on the current market value free of taxes including capital gain tax (CGT), documentary stamps tax (DST), transfer tax and registration fees, AND Transaction costs (e.g. administrative charges and registration or title fees) [Marginally Affected[12]] Cash compensation for the affected portion of the land based on the current market value free of taxes including CGT, DST, transfer tax and registration fees. ~~*Transaction costs for land acquisition shall be shouldered by DPWH~~	DPWH-UPMO (RMC I)
	PAPs who were formerly ISFs and government social housing program beneficiaries whose titles are still under the name of the organization	Same as PAPs with OCT with less any amount still owing to the title	
	PAPs whose properties are mortgaged	Same as PAPs with OCT with less any amount still owing to the title	

[11] Severely Affected - PAPs who stand to lose 20% or more of their assets, or less than 20% of their assets are lost and the remaining land/structure is no longer viable for continued use as intended.
[12] Marginally Affected - PAPs who stand to lose less than 20% of their assets and the remaining land/structure is still viable for continued use as intended.

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
		or the mortgage bank or other financial institutions	
	PAPs who are original patent holders of lands granted through CA 141 which has not been subject to previous government exercise of its lien	No compensation for land up to 20 m width if patent was granted prior to 1975 or up to 60 m width for patents granted thereafter. For area more than government lien, same as PAPs with OCT	
Loss of Structures and Improvements (168 PAPs)			
Structures (Residential, Commercial, Industrial/ Institutional)	PAPs that own affected structures including absentee owners	[Severely Affected] Cash compensation for entire structure at replacement cost including transaction costs without deduction for depreciation or salvaged materials AND In case affected structures are used as dwelling, permission to stay for one month or a longer time between delivery of compensation and other assistance, and demolition of the dwelling AND In case PAPs are ISFs and affected structures are used as dwelling, option of living in a resettlement site [Marginally Affected] Cash compensation for affected portion of structure at replacement cost	DPWH-UPMO (RMC I)
	Tenants of structures	Three months or longer prior notice to the tenants before evacuation *Not applicable to lease contracts that will expire at the time of taking	
Improvements/ Assets	PAPs that own affected improvements/assets	Cash compensation for affected improvements/assets at replacement cost AND Transportation assistance if improvements/assets need to be transferred and requires cost	

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
Loss of Crops and Perennials (352 PAPs)*			
Crops, Trees and Perennials	PAPs that own land directly involved in farming	Cash compensation for affected crops at replacement cost	DPWH-UPMO (RMC I) with support from MAO and DENR
	PAPs that are lessees directly involved in farming	Disturbance compensation equivalent to five times the average of gross harvest over the last five years	
	Displaced tenants and settlers on agricultural land	Financial assistance equivalent to the average gross harvest over the last three years and not less than PhP15,000/ha	
	PAPs growing crops, trees, and perennials informally	Permission to harvest crops prior to commencement of construction AND Cash compensation for affected crops at replacement cost	
Other Entitlements			
Income Earning/ Business Activities (3 PAPs)	PAPs who own affected fixed micro businesses (e.g. small shops)	In case affected business entities move to new locations and continue with their business there, permission to continue with the business activities at the original location for a period that is sufficient to build, relocate and resume the business in the new site at a production level no less favorable than pre-project level AND Cash compensation for relocation costs and transaction costs (e.g. payment of taxes due to the government) AND Assistance in securing government soft loans that offer lower transaction costs and interest rates, and long-term and flexible payment schedule OR Income rehabilitation assistance AND Assistance in securing government soft loans that offer lower transaction costs and interest rates, and long-term and flexible payment schedule	DPWH-UPMO (RMC I) with support from concerned government agencies

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
	PAPs who own affected small, medium, or large businesses	In case affected business entities move to new locations and continue with their business there, permission to continue with the business activities at the original location for a period that is sufficient to build, relocate and resume the business in the new site at a production level no less favorable than pre-project level AND Cash compensation for relocation costs and transaction costs (e.g. payment of taxes due to the government) AND Assistance in securing government soft loans that offer lower transaction costs and interest rates, and long-term and flexible payment schedule	
	PAPs who are employed in displaced establishments and lose job for reasons reasonably attributable to the damages caused by the project	Compensation equivalent to one month pay or at least one-half a month pay for every year of service, whichever is higher AND One month or longer prior notice to the establishments AND Priority in employment during construction and operation stage of the project AND Rehabilitation assistance in the form of skills training and other development activities	
Government Structure and Utilities	Government agencies that own affected structures	Compensation to the government agencies based on mutual agreement between DPWH and the government agencies	
Vulnerable Groups	Severely PAPs that are classified as any of the following groups:	Rehabilitation assistance in the form of skills training and other development activities equivalent	DPWH-UPMO (RMC I)

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
(53 PAFs)	Vulnerable groups include (i) households with elderly (aged 60 years old and above); (ii) indigenous people (IP); (iii) poor households whose income fall below the poverty threshold; (iv) households with member who has disability (PWD); (v) solo parent; and (vi) women-headed households (WHH)	to PhP15, 000 per family will be provided in coordination with other government agencies, if the present means of livelihood is no longer viable and the AF will have to engage in a new income activity AND For PAPs that need special assistance and/or medical care, respective LGUs to provide support before and during resettlement	with support from NHA and LGUs
Relocation			
Loss of residential structure (100 PAPs)	PAPs/Informal Settlers Families (ISFs)[13] who are relocating	Transportation Allowance to move household belongings to new site AND participation in Livelihood Restoration Program	DPWH-UPMO (RMC I) with support from NHA and LGUs
	Qualified Informal Settlers Family	Provided option for relocation at a resettlement site in coordination with the LGUs. Should relocation not be possible within the said period financial assistance in the amount equivalent to the prevailing minimum daily wage multiplied by 60 days shall be extended to the affected families by LGUs concerned (RA 7279) Should relocation at the project resettlement site not be possible by the time of expiration of the 60 days financial assistance, rental assistance will be provided until such time that relocation is possible PAPs will be provided with relocation options suitable to their preference. Options are (i) self-relocation, (ii) on-site relocation, and (iii) relocation to project-sponsored resettlement sites in cooperation with key actors – local	

[13] Informal Settler Families (ISFs) are identified as poor, not owners of land they occupy and their residential and/or combined residential – commercial structures will be severely affected in terms of both area and foundation and/or structural integrity.

Type of Loss	Entitled Person	Compensation/ Entitlements	Responsible Organization
		governments and other entities as mandated by law	

For PAPs that are willing to donate their properties, including structures, donation is the appropriate mode of acquisition. Donation, as defined under Art. 2725 of the Civil Code, "is an act of liberality whereby a person disposes gratuitously of a thing or right in favor of another who accepts it". Deed of donation should be simple and unconditional, contain clauses to the effect that:

- Donation is made by the donor not to defraud his creditors
- Donor reserved for himself enough property for his and his family's subsistence, sustenance, and support.
- Deed of donation should be registered with the Registry of Deeds.
- The implementing agency may utilize donation or similar mode of acquisition if the landowner is a government-owned or government-controlled corporation.

In the event that PAPs are unable or unwilling to receive their compensation and/or entitlements due to contested ownership, PAPs being absent and unreachable or PAPs contest the compensation offered, and following reasonable efforts to identify owners, and adjudicate resolution of disputes as required under RA10752, DPWH will deposit the full amount of compensation and allowances due in to an escrow account until such time as the money can be released to the affected persons.

Gender key considerations. Regardless as to whether the designated household head is a man or a woman, both spouses heading AHs will be invited when the compensation is disbursed. New titles at resettlement sites will be issued in the names of both spouses heading household recipients of resettlement site plots. In the long term, the road project is expected to improve women's access to social services, economic or financial resources or opportunities, and other basic infrastructure.

8 LIVELIHOOD RESTORATION PROGRAM

The Livelihood Restoration Program (LRP) is an essential component of a RAP. It provides the PAPs assistance whose livelihoods are directly adversely affected by the Project by restoring their income generating capacity to at least pre-project levels. For vulnerable PAPs, the LRP is also aimed at improving their living standards. The livelihood restoration measures are to be planned to take account of each individual situation. Sufficient time for planning and substantial interaction with the PAPs is deemed essential requisites to developing a more robust plan that will promote both immediate and long-term self-sufficiency. As such, while this plan outlines the necessary livelihood restoration measures, further consultations with the PAPs to plan specific livelihood restoration and improvement measures.

As explained in above, the following groups of people are considered to have their livelihood hindered because of the project and hence be eligible to participating in the program.

1) Business entities and employees;
2) Displaced persons; and
3) Vulnerable groups

8.1 Livelihood Restoration of Business Entities and Employees

In terms of business entities and employees, the assistance and entitlements that can be provided by DPWH, with support from concerned government agencies are summarized in Table 7-1 under the "Other Entitlements". They are grouped based on the following:

1) PAPs who own affected fixed micro businesses (e.g. small shops)
2) PAPs who own affected small, medium or large businesses
3) PAPs who are employed in displaced establishments and lose job for reasons reasonably attributable to the damages caused by the project

8.2 Livelihood Restoration of Displaced Persons and Vulnerable Groups

The LRP for individuals including displaced employees is designed based on the existing relevant programs at the national, regional, provincial and LGU levels. While DPWH carries the ultimate responsibility for the entitlement program, LGUs are expected to play an equally, if not more, important role in ensuring that the PAPs' livelihood is restored and/or improved in a long run and that the LRP is in line with the existing programs and institutions.

The program should start prior to implementation stage of the project and may extend as far as the end of its completion yet not less than one year after commencement of construction. To ensure social inclusion, development outcomes should pay a special attention to integrating the different needs and concerns of women and men, people with disability, and the elderly as agents and beneficiaries of the programs and services.

As part of its function in providing livelihood restoration program to its constituents, the local government will assist the PAPs in availing the following livelihood programs from TESDA and DSWD.

8.2.1 Vocational Training offered by TESDA

Vocational training will be provided to the PAPs by the Technical Education and Skills Development Authority (TESDA). TESDA is the government agency tasked to manage and supervise technical education and skills development in the region. Training activities will be delivered through the following three modes.

a. **Training Centers operated by TESDA -** provides certificates of completion after each training course. The certificates of the completion are presented to would-be employers who will provide permanent employment and a regular stream of income. Trainings cost an average of Php 10,000/course but may be as high as PhP 15,000. TESDA, in collaboration with the LGUs, industries that provide funds, implement the Training for Work Scholarship Program (TWSP) where successful scholars are chosen to undergo trainings based on industry requirements. The scholars, before being chosen, undergo a rigid selection process. PAFs and/or vulnerable groups may avail of this program after they pass the tests or assessments.

b. **Private Institutions** - Vouchers are allocated by TESDA at least three to four times a year to accredited training centers. The number of vouchers is based on demand and is usually determined through surveys on the training courses needed in each barangay.

c. **Community-based Programs** - Community-based Training for Enterprise Development Program is primarily addressed to the poor and marginal groups who cannot access formal training provisions. They may have low skills, limited management abilities, and have few economic options. They may have no access to capital and hence unqualified for formal credit programs. The program goes further than just skills trainings. It is purposefully designed to help form livelihood enterprises that will be implemented by the trainees immediately after the training. Likewise, it is designed to assist partner agencies such as LGUs, NGOs, people organizations and other agencies and organizations tasked to help the poor people engage in productive activities to help themselves and their communities.

d. **Vocational Trainings** - those provided by TESDA in particular, should ensure women's enrolment in non-traditional skills training (e.g. welding, carpentry and plumbing) as it offers higher income compared to being engaged in traditional livelihood activities (Sec. 13, RA 9710). TESDA should ensure the full implementation of the gender sensitive TVET curriculum in all training courses regardless of the mode of delivery of these trainings.

8.2.2 Sustainable Livelihood Program offered by the Department of Social Services and Development (DSWD)

The Sustainable Livelihood Program (SLP) is a community-based capacity building program that seeks to improve the program participants' socioeconomic status.

The program design has two tracks: the Microenterprise Development Track and the Employment Facilitation Track.

a. **Track 1: Microenterprise Development** - The Microenterprise Development Track is a capacity building program that focuses on micro-enterprise development, skills enhancement, networking and partnership building, and provision of capital assistance to poor families. The participants shall be organized by their economic or livelihood activity, depending on the local field implementer's assessment of the most appropriate form.

b. **Track 2: Employment Facilitation** - The Employment Facilitation Track provides assistance to unemployed members of poor families preferring a job rather than start an enterprise for income generation. They shall be provided with technical skills training, occupational guidance and counselling, and job referrals or placement.

Given the necessary interventions identified for both tracks, the field implementers are expected to serve as process facilitators and partnership builders to generate and bridge opportunities for the program participants.

Both tracks are executed based on the Community-Driven Enterprise Development (CDED) approach, which equips program participants to actively contribute to production and, labor markets by looking at available resources and accessible markets. The CDED approach promotes the Local Economic Development (LED) strategy and Value Chain Production of each community.

The Community-Driven Enterprise Development (CDED) is an important instrument for the realization of potential among marginal and deprived communities and is important in bringing social upliftment. It is a low cost, easy to implement training approach for helping entrepreneurs and development partners. It is one of the strategies being implemented by the national and local governments in addressing the issue of poverty.

9 GRIEVANCE PROCEDURE

9.1 Objectives and Advantages of Developing a Grievance Redress Mechanism

A well-designed grievance redress mechanism can help ensure the sound implementation of the project. The mechanism shall provide PAPs a platform to lodge their complaints, if any, towards the project especially on matters relating to land acquisition and resettlement. It shall facilitate accessible and efficient delivery of concerns directly to the decisionmakers as compared to the formal judicial process. This mechanism shall also allow the DPWH to get hold of the concerns immediately so that corresponding response measures can be formed and implemented in a timely manner. Recognizing and addressing grievances early on makes them more manageable and resolvable and will therefore benefit both parties. A good grievance redress mechanism also helps build trust between the parties.

A raise grievance is examined in M/RIC which is composed of wide ranges of people including representatives of PAPs from each affected barangay and Peoples Organization (POs) as necessary. Thus, reliability can be secured in addition to transparency and easy access.

Thus, a proper grievance redress mechanism shall be established for this project. A person within the DWPH and/or the RIC shall be assigned to receive and process the grievances. His/her name and contact information shall be shared with all PAPs. The DPWH shall also ensure that the PAPs know and understand the mechanism including the people involved, the procedure, and the time and costs needed to be functional and effective. Special consideration shall be given to vulnerable people such as the illiterate, for which the DPWH may wish to explain the mechanism in a different manner (e.g. verbally instead of by paper). Grievances received must then be properly treated and discussed, and the resolution or conclusion delivered to the complainants within a reasonable time.

9.2 Composition of the RAP Implementation Committee

The RIC will be established where the road project will traverse. With the DPWH-UPMO-RMC1 Director his/her representative as Chairperson and Convenor, the RIC will be composed of the following:

1.	City/Municipal Mayor or his/her representative	-	Co-Chairperson
2.	DPWH National, Regional Director or his/her representative	-	Member
3.	DPWH Regional Director or his/her representative	-	Member
4.	NCIP Provincial and or Regional Office	-	Member
5.	Chairperson of the Barangay or his/her representative	-	Member
6.	City/Municipal Division Chiefs or his/her representative	-	Members
7.	A representative of the IP/ICC	-	Member
8.	A representative of the PAPs in the barangay	-	Member
9.	A representative of a city/municipal-wide		
10.	Non-government Organization (NGO), if there is any, endorsed by the other members of the RIC.	-	Member

The Barangay Chairperson or his/her representative and the representative of the PAP will take active part in the activities of the RIC on matters concerning their respective communities. The RIC will have the following functions:

1. Assist in the validation of the list of PAPs.
2. Assist in the validation of assets that will be affected by the project and compute the compensation and other entitlements due to the PAPs as per RA 10752, DPWH Resettlement Policy and pertinent Department Guidelines and submit the same to the DPWH for appropriate action.
3. Assist the Implementing Office in the conduct of public information campaign, public participation and consultation.
4. Assist the DPWH in the payment of compensation to PAPs
5. Receive complaints/grievance from PAPs and other stakeholders and act on the same within 15 days upon receipt thereof, except for complaints and grievances that specifically pertain to the valuation of affected assets, since such will be decided upon by the proper courts. (The PAP may refer his/her grievance to the DPWH UPMO, RMC 1 Director, or even to a court of law, if he/she is not satisfied with the action of the RIC or the DPWH.
6. Maintain a record of all public meetings, complaints, and actions taken to address complaints and grievances
7. Assists the DPWH and NCIP staff in identifying who among the PAP's are IPs or belong to ICCs
8. In coordination with the concerned government authorities, assist in the enforcement of laws/ordinances regarding encroachment in the project site or ROW

9.3 Composition of DPWH-UPMO ROW Task Force

The DPWH Secretary issued Department Order (DO) No. 203, series of 2016 which created the UPMO-ROW Task Force (URTF) and its Technical Working Group (TWG). This Order is in line with the Department's decentralization efforts to streamline procedures for a more effective and expeditious implementation of urgent national roads, bridges and various flood control projects being implemented by the Unified Project Management Offices which are hampered by the delay in the ROW acquisition.

The URTF is composed of the Undersecretary for UPMO Operations as Chairman, the Director of the LA as Vice-Chairman, and the UPMO Cluster Directors as Members. The URTF shall be supported by a TWG composed of representatives of the URTF members.

The URTF shall perform the following functions:

1. Organize a ROW Team for each UPMO Cluster that will handle the ROW acquisition of its projects, to be headed by the Project Managers assigned to the project.
2. Monitor the ROW acquisition status and recommend appropriate actions on projects with problematic ROW.
3. Execute and recommend appropriate resolutions pertaining to payment of ROW affected by various UPMO projects which are beyond the authority of the Project Directors.

4. Review the validation of supporting documents undertaken by its TWG and recommend payments after evaluation as to propriety of the claims.

The TWG shall exercise the following functions:

1. Ensure that all relevant papers and documents in support of the ROW claim are carefully screened and verified as to their authenticity and genuineness in order to forestall fraud, pursuant to the provisions of the Simplified Guidelines for Validation and Evaluation of ROW Claims.
2. Ensure that the computation of land valuations and disturbance compensation (structures and other improvements) are based on the RA 10752 and its IRR and other applicable laws, policies and department orders.

9.4 Procedures of Grievance Redress

A framework for the grievance redress mechanism for land acquisition, compensation and other concerns on the project is provided in the LARRIPP (2007) mentioned above. Grievances related to any aspect of the project will be dealt with through dialogue and negotiations with the aim of rapidly and amicably addressing the concerns in a less costly manner compared to those dealt with as legal cases.

Under this framework, a Municipal/City RAP Implementation Committee (M/CRIC), a local coordinating and consultative body organized for the implementation of RAP and established by UPMO through a Memorandum of Understanding (MOA) with concerned parties prior to commencement of the project, will play a key role. Among their responsibilities is to receive and record the voices, complaints, opinions, and suggestions provided by the PAPs, and address them as the first level of decisionmakers. If the response to the complaint is deemed inadequate in the view of the PAPs, the PAPs may elevate their grievance to the ROW Task Force that consists of higher-level officials of the DPWH CO. Should the grievance still not be settled, the PAPs may finally resort to filing a case with the court. Under this project, grievances from the PAPs shall be handled in the following manner:

1) Grievance shall be filed by the PAP with the M/CRIC. The M/CRIC shall act on the grievance within 15 days upon receipt, with the exception of complaints and grievances that specifically pertain to the valuation of affected assets, since such will be decided upon by the proper courts;

2) If no understanding or amicable solution can be reached, or if the PAP does not receive a response from the M/CRIC within 15 days of the filing of the complaint, he or she can appeal to the ROW Task Force which should then act on the complaint or grievance within 15 days from the day of its filing;
3) If the PAP is still not satisfied with the decision of ROW Task Force, he/she, as a last resort, can submit the complaint to any court of law.

PAPs shall be exempted from all administrative and legal fees incurred pursuant to the grievance redress procedures as guaranteed by the LARRIP (2007). All complaints received in writing (or written when received verbally) from PAPs will be documented and shall be acted upon immediately according to the procedures detailed above.

In the event that the PAP/F rejects the compensation offered by the DPWH, the DPWH or the PAP/F may take the matter to court. When court cases are resorted to by either the DPWH through expropriation or by the PAP/Fs through legal complaints, the DPWH will deposit to the court the (100%) value of the land based on the current relevant BIR Zonal Value.

9.5 Formation of Municipal/City RAP Implementation Committee

The M/CRIC is the responsible body organized for the smooth implementation Right-of-Way Action Plan. In the formation of the M/CRIC, the following activities were undertaken jointly by DPWH and the concerned LGUs:

1) Consultation on who will be the members of the committee and their roles and responsibilities.
2) Drafting of Memorandum of Understanding (MOU) for the Creation of the M/CRIC for the Central Mindanao Highway Construction Project (Cagayan De Oro – Malaybalay Section).
3) Review of the draft MOU by the concerned LGUs.

10 INSTITUTIONAL FRAMEWORK

10.1 Current DPWH Capacities on Social Safeguards

Effective resettlement depends on the capacity and commitment of the agencies responsible for resettlement planning and management. In the past few years, DPWH has improved its management processes, however, the capacity across all levels needs to be further strengthened. JICA will continue to assess the adequacy institutional capacity of DPWH, including NCIP at the National, Regional and Local levels and provide technical assistance to address the issue of institutional development and capacity building by financing the conduct of indigenous people management training seminars and workshops.

District Engineering Office, DPWH. The DEO will act as Technical Coordinator and will (i) oversee the staking-out and verification of affected properties; (ii) review, and if found correct, prepares and approves disbursement vouchers/payments; (iii) cause the prompt delivery of payments to the affected persons with the assistance of RIC (iv) submit reports on disbursements and payments to APs to the RO and the UPMO; and (v) submit monthly progress reports to ESSD, the ROs and the UPMO. The DEO will chair the RIC and will actively participate in its functions.

10.2 National Level

The DPWH will be the Executing Agency (EA) for the Project. The overall direction and leadership for implementing the RAP will be exercised by the Secretary, supported by the Undersecretary of UPMO Operations and other members of the Executive Committee (EXECOM) of the DPWH composed of the Undersecretaries and Assistant Secretaries of the Department.

The Unified Project Management Office (UPMO) shall be responsible for implementing and monitoring the Project, including land acquisition and other resettlement related activities. It will ensure that funds for the timely implementation of RAP are available and that all costs are properly accounted for.

The Roads Management Cluster I, Bilateral, Unified Project Management Office, as the overall project management unit, shall manage and supervise the implementation of the RAP. Resettlement activities and land acquisition will be carried out in close coordination with the DPWH Planning Service through its ESSD, RO, DEO, LGUs, NCIP, RIC and all other pertinent agencies and instrumentalities of the government to fully address the impacts of involuntary resettlement.

The Environmental and Social Services Division (ESSD) shall provide technical guidance and support in the implementation and monitoring of the social safeguards document/plan. They are tasked to:

a) Carry out overall preparation and planning of the RAP;

b) Submit social safeguards document/plan budget plans (to include compensation, relocation costs, operations) for approval and allocation of needed resources by the DPWH central office;
c) In accordance with the Department's resettlement policies, guide the District Engineering Offices and the Regional Offices in their tasks, such as the verification of APs, final inventory of affected assets, consultation, and information dissemination;
d) Amend or complement the RAP in case problems or potential problems are identified during the internal and/or external monitoring of its implementation;
e) In collaboration with its counterpart in the Region, work closely with the DPWH RO on the processing of compensation claims of APs;
f) In collaboration with UPMO, monitor the progress of compensation payment to APs and other resettlement-related activities stated in the RAP; and;
g) In collaboration with its regional counterpart, prepare quarterly monitoring reports on social safeguards document/plan implementation for submission to the UPMO and JICA;
h) For uploading the RAP, the DEO with assistance of the RIC shall conduct inventory of loss and socio-economic surveys validation for submission the UPMO and JICA.
i) Provide RAP orientation to DPWH RO and DEO Team and RIC to strengthen the social, legal, and technical capabilities of these resettlement implementing entities.
j) Assist the RIC in community awareness raising activities for the RAP implementation.

10.3 Site Level

The District Engineering Office (DEO) will act as Technical Coordinator and will

a) Oversee the staking-out and verification of affected properties;
b) Review, and if found correct, prepares and approves disbursement vouchers/payments;
c) Cause the prompt delivery of payments to the affected persons with the assistance of RIC;
d) Submit reports on disbursements and payments to APs to the RO and the UPMO; and
e) Submit monthly progress reports to ESSD, the ROs and the UPMO. The DEO will chair the RIC and will actively participate in its functions.

The Regional Office (RO) will act as the liaison between ESSD and the DEO and will ensure that the RAP is implemented as planned. Specific activities of the RO are:

a) Monitor the RAP implementation and fund disbursement;
b) Submit the monthly progress reports to ESSD;
c) Monitor payments to APs;
d) Monitor assistance provided to the poor and vulnerable households; and
e) Address grievances filed by the APs for speedy resolution.

The RAP Implementation Committee shall be composed of representatives from the RO and DEO, the City/Municipal, the NCIP provincial and/or regional office, affected barangays, and APs with separate representation for IP/ICC communities affected by the project. The

Representative from NCIP is vital in this committee in case there is a possibility of impact to IPs.

Selection of these ICC/IP representatives shall follow the procedures of the NCIP. Its functions are:

a. Assist the DPWH staff engaged in resettlement activities in (i) validating the list of PAPs; (ii) validating the assets of the APs that will be affected by the project (using a prepared compensation form); and (iii) monitoring and implementing the RAP;
b. Assist the DPWH and NCIP staff in identifying who among the APs are IPs or belong to ICCs;
c. Assist the DPWH and staff engaged in the RAP activities in the public information campaign, public participation and consultation;
d. Assist DPWH in the payment of compensation to PAPs;
e. Receive complaints and grievances from PAPs and other stakeholders and act accordingly;
f. Maintain a record of all public meetings, complaints, and actions taken to address complaints and grievances; and
g. In coordination with concerned government authorities, assist in the enforcement of laws/ordinances regarding encroachment into the project site or ROW.

The Municipal or City RIC shall be formed through a MOU between DPWH, the concerned local government unit, with the NCIP Provincial or Regional Office.

National Commission on Indigenous Peoples (NCIP). The NCIP is the primary government agency through which ICCs/IPs can seek government assistance. The Indigenous People's Rights Act (IPRA)vests upon the NCIP the power to issue certificate of ancestral land/domain title (CALT/CADT) (IPRA, Section 44e). It has the power to issue appropriate certification as a pre-condition to the grant of permit, lease, grant or any other similar authority for the disposition, utilization, management, and appropriation by any private individual, corporate entity or any government agency, corporation, or subdivision thereof on any part or portion of the ancestral domain taking into consideration the consensus approval of the ICCs/IPs concerned.

The Local Government Unit provide legal instruments (e.g., Executive Orders, Municipal Resolutions, Memorandum Orders, etc.) that are necessary for the implementation of the RAP. LGUs shall (i) provide the necessary land for relocation purposes, (ii) cooperate with UPMO to form and mobilize RIC to direct and oversee implementation and monitor RAP implementation, and (iii) address issues, grievances and complaints as indicated in the GRM section of this document.

11 POSSIBLE RESETTLEMENT SITE

There are 96 households (379 persons) whose houses and houses-cum-shops will be fully affected.

If relocation is necessary to be undertaken during the implementation of the project, the Municipality of Sumilao committed to provide a land dedicated to affected families. The other LGUs are still determining the location of their relocation sites. Table 11-1shows the proposed relocation sites with the corresponding land areas.

Table 11-1. Proposed Relocation sites of the Affected Cities and Municipalities

Municipality/City	Location	Land Area
Tagoloan	To be determined	To be determined
City of Cagayan de Oro	To be determined	To be determined
Manolo Fortich	To be determined	To be determined
Sumilao	NHA – Sumilao Resettlement Project 1 in Purok 5, Barangay San Vicente	1.58 hectares (89 units)
	Zubiri – Villo Paglaum Village, Purok 2, Barangay Poblacion	2.05 hectares (100 units)
	NHA – Sumilao Resettlement Project 2 in Purok 4, Barangay Kisolon	1.5 hectares (60 units)
Impasug-ong	To be determined	To be determined
City of Malaybalay	To be determined	To be determined

12 IMPLEMENTATION SCHEDULE

As shown in Figure 12-1, the DPWH is expected to initiate the process of land acquisition and compensation for structures, crops and trees starting July 2023 to secure the project's ROW prior to construction. The DPWH shall ensure that ROW acquisition proceeds in close parallel with the construction schedule, making sure that land and structure owners are adequately compensated and re- established away from the construction site months ahead of the civil works implementation.

During the preconstruction stage, DPWH will update the Preliminary RAP based on result of the Feasibility Study. Once the Preliminary RAP has been updated and validated, DPWH will disclose the validated appraised value of lands, structures/improvements, crops, and trees. In addition to this, DPWH will finalize the Compensation and Entitlements Matrix, Livelihood Restoration Program cost, and number of households affected. This task shall be undertaken by the UPMO Cluster/PPPS/RO/DEO and the ESSD. If necessary, they may seek the assistance of the M/CRIC.

12.1 Overall ROW Acquisition Workflow

The IA must observe the overall workflow for the ROW acquisition process. The significant features of the DPWH ROW process include the following:

1. The process shall be applicable to both foreign-assisted and locally funded infrastructure projects.
2. The principles and general rules shall apply to all scopes of work of the project – whether the project involves entirely new construction or expansion/improvement of existing infrastructure.
3. The IA shall ensure that adequate funds for ROW costs are provided in project budgets which are included in the DPWH infrastructure program within the budget ceilings. The appropriations shall preferably be made at least one year ahead of actual construction works.
4. A Pre-Feasibility Study (PFS) or Feasibility Study (FS) shall generally be conducted for each project to define, among other things, the ROW requirements. The level of detail for these studies will vary, depending on the type, size, and complexity of the project.
5. The IA shall formulate a ROW Action Plan (RAP) based on the PFS/FS. The RAP shall contain the description and extent of the lands, structures/improvements, and crops/trees to be acquired as ROW, the estimated costs and compensation due to the property owners and PAPs, the budget for all ROW costs including provision for inflation and contingencies, and the schedule of implementation and annual funding requirements.
6. If ROW costs differ from the approved ROW budget after the Detailed Engineering Design (DED) has been finalized, a budget adjustment shall be made.
7. Parcellary Surveys shall be conducted for all projects in accordance with DO 187, series 2002, as amended . Parcellary Surveys, as well as the RAP preparation, shall be undertaken at least one year ahead of the scheduled construction works.
8. The determination of PAPs and affected improvements shall be based on the cut-off date, which is the start of the census of PAPs and tagging for improvements.

9. Where feasible, the first mode of acquisition shall be to request donation from the property owner.
10. If donation is not feasible, negotiated sale for the acquisition of the property shall be pursued based on the provisions of RA 10752 and its IRR as prescribed in this Manual. Hence, the first and final price offer shall be the sum of: (i) the current market value of the land, (ii) the replacement cost for structures and improvements, and (iii) the current market value of the crops and trees.
11. To determine the appropriate price offer for negotiated sale, the IA may engage a GFI or IPA.
12. If, within 30 days, the owner does not accept the price offer under negotiated sale, the IA may initiate expropriation proceedings with the appropriate court.
13. It is the responsibility of the IA to obtain and validate all necessary documents for ROW claims.
14. Prior to payment, ROW claims shall be screened, fully verified and validated, and the supporting documents authenticated in accordance with the checklist of DPWH.
15. Valid claims for all lands, structures and other improvements shall be paid in full in accordance with government rules and regulations. For negotiated sale, the IA shall remit to the BIR the Capital Gains Tax (CGT), for the account of the owner, to be deducted from the Total Price or compensation indicated in the Deed of Aboslute Sale (DAS). The IA shall remit to the LGU concerned any unpaid Real Property Taxes of the owner, to be deducted from the consideration or Total Price in the DAS. The IA shall pay the Documentary Stamp Tax (DST) to the BIR, the Transfer Tax to the Provincial/City Treasurer, and the Registration Fees to the Register of Deeds, to be funded from appropriate funds of the IA outside the said compensation or Total Price in the DAS.

The JICA Preparatory Survey on Central Mindanao High Standard Highway Construction Project
(Cagayan De Oro – Malaybalay Section)

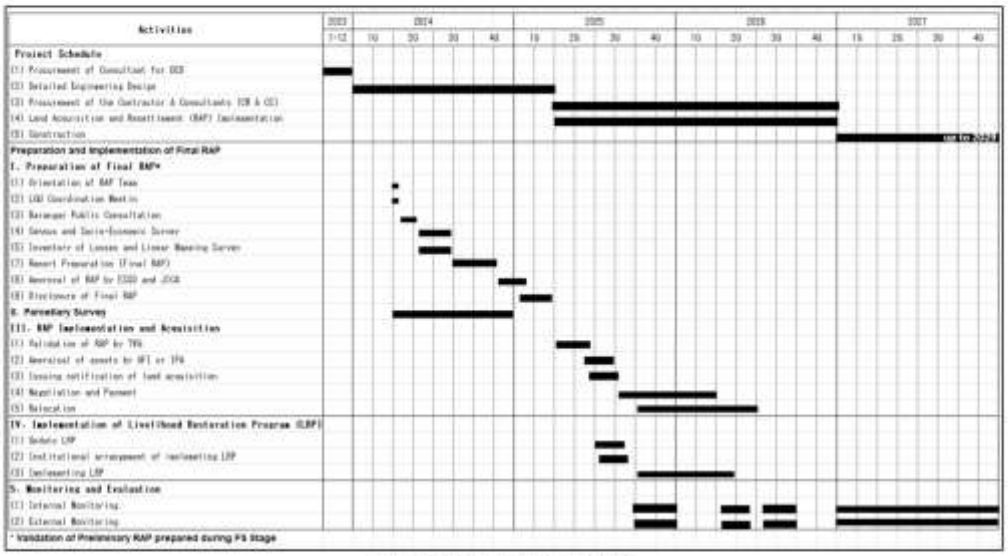


Figure 12-1. Implementation Schedule

Draft Preliminary Right-of-Way Action Plan | 91

13 BUDGET

The total cost for the implementation of the RAP for the CMHSHCP (CDO-Malaybalay Section) is estimated at PhP 1,361,812,550 (USD 25,944,228). The budget includes costs for acquisition of land and non-land assets, relocation and resettlement assistance including livelihood programs to APs/ AHs, and utility relocation, among others.

The estimated RP Implementation Cost is provided in Table 13-1. The summary of cost budget estimate for affected lands, structures, crops, and trees is presented in Appendices 1-4.

Table 13-1. Estimated RAP Implementation Cost

Kind of affected assets	Unit	Total	Amount (PhP)	Amount (USD)
1. Land	m²	3,943,800	847,966,900	16,154,828
2. Structures	#	298	53,789,139	1,024,750
3. Crops *(agricultural crops/coconut)*	m²	2,571,526	23,072,305	439,556
	#	2,552	8,499,121	161,919
4. Trees *(including seedling replacement)*	#	9,815	120,051,751	2,287,136
5. Livelihood Restoration Program	hh	96	1,440,000	27,434
6. Relocation and Resettlement	hh	96	50,904,000	969,785
7. Other Entitlements	hh	96	5,280,000	100,591
7.1 Financial Assistance	*hh*	*96*	*1,440,000*	
7.2 Income Loss	*hh*	*96*	*1,440,000*	
7.3 Inconvenience Allowance	*hh*	*96*	*960,000*	
7.4 Rehabilitation Allowance	*hh*	*96*	*1,440,000*	
8. Other Assistance			84,158,852	1,603,331
8.1 Capital Gains Tax (6%)			*50,878,014*	
8.2 Documentary Stamp Tax (1.5%)			*12,719,504*	
8.3 Transfer Tax (50% of 1% of the Selling Price)			*4,239,835*	
8.4 Cost of Registration (PhP40,000/transaction)			*16,200,000*	
8.5 Notarial Fee (PhP300/transaction)			*121,500*	
Administrative Costs (5% of Direct Costs: 1-7)			55,550,161	1,058,300
Cost contingencies (10% of Direct Costs: 1-7)			111,100,322	2,116,600
TOTAL			1,361,812,550	25,944,228

Note: 1 USD = PhP 52.49

13.1 Preliminary ROW Cost Estimates for Land

The compensation offer will be at current market value at the time of taking. DPWH will pay, for the account of the PAP, the capital gains tax, documentary stamp tax, transfer tax, and registration fee. The owner will pay any unpaid real property tax.

Other modes of compensation will be explored when feasible, such as land swap (exchange or barter) for a new parcel of land on a value-for-value basis. The owner of the

property needed for ROW of a national government project may request the DPWH to exchange or barter an old, abandoned road or other government property near the project with his property.

Holders of Certificates of Land Award (CLOA) granted under Comprehensive Agrarian Reform Act will be compensated at current market value at the time of land acquisition. In case of lands granted through Commonwealth Act No 141, otherwise known as "The Public Land Act", the Project will:

1) Follow modes of acquisition enumerated in RA 10752, if the landowner is not the original patent holder and any previous acquisition of said land is not through a gratuitous title; or
2) Follow the provisions under CA No. 141, as amended, regarding the acquisition of ROW on patent lands is the original patent holder or the acquisition of the land from the original patent holder is through a gratuitous title

The cost for land compensation is computed at:

Current Fair Market Value of Land[14]

Based on the inventory, 3,943,800 m² of land belonging to 352 PAPs will be subject to valuation and eventual compensation. The total value therefore of is **PhP 847,966,900** for the 405 parcels of land.

Transaction costs for land acquisition, based on the Bureau of Internal Revenue (BIR) and Land Registration Authority (LRA) schedule of fees, shall be shouldered by DPWH as follow:

1. Capital Gains Tax[15] (6%)
2. Documentary Stamp Tax[16] (1.5%)
3. Transfer Tax[17] (50% of 1%)
4. Registration Fee[18]

Final cost for land, therefore, is **PhP 932,125,752**. The owner, however, will pay any unpaid real property tax.

13.2 Preliminary ROW Cost Estimates for Structures and Improvements

The replacement cost of a structure or improvement affected by the project per IRR of RA 10752 is based on the current market prices of materials, equipment, labor, contractor's profit and overhead, and all other attendant costs associated with the acquisition and installation of a similar asset in place of the affected asset. If the affected structure has been damaged, then the Replacement Cost shall be based on the pre-damaged condition of that structure. The

[14] To be prepared by an independent property appraiser (IPA) accredited by either (1) the Bangko Sentral ng Pilipinas (BSP) or (2) a professional association of appraisers recognized by BSP.
[15] Capital Gains Tax: equivalent to 6 percent of the selling price on the Deed of Sale or the zonal value, whichever is higher
[16] Commonly set at 1.5 percent of the selling price, or its zonal value or fair market value, depending on which is higher
[17] Transfer Tax (Local Treasurer's Office): this is tax is imposed on the sale, barter, or any other mode of transferring of ownership or title of real property, at the maximum rate of 50 percent of 1 percent of a property's worth.
[18] LRA Circular No. 11-2020, Schedule of Fees.

Replacement Cost of the structure may vary from the market value of the existing structure since the structure that would replace it may have a different cost at current market price. The replacement structure must perform the same functions and meet the performance specifications as the original structure. The following thus applies:

1) Cash compensation at replacement cost for the affected structures belonging to the government or non-governmentagencies or the community.
2) Cash compensation to cover the cost of reconnecting damaged facilities, such as water, power, and telephone lines.

The replacement cost shall be composed of the Estimated Direct Cost (EDC) and the Estimated Indirect Cost (EIC) of the replacement structure to be finalized by the IPA and validated by DPWH.

The EDC consists of the following:

1. Current market cost of materials;
2. Current market cost of labor; and
3. Rental of equipment expenses.

The EIC comprised of the following based on accepted construction industry practices:

1. Overhead expenses;
2. Contingencies;
3. Miscellaneous;
4. Engineering and Administrative Overhead (2%)
5. Contractor's profit margin; and
6. Value added tax (VAT) component in accordance with law, 5% in the case of a property owned by a government agency, or 12% in the case of a property owned by a private party.

The replacement cost for structures is computed at:

Estimated Direct Cost + Estimated Indirect Cost = Total Replacement Cost[19]

A total of 298 structures owned by 168 PAPs will be affected of which 99 are residential structures, one (1) residential-commercial, three (3) purely commercial and 195 other improvements. The total replacement cost of **PhP 53,780,139**.

13.3 Preliminary ROW Cost Estimates for Crops and Trees

The following applies in compensation for affected crops, fruit trees, and perennials:

[19] For houses, buildings, and other structures, estimates must be based on Section 6.6 of the IRR for RA10752 (DPWH DO No. 197, series of 2016)

1) Cash compensation for perennials at current market value;
2) Compensation for damaged crops (e.g., rice and corn) at current -market value at the time of taking (compensation will be based on the cost of production per hectare pro-rata to the affected area); and
3) Cash compensation for fruit trees will be based on current market value.

PAPs will be given sufficient time to harvest crops on the subject land. The total cost for trees and crops is computed at:

Forest Charges Rates and or Schedule of Market Values[20]

A total of **9,815** trees and **2,571,526 m²** of crops will be affected with a total market value of **PhP 120,051,751**.

13.4 Preliminary ROW Cost Estimates for Other Entitlements

The project shall also extend assistance and other entitlements to PAPs who will experience additional hardship due to displacement are eligible for the following:

1) Rehabilitation assistance shall be in the form of skills training and other development activities with the value of up to Php 15,000 will be provided in coordination with other government agencies.
2) Inconvenience allowance. Inconvenience allowance in the amount equivalent to Php 10,000 per household.
3) Support and/or maintain access to government welfare programs.
4) Inclusion in the Livelihood Improvement Program.

Vendors with or without permits from the LGU concerned are provided, with due consultation, with assistance in identification of, and transportation to, an alternative site to continue economic activity, e.g. assistance in (a) shifting to areas within the same LGU where there is no construction and/or (b) identify alternative sites to sell. They will also be provided with compensation for loss of business incomes and transport cost during the transition period. Transitional allowance shall not exceed PhP 5,000 per household/per month for three months.

DPWH shall coordinate through the local governments and link PAPs with other agencies concerned about livelihood support (e.g., TESDA, DSWD, etc.) for skills training and development assistance.

13.5 Preliminary ROW Cost Estimates for Resettlement Site Development

During the conduct of public consultation and census, it was explained thoroughly and in their local language, the policy and process of the government on involuntary resettlement. As a national policy, involuntary resettlement should be avoided where feasible by the

[20] Current Market Values of the of the following entities: DA, PCA, DENR, DOF and LGU-Assessor's Office.

government. Where population displacement is unavoidable, it should be minimized by exploring all viable project options. People unavoidably displaced should be compensated and assisted, so that their economic and social future would be generally as favorable as it would have been in the absence of the project. Lastly, the PAPs should be fully informed and consulted on resettlement and compensation options.

Based on the census, there are a total of 96 PAFs whose residential structures (99) and residential-commercial structures (1), and (3) purely commercial structures will be affected by the project.

Based on the 2020 Updated Building Cost of National Housing Authority (NHA) Standard Housing Models, the cost for the following housing units in Region X are shown below:

1) Rowhouse for PWD (26 m²) = PhP 475,250
2) Rowhouse with storage space (26 m²) = PhP 461,000
3) Rowhouse Mandamus (26 m²) = PhP 438,700
4) Rowhouse Mandamus/Yolanda (33 m²) = PhP 470,700
5) Rowhouse with storage space Mandamus (33 m²) = PhP 475,200
6) Rowhouse (36 m²) = PhP 530,250
7) Rowhouse with rainwater collector (36 m²) = PhP 540,800
8) Single attached with loft (36 m²) = PhP 602,350
9) Duplex (42 m²) = PhP 769,200

The cost for rowhouses (36 m²) amounting to PhP 530,250 was used in the computation of Relocation and Resettlement budget (See Appendix 7). The selected house model was chosen since it is in between the smallest and biggest house models and can provide decent housing for the PAPs.

14 MONITORING AND EVALUATION

The main objective of monitoring the implementation of the RAP is to determine whether these RAP is carried out in accordance with the Resettlement Policy. It involves the monitoring of land acquisition, payment of compensation for lost assets and resettlement of severely project-affected persons. The key points for monitoring are but not limited to the following:

1) Payment of compensation to all PAPs in various categories, according to the compensation policy described in the RAP;
2) Delivery of livelihood restoration and social support entitlements;
3) Public information dissemination and consultation procedures;
4) Adherence to grievance procedures and outstanding issues requiring management's attention;
5) Priority of PAPs regarding the options offered; and
6) The benefits provided from the project.

14.1 Supervision and Internal Monitoring

The DPWH Environmental and Social Safeguards Division (ESSD) shall conduct the supervision and in-house monitoring of RAP implementation.

The tasks of the Internal Monitoring Agency (IMA) are to:

1) Regularly supervise and monitor the implementation of the RAPs in coordination with the concerned DPWH RMC1-UPMO and the Resettlement Implementation Committee. The findings will be documented in the quarterly report to be submitted to the to the JICA.
2) Verify that the re-inventory baseline information of all PAPs has been carried out and that the valuation of assets lost or damaged, the provision of compensation and other entitlements, and relocation if there is any has been carried out in accordance with the RAP Policy and the RAP Report.
3) Supervise that the RAP is implemented as designed and approved.
4) Verify that funds for implementing the RAP is provided by the RMC1-UPMO in timely manner and in amounts sufficient for the purpose.
5) Record all grievances and their resolution and ensure that complaints are dealt with, in timely manner.

14.2 External Monitoring and Evaluation

An External Monitoring Agent (EMA) shall do the external monitoring and evaluation. The EMA for this Projects is a consultancy firm with qualified and experienced staff with Terms of Reference acceptable to the DPWH and JICA.

The external monitoring is to provide an independent periodic review and assessment of (i) achievement of resettlement objectives; (ii) changes in income, living standards and livelihoods; (iii) restoration and/or improvement of the economic and social base of the

affected people;(iv) effectiveness and sustainability of entitlements; and (v) the need for further mitigation measures.

The tasks of the EMA are the following:

1) Verify results of internal monitoring;
2) Verify and assess the results of the information campaign for PAPs rights and entitlements,
3) Verify that the compensation process has been carried out with the procedures communicated with the PAPs during the consultations;
4) Assess whether resettlement objectives have been met; specifically, whether livelihood and living standards have been restored or enhanced;
5) Assess efficiency, effectiveness, impact and sustainability of RP implementation drawing lessons as a guide to future resettlement and indigenous people's policy making and planning;
6) Ascertain whether the RAP entitlements were appropriate to meet the objectives, and whether the objectives were suited to PAPs conditions;
7) Suggest modification in the implementation procedures of the RP if necessary, to achieve the principles and objectives of the RAP Policy;
8) Review on how compensation rates were evaluated; and
9) Review of the handling of compliance and grievances cases.

The services of the EMA will be procured through selection process of DPWH. Relative to compliance monitoring during resettlement implementation, the main activities of external monitoring will revolve around the following:

1) Verify whether the overall project and resettlement objectives are being met in accordance with the RP, and if not, suggest corrective measures;
2) Assess the extent to which implementation of the social safeguards document/plan complies with JICA's Policies;
3) Identify problems or potential problems;
4) Identify methods of responding immediately to mitigate problems and advise the DPWH accordingly; and;
5) Verify if the livelihoods and the standard of living of PAPs, including those displaced persons with no legal titles, are restored or improved.

14.3 Stages and Frequency of Monitoring

The stages and monitoring frequency of the contract packages by the IMA and EMA as follows:

14.3.1 Internal Monitoring

This is the first activity that shall be undertaken to determine whether the RAP was carried out as planned and according to Right of Way Acquisition Policy. Once the RAP has been approved by DPWH, the internal monitoring will commence and will be done on a monthly

basis up to completion of income and livelihood restoration activities. The IMA will prepare and submit a quarterly report, 15 days after the reporting period.

14.3.2 External Monitoring

The EMA will be required to conduct a year-end monitoring of RAP implementation activities. The EMA will prepare and submit an annual report, 15 days after the reporting period.

14.3.3 Final Evaluation

Final evaluation of the implementation of the RAP will be conducted after the completion of income and livelihood restoration activities. This will be led by a third-party evaluator.

14.3.4 Post- Evaluation

This activity will be undertaken a year after the completion of the project, to determine whether the social and economic conditions of the PAPs after the implementation of the project have improved. This will be led by a third-party evaluator.

14.4 Schedule of Implementation of RAPs and Monitoring

The RMC1-UPMO in coordination with the ESSD shall establish a schedule for the implementation of RAPs and the required monitoring considering the project's implementing schedule. It is expected that one month prior to the start of the RAP implementation, all RAP-related activities have been determined by the IMA and EMA.

The internal and external monitoring will be conducted every month and end of the year, respectively.

14.5 Reporting

The EMA is accountable to the RMC1 UPMO and reports to the ESSD. The UPMO RMC1 submits copy of EMA's and IMA's Reports to JICA.

14.6 Monitoring Indicators

Table 14-1. Monitoring Indicators

Monitoring Indicators	Basis for Indicators
For the Internal Monitoring (IMA)	
1. Budget and timeframe	❑ Have all land acquisition and resettlement staff been appointed and mobilized for the field and office work on schedule? ❑ Have capacity building and training activities been completed on schedule?

Monitoring Indicators	Basis for Indicators
	❑ Are resettlement implementation activities being achieved against the agreed implementation plan? ❑ Are funds for resettlement being allocated to resettlement agencies on time? ❑ Have resettlement offices received the scheduled funds? ❑ Have funds been disbursed according to the RAP? ❑ Has the social preparation phase taken place as scheduled? ❑ Has all land been acquired and occupied in time for project implementation?
2. Delivery of Compensation and Entitlements	❑ Have all AFs received entitlements according to numbers and categories of loss set out in the entitlement matrix? ❑ Have AFs received payments for affected structures and lands on time? ❑ Have AFs losing from temporary land ROW been compensated? ❑ Have all received the agreed transport costs, relocation costs, income substitution support and any resettlement allowances, according to schedule? ❑ Have all replacement land plots, or contracts been provided? Was the land developed as specified? Are measures in train to provide land titles to PAFs? ❑ How many PAFs opted to donate their land to the government? ❑ How many PAFs did not receive payment because their title is covered by the provisions of Sec. 112 of CA 141? ❑ How many landholdings were subjected to quit claim? Easement? ❑ How many PAFs accepted the first offer at zonal valuation? ❑ How many PAFs rejected the first offer and accepted the second offer? ❑ How many PAFs resorted to expropriation? ❑ How many PAF households have received land titles? ❑ How many PAFs have received housing as per relocation options in the RAP? ❑ Does house quality meet the standards agreed? ❑ Have relocation sites been selected and developed as per agreed standards? ❑ Are the PAFs occupying the new houses? ❑ Are assistance measures being implemented as planned for host communities? ❑ Is restoration proceeding for social infrastructure and services?

Monitoring Indicators	Basis for Indicators
	❑ Are the PAFs able to access schools, health services, cultural sites, and activities at the level of accessibility prior to resettlement? ❑ Are income and livelihood restoration activities being implemented as set out in income restoration Plan? For example, utilizing replacement land, commencement of production, numbers of PAFs trained and provided with jobs, micro-credit disbursed, number of income generating activities assisted? ❑ Have affected businesses received entitlements including transfer and payments for net losses resulting from lost business and stoppage of production?
3. Public Participation and Consultation	❑ Have consultations taken place as scheduled including meetings, groups, and community activities? Have appropriate resettlement leaflets been prepared and distributed? ❑ How many PAFs know their entitlements? How many know if they have been received? ❑ Have any PAFs used the grievance redress procedures? What were the outcomes? ❑ Have conflicts been resolved? ❑ Was the social preparation phase implemented? ❑ Was separate consultation done for indigenous peoples? ❑ How was the participation of IP women and children? ❑ Were they adequately represented? ❑ Were special measures for indigenous peoples implemented?
4. Benefit Monitoring	❑ What changes have occurred in patterns of occupation, production and resources use compared to the pre-project situation? ❑ What changes have occurred in income and expenditure patterns compared to pre-project situation? What have been the changes in cost of living compared to pre-project situation? Have PAFs' incomes kept pace with these changes? ❑ What changes have taken place in key social and cultural parameters relating to living standards? ❑ What changes have occurred for vulnerable groups? ❑ Has the situation of ICCs/IPs improved, or at least maintained, because of the project? ❑ Are IP women reaping the same benefits as IP men? ❑ Are negative impacts proportionally by IP men and women?
For the External Monitoring (EMA)	

Monitoring Indicators	Basis for Indicators
1. Basic information on PAP households	❑ Location ❑ Composition and structures, ages, education, and skill levels ❑ Gender of household head ❑ Ethnic group ❑ Access to health, education, utilities, and other social services ❑ Housing type ❑ Land use and other resource ownership patterns ❑ Occupation and employment patterns ❑ Income sources and levels ❑ Agricultural production data (for rural households) ❑ Participation in neighborhood or community groups ❑ Access to cultural sites and events ❑ Value of all assets forming entitlements and resettlement entitlements
2. Restoration of living standards	❑ Were house compensation payments made free of depreciation, fees, or transfer costs to the PAP? ❑ Have PAFs adopted the housing options developed? ❑ Have perceptions of "community" been restored ❑ Have PAFs achieved replacement of key social cultural elements?
3. Restoration of Livelihoods	❑ Were compensation payments free of deduction for depreciation, fees, or transfer costs to the RAP? ❑ Were compensation payments sufficient to replace lost assets? ❑ Was sufficient replacement land available of suitable standard? ❑ Did transfer and relocation payments cover these costs? ❑ Did income substitution allow for re-establishment of enterprises and production? ❑ Have enterprises affected received sufficient assistance to re-establish themselves? ❑ Have vulnerable groups been provided income-earning opportunities? Are these effective and sustainable? ❑ Do jobs provided restore pre-project income levels and living standards?
4. Levels of PAP Satisfaction	❑ How much do AFs know about resettlement procedures and entitlements? Do PAFs know their entitlements? ❑ Do they know if these have been met? ❑ How do PAFs assess the extent to which their own living standards and livelihood been restored? ❑ How much do PAFs know about grievance procedures and conflict resolution procedures? How satisfied are those who have used said mechanisms.

Monitoring Indicators	Basis for Indicators
5. Effectiveness of Resettlement Planning	❑ Were the PAFs and their assets correctly enumerated? ❑ Were any land speculators assisted? ❑ Was the time frame and budget sufficient to meet objectives? ❑ Were entitlements too generous? ❑ Were vulnerable groups identified and assisted? ❑ How did resettlement implementers deal with unforeseen problems?
6. Other Impacts	❑ Were there unintended environmental impacts? ❑ Were there unintended impacts on employment or incomes?
7. IP Indicators	❑ Are special measures to protect IP culture, tradition resources rights, and resources in place? ❑ How are these being implemented? ❑ Are complaints and grievances of affected IPs/ICCs being documented? ❑ Are these being addressed? ❑ Did the project proponent respect customary law in dispute resolution process, in the conduct of public consultation, in IPAP and MOA implementation?

15 CONSULTATION

15.1 Preliminary Activities

Prior to the public consultation, an orientation meeting with the RAP Consultant Team was conducted with the representatives from the DPWH – ESSD. The consultation meeting was conducted through Zoom application which was organized by the Study Team. This is in view of the difficulty to be physically present due to the present predicament caused by this COVID 19 Pandemic.

The objective of the meeting is to orient the RAP Study Team to have a common understanding on the laws and policies of the DPWH pertaining to acquisition of right of way. The presentation was also done so that the RAP Study Team will have an idea on the salient provisions of the DPWH polices that should be presented during the local public consultation with the project stakeholders on the ground.

15.2 Review of Previous Studies, Plans and Design Standards

Initial data gathering and review of scope of services, previous studies, plans and design standards were undertaken by the Study Team. Among the initial data gathered and reviewed by the Study Team were the socioeconomic profiles of the affected cities and municipalities, Google maps of the road alignment, construction materials price data, materials source, topographic maps.

Information regarding the existing condition of the project road was gathered through initial ocular inspection. Video footage and photographs were taken on areas particularly with concerns. Coordination with LGUs was done to access to the barangay level officials for the survey activities conducted.

15.3 Public Consultation Meetings

Pursuant to the operational framework for Public Participation and Consultation, all LGUs and PAPs traversed by the road project, other stakeholders and Non-Government Organization NGOs should be fully informed and consulted on resettlement and compensation options. This is to ensure that the implementation of the RAP will be done systematically in accordance with the resettlement policy of the Department.

Using the definition of DPWH of meaningful participation, it is a process that (i) begins early in the project preparation stage and is carried out on an on-going basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

In the conduct of public consultation, the following step-by-step progression of activities were undertaken:

1) When and where participation is required;
2) Who should be participating;
3) How they should participate; and
4) What results are expected of their participation.

In line with its continuing efforts to upgrade its operations and services. DPWH has recently formulated a new policy framework on land acquisition, compensation, and resettlement, herein after called "Resettlement Policy". Said framework aims to provide clear guidance and direction to the personnel of the Department in planning, design and implementation of the projects DPWH undertakes. Specifically, the resettlement policy underscores the importance of getting PAPs informed about the project and, more importantly, getting their actual and active involvement in the planning and implementation.

15.3.1 Objective of the Consultation

Providing adequate information to affected communities and stakeholders reduces the potential for conflicts, minimizes the risk of project on communities and enable resettlement and compensation a comprehensive development programme.

In Specific terms, public consultation sought to achieve the following objectives:

1. Ensure accurate and transparent resettlement and rehabilitation process for Project-affected Persons (PAPs);
2. Inform stakeholders of the project activities and provide adequate information on the project, its components and its activities with affected communities;
3. Establish grievance and effective complaints mechanism on the project;
4. Obtain cooperation and support of the project affected persons;
5. Inform the PAPs and the communities about various options of resettlement and compensation; and
6. Obtain vital information about the needs and priorities of affected settlements.

15.3.2 Public Consultation Proceedings

To ensure wider participation, particularly among the LGUs and potential stakeholders, letters of invitation were sent earlier to notify the respective LGU officials. The consultation meetings were conducted in the four (4) municipalities and two (2) cities in the Provinces of Misamis Oriental and Bukidnon.

The public consultations were conducted with the LGUs, PAPs and Non-Government Organization (NGOs) as participants. The meeting was designed to present and inform the stakeholders on the Land Acquisition Resettlement Rehabilitation and Indigenous Peoples Policy (LARRIPP) of the DPWH as per RA 10752, Legal Framework for Infrastructure Right-of-Way (ROW) Acquisition and Management and other Provisions of the Road Right of Way

Act (RA 10752). Highlighted, during the public consultation and discussed clearly are the modes and process of acquisition for affected properties. During the meeting, the team informed the stakeholders that the RAP team will be conducting socioeconomic survey and inventory of affected assets after the consultations in all municipalities traverse by the project.

Further, the team requested permission to enter their premises to conduct the survey/ assessment and informed the affected families on the cut off dates.

15.3.3 Consultation and Participation

The formulation of the RAP has been achieved through close collaboration and consultation with the LGUs of Cagayan de Oro City, Tagoloan, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay City.

The consultation meeting aimed to:

a) Provide background on the project titled "Preparatory Survey for Central Mindanao High Standard Highway Construction Project (Cagayan De Oro – Malaybalay Section)"
b) Provide background on the Road Right of Way Act (RA 10752), and the DPWH Policies and Process on Road Right of Way Acquisition.
c) Provide an avenue to solicit inputs, comments, suggestions, and recommendations from the local stakeholders.
d) Provide project updates to the stakeholders including the formation of the RAP Implementation Committee (RIC).

There were a series of consultation meeting conducted by the study team from March to April 2021. The first meeting was with representatives from DPWH-Central Office. The objective of the meeting was to orient the RAP Study Team to have a common understanding on the laws and policies of the DPWH pertaining to acquisition of right of way. The meeting was also done so that the RAP Study Team will have an idea on the salient provisions of the DPWH polices that should be presented during the local public consultation with the project stakeholders on the ground.

The next public consultation meetings were conducted at the municipal, barangay level, and private sector with PAPs. The letters of invitation were sent at least two (2) weeks before the conduct of the meeting. On the other hand, the LGUs also informed the PAPs through sending invitation letters.

Table 15-1 to Table 15-3 summarized the meetings undertaken by the JICA Study Team together with DPWH-CO staff. Appendix 5 shows the highlights of the series of public consultation meetings.

Table 15-1. LGUs Coordination/ Consultation Meeting

Coordination/Consultation Meeting	Date	Venue	Remarks
1. Orientation Meeting	09 March 2021	Via Zoom Application	RAP Team Orientation with the DPWH-ESSD and JICA Study Team
2. Cagayan de Oro City Coordination/Consultation Meeting	22 March 2021	Face to Face and Via Zoom Application	Department heads of Cagayan de Oro City LGU, DPWH Region X Representative, and RAP Team (Face to Face) JST Consultants and DPWH, ESSD (Via Zoom Application) Total number of LGU attendees is 11 (2 females and 9 males)
3. Tagoloan Coordination/ Consultation Meeting	23 March 2021	Face to Face	Department heads of Tagoloan LGU, DPWH Region X Representative, and RAP Team Total number of LGU attendees is 9 (3 females and 6 males)
4. Manolo Fortich Coordination/Consultation Meeting	24 March 2021	Face to Face and Via Zoom Application	Department heads of Manolo Fortich LGU, DPWH Region X Representative, and RAP Team (Face to Face) JST Consultants and DPWH, ESSD (Via Zoom Application) Total number of LGU attendees is 12 (2 females and 10 males)

Coordination/Consultation Meeting	Date	Venue	Remarks
5. Sumilao Coordination/ Consultation Meeting	25 March 2021	Face to Face and Via Zoom Application	Department heads of Sumilao LGU, DPWH Region X Representative, AND RAP Team JST Consultants and DPWH, ESSD (Via Zoom Application) Total number of LGU attendees is 16 (3 females and 13 males)
6. Malaybalay Coordination/ Consultation Meeting	26 March 2021	Face to Face	Department heads of Malaybalay LGU, DPWH Region X Representative, and RAP Team Total number of LGU attendees is 5 (1 female and 4 males)
7. Impasug-ong Coordination/ Consultation Meeting	29 March 2021	Face to Face	Department heads of Impasug-ong LGU, DPWH Region X Representative, and RAP Team Total number of LGU attendees is 10 (2 females and 8 males)

Table 15-2. Barangay Public Consultation Meeting

Barangay Public Consultation Meeting	Date	Venue	Remarks
1. Cagayan de Oro City, Barangay Puerto	14 April 2021	Face to Face	35 PAPs attended the Meeting (22 females and 13 males)
Barangay Bugo	24 April 2021	Face to Face	14 PAPs attended the Meeting (2 females and 12 males)

Barangay Public Consultation Meeting	Date	Venue	Remarks
Barangay Balubal	04 May 2021	Face to Face	16 PAPs attended the Meeting (5 females and 11 males)
Barangay Bugo (2nd Meeting-requested by the Barangay Captain, exclusively intended for the landowners, whom was not able to attend las 24 April 2021.	07 May 2021	Face to Face	9 PAPs attended the Meeting (3 females and 6 males)
2. Municipality of Tagoloan Barangay Casinglot	15 April 2021	Face to Face	34 PAPs attended the Meeting (15 females and 19 males)
Barangay Natumolon	28 April 2021	Face to Face	26 PAPs attended the Meeting (13 females and 13 males)
3. Municipality of Manolo Fortich Barangay Sankanan	30 April 2021	Face to Face	22 PAPs attended the Meeting (8 females and 14 males)
Barangay Ticala	30 April 2021	Face to Face	23 PAPs attended the Meeting (13 females and 10 males)
Barangay San Miguel	03 May 2021	Face to Face	13 PAPs attended the Meeting (6 females and 7 males)
Barangay Alae	05 May 2021	Face to Face	17 PAPs attended the Meeting (8 females and 9 males)
Barangay Mambatangan	14 May 2021	Face to Face	12 PAPs attended the Meeting (2 females and 10 males)
4. Municipality of Sumilao Barangay Puntian	27 April 2021	Face to Face	25 PAPs attended the Meeting (13 females and 12 males)
Barangay San Roque	06 May 2021	Face to Face	43 PAPs attended the Meeting (30 females and 13 males)
Barangay Kisolon	10 May 2021	Face to Face	24 PAPs attended the Meeting (8 females and 16 males)
5. Municipality of Impasug-ong Barangay Impalutao	26 April 2021	Face to Face	19 PAPs attended the Meeting (11 females and 8 males)

Barangay Public Consultation Meeting	Date	Venue	Remarks
Barangays Capitan Bayong and Kawayan	26 April 2021	Face to Face	12 PAPs attended the Meeting (4 females and 8 males)
Barangay Poblacion	29 April 2021	Face to Face	11 PAPs attended the Meeting (6 females and 5 males)
Barangay La Fortuna	29 April 2021	Face to Face	14 PAPs attended the Meeting (7 females and 7 males)
6. Malaybalay City Barangay Kalasungay	11 May 2021	Face to Face	16 PAPs attended the Meeting (7 females and 9 males)
Barangay Dalwangan	11 May 2021	Face to Face	16 PAPs attended the Meeting (7 females and 9 males)
Barangay Patpat	14 May 2021	Face to Face	9 PAPs attended the Meeting (3 females and 6 males)

A focused group discussion was conducted with representatives from the Del Monte Philippines, Inc. and DOLE Philippines, Inc. the purpose of the meeting was the same as with the public consultation.

Table 15-3. Focused Group Discussion

Focused Group Discussion	Date	Venue	Remarks
1. Del Monte Philippines, Inc. in Manolo Fortich	19 May 2021	Face to Face	10 PAPs attended the Meeting (10 males)
2. DOLE Philippines, Inc. in Malaybalay City	19 May 2021	Face to Face and Via Zoom Application	6 PAPs attended the Meeting (6 males) JICA Study Team – Via Zoom Application

15.3.4 Stakeholders Issues and Concerns

During the open forum, the stakeholders were encouraged to raised questions, issues and concerns with regards to the RAP policy. The major issues and concerns commonly raised/asked during consultations are summarized in Table 15-4.

Table 15-4. Major Issues and Concerns Raised During Consultation

Question	Raised by	Response
Orientation Meeting		
1. During the barangay consultation meeting, we may need to explain the idea of cut-off date for the entire stretch of the road is just one date?	RAP Specialist Expert (JICA Study Team)	The Senior Environmental Management Specialist of DPWH-ESSD explained that the cut-off-date is the start of the census survey; however, to be clarified with the Chief of ESSD.
2. Are the Barangay adjacent to each other? For example, in Cagayan de Oro, Bugo, and Puerto. Are they connected?	Engineer III, OIC-Section Chief (DPWH)	The RAP Team Coordinator responded that Barangays Bugo and Puerto are connected, located in Cagayan de Oro City.
3. Suppose there are areas with a minimal number of affected persons. In that case, there are five (5) or 10 affected persons in one or two barangay. Can you consider one public consultation meeting?	Senior Environmental Management Specialist (DPWH-ESSD)	The RAP Team Coordinator narrated that this is the first plan is to combine two barangays during the PCM; however, this will be confirmed during the LGU Consultation Meeting. She further explained that upon confirmation of the proximity and possible number of PAPs, the PCM schedule might be shortened or might be prolonged.
4. ESSD suggested making arrangements before the courtesy call to ensure the availability of the LGUs Mayor concerned offices.	Senior Environmental Management Specialist (DPWH-ESSD)	The RAP Team Coordinator explained that letter prepared by the Consultant be signed at once by the Team Leader. The DPWH still has enough time to prepare an endorsement letter endorsing the RAP Team to all concerned Regional/DEO and LGUs Offices. This letter can be sent through facsimile or email before our courtesy call and LGUs Consultation Meeting.
Cagayan de Oro City Coordination/Consultation Meeting		
1. Who will be those affected people? Who will pay for the compensation? Is it from the local or national budget?	City Engineering Office, CDO	The RAP Team Coordinator responded that the project affected person is the local people, whose property will be traversed within the project road right-of-way. Further answered that it's a National project and the compensation

Question	Raised by	Response
		will be provided from the National Fund.
2. Is Casinglot located in the Province of Misamis Oriental?	Senior Environmental Management Specialist (DPWH-ESSD)	The RAP Team Coordinator, responded that Casinglot is located in the Province of Misamis Oriental, Municipality of Tagoloan, the starting point of the Project.
3. Why is the alignment traverse in Bugo and Puerto? Why not directly go straight to Malaybalay City?	Barangay Kagawad (Bugo)	The RAP Team Coordinator responded that the consultant alignment has to consider the cost impact, the IPs to be affected, the topography; engineering aspect was also being considered by the consultant. This alignment is still at the Feasibility Study stage and will also be finalized during the DED stage.
4. Can we have actual inspection in the two (2) Barangays Bugo and Puerto? We have experienced during post construction, that there was a landslide which affect the area of Puerto, sometimes last year. It is important to visit actual the siltation and to mitigate affecting the landslide portion during post implementation.	City Engineering Office, CDO	The RAP Team Coordinator responded, that this landslide concern will be addressed during the conduct of the geotechnical investigation throughout the section. Representative from DPWH-ESSD informed that there will be Environmental Impact Statement, and this landslide will be considered. She mentioned that the EIS Consultant will discuss this matter with the LGUs in another forum.

Question	Raised by	Response
5. Do we have another Barangay Meeting?	Barangay Kagawad (Puerto)	The RAP Team Coordinator responded that there will be a Barangay Public Consultation Meeting in Barangays Puerto and Bugo, most likely on April 6, 2021. She cited that there will be a focus discussion with concerned two-barangays right after consultation meeting. The RAP Team will provide Maps for the Brgy. Captain/s concerned to identify the possible affected persons to be invited. She further explained that after the Barangay Public Consultation Meeting, census, socioeconomic survey, inventory of loss of assets, such as of structures, crops and trees will be conducted.
6. Suggested to include the slide on the JICA General Policy in the next Consultation Meeting	Senior Environmental Management Specialist (DPWH-ESSD)	The RAP Team Coordinator responded that the slide on JICA General Outline will also be presented in the next succeeding Consultation Meeting with LGUs concerned offices.
Tagoloan Coordination/ Consultation Meeting		
1. The Barangay Administrator of Casinglot pointed to the reservoir constructed last 2018 of which will be passed through present road alignment within KM 0+600 and KM 0+700. He raised whether it is possible to make realignment or not. (Please see attached google alignment). It was emphasized by the other local offficials that there are now some residential structures in the nearby vicinity of the reservoir.	Barangay Administrator (Casinglot)	The RAP Team Coordinator informed that the alignment is still subject for improvements to avoid and mitigate major adverse impacts of the construction project.

Question	Raised by	Response
2. If the affected property is untitled, will it be compensated?	Municipal Assessor (Tagoloan)	The RAP Team Leader responded that the government does not pay for the lands without transferring the ownership or title.
3. How about if we have only a copy tax declaration, deed of sale and paying taxes, could we paid?		The RAP Team Coordinator answered, that need to approve the subdivision plan from the Mother Title, to process the land titling. Untitled land cannot be paid, only structures and improvement will be given compensation.
4. Is there any informal settlers in barangays Casinglot and Natumolan that will be affected?	JICA Study Team	The Barangay Chairperson of Casinglot responded that there is no informal settlers in Barangay Casinglot. Most of the structures owner do not have land title. He cited that only one owner of the land has the mother title. He only sold the rights lot by lot, without giving the title, except for the rights to build the structure.
5. Are there any structures/houses in Barangay Natumolan to be affected?	RAP Team Coordinato, RASA Surveying	Barangay Kagawad from Natomulan responded that there might not have houses to be affected, but the lot owner is a prominent person.
6. A property owned by Moras (a private corporation) might be affected. This is mostly planted with coconuts.	Barangay Chairperson (Casinglot)	The RAP Team Leader verified in the maps that only a minor portion of Moras property will be affected.
7. Can we invite representative from MORAS Coconut Farm to attend the Barangay Public Consultation Meeting?	RAP Team Coordinato, RASA Surveying	The Barangay Chairperson of Casinglot cited that he will invite representative from MORAS to attend the said Barangay Public Consultation Meeting.
Manolo Fortich Coordination/Consultation Meeting		
1. Do we have any IPs or Ancestral Domain traversing along the Manolo Fortich alignment?	RAP Team Coordinator, RASA Surveying	The Barangay Chairperson of Alae responded that there is IPs to be affected in a portion traversing along the Manolo Fortich alignment.[21]

[21] The National Commission on Indigenous People (NCIP) Region X issued a Certificate of No Overlap (CNO) for both Misamis Oriental and Bukidnon. However, NCIP Region X issued Work Order No. 429-A, dated June 16, 2022, requiring the proponent to conduct a Free and Prior Informed Consent (FPIC). Ethnic minority groups who reside in ROW and are defined as IPs under NCIP AO No.3 2012 are being validated to be defined as IPs under JICA Guidelines

Question	Raised by	Response
2. Can you provide more maps showing the alignment where we could clearly visualize the affected properties?	Barangay Kagawad (Tankulan)	The RAP Team Coordinator responded that maps showing the alignment will be provided where the affected lots and owners could be identified and the owners of the affected structures, other improvements and crops and trees. These additional maps will be provided to identify those possible affected persons (PAPs) who could be invited for the upcoming Barangay Public Consultation Meetings. She elaborated, that after the Barangay Public Consultation Meeting, RAP Team will start the conduct of the Socioeconomic Survey including Census on the owners of the affected lots and structures, once the Consultant finalize the preliminary alignment.
Sumilao Coordination/ Consultation Meeting		
1. Municipal Mayor cited that most of the problem arise because of misunderstanding about of the Project. He suggested and gave emphasis that on the next presentation make it something that they can understand in simple language. He suggested the Team to have people that can communicate with them. So they can understand more and implication of the Project to the people.	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator responded and explained that this upcoming Barangay Public Consultation Meetings, she already requested the representative from the DPWH Region X, to assist the RAP Team to explain in local dialect the Resettlement Action Plan and Land Acquisition Plan for the local people to understand thoroughly the presentation.
2. We have so many problems with projects being implemented by the DPWH Regional Office. What happens is that I am the one left to solve the problems. We had a case in San Roque side where problems arose due to	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator cited and informed that this Project is already discussed with the DPWH and the alignment is under Feasibility Study. She cited that FS is to determine if the project is viable and beneficial to the government. The alignment under FS still preliminary. She elaborated that a year after the FS, the detailed

Question	Raised by	Response
road ROW where the DPWH Regional Office move the alignment 5 times and then they would say that we are delaying the projects because of so many problem. The Local Chief Executive (LCE) cited, that the alignment being presented where already identified areas that might be affected, then we have already talked with the residents, but later the alignment will be revised again. These cause problems where we had encountered so many times in the past. The ongoing projects now are having those problems. I think this is the most important aspect that we need to address because a lot of people are reluctant already to talk with the DPWH, because of the different alignment.		engineering design will be undertaken, of which a more thorough study will be done. During the detailed engineering design, the final alignment will be determined.
3. I just want to clarify. Will this project be implemented or if the Feasibility Study shows that it is not feasible, it will not push thru.	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator answered that from past experience, most of the projects being undertaken by JICA are all feasible, and about 90% are being implemented. When JICA starts to invest on projects, most of them are implemented until Civil Works. She elaborated, the FS is a Grant Project under JICA; hopefully, Detailed Engineering Design will also be a Grant so the expenses of government is less. This project is assisted by JICA, hopefully DED is also grant and Civil

Question	Raised by	Response
		Works to be loan under JICA . The temporarily plan for Civil Works is to be started by 2023 onwards.
4. The LCE informed all the Barangay Captains that this is just fund for only feasibility study and not for the whole project itself.	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator responded, it's only for Feasibility Study, not for the whole project itself.
5. That is what we want to clarify. It might be that when the Barangay Officials come back to their places, they will announce that we have a new Highway. What happens, the prices of the lands go up pointing to the new Highway. These really happen, because we have many Highways. We already have a Circumferential Highway. This highway that we talking now will cuts thru Sumilao. It will have major effect on places such as Culasi, Vista Villa. People might be super excited about the Project. The price of the land from 200,000 thousand per hectare become 1MP per hectare. Let us be clear about it, this	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator stated that this Feasibility Study is also to make people aware that sooner or later the government will also construct a new High Standard Highway. She narrated that final alignment are not sure yet. She cited, that alignment during the feasibility study is just a preliminary, that might change during the detailed design stage.

Question	Raised by	Response
is just a Feasibility Study. This is not the start of the project itself.		
6. I also suggest that you talk to all affected companies because big portions of where you are going thru are pineapple plantations. You need to coordinate with them because those lands are under lease including Culasi, Vista Villa, San Roque, Puntian,	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator answered, that the Team will be coordinating with the Del Monte Philippines Inc. She is so thankful to the LCE for this information.
7. We want to let the LCE know that this LGUs consultation meeting is important, because some people are asking, if the Mayor know this Project. Likewise, the Barangay and local government Officials must know about the details of the Project.	Senior Environmental Management Specialist (DPWH-ESSD)	The RAP Team Coordinator responded and noted for this information dissemination about the Project. She is thankful with the LCE for attending the Consultation Meeting.
8. Another concern of the LCE based on the initial map being presented, some of the areas where the road will pass thru are mostly untitled land.	Local Chief Executive (Manolo Fortich)	The RAP Team Coordinator responded that as early at the feasibility study stage, they still have time to process the subdivision plan from the mother title, and eventually to the process the land titling. It's better for the people to be aware for future problem like this.
9. Specially the IPs, they considered the Tax Declaration as a Proof of ownership. This will be our problem, only tax declaration that they have, then they will not be the owner of the land. This is the problem that we need to address also. The Local government unit could be of helped, that we are going to process this tax declaration into title once we can see a very accurate		The RAP Team Coordinator answered that LGUs assistance especially to the IPs to process land titling is a big help for them. She cited that CTII mentioned that the FS alignment vs. detailed design alignment will not have a big difference like one km. FS alignment to detailed design alignment is just a little bit difference.

Question	Raised by	Response
map where the alignment will pass thru. We will see first who take in position within the alignment, then will going to check if they have titled or not, so that LGUs could help in the process of land titling. Also I do not want them, specially the IPs leaving in the area even without papers, they considered the land as their owned, then we will inform them that it's not their land. This will be our problem. At least if we can identify where the road pass thru, we will talk with them, who take the position, then we will help them process their paper for them to acquire title.		
10. With regards to IPs to be affected, we are in coordination with NCIP for their concerns.	Senior Environmental Management Specialist (DPWH-ESSD)n	The RAP Team Coordinator responded that during actual census survey, we will also considered IPs to be affected. There will be also another process, it's an IPRA Law process to be conducted.
11. Do we have map to see the area to be affected?	Punong Barangay	The RAP Team Coordinator requested the Team to present the location Map with the area to be affected.
Malaybalay Coordination/ Consultation Meeting		

The JICA Preparatory Survey on Central Mindanao High Standard Highway Construction Project
(Cagayan De Oro – Malaybalay Section)

Question	Raised by	Response
1. According to the presentation, this year is the Feasibility Study, when will get the list of names to be affected by the project.	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The RAP Team Coordinator responded that their will be upcoming Barangay Public Consultation Meeting after the Holy Week. She elaborated that the Team Leader will provide to each Barangay Captain Location Map showing the alignment to identify the possible affected lot owner, structures, and other improvement to be invited for the upcoming Barangay Public Consultation Meeting. She cited that the RAP Team Leader will be closely coordinated to each Barangay Captain for the venue and schedule of the Public Consultation Meeting.
2. My concern is regarding those titled acquired 1975 onward, there will be no compensation for the land?	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The RAP Team Leader responded that no compensation for the land within 60m right of way, but for the structures and other improvements will be compensated by the DPWH.
3. How about for the free patent application title acquired in 1974 below, if the government will acquire more than 20 meter, is the government will pay in excess of 20 meter acquisition?	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The RAP Team Leader responded that the government would pay the lot owner in excess of 20-meter acquisition.
4. How about for the structure, are all structures affected be paid by the Government?	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The RAP Team Leader answered that all affected structures will be paid by the government.
5. Another concerns is the project is proposed to be implemented by 2023, if the President is no longer President Duterte, will this project be implemented or not? Mindanao area might not be longer a priority?	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The RAP Team Coordinator responded that this Project is not politically inclined but more on the benefits and necessity of the people.

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Question	Raised by	Response
6. Barangay 1 will not be affected by the Project.	Barangay Kagawad – Infrastructure Chairman, Brgy. 10	The Infrastructure Chairman explained that Barangay 1 will not be affected but instead Barangay Sumpong is the one affected. Likewise, there is no need for Lapu-Lapu, but only Barangay Patpat.
7. Are their IPs to be affected?	RAP Team Coordinato, RASA Surveying	The Infrastructure Chairman explained that in Barangay 10, there is IPs to be affected, but the land is owned by Military Service, as recorded in the DENR. However, IPs claim it's an Ancestral Domain[22].
Impasug-ong Coordination/ Consultation Meeting		
1. He asked whether the alignment will really pass the Barangay of La Fortuna. He wanted to be sure since his constituents will be asking him questions regarding the project. He added that he wants to inform the people in his area specially those who will be affected. He wants to be sure on the alignment of the highway because he is worried that his constituents may given wrong information.	Barangay Chairperson (La Fortuna)	The RAP Team Leader responded that the RAP Team has already prepared maps showing the preliminary alignment. Its shows that Barangay La Fortuna will be affected by the proposed preliminary alignment. He added that the RAP Team will coordinate with the Municipal Assessor and the MPDC, as well as with concerned Barangay officials to furnish maps for their reference. The Municipal Engineer then confirmed that La Fortuna will be traversed by the project. He pointed on the portions of the alignment maps indicating that there are really affected segments within Barangay La Fortuna.
2. Why should we avoid Ancestral Domains areas?	Barangay Chairperson (La Fortuna)	The RAP Team replied that the DPWH does not categorically avoid Ancestral Domains. We only introduce re-alignments to avoid cutting thru the Ancestral Domains. As much as possible, we adjust towards the perimeter sides of the AD areas so these areas will still be conserved. We might prepare additional plan called the

[22] The National Commission on Indigenous People (NCIP) Region X issued a Certificate of No Overlap (CNO) for both Misamis Oriental and Bukidnon

Question	Raised by	Response
		Indigenous People's Plan as required under the D.O. #152.
Cagayan de Oro City Coordination/Consultation Meeting (Barangay Level)		
1. She asked (in local dialect) "when will we know whether we will be affected or not by the project?"	Project Affected Person	DPWH representative responded (in local dialect) that it will be confirmed during the conduct of Socioeconomic Survey and inventory of assets.
2. She asked (in local dialect) "is the alignment final already?"	Project Affected Person	The RAP Team Leader replied that the alignment at this stage is not final yet, and that it will be finalized at Detailed Engineering Design stage. He added that there will not be significant or major changes unless there is critical issue in the FS alignment. (DPWH representative explained further in local dialect).
3. She asked (in local dialect) "is it possible to adjust to the right the alignment to avoid our group of houses in Purok 7? There are no houses at the adjacent area right of the alignment. We were not able to have enough sleep since being informed that we will be affected. We do not want to be relocated.	Project Affected Person	DPWH and RASA representatives referred to the Google Earth Map for the subject portion. RASA representatives pointed that most of the existing houses are not yet indicated. The RAP Team informed the PAPs that their case will be brought to the attention of the Japanese Consultants and will surely be given consideration.
4. A PAP asked when will be the start of the Survey.	Project Affected Person	RASA representative replied that the Socioeconomic Survey and Inventory of Assets will most probably start in the first week of May.
5. He requested to discuss more substantially how the affected properties owners will be compensated.	Barangay Chairman	The RAP Team Coordinator referred to the slides that show how PAPs will be compensated thru Negotiated Sale. The DPWH representative in local dialect, reiterated that compensation shall be the sum of the current market value of the land, the replacement cost for structures and other improvements and the current market value of the crops and trees.

Question	Raised by	Response
6. The JICA Study Team requested the support of the Barangay Captain for the upcoming socioeconomic survey and inventory of asset, to be conducted most probably first week of June 2021.	JICA Study Team	The Barangay chairperson cited that he will guarantee that the Barangay Council will be always ready for any assistance relative to the proposed project.
7. Sir, as caretaker what are the procedure in paying for our crops and land?	Project Affected Person	DPWH representative responded that the owner of the land will be compensated based on the current market value of land, while the owner of crops, will likewise be paid base on the current market value of crops.
8. Is it possible to have the alignment along the boundary lines of the lots?	Project Affected Person	DPWH representative responded that the proposed new highway is a High Standard Highway, as much as possible, curves are minimized because the design speed will be higher. We could not follow the boundaries of lots for the alignment.
9. We hope that we will not encounter difficulties in securing the requirements for transfer or payments for our lands. We are happy that we will have concrete roads but the payment we receive for our lots are not high.	Project Affected Person	The JICA Study Team responded that the DPWH requirements are mandatory. He added that the DPWH and the Consultants will explore all possibilities to lessen the difficulties encountered by the PAPs in securing the mandatory required documents and payment for the land is based on current market value as well.
10. Will it be possible to have a single office for the Road Right of Way Acquisition so we will not need to secure required documents from so many offices?	Project Affected Person	The JICA Study Team mentioned that every concern raised will be forwarded or coordinated with the DPWH and the Consultants for proper actions.
11. We are concerned because we could not contact the owners of our farmlands. For the Cagayan De Oro Diversion Project, we got no payment for our affected crops. Our farmlands have been	Project Affected Person	The JICA Study Team gave assurance that for this project, they will be compensated for affected crops.

Question	Raised by	Response
foreclosed by the banks and there various new owners who we do not know.		
Tagoloan Coordination/Consultation Meeting (Barangay Level)		
1. He expressed his concerns on whether the PAPs who did not secure land title yet will be compensated for the land they occupied aside from their structures. He said his concerns as to the stated policy where the DPWH only pays titled lots.	Project Affected Person	The JICA Study Team responded that the DPWH always adheres to the provisions of the law as defined under RA 10752 with regards to payment of compensation for affected properties due to ROAD ROW acquisition for national government projects. He added that for PAPs who have not yet must secured titles for their lots, otherwise, expropriation would be applied and the concerned courts will be tasked to resolve the case.
2. The PAPs suggested/requested to re-align the proposed road project so that it will directly traverse the MORAS Property instead of the reservoir area.	Project Affected Person	The JICA Study Team responded that the preliminary final alignment will be determined considering the results of the Feasibility Study and added that the Socioeconomic Survey and Inventory of Assets would most probably start in the first week of May to determine the actual PAPs. Furthered discussed that the final alignment will be done during the conduct of the detailed engineering design.
3. How much will be paid for the land?	Project Affected Person	The JICA Study Team replied that the affected land will be appraised by a Government Finance Institution such as the Land Bank or the Development Bank of the Philippines to determine the current market value per square meter. This will be applied in the computation of the compensation for the land.
4. Could we know the exact alignment of the project so we may know if our projects will be affected?	Project Affected Person	The JICA Study Team replied that the alignment maps will be shared upon the finalization of the selection for the route or alignment.

Question	Raised by	Response
5. He expressed his acceptance for the project considering the benefits it will bring to the people.	Project Affected Person	The JICA Study Team appreciated the project acceptance of Mr. Betonio
6. They mentioned that they attended the meeting to communicate with authorized persons and officials that they have filed a case in 1974 for a tract of land which will be traversed by the proposed road (Based on present alignment). They added that a decision was given by the court in 2000 declaring the claim of Mr. Neri as invalid considering he has no property in Natumolan.	Project Affected Person	The JICA Study Team listens and noted on their narrated story.
Manolo Fortich Coordination/Consultation Meeting (Barangay Level)		
1. Is there already a budget for this project?	Project Affected Person	As of this stage, the Feasibility Study is under a Grant by JICA. Then after the FS, and the proposed project is to be approved by NEDA for implementation, funds will be allocated. AS of now that the FS is still on-going, there is still no funds for the actual construction.
2. I would like to ask if that 60 meter project already has a budget for construction. Why not utilize the existing 10.00 meters Barangay Road where concreting is the only problem? It already has ROW, however it lacks budget. Your proposed project will affect many lot owners who also have future plans for their lots. Will it not be easier to follow the existing Barangay Road?	Barangay Kagawad (Ampal)	60.00 meters is the Road Right of Way limit. Our project has four (4) lanes and 3.65 m. width per lane. The 60.00 meters will not be fully-occupied by the concrete road. There are allowances for future expansions. For that Sir, we will check whether the existing road will pass for the High Standard Highway where we limit curves. Can you please point the location of the existing 10.00 meters Barangay Road so we could refer to the Designers?

Question	Raised by	Response
3. If ever the 60.00 meters wide project pushes thru, since only four (4) lanes are for concreting, can we prepare a Memorandum of Agreement that while the government is still not using, the owners may utilize the vacant areas as a favor to prevent the illegal settlers.	Project Affected Person	JICA is strict in monitoring the DPWH on the maintenance of Road Right of Way. DPWH District Engineering Offices are responsible in the clearing and private purposes are strictly not allowed.
4. Our property was traversed by the national highway and the easements were occupied by squatters. What actions can we do to remove the squatters at the frontage of our property?	Project Affected Person	DPWH Regional and District Engineering Offices are responsible for the clearing and maintenance of the ROAD ROW including the road easements.
5. Have you presented the project to the LGUs? How many percent already is the FS? How many affected property owners?	Project Affected Person	Yes Mam, we have already presented the proposed project to the LGUs. This meeting is still part of the FS which is about 20% completed. We still do not have the final data on the final affected property owners.
6. How long will be the construction of this project? We are concerned that this project will be started but could not be completed for lack of funds.	Project Affected Person	JICA Projects are funded up to completion.
7. Regarding the compensation for the affected property owners, do you have initial negotiation with them?	Project Affected Person	The DPWH will have different teams under the Road Right of Way who will be in-charge with the negotiations.
8. Sir, from creek how many meter is the clearance?	Project Affected Person	DPWH representative responded that regarding the distance from the creek, we could not determine yet as of now. However, design clearance from the creek will be determined during the actual survey and the design alignment of the Japanese Consultants.

Question	Raised by	Response
9. Will there be compensation for the affected lots? How much is the exact prevailing price?	Project Affected Person	DPWH representative responded in local dialect that the land titles will be checked if qualified for compensation in accordance with the applicable laws specifically RA 10752. However, for land titles acquired under CA 141, twenty (20) meters is reserved by the government for public use. CA No. 141 was amended by Presidential Decree (PD) No. 635, dated Jan. 07, 1975, which increased the ROW strip reserved for public use sixty (60) meters. However, any improvements will be paid by the government.
10. What if in the affected areas there are few holders of land titles and the others only hold Tax Declarations?	Project Affected Person	The JICA Study Team responded with an advice that since there are still several years prior to actual construction, the best recourse is to seek assistance from concerned LGU officials in securing land titles, specially upon confirmation that the said lots will be affected by the ROAD ROW for this project.
11. Upon realization of this proposed project, will there be Toll Fees like in Manila or the SLEX and NLEX?	Project Affected Person	The JICA Study Team responded that there will be no Toll Fees for this High Standard Highway considering that as indicated in the Typical Cross-Section.
12. We are tenants and according to the landwners, they will not allow the project to pass thru the middle of their lands.	Project Affected Person	The JICA Study Team explained that the purposed of the Public Consultation Meeting is to present and discuss to all Project Affected Person(s) PAPs the Objectives of the Project and explain with them, how the government, thru the DPWH the process in acquiring and mode of payment for all affected lots, structures, trees and crops to be affected and for the smooth implementation of the Project.
13. How about the access roads, will they be preserved for the local residents' use? She pointed to the access road between Salvador Home	Project Affected Person	The JICA Study Team cited, that they will inform the Japanese Consultants on this existing access road almost parallel to the proposed alignment, for further study and consideration. (Please see attached location map of the existing access road).

Question	Raised by	Response
Goods Store and Dodong Iligan Lodging.		
14. He is concerned because their land which will be affected by the proposed new Highway has no title. They are five (5) siblings in the family and they have lived in that property since their childhood. They only have a Tax Declaration.	Project Affected Person	The JICA Study Team responded that only titled lot will be compensated. However, the crops and trees and other improvement will be compensated based on the current market value of crops and trees and current price of construction materials for the affected structures and other improvements.
15. She informed that their lot is rented by Del Monte for 10 years, and the payment has been given in advance. Are we going to repay back Del Monte in the advance payment given to us?	Project Affected Person	This was noted by the JICA Study Team. However, regarding the repaying back the advance payment, it's up to Del Monte to decide.
16. He cited that their house was constructed for about Three Hundred Thousand Pesos (Php 300,000) before. He asked how much they will receive now if their house will be affected.	Project Affected Person	The JICA Study Team and DPWH representative responded that as explained during the Presentation, the compensation for structure or the house will be computed based on the current prices of materials and current rate for labor, equipment, contractor's profit (if applicable), overhead and all other expenses associated with the structure.
17. Will there be Toll Fees for the proposed new Highway?	Project Affected Person	The CMHSHCP project is not a Toll Fee road project.
18. He raised his concern on what will happen to him if the whole 60.00 meters ROW will come from his lot which is only about 2 hectares. He added that he will be left with no land. He also informed that his title is still on process.	Project Affected Person	The JICA Study Team relied with an advice that it will be much better if he could secure the title prior to acquisition, if ever the project will push thru. He added that there are unavoidable situations where people, including farmers, will be losing valuable properties due to construction of major

Question	Raised by	Response
		roads which are highly necessary for national or regional development.
19. He inquired if they could be provided with copies of the updated alignment maps.	Project Affected Person	The JICA Study Team informed him that copy of the alignment maps have been provided to the Office of the Barangay Chairman for reference in determining the potential PAPs. The JICA Study Team added that updated alignment maps will be provided also thru the concerned LGU officials in proper time.
Sumilao Coordination/Consultation Meeting (Barangay Level)		
1. What is the assurance that we will be relocated? How much is the percentage of assurance that there will be an area for our relocation as affected persons?	Project Affected Person	The JICA Study Team responded that Relocation Site will be provided to Informal Settlers only in pursuant to the provisions of Republic Act No. 7279.
2. If my child has an existing land title, is it possible that we will not be provided relocation lot? What if the payment for the affected lot is not enough to buy another lot for our house?		The JICA Study Team replied that the price or value of affected lots will be based on appraisals to be undertaken by GFIs such as Land Bank and DBP base on the current market value. Affected lots will be appraised according to classification, so we presume payment for residential lots will be sufficient to buy another lot where to build your new houses. He added that since the compensation for the houses will be based on current market value of materials, the affected owners will surely be able to re-construct the same house.
3. There are lots that are rented by Del Monte and Dole for twenty-five (25) years and there are already advanced payments for five years rental. How will be the compensation for the lot owners whose titles are	Project Affected Person	Regarding the advanced payment for five years (5), we still have at least three (3) years prior to target (tentative) actual construction schedule. Also, additional compensation for future harvests is added for the damaged or affected crops. So, we foresee no big problem with regards to the advanced payment.

Question	Raised by	Response
given (surrendered) to the companies?		
4. Our Council would like to request that, if really possible, your Team should buy a land where affected families could transfer or relocation site which will be near the location of their old houses. There are land owners here who are prepared to sell their lots so the affected families could transfer near their present occupation or sources of living.	Project Affected Person	The JICA Study Team responded that their concern will be forwarded to the DPWH for consideration.
5. It is really our request that, if we will be relocated to a location near our livelihood because we will really have difficulties if we will be relocated to other Barangays. We are working in a farm and is a potential area where we could transfer residence and we hope you could negotiate for it. We hope assessment for our affected areas will be pushed thru so it will be not hard for us to start our lives again.	Project Affected Person	The JICA Study Team assured that this concern will be given proper attention.

Question	Raised by	Response
6. What will be the indication that the alignment is already final?	Project Affected Person	Based on the results of the Barangay Public Consultation Meetings, there are areas that have been considered for re-alignment including along a relocation site in Basag, Vista Villa. After these adjustments, by June 2021, prior to the start of Census and Assets Inventory, we will already have a semi-final alignment for FS level or stage. By first or second week of June, we will know who will be affected and we will inform the PAPs thru the Barangay Chairmen. However, the final alignment for project implementation/construction will be determined during the conduct of the detailed design stage.
7. How many meters will be the distance between the Sayre Highway and the proposed JICA Project?	Barangay Chairperson	DPWH representative responded that the Sayre Highway and the proposed project of JICA will be near to each other. (please see attached map)
8. Many lots located in our place are rented by Del Monte in the past years, and we only have Tax Declarations. After several years, we were able to secure titles and the lots were sub-divided thru the assistance of Del Monte. Who will receive the payment now, the original owners of the land or Del Monte?	Project Affected Person	The JICA Study Team and the DPWJH representative both responded that the registered owners of the lots will receive the compensation for the affected lots while Del Monte will be compensated for the crops.
9. There is a parcel of land which was already sold, however, they only have Deeds of Sale. Are they going to be paid?	Project Affected Person	The JICA Study Team responded that since, as per tentative implementation schedule, the construction project will start by 2023, it will be better to process the transferring of the title now.
10. How about the timberland where there is a claimant, does he has rights?	Project Affected Person	The JICA Study Team responded that there will be no compensation for the timberland, however, if there will be affected crops or structures, the claimant will be compensated.

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(Cagayan De Oro – Malaybalay Section)

Question	Raised by	Response
11. He raised his concern on the present alignment which will traverse directly the Relocation Site in Purok Basag, Vista Villa, Sumilao, Bukidnon near the boundary with Ticala, Manolo Fortich, Bukidnon. He informed that the Relocation Site was initiated by the Municipal Government for those who previously resided in accident and landslide prone areas. He added that the Municipal Government will have difficulty putting-up another Relocation Site. Further, he requested to re-align the project towards the open areas right side of the alignment so as to avoid also the farmlands of the relocated families whose livelihood will be affected heavily if they lose their farmlands located in San Roque, Sumilao, Bukidnon.	Municipal Vice-Mayor	The JICA Study Team responded that their concerns will be brought to the attention of the Japanese Consultants. (please see attached location map) for consideration.
12. He mentioned that the Municipal Mayor has instructed him to talk with the RAP Team to convince the Designers that the Relocation Site in Basag must be avoided.	Barangay Chairman (Vista Villa)	The JICA Study Team cited that the relocation site will surely be avoided by the consultant.
13. Relayed the request of the whole community of the Relocated Families for the re-alignment to avoid disrupting their settlement which is very valuable to their lives.	Barangay Kagawad (Vista Villa)	The JICA Study Team and DPWH representative assured that the request for the realignment to avoid the Relocation Site in Sitio Basag, Sumilao, will be forwarded to the Japanese Consultant.

Question	Raised by	Response
14. He raised his concern regarding the fruit-bearing trees such as lanzones which might be affected.	Barangay Kagawad (Vista Villa)	It was informed by the JICA Study Team that in case there will be affected fruit-bearing trees, the future harvests of the fruit-bearing trees will be considered in the computation of compensation.
15. He voiced his request to avoid the water sources within the relocation site in Sitio Basag.	Project Affected Person	The JICA Study Team cited that this will surely be address by the Consultant.
Malaybalay Coordination/Consultation Meeting (Barangay Level)		
1. In case, the affected persons do not participate in the consultation meetings, what will happen?	Barangay Chairperson	Upon finalization of the alignment, we have what we call the Parcellary Survey. If the affected persons or the owners still do not want to cooperate, they will be sent notices that their properties will be affected. If the owners still do not want to cooperate, the government thru the DPWH may apply expropriation as the mode of acquisition in order to avoid/ minimize delay on the project.
2. If the affected lots do not have title, will they not be paid?	Project Affected Person	The JICA Study Team responded that only titled lot will be compensated. So, since we have still at least three (3) years before the actual construction, we suggest that you process the land titling.
3. How could the titles be processed, the owners have not paid taxes for a long time?	Project Affected Person	The JICA Study Team responded that unpaid property tax, must be paid now, so that you can process for the titling of the land.
4. Is this project the same as NLEX and SLEX that we have to pay toll fees?	Barangay Chairperson	The JICA Study Team responded that the proposed CMHSHCP is not a toll fee expressway. It's almost the same like existing Sayre Highway, except, the CMHSHCP road right-of-way limit is 60meter and the proposed alignment is more wider that the existing Sayre Highway.

Question	Raised by	Response
5. My question is: Is there an assurance that before the construction in 2023, the affected owners will be compensated? There are instances the affected owners are not paid so the project could not be continued and there are cases the affected persons are already paid but they remain in their properties.	Project Affected Person	The DPWH will start Road ROW Acquisition at least one year prior to the start of actual construction works. Houses and other structures will not be demolished or removed unless paid while lots with complete requirements will be processed before being occupied.
6. There are titled lots here and there are owners who only hold Tax Declarations. Are owners with Tax Declarations only going to be paid also?		Our tentative schedule for the project's construction works is 2023 and we will have the semi-final alignment for the FS Stage by June this year, so it is our advice to secure the title if your lots will be affected.
7. For example, we still have no title for the lots when construction comes, what will you do?		This subject will be discussed again with the DPWH. However, as per RA 10752, the mode of acquisition applicable is expropriation.
8. What is the probability that this project has funds?		We are still at the Feasibility Study Stage. The Feasibility Study Stage is being undertaken thru a Grant by JICA.
9. What is also the probability that this project will be implemented?		We are still at the Feasibility Stage, so we are not sure of its implementation. However, most proposed DPWH projects considered for FS by JICA are implemented. After the FS, NEDA will decide on approval for its implementation. So, after one year, we will know whether it will be implemented or not.
10. Why are you going to have a new highway while we have a good existing highway?		DPWH, JICA and other concerned officials are looking on positive economic activities for the future, hence, this project is being considered.
11. Can we get a copy of the Minutes of the Meeting? If you are going to look at the project, it traverses right at the center of a	Project Affected Person	The minutes of the meeting will be provided thru the Office of the Barangay Chairman. May we respectfully ask for a copy of the plan so we can justify your request for consideration in order not to divide your farm which bio- security

Question	Raised by	Response
farm establishment. You can not divide a poultry like that technically, due to biosecurity. Can we have a better option that could not severely affect other farms?		will not allow. We will notify you if it is possible to re-align.
12. He suggested to utilize the existing access road which is 6.00 meters wide for the proposed project.	Project Affected Person	The JICA Study Team responded that the proposed project is a High Standard Highway with 60.00 meters ROAD ROW. There will be more structures particularly residential houses if the access road will be utilized. He added that the access road also serve a different purpose for the local residents.
13. Our farm lot has a Tax Declaration under a mother title. The title is still for application since the survey has just been undertaken. How will it be?	Project Affected Person	The JICA Study Team responded that we still have at least three (3) years prior to target construction works schedule so, we advise that you try to secure the title so the processing of payment will be simpler or easier.
14. He asked: With regards to the lots rented by Del Monte, who will have the claims for the affected portion of the lots, the company or the owners?	Project Affected Person	Thank you Sir. The land owners will receive the payment for the affected portion of the lots while Del Monte will receive the payments for the crops.
Impasug-ong Coordination/Consultation Meeting (Barangay Level)		
1. Where will be the alignment of the proposed Highway	Project Affected Person	The JICA Study Team showed the Detailed Alignment Maps to the PAPs. The PAPs were given the chance and time to scrutinize the maps and inspect the areas that will be affected.
2. If we will be affected by the project, could we be prioritized in the hiring of workers?	Project Affected Person	The JICA Study Team responded that the PAPs will be given priority in the hiring of workers. In coordination with the LGUs, the full implementation of Local Hiring requirements of at least 50% for un-skilled workers and at least 30% for skilled workers will be ensured.

Question	Raised by	Response
3. How about the lands that were rented by Del Monte and DOLE?	Project Affected Person	The JICA Study Team responded that if the project will push thru, it may take about at least 3 years from now before the actual construction, so the contracts could be finished by then. Whatever the case may be, the registered owners of the lands will be compensated for the lots while Del Monte and DOLE will be compensated for the crops.
4. Will the existing access roads be preserved upon the construction of the proposed Highway? The existing access roads are be able to accommodate trucks such as those used in transporting sugar canes.	Project Affected Person	The JICA Study Team responded that the existing access roads will be considered in the design of the proposed High Standard Highway. He informed that their concerns of preserving their existing access roads will be brought to the attention of the Japanese Consultants who are responsible for the Design. (please see attached location of the existing access road).
5. Will there be toll payments for the Highway?	Project Affected Person	The query regarding the toll payments will be referred to the Japanese Consultants also.
6. He raised his concerns that their lot is being rented by DOLE Philippine Inc.	Project Affected Person	The JICA Study Teamresponded that the registered owners of the lots being rented by DOLE Philippine Inc. will receive the compensation for the affected crops, while the land owners will receive compensation for the affected lots.
7. She raised her concern on what will happen to them if they will be affected considering that their land is under Agrarian Reform.	Project Affected Person	The PAP in local dialect, responded in behalf of the RAP Team Leader that land under Agrarian Reform Title still need to be studied how they will acquire the Title prior to address the compensation for their land.
8. He raised his concern regarding their land because their lots Title is under the name of his mother.	Project Affected Person	The JICA Study Team replied that their case will be resolved by the DPWH in accordance with RA 10752.

Question	Raised by	Response
9. He asked why they were informed/requested to attend the meeting while they have already sold the subject lot.	Project Affected Person	The JICA Study Team replied that the of lot owners given by the Municipal Assessor was based on the current Tax Declarations. It means that the new owners have not yet applied for Tax Declarations and that may have no Title/s yet.
10. Our lots are under contract with Del Monte, how shall we be paid or compensated?	Project Affected Person	The JICA Study Team also responded that the registered owners of the land will receive the compensation for the land while Del Monte will be compensated for the crops (pineapple plants).

The above-mentioned problems of the PAPs were tackled and settled. Other issues and concerns discussed during the consultation have been taken into consideration as well. After the meeting, stakeholders expressed strong support with the proposed project. All the consultations were properly documented.

Annex 15. Public Consultations (Pre-Scoping Information, Education and Communication)

Information Education Campaign

Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)

PRE-SCOPING INFORMATION, EDUCATION AND COMMUNICATION REPORT

Draft Report

AMET Asia, Inc.

April 2021

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EXECUTIVE SUMMARY

In accordance with the guidelines on public participation under the Philippine Environmental Impact Statement (EIS) system, DAO 2017 – 15, the stakeholders shall be involved in various stages of the EIA process and must be introduced early through Information, Education, and Communication (IEC). IEC were conducted last March 22 to 24, 2021 in the municipalities of Tagoloan and Cagayan de Oro City, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong and Malaybalay City, Bukidnon. Local Government Units, barangay officials of the affected barangays and representative from various sectors were invited. The road alignment and the components of the Project were presented along with the process of Environmental Impact Assessment (EIA). Stakeholders' issues and concerns about the project, as well as their suggestions and other inputs were discussed in the open forum. Initial Perception Survey, that covers the identification, perception, and attitudes of the respondents from the direct impact barangays towards the project was conducted afterwards.

The IEC were considered to be conducted successfully and no conflict has been arisen between the attendees and the IEC Team. Based on the open forum and from the Initial Perception Survey conducted, majority of the stakeholders appreciated the project as it will provide easement in their transportation and will provide accessibility of transporting farm products to the market. Major concerns of the stakeholders addressed were the issues on just compensation for the affected titled/untitled land and properties, detailed project design in preparation of the affected property owners, presence of CADC/CADT and sacred places in the area, issuance of toll fee, inclusion of hinterlands in the road alignment. The stakeholders suggested to conduct a massive information dissemination about the Project and all the issues and concerns must be addressed and consensus on the affected property owners must be sought.

1. Preparation for IEC

Courtesy calls were conducted on March 11-12, 2021 to the Municipal Mayors and Administrators in preparation for the IEC and also to determine the schedules, venues and list of stakeholders to be invited. Invitation letters were distributed to the stakeholders prior to the scheduled IEC. **Table 1** shows the schedules and venues of the IEC meetings.

Table 1. IEC Meetings Venues and Schedules

Province	City/Municipality	Date and Time	Venue
Misamis Oriental	Tagaloan	March 24, 2021, 2:00 pm	Tagoloan Central Elementary School, Tagoloan
	Cagayan De Oro	March 24, 2021, 10:00 am	Puerto Barangay Hall, Cagayan De Oro
Bukidnon	Manolo Fortich	March 22, 2021, 2:00 pm	BRCI Bldg., Diclum, Manolo Fortich
	Sumilao	March 24, 2021, 10:00 am	Conference Hall, 2nd Floor, New Building, Sumilao
	Impasug-ong	March 23, 2021, 2:00 pm	Conference Hall, Municipal Hall, Impasug-ong
	Malaybalay	March 23, 2021, 10:00 am	Casisang Covered Court, Malaybalay City

The required IEC documents reviewed and approved by the JICA Study Team are enumerated below.

1. Preliminary list of stakeholders (Attachement 1)
2. Invitation letters to the stakeholders (Attachment 2)
3. IEC program (Attachment3)
4. IEC presentation material (Attachment 4)
5. IEC brochure (Attachment 5)

2. IEC Meetings

2.1 Municipality Tagoloan

The project fliers were given to the participants during registration. The program started at 2:00 PM and ended at 3:30 PM. The opening prayer given by Mr. Benecio Naduma, Purok Leader of Baluarte followed by the singing of the National Anthem led by Ms. Lucila Sabio, Office for the Senior Citizen's Affairs President. The opening remarks was given by Sharon Sabio, Chief Executive Officer of the Mayor. This was followed by the presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Region 10 office.

The presentation of the important features of the project was given by Dr. Nimfa L. Bracamonte and then the open forum followed. After the open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Maranda. The closing remarks given by Eng. Gene Baculpo from Municipal Planning and Development Office.

2.2 Cagayan de Oro City

The brochures were given to each of the participants during registration. The program started at 10:00 AM and ended at 11:40 AM. The opening prayer was given by Julie Pearl Curilan, a City Local Environment and Natural Resources Office (CLENRO) staff. This was followed by the singing of the National Anthem led by Ms. Shara Angelie (CLENRO staff). The opening remarks was given by Engr. Armen A. Cuenca (CLENRO, Head).

The presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Regional office followed. The presentation of the important features of the Project was given by Dr. Nimfa L. Bracamonte followed by open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Alma Maranda. Closing remarks was given by Mr. Ramir M. Balqwin from City Planning and Development Office.

2.3 Municipality of Manolo Fortich

The fliers were given to the participants during registration. The program started at 2: 00 PM and ended at 4:30 PM. The opening prayer was given by Datu Macabulig followed by the singing of the national anthem led by Ms. Jessica Anlagan. The opening remarks was given by Brgy. Councilor Warleo A. Goayon. The presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Regional office followed. The presentation of the important features of the Project by Dr. Nimfa L. Bracamonte ensued. Manolo Fortich Mayor Hon. Clive D. Quino accompanied by the Municipal Planning gave a brief message and appreciated the project as this will help ease the movement of people and goods. After the open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Maranda, the closing remarks was given by Municipal Environment and Natural Resources (MENRO) head, Ms. Sharon Tacbobo.

2.4 Municipality of Sumilao

The program started with registration and distribution of Project brochure. The program started at 10:00 AM with a prayer from Ms. Bae Ruti Toreno and the national anthem by Ms. Marife Modrangko. This was followed by the opening remarks by Barangay Captain of Poblacion Mr. Julius Cesar Tan. Prof. Embornas presented the Project information and then followed by the open forum where participants asked questions and provided suggestions for the Project. The closing remarks was given by the Barangay Captain Jose T. Curay from Barangay San Roque.

2.5 Municipality of Impasug-ong

Fliers were distributed to each of the participants during registration. The program started at 2:30 PM with the prayer led by Brgy. Councilor Abner Garcia from Brgy. Poblacion and national anthem conducted by Brgy. Councilor Ikee Quines. The opening remarks was given by Municipal Administrator, Mr. Ben Gabriel Uy. The project presentation was given by Prof. Embornas and the open forum followed with some questions and suggestions from the participants. The closing remarks was given by Barangay Captain Josefino Manalo of Brgy. Cawayan. The program ended at 4:00 PM.

2.6 Malaybalay City

The fliers were distributed to each of the participants during registration. The program started at 10:15 AM with the invocation led by Brgy. Councilor Francis Eddie Dagang from Brgy. 10 (Poblacion) followed by the

national anthem led by Ms. Rita Gumita. The opening remarks was given by the Barangay Captain of Casisang Capt. Bonifacio Valiente who was positive about the project. Afterwards Prof. Embornas presented the project and the flow of the EIA. The open forum followed and then the closing remarks by the CENRO Valencia Representative Mr. Ferdie Sususco.

3. Comments, issues, and suggestion raised

The highlights of the issues and concerns raised are presented in **Table 2** to **Table 7**

Table 2. Summary of Issues and Responses in Municipality of Tagoloan

LGU'S Covered	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Municipality of Tagoloan Barangay - Casinglot - Natumolan	**Project Design** - Is this Project an elevated road? - There might be informal settlers who will inhabit the area down.	Engr. Gene Baculpo – Municipal Planning and Development Office	*Dr. Nimfa Bracamonte (Amet-Asia)* The Project is still in the feasibility stage and at this time.
	Necessity of the Project - Is it necessary to build another road and not contrary to other roads that are already congested? - Would it be recommendable that this be continuous to the existing road since once constructed there will be those who will be affected?	Mr. Rogelio – Casinglot Brgy. Councilor	*Ms. Catherine Salingay (DPWH R10)* - CMH is a high standard highway. There is a high-speed movement of vehicles with speed reaching 200 kph. - This will be useful as the existing road is not good for fast moving vehicles and there will be interchanges and connection of the roads.
	Project Timeline and Relocation - Where does the Project start? - If our house will be affected and we are not prepared, where should we go?	Mr. Nestor Baltazar - President of KASINLOP)	*Ms. Catherine Salingay (DPWH R10)* - There is no final engineering design yet. - There will be another team that will go and explain regarding the relocation.
	Presence of IP sacred places - Will there be royal grounds and sacred places that will be affected? - If yes, how can you prevent the impacts and what will be the last option?	Mr. Wendell - IP secretary	*Dr. Nimfa Bracamonte (Amet-Asia)* - The Project is still in the feasibility stage and at this time. The issues and concerns will be addressed in the public scoping - The proponent is aware of the IPRA Law, RA 7381 and FPIC. In case that there will be affected IPs, the proponent will apply for FPIC. - This project is not only culture-sensitive but also gender-sensitive.
	Compensation to the affected properties - What are the benefits that will be provided to those who are affected by loss of houses and	OSCA Senior Citizen	*Dr. Nimfa Bracamonte (Amet-Asia)* - Any properties that will be affected by a development Project, they should be duly compensated based on current

LGU'S Covered	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	lands? - Will you provide a relocation area?		fair market value as embodied in the Philippine Constitution Article III, Section 9 - Another team will be sent to the barangay and will determine the affected properties.
	Untitled Lands Compensation Most of those from the area does not possess a title to their respective properties.	Mr. Rogelio – Casinglot Brgy. Councilor	*Prof. Amabelle Embornas (Amet-Asia)* - There will be a team that will be sent to the area and negotiate regarding affected properties. - There is a memorandum order that even those without titles to their properties will still be compensated. - The proponent will assure you that they will follow the right process.
	Safety Most of us reside near traffic lights which is accident prone area. We have problems with precautions, it would be a prominent zone.	Mr. Rogelio – Casinglot Brgy. Councilor	*Engr. Angelita Balid (JICA Study Team)* - The proponent is proposing CMH because Sayre is an accident-prone highway with steep slopes - CMH will be designed with a gradient of 4-5% compared to Sayre with about 15% gradient which is more dangerous
	MMT and EGF - Is MMT part of the EIA? We are looking forward for the monitoring and evaluation. - The EGF will be coming from the DPWH?	Mr. Jeffrey – Sanguniang Kabataan Member	*Dr. Nimfa Bracamonte (Amet-Asia)* - MMT is part of the process. There is MMT not only from the public officials/ LGUs, but also with the stakeholders' participation. DPWH will also be part of the monitoring team - The proponent of the project is the DPWH in assistance with JICA.
	Comment - We are thankful with this project as this will have a big impact to Barangay Casinglot. - We have a plan identifying this as a growth area in the upper part. - This road will have big impact as this invites the investors	Engr. Gene Baculpo – Municipal Planning and Development Office	
	Others There is the road Malaiba, is it not part of DPWH?	Mr. Rogelio – Casinglot Brgy. Councilor	*Dr. Nimfa Bracamonte (Amet-Asia)* CMH is another highway, parallel to Sayre

Table 3. Summary of Issues and Responses in Cagayan de Oro City

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Cagayan de Oro City Barangay - Bugo - Puerto - Balubal	**Compensation of Affected Properties** Is there a payment for the land, house and trees that will be affected by the Project?	Mr. Presley C. Emano – Brgy. Councilor, Bugo	*Dr. Nimfa Bracamonte (Amet-Asia)* Private properties that will be taken for public use should be done upon payment of just compensation (power of eminent domain) *Engr. Armen Cuenca (CLENRO)* There are 3 modes: through donation, negotiation or expropriation.
	Payment for Compensation of Properties Can compensation payment be done before the start of the Project?	Mr. Renante Rosalo – Brgy. Balubal Resident	*Mr. Armen Cuenca (CLENRO)* - Before the project implementation, the owner of the affected properties should already demand for payment. - The DPWH Contractors would not start the project unless there is consent from the owner of the properties - Based on experience, 50% would be paid in advance, and the remaining 50% would be paid after the property would be demolished. For the plants /trees affected, 30% would be paid in advance and the remaining 70% would be paid after the plants/trees will be cut.
	Duration of Payment for Compensation If ever the owner of the land/house/plants /trees will not be paid before the project will be implemented, how long will they be paid?	Mr. Renante Rosalo – Brgy. Balubal Resident	*Ms. Catherine Salingay (DPWH R10)* We are not really sure as to how long will the owner of the land/house/plants will be paid, but in our experience, I think it would be 5 years
	Benefits from the affected properties If ever even after the implementation of this project, the owner of the land/house/plants/ trees will suffer from flood, mud or water-soaked soil due to Project, what benefits would they receive?	Mr. Venido Payana-Barangay Puerto Staff	*Ms. Jan Bautista (Amet-Asia)* The ROW Team will make a report and based from their report will know the number of affected persons and how much will be paid for the damages incurred.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
			Mr. Armen Cuenca (CLENRO) - EIA will include in the report the needed actions if ever the owner of the land will suffer from flood, mud or water-soaked soil after the project implementation - MMT will be responsible in monitoring the project implementation to avoid this occurrence to happen. - Even after due monitoring by the MMT, this still happens, Government Compensation Fund will be used to pay the affected owners.

Table 4. Summary of Issues and Responses in the Municipality of Manolo Fortich

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Municipality of Manolo fortich Barangays: - Alae - San Miguel, Damilag - Diclum - Sankanan, Tankulan - Ticala, Mambatangan	**Project Design** Difference between the proposed highway and the 'Build, Build, Build' project of the government?	Mr. Warleo A. Goayon – Brgy. Councilor, Diclum	*Engr. Greg Dablo (DPWH R10)* - 'Build Build Build' is focused on construction of not just roads but also other buildings and more on civil works and structural. - It is the same because it is an implementing government projects
	Detailed Engineering Design Can we ask for specifics of the Project?	Mr. Chris Loren - Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - There is still no detailed design. The Project is still in the feasibility study phase, and the impact will be learned once the EIA is conducted.
	Ground Work/Soil Testing Why is soil testing commencing without properly informing the lot owners?	Mr. Joaquin L. Fudolin – Brgy. Councilor of San Miguel	*Mr. Paul Paraguya (EB Soil Testing Inc.)* - The soil testing group was granted permission by the father of the owner of the land. However, they are not aware that the land was already subdivided. - The purpose of the group is to identify the coordination grid points for the design/plan. - Mayor Quiňo and Brgy. Joaquin acknowledged the apology of Mr. Paraguya
	Oppositions of the Project What if there are oppositions in the specifics of the road like conflict in boundary and right of way?	Mr. Chris Loren - Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - The proponent will look at your issues and suggestions. - If there are issues that remain unresolved, there will be a public hearing which is a part of the whole process

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	Presence of conflict/opposition - Will this project still be implemented if there are oppositions from the unconcerned people? - Will the issues/concerns of the affected people be considered?	Mr. Chris Loren - Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - This project will follow the guidelines set by DAO 2017-15 and the PEISS. - If there are oppositions raised by concerned people, a public hearing will be conducted in the presence of appropriate government agencies.
	Compensation of Properties to be affected What will be done to the affected houses and trees?	Datu of Sankanan	*Dr. Nimfa Bracamonte (Amet-Asia)* - According to 1987 Philippine Constitution, particularly in Section 7 of Article III, private properties that will be taken for public use should be done only upon payment of just compensation (power of eminent domain)
	FPIC Application Will this project procure the needed FPIC?	Mr. Datu Macabulig	*Dr. Nimfa Bracamonte (Amet-Asia)* - If the detailed design will affect the CADT/CADC of the cultural communities, definitely yes. - This is still the initial phase of the feasibility study
	Political change of administration There should be proper communication channel during transition if case there is a political change of admin for the proper project implementation.	Damulag Public Information Officer	*Dr. Nimfa Bracamonte (Amet-Asia)* The Project will go through proper procedures where transparency and due courtesy will be conducted in coordination with the LGU concerned during project implementation.
	Existing government projects that might be affected If the irrigation project will be affected, what should be done?	Ms. Elyiza Orap, SEA Irrigators	*Dr. Nimfa Bracamonte (Amet-Asia)* There should be due courtesy with DPWH to the municipality regarding the plans of the project.
	Construction waste - Problem with hired contractors whose diggings and excavations of soil are carelessly thrown elsewhere. - Arbitrarily throwing of cut/fallen trees - a behavior problem	Ms. Sharon Tacbol, MENRO Staff	*Dr. Nimfa Bracamonte (Amet-Asia)* Hired contractors will coordinate with LGU in terms of proper waste disposal, spoil area, and taking care of environment.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	Suggestion - The project is good and we need to go through the process. - If the project is good, we support it. - If there are areas which will be affected with CADT or CADC we should respect them. - The public should be made to understand about the processes involved in this project	Hon. Mayo Clive Quiňo – Manolo Fortich Mayor	*Dr. Nimfa Bracamonte (Amet-Asia)* - If the cultural communities will be affected the FPIC will be undertaken. - There will be a public scoping which will present the EIA process in detail and the impacts of the Project. - The IEC is to inform the public about the plan of the Central Mindanao High Standard Highway project and gather various issues/concerns.

Table 5. Summary of Issues and Concerns in the Municipality of Sumilao

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Municipality of Sumilao Barangays: - Culasi - Kisolon Poblacion Puntian - San Roque	**Project purpose** What is the main objective of this project since there is already an existing road from Cagayan de Oro to Malaybalay?	Mr. Gemmo Olana – Brgy. Councilor, Kisolon	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* The Project aims to increase the speed of travel from Cagayan de Oro to Malaybalay.
	Issuance of toll fee Will there be a toll fee for this road?	Mr. Daloais Silvestre – Brgy. Captain, Kulasi	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The project is still in the feasibility stage. - The establishment of toll fee will still be studied.
	Suggestion - There is a circumferential road to Dahilayan, why not connect these roads? So the roads are connected and it will not be cut since some barangays are not included in the project. - Why not connect the road from Mutia to Likuan?	Mr. Gemmo Olana – Brgy. Councilor, Kisolon	*Engr. Greg Dablo (DPWH R10)* Based on the alignment, the Sayre Highway Parallel Road 1 will be the one connected to Dahilayan.
	Environmental considerations - Can the project consider the landslide prone areas such as in San Vicente in Maluko? They built a road but there is always landslide. - Why don't they build a tunnel under the mountains to make the road straight instead of curved?	Mr. Jerome Cagawas – Brgy. Councilor, Poblacion	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The project is still in the feasibility stage. - The suggestion is duly noted.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	Consent to the IPs - Before anyone from the Proponent will go to the area, they should contact the IPs and seek consent to enter the area especially the Chieftain and Municipal IPMR. - The proponent should also ask for local IP guides in the area so to avoid the sacred places and other dangerous areas	Mr. Anliston Rosaliad – Tribal Secretary, Cultural Sector	*Engr. Greg Dablo (DPWH R10)* - The team will follow the protocol in informing the LGU and Barangay Captains before entering the area. *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The team will also seek the consent of the IPs/ tribal sector before entering the area.
	Participation in the project We are in San Vicente and far from the project. What is our participation in this project?	Paterno Tuminlag – Brgy. Captain, San Vicente	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We are informing the public about the new project. - We are making the IPs and everyone aware of this project in Sumilao.
	Informing affected landowners and compensation - How will you inform the affected landowners/ people? - Will they be receiving compensation?	Nolandf Caramonte, Brgy. Councilor, San Roque	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The scheme about the land affected will be attended by another team the Right-of-Way Action Plan team. - There will be another consultation/ negotiation about this.

Table 6. Summary of Issues and Concerns in the Municipality of Impasug-ong

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Municipality of Impasug-ong Barangays: Capitan Bayong Cawayan Impalutao La Fortuna Poblacion	**Rationale of the Project** - Why is the project established in Bukidnon? What are the reasons? - There many roads established here	Mr. Romeo Abunda Sr. - Brgy. Councilor, Impalutao	*Engr. Greg Dablo (DPWH R10)* - There are existing roads in Bukidnon but they are not high standard highways. - A high standard highway can make travelling faster since the roads allow for faster movement of vehicles. - Bukidnon is seen as an area for economic growth and there is a need to improve the connectivity of Bukidnon and Cagayan de Oro. *Ms. Jan Bautista (Amet-Asia)* - There is an existing road (Sayre) but not a high standard highway *Engr. Angelita Balid (JICA Study Team)* - Malaybalay has a high potential of attracting traffic

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
			- The existing roads are designed with slow mobility
	Inclusion of hinterlands in road alignment - Can other barangays be included in the highway project. - The proposed Project is near the national highway but those in the hinterland do not have roads?	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Engr. Maria Victoria Lofamia (DPWH ESSD)* - There were several considerations – social, environmental, and economic. - The project will still undergo further study for the final alignment.
	Road alignment - Will this road connect to other existing roads or is this different?	Mr. Emmanuel Lumayod – MENRO Staff	*Engr. Greg Dablo (DPWH R10)* - This Project is different. - There will be interchanges in the project which will allow connection of the different roads.
	Changes of Alignment - There were projects in the past which the alignment presented is different to the one that is implemented and we are not informed in the re-alignment. - We want a clear alignment so people will know who will be affected.	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - This is still the FS stage and finalization of the detailed design will still undergo more studies and discussion. - If there will be changes in the alignment it will not be very far from what is presented here. - Right of Way Action Plan team will present the scheme for land acquisition compensation.
	LGU Resolutions for the request of re-alignment - The municipality have a resolution (Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021) for the road to traverse other barangays and include other barangays in the topographic survey **(Attachment 9.** Impasugong Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021 - The is requested for the need of roads and also for the peace and order situation in the area.	Municipal LGUs	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* This is duly noted and will inform the proponent about this.
	Toll fee Issuance Will this project also require the users to pay toll fee?	Mr. Arnel Garcia – Brgy. Councilor Poblacion	*Engr. Angelita Balid (JICA Study Team)* - This is still the Feasibility Study stage.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
			- Toll or Non-toll will still be studied during the detailed design stage
	Measurement of highway What is the measurement of the highway, so the people will know especially those who will be affected?	Mr. Diomedes Tunasan – Brgy/ Kagawad Poblacion	*Engr. Maria Victoria Lofamia (DPWH ESSD)* - The road alignment is still in FS stage - There will be a detailed design in which analytical study has been conducted for the finality of the road alignment. *Engr. Greg Dablo (DPWH R10)* - The road will be 65.6 km and 60 meters wide including the canal and shoulder. - The details are not yet final and would still undergo further studies.
	Presence of sacred lands There might be sacred land affected by the project.	Mr. Arnel Garcia – Brgy. Councilor Poblacion	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The Project is still in the feasibility stage - In case that there will be CADT/CADC affected, FPIC process will be undertaken. This is a separate process.
	Compensation for affected properties - If the house or lot is affected by the Project, will there be payment? - What is the process of just compensation to those affected?	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Engr. Greg Dablo (DPWH R10)* and *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - RAP team will assess the affected property and there will be a consultation/ negotiation about this. - RAP is a separate process and another team will come for this activity. - There will be just compensation to those properties that will be affected - This is the next process if the alignment is finalized during the detailed engineering design.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	Compensation to untitled lands - Impasug-ong is 82% timberland and people do not have land titles or there is no proof of ownership. What will happen to them? - What will happen to those who have planted trees and have made improvements?	Mr. Arnel Garcia – Brgy. Councilor, Poblacion	*Engr. Greg Dablo (DPWH R10)* - There will be a RAP team that will coordinate to the affected owners - There will be negotiation on just compensation for the affected areas.

Table 7. Summary of Issues and Concerns in Malaybalay City

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
Malaybalay City Barangay 10, Dalwangan, Kalasungay, Patpat, Sumpong	**Project Fund** What is this project, grant or loan from JICA?	Mr. Rodrigo O. Niere, Brgy. Captain, Kalasungay	*Engr. Angelita Balid (JICA Study Team)* - This is an assistance from JICA in the FS part. But the project construction will be discussed further whether it will be a grant or a loan. - Detailed design and Feasibility study would depend on the study result if it is going to be a loan project
	Issue of Eminent Domain - What is the process of just compensation? - We experienced before where the owners were not paid. They had to file a case or file a legal action before they were paid.	Mr. Nilo Salga, Brgy. Captain, Patpat	*Ms. Michiko Quiachon (DPWH-ESSD)* - There will be a report called Right of Way Action Plan which will cover the affected persons, what properties will be affected and the payment scheme for their compensation. - The RAP team is currently coordinating with the LGUs and the Mayors and explain about these things. - There will be a survey to know about the details of the properties which will be affected. - This is the next process if the alignment is finalized during the detailed engineering design. - There is discussion/ consultation between the landowners and the proponent before the project starts. - We will comply with the provisions of RA 10752

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
			Engr. Angelita Balid (JICA Study Team) There is a separate group for RAP *Engr. Maria Victoria Lofamia (DPWH ESSD)* The Project is still in the feasibility stage.
	Property demolition and payment - Will DPWH help to demolish the people's houses as these are mostly poor people who cannot afford to do so? - The affected people should be relocated or paid first before the demolition.	Mr. Nilo Salga, Brgy. Captain, Patpat	*Engr. Greg Dablo (DPWH R10)* - The suggested guidelines for the contractor include coordinating with the affected house owners in the demolition. - This can also be discussed in the Right of Way Action Plan between the landowners/house owners and the proponent.
	Informing affected property owners - You should inform affected land owners, especially those with conflict regarding ownership. - During this stage, the property owners should already know.	Mr. Rodrigo O. Niere, Brgy. Captain, Kalasungay	*Engr. Greg Dablo (DPWH R10)* The project is still in the feasibility stage there is a possibility of the change of alignment *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - A separate team will come in. They will be the one who will inform the affected lands and houses - There should be just compensation based on RA 10752
	FPIC Issue The FPIC should be followed for those with CADT or CADC areas.	Mr. Rodrigo O. Niere, Brgy. Captain, Kalasungay	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - Those with CADT and CADC lands that will be affected will be consulted and this process will also be followed by DPWH and JICA. - This is a separate study from the EIS
	Coordination between Regional and District DPWH There should be coordination of the regional and district DPWH about the projects they are implementing.	Mr. Adiran Gamboa - City Planning and Development Coordinator	*Engr. Greg Dablo (DPWH R10)* This is noted and will be reported to DPWH.

LGU'S Covered by the IEC	Issues/Suggestions Raised by Stakeholder	Sector or Representative	Response
	Coordination with LGU - Local planning councils should be informed before the project begins - We are updating our CLUP and we want to know about the projects so we can incorporate this.	Mr. Adiran Gamboa - City Planning and Development Coordinator	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We will take note of all the suggestions and recommendations from the LGU and submit a report to the proponent
	Affected Trees - To consider the areas where the protected trees can be avoided - Previous projects have disregarded and did not consider first with the local government. There is no coordination between the agencies. - Request for inventory before the project - There is also a need to clarify the cut and field. DENR clearance before the start of the project.	Mr. Ferdie Sususco – DENR PENRO	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* We will take note of the concerns and make a report to the proponent
	LGU Endorsement Endorsement by the concerned barangays and LGU needs to be acquired.	Mr. Nilo Salga- Brgy. Captain, Patpat	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - This is noted as part of the process.
	Change of the name of Barangay Lapu-lapu to Patpat - Please change the barangay name of Lapu-Lapu to Patpat - Lapu-Lapu is not yet recognized as a barangay	Mr. Nilo Salga- Brgy. Captain, Patpat	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We will edit the powerpoint presentation. - The invitation letters were addressed to Brgy. Patpat

4. Initial Perception Survey Results

Subsequent to the Information Education and Information (IEC) efforts an Initial Perception Survey (IPS) was conducted in in the 30 affected barangays of the 6 cities and municipalities. The survey instrument was patterned from the Environmental Management Bureau Guidelines and covers the identification, perception, and attitudes of the respondents from the DIA towards the project that includes project awareness of the respondent regarding the project, preference to be informed of the Project, perceived positive and negative impacts of the Project and whether or not they would approve the establishment of the Project. The conducted to IPS included a total of 175 respondents. From the table presented below, 20% or 35 respondents came from Sumilao, followed by 18.9% of respondents from Malaybalay, and 17.7% or 31

respondents from Manolo Fortich, followed by 17% or 30 respondents form Cagayan de Oro, 14.3% from Impasug-ong and 12% from Tagoloan.

Table 8. Respondents' city/municipality

City/Municipality	Frequency	Percent
Sumilao	35	20.0
Malaybalay	33	18.9
Manolo Fortich	31	17.7
Cagayan de Oro	30	17.1
Impasug-ong	25	14.3
Tagoloan	21	12.0
Total	175	100.0

Source: EIA Initial Perception Survey

4.1 Demography and Social Profile

Gender and Civil Status - In terms of gender, more than half of the respondents or 54.3% were male and 45.7% were female. Majority or 78% are married followed by 11% or 18 respondents who are single.

Table 9. Gender and civil status of the respondents

Gender	Frequency	Percent
Male	94	54.3
Female	79	45.7
Total	173	100.0
Civil Status		
Single	18	11.0
Married	128	78.0
Widow	15	9.1
Separated	2	1.2
Annulled	1	0.6
Total	164	100.0

Source: EIA Initial Perception Survey

Age Distribution - Based on age, 27.7% or 48 of the respondents were between the ages 55 to 64 years old. This was followed by those between 33 to 43 years old. The youngest respondent was 22 and the oldest was 82 years old.

Table 10. Age distribution of the respondents

Age	Frequency	Percent
22 to 32 years old	18	10.4
33 to 43 years old	41	23.7
44 to 54 years old	37	21.4

Age	Frequency	Percent
55 to 64 years old	48	27.7
65 to 74 years old	25	14.5
75 and above	4	2.3
Total	173	100.0

Source: EIA Initial Perception Survey

Educational Attainment **-** For their educational attainment, 44.67% are college graduates followed by 22.67% who were college level. There was 3.33% who had post graduate studies.

Table 11. Educational attainment of the respondents

Educational Attainment	Frequency	Percent
Elementary level	1	0.6
Elementary Graduate	4	2.67
High School level	4	2.67
High School Graduate	33	22.0
College level	34	22.67
College Graduate	69	44.67
Post Grad	5	3.33
Total	150	100.0

Source: EIA Initial Perception Survey

Occupation - In terms of occupation, 51.35% of the survey respondents were Barangay Officials followed by 11.49% who were government employees from the LGU. There were also barangay workers, farmers, barangay health workers, teachers/ principal, IP Mandatory Representatives, Women's Organization members and chairpersons, banana plantation workers, transportation people's organization leader, driver, business owner, and retired employees **(Table 12).** For the positions held by the survey respondents, 40% are Barangay Kagawad, 8.15% are Barangay Captains, and 7.41% are Indigenous People's/ Tribal Leaders. There are also teachers, Barangay Secretary, Women's Organization President, Purok Leaders, SK Chairpersons, Transportation Organization President, Senior Citizen, Farmer's Organization Leader, Principal, Religious Leader, Barangay Treasurer, Irrigators Association President, Fisherfolks President and other stakeholders in the community.

Table 12. Occupation of the respondents

Occupation	Frequency	Percent
Barangay Official	76	51.35
Government Employee	17	11.49
Barangay Worker	10	6.76
Farmer	8	5.41
Barangay Health Worker	7	4.73
Teacher	7	4.73
IP Mandatory Representative	6	4.05
Women's Organization	3	2.03
Principal	2	1.35
Banana Plantation Worker	1	0.68
Barangay Field Officer	1	0.68
Board member FBWDC	1	0.68
BOD Transportation Coop	1	0.68
Business	1	0.68
Driver	1	0.68
House keeper	1	0.68
Landscaper	1	0.68
LGU Official	1	0.68
LGU Executive Assistant	1	0.68
MENRO	1	0.68
Retired	1	0.68
Total	148	100.0

Source: EIA Initial Perception Survey

Table 13. Position of the respondents

Position	Frequency	Percent
Barangay Kagawad	54	40.00
Barangay Captain	11	8.15
IP/ Tribal Leader	10	7.41
Teacher	7	5.19
Barangay Secretary	6	4.44
Women's President	6	4.44
Purok leader	5	3.70
SK Chairman	4	2.96
Transportation Organization President	4	2.96
Senior Citizen	3	2.22
Farmer's Organization Leader	2	1.48
Principal	2	1.48
Religious Leader	2	1.48
Barangay Treasurer	2	1.48
Administrative/ Clerk	2	1.48
Barangay Agricultural and Fisheries	1	0.74

Position	Frequency	Percent
Council Member		
Business	1	0.74
Department Head	1	0.74
Engineer	1	0.74
Farmer's Organization Member	1	0.74
Fisher Folks President	1	0.74
MAAMA Organization Coordinator	1	0.74
Market Supervisor of Market	1	0.74
MPDO	1	0.74
Municipal Information Officer	1	0.74
NGO President	1	0.74
OSCA head	1	0.74
People's Organization President	1	0.74
President of Irrigators Association	1	0.74
SB Representative	1	0.74
Total	135	100.0

Source: EIA Initial Perception Survey

4.2 Perception and Attitude towards the Project

Awareness and knowledge of the Project **-** A great majority of 91.4% of the respondents are aware of the Central Mindanao High Standard Highway Construction Project. Nine persons register without any knowledge of the project. And 6 respondents did not answer the question.

Table 14. Respondent's Awareness about the Project

Awareness	Frequency	Percent
Yes	160	91.4
No	9	5.1
No answer	6	3.4
Total	175	100.0

Source: EIA Initial Perception Survey

Perception towards the Project - When asked what the respondents know about the project, 30.6% said it is a good project that is for progress and needed by the people. This was followed by those who said that this project can bring development to everyone, especially the farmers for their farm-to-market road. Another perception about the project refer to the benefits to the community – the barangay, and municipality/city. Some of the respondents also said that it is a great opportunity for economic growth and will boost the economy of Central Mindanao. Around 7.6% of the respondents also believe that it will ease traffic congestion and will answer the traffic problem and 5.1% also said it will build roads and highways in constructing a high standard highway along Sayre Highway. There are other perceptions about the project presented in the table below.

Table 15. Respondent's Perception towards the Project

Perception about the project	Frequency	Percent
It is a good project; progressive; needed; good for the people	48	30.6
Can bring development to all; help farmers for farm-to-market road	24	15.3
It is beneficial to the community; benefits the barangay/ municipality/ city	22	14.0
Great opportunity for economic growth; boost the economy of Central Mindanao	14	8.9
Ease traffic congestion; for traffic problem	12	7.6
It will build roads and highways; construction project; high standard road along Sayre highway	8	5.1
To improve access and connectivity; less travel time	8	5.1
Can give standard highway project especially the IPs and those living in the hinterlands	5	3.2
It is good for the next generation	4	2.5
It is good if it will be implemented; if possible to work 24/7 to avoid delay	4	2.5
It is ok provided the process is followed	4	2.5
Proponent should consider the suggested roads in Guihean to Mamalog	2	1.3
IPRA law must be followed in the project	2	1.3
Total	157	100.0

Source: EIA Initial Perception Survey

Perceived positive effects from the Project – With regards to the perceived benefits from the establishment of the project, 46.5% see the project as providing accessibility of transporting farm products to the market. This is followed by 22.6% who said that the right road will invite more investors to their town and increase the people's employment opportunities. Some of the respondents also said that this is an alternative route to Malaybalay which makes shorter travel time and increase transportation efficiency. Other comments about the benefits of the project include: agricultural and eco-tourism, easier travel; for future generation's development and they believe the project can increase the market value of the land.

Table 16. Respondent's Perceived benefits from the Project

Perceived benefits to community	Frequency	Percent
Accessibility of our farm products to the market; ease of transporting products	74	46.5
To have the right road, more investors will come to our town and increase people's employment opportunities	36	22.6
Alternative route to Malaybalay; shorter travel time; more convenient for travelers; improve transport efficiency	25	15.7
Agricultural reason and for eco-tourism	10	6.3
Easier travel thanks to DPWH, JICA and AMET ASIA	8	5.0
For future generation's development	4	2.5
The project can increase the market value of the land	2	1.3
Total	159	100.0

Source: EIA Initial Perception Survey

Perceived negative effects from the project In regards to the perceived disadvantages of the project, they said that the location of the proposed road is far from their area and that the government agencies might be looking at the project for their own benefit.

Table 17. Respondent's perceived disadvantage from the Project

Perceived disadvantage to community	Frequency	Percent
Location is too far	2	66.6
If the concerned agencies involve is looking forward for their own benefit	1	33.3
Total	3	100.0

Source: EIA Initial Perception Survey

Issues and Concerns - In regard to the issues raised by the respondents, 64.5% emphasized just compensation of affected houses, agricultural development, Right of Way (ROW) payment, having no land title and those with land disputes. Similarly, 10.7% raised the issue on environmental issues, flooding and landslide prone areas and stressing that the vegetation should not be damaged. Some of the respondents also said that they are happy about the project while 5.8% stressed the importance of prioritizing the ancestral domain claims and CADT/CADC areas following the FPIC process. There were also concerns about the accidents and possible traffic and inconvenience during construction. The respondents were also happy about the possible benefits of the project to the community. The respondents were also asking for more information campaign activities to inform the people about the project. They were also concerned about the possible delays in the project and the relocation of affected families. It appears that the issues/concerns raised during the open forum are reiterated in the initial perception survey.

Table 18. Issues and concerns by the respondents

Issues and Concerns	Frequency	Percent
Just compensation of affected houses, agricultural development, Right of Way (ROW) payment, no land title, land dispute	78	64.5
Environmental issues; flooding and landslide prone areas; do not damage vegetation	13	10.7
I am happy about the road; no more muddy roads	10	8.3
Ancestral domain claims must be prioritized; FPIC process; CADT issues	7	5.8
Accidents; traffic and inconvenience during construction	5	4.1
There are always issues about land but the bottom line is the project can give more profit/benefits to the community	3	2.5
More information drive/campaign to let the people know about the project	3	2.5
Long delays in finishing the DPWH projects	1	0.8
Relocation of affected families	1	0.8
Total	121	100.0

Source: EIA Initial Perception Survey

Comments and suggestions - The respondents also had suggestions and comments regarding the proposed Central Mindanao High Standard Highway Construction Project. The top 5 suggestions and comments include: all concerns must be addressed and follow the process to have consensus (18.8%), massive information dissemination about the project and more consultations (18.8%), the project is good for the people for easy transport of goods and products (15.9%), implementation of the project as soon as possible (11.6%), and coordination with the Barangay Captain, Mayor and the IPMR to inform the IPs about the project (10.1%). Other comments/suggestions take account the relocation of affected people before starting the construction (4.3%), mitigation to protect the environment throughout the project implementation (4.3%), consider the request for the alignment of the project along Guihea to Manalog (4.3%), to take care of the environmental biodiversity (2.9%), prioritize local hiring (2.9%), early payment of the affected areas, safety in crossing the road, and if there will be toll fee during the operation period (1.4%).

Table 19. Comments and suggestions from the respondents

Comments/ Suggestions	Frequency	Percent
All concerns must be addressed; follow the process; there should be consensus	13	18.8
Massive information dissemination about the project; more consultations	13	18.8
Implement the project as soon as possible	8	11.6
Aside from the Mayor and Brgy Captain, coordinate with the Municipal IPMR as respect. The IPs should be informed	7	10.1
Affected residents transferred to relocation area. Secure affected people before starting construction.	3	4.3
All mitigations to protect the environment and the people should be considered throughout the project implementation	3	4.3
Consider our request that the road will traverse Guihea to Manalog in Malaybalay	3	4.3
Take care of environmental biodiversity	2	2.9
Local workers or laborers to be hired during the construction of the project	2	2.9
Can create good and bad issues	1	1.4
Early payment of the affected areas	1	1.4
If the road will be fenced, how to cross to the other side?	1	1.4
Will there be toll fee like the NLEX?	1	1.4
Total	69	100.0

Source: EIA Initial Perception Survey

5. Conclusion

The activity was professed to be conducted successfully and peacefully. Based on the open forum and from the Initial Perception Survey, majority of the stakeholders appreciated the Project as it will provide easement in their transportation and will provide accessibility of transporting farm products to the market. Major concerns of the stakeholders were the issues on just compensation for the affected titled/untitled land and properties, Project rationale, detailed project design in preparation of the affected property owners, presence of CADC/CADT and sacred places in the area, issuance of toll fee, inclusion of hinterlands in the road alignment. The stakeholders suggested to conduct a massive information dissemination about the Project and

all the issues and concerns must be addressed and consensus on the affected property owners must be sought.

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ATTACHMENTS

Attachment 1. Preliminary List of Stakeholders

Attachment 2. Receiving copy of the Invitation letters

Attachment 3. IEC Program

Attachment 4. IEC Presentation Material

Attachment 5. IEC Brochure

Attachment 6. Initial Perception Survey

Attachment 7. Attendance Sheet

Attachment 8. Photodocumentation

Attachment 1. Preliminary List of Invitees

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION CAMPAIGN
List of Invitees
March 23, 2020, 10:00-12:00 PM
Tagoloan Municipal Hall

Tagoloan Municipal Council Members and LGU Heads*

Name	Position
Mayor Gomer A. Sabio	Municipal Mayor
Roger Achas	Municipal Councilor
Cathlyn Alfante	Municipal Councilor
Ignacio Factura III	Municipal Councilor
Arturo Casiṅo	Municipal Councilor
Armando Pomar	Municipal Councilor
Audie Paduganan	Municipal Councilor
Felipe Valdehuesa	Municipal Councilor
Engr. Jeffrey Elogsong	Municipal Local Environment and Natural Resources Officer
Engr. Eric Ragadang	Municipal Planning & Development Coordinator
Engr. Gene Baculpo	Office of the Municipal Engineer
Romeo Sister	Tagoloan Tricycle Operator Drivers Association
Ferdinand Tormis	Poblacion Natumolan Mootorcycle Association
Dindo Arnan	Tagoloan Center Car Association
Ben Naduma	United Tagoloan Trisikad Association
Rainfredo Sabejon	Tagoloan Market Habal-habal Operators/Drivers Multi-purpose Cooperative
Benjamin Ellarina	Municipal Senior Citizen Federation of the Philippines Tagoloan Chapter
Melden Saguilayan	Tagoloan Federation Differently Able Person Organization
Gleandel Arajuez	Tago-Ulohan Higaonon Tribe
Rose Jean Labajo	Talogan Ta Balatukan ancestral Domain Tagoloan Higaonon Tribal
Matilde Gamba	Philippine Tribal Governance Administration
Ms. Linda F. Libres	Sinag Tagoloan
Carlito Quilang	Tagoloan River Concessionaires Association
Nole Che Guevarra	Tagoloan Sand and Gravel
Client Ray Cosin	Green Heads
Maricor Torres	Save Tagoloan River and its Estuaries and Aquatlife Movement

Brgy. Natumolan, Tagoloan, Misamis Oriental

Name	Position
Rafael P. Vidal	Brgy. Captain
Elma C. Paderna	Sangguniang Barangay Member
Eugene A. Palapo	Sangguniang Barangay Member
Jocelyn A. Lim	Sangguniang Barangay Member
Marivic B. Ajon	Sangguniang Barangay Member
Segundino Q. Galorio	Sangguniang Barangay Member

Lenie E. Adame	Sangguniang Barangay Member
Janea Maura M. Mencias	Sk Chairperson
Ivy L. Asiñero	Barangay Secretary
Representative from Natumolan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Casinglot, Tagoloan, Misamis Oriental

Name	Position
Marlon J. Bolanio	Brgy. Captain
Julian M. Hernan	Sangguniang Barangay Member
Richard P. Pelin	Sangguniang Barangay Member
Oona Karen L. Emano	Sangguniang Barangay Member
Teodoro N. Ociones	Sangguniang Barangay Member
Vivian V. De Los Santos	Sangguniang Barangay Member
Alrie J. Allones	Sangguniang Barangay Member
Joseph R. Sereño	Sk Chairperson
Doris O. Maghanoy	Barangay Secretary
Representative from Casinglot Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION
List of Invitees
March 24, 2020, 10:00-12:00 AM
Puerto Gym, Puerto, Cagayan de Oro City

Cagayan de Oro City Council Members and LGU Heads*

Name	Position
Mayor Oscar S. Moreno	City Mayor
Hon. Teodolfo Lao	City Councilor
Hon. Enrico Salcedo	City Councilor
Hon. Zaldy Ocon	City Councilor
Hon. Lordan Suan	City Councilor
Hon. Jocelyn Rodriguez	City Councilor
Hon. Maria Lourdes Gaane	City Councilor
Hon. Romeo Calizo	City Councilor
Hon. George Gualberto Goking	City Councilor
Hon. Joyleen Mercedes Balaba	City Councilor
Hon. Jay Pascual	City Councilor
Hon. Ian Mark Nacaya	City Councilor

Hon. Edna Dahino	City Councilor
Hon. Suzette Daba	City Councilor
Hon. Reuben Daba	City Councilor
Hon. Edgar Cabanlas	City Councilor
Hon. Roger Abaday	City Councilor
Hon. Teodolfo Lao	City Councilor
Engr. Armen A. Cuenca	City Local Environment and Natural Resources Officer
Mr. Ramir M. Balquin, EnP	City Planning & Development Coordinator
Engr. Rolando M. Pacuribot	Office of the City Engineer

*At least 4 representatives from the City Council Members

Brgy. Bugo, Cagayan de Oro

Name	Position
Ho. Vic Talingting	Brgy. Captain
Hon. Presley C. Emano	Sangguniang Barangay Member
Hon. Ronald Rey S. Cabana	Sangguniang Barangay Member
Hon. Marie Anne G. Gironella	Sangguniang Barangay Member
Hon. Ariel Igot	Sangguniang Barangay Member
Hon. Alan D. Igot	Sangguniang Barangay Member
Hon. Ricarte V. Codilla	Sangguniang Barangay Member
Hon. Ponciano J. Dawal	Sangguniang Barangay Member
Mr. Noel Nober O. Perpetua	Sk Chairperson
Mr. Paul Jordan S. Morial	Barangay Secretary
Ms. Anita B. Yaeso	Federation of Zone Five Bugo Neighborhood Incorporated (FEZOFIBUNI)
Mr. Avelino M. Sario, Sr.	Federation of Bugo Zone 6 Association, Incorporated
Ms. Venus H. Galdo	Villa Trinitas Phase 2, Homeowner's Association, Incorporated
Sitio/Purok Leaders	
Representative from Upper Puerto Carp Beneficiary Association, Inc.	
Representative from Bugo - Puerto - Cogon Operators & Drivers Association (Bpcoda), Inc.	
Representative from Cugman - Bugo Tricycle Operators and Drivers Association, Inc.	
Representative from Bugo Motorized Operators and Drivers Association (Bumotoda), Inc	
Representative from Bugo Central School	
Representative from Bugo Christian School	
Representative from Bugo National High School	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representative from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Puerto, Cagayan de Oro City, Misamis Oriental

Name	Position
Hon. Christian Rustico M. Achas	Brgy. Captain
Hon. Presley C. Emano	Sangguniang Barangay Member
Hon. Ronald Rey S. Cabana	Sangguniang Barangay Member
Hon. Marie Anne G. Gironella	Sangguniang Barangay Member

Hon. Ariel Igot	Sangguniang Barangay Member
Hon. Alan D. Igot	Sangguniang Barangay Member
Hon. Ricarte V. Codilla	Sangguniang Barangay Member
Hon. Ponciano J. Dawal	Sangguniang Barangay Member
Mr. Noel Nober O. Perpetua	Sk Chairperson
Mr. Paul Jordan S. Morial	Barangay Secretary
Representative from Puerto Elementary School	
Representative from Puerto National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Balubal, Cagayan de Oro City, Misamis Oriental

Name	Position
Hon. Bactong Pablo	Brgy. Captain
Hon. Ervic Bade	Sangguniang Barangay Member
Reynante Razalo	Sangguniang Barangay Member
Renato Agabalog	Sangguniang Barangay Member
Patrina Malingin	Sangguniang Barangay Member
Richard Razalo	Sangguniang Barangay Member
Dionedes Rosel	Sangguniang Barangay Member
Larry Pajo	Sangguniang Barangay Member
Mary Nel Saguban	Sk Chairperson
Mirasol Yutuc	Barangay Secretary
Representative from Balubal Elementary School	
Representative from Balubal National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

List of Invitees
March 22, 2020, 2:00-4:00 PM
Manolo Fortich Municipal Hall

Manolo Fortich City Council Members and LGU Heads*

Name	Position
Mayor Clive D. Quiño	Municipal Mayor
Christy L. Sabale	Municipal Councilor – Committee on Livelihood, Women and family relations, Child care and nutrition
Alberto B. Tinoy	Municipal Councilor – Human rights, trade and commerce/ cooperative
Warleo A. Goayan	Municipal Councilor– Peace and order, public safety, senior citizen/ PWD
Alex D. Payangga	Municipal Councilor– Indigenous cultural communities
Nelson S. Binayao	Municipal Councilor– Barangay affairs
John Anthony G. Leyson	Municipal Councilor– Sports, youth development
Sharon Tacbobo – 0915-365 4649	Municipal Local Environment and Natural Resources Officer
Cherry Fe Amor Q. Magallones	Municipal Planning & Development Coordinator
Engr. Bernabe Auxtero – 0936-195 5285	Office of the Municipal Engineer
Carlos A. Dumas	CENRO Manolo Fortich
Marie Superales	NCIP Manolo Fortich Community Service Center
Judith Dinsag	Representative from Cultural Sector
	Representative from Environmental Sector
Luigi Amoin	Representative from Driver's and Operators Associations
Ceceil Sajonia	Representative from Women's Group
Phoebe Cau	Representative from Senior Citizen's Group

Brgy. Alae, Manolo Fortich, Bukidnon

Name	Position
Hon. Erasmo Ceasar A. Ramirez	Brgy. Captain
Hon. Jocelyn A. Legaspi	Sangguniang Barangay Member
Hon. John Marvin C. Namocatcat Sr.	Sangguniang Barangay Member
Hon. Roy L. Ganas	Sangguniang Barangay Member
Hon. Deborah Y. Marinay	Sangguniang Barangay Member
Hon. Junidini J. Artajo	Sangguniang Barangay Member
Hon. Teogenes R. Abarabar Sr.	Sangguniang Barangay Member
Hon. Deogracias O. Piosca	Sangguniang Barangay Member
Hon. Keith Emilian C. Melendez	SK Chairperson
Nelfa R. Tero	Barangay Secretary
Representative from Alae Elementary School	
Representative from Alae National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. San Miguel, Manolo Fortich, Bukidnon

Name	Position
Hon. Benjamin S. Miṅoza	Brgy. Captain
Hon. Joaquin L. Fudolin	Sangguniang Barangay Member
Hon. John Windel J. Gallenero	Sangguniang Barangay Member
Hon. Mary Ann D. Edusma	Sangguniang Barangay Member
Hon. Jesus M. Galagar	Sangguniang Barangay Member
Hon. Sabina E. Babion	Sangguniang Barangay Member
Hon. Sanny D. Badelic	Sangguniang Barangay Member
Hon. Arsenio T. Mondilla	Sangguniang Barangay Member
Hon. Pauline Grace B. Gonzaga	SK Chairperson
Orlando S. Sarabia	Barangay Secretary
Representative from San Miguel Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Damilag, Manolo Fortich, Bukidnon

Name	Position
Hon. Allan G. Torres Jr.	Brgy. Captain
Hon. Allan E. Cahoy	Sangguniang Barangay Member
Hon. Anthony G. Inihao	Sangguniang Barangay Member
Hon. Jonathan S. Demata	Sangguniang Barangay Member
Hon. Lorenza I. Madjus	Sangguniang Barangay Member
Hon. Roberto S. Madula	Sangguniang Barangay Member
Hon. Eduardo Ralph S. Bagayas	Sangguniang Barangay Member
Hon. Edmond A. Licuanan	Sangguniang Barangay Member
Alejandro B. Arenal	SK Chairperson
Arlene B. Arenal	Barangay Secretary
Representative from Damilag Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Diclum, Manolo Fortich, Bukidnon

Name	Position
Hon. Nelson S. BInayao	Brgy. Captain
Hon. Tomasito A. Coquilla	Sangguniang Barangay Member
Hon. Pablo A. Jimenez Jr.	Sangguniang Barangay Member

Hon. Ildefonso O. Pablo Jr.	Sangguniang Barangay Member
Hon. Shirley L. Tagapulot	Sangguniang Barangay Member
Hon. Brian T. Lozada	Sangguniang Barangay Member
Hon. Benito V. Bantilan	Sangguniang Barangay Member
Hon. Roque A. Balcos	Sangguniang Barangay Member
Hon. Ethel Jean Q. Emata	SK Chairperson
Charito A. Villegas	Barangay Secretary
Representative from Diclum Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Sankanan, Manolo Fortich, Bukidnon

Name	Position
Hon. Dennis G. Salvo	Brgy. Captain
Hon. Ariel L. Jenisan	Sangguniang Barangay Member
Hon. Genevieve M. Monopollo	Sangguniang Barangay Member
Hon. Julieto A. Baliguat	Sangguniang Barangay Member
Hon. Alfonso L. Dahe	Sangguniang Barangay Member
Hon. Bernie D. Guinayao	Sangguniang Barangay Member
Hon. Jesus M. Vitor	Sangguniang Barangay Member
Hon. Alberto B. Buynay	Sangguniang Barangay Member
Hon. Kyrr Heinritz N. Quiray	SK Chairperson
Hon. Charity D. Cajilla	Barangay Secretary
Representative from Sankanan Elementary School	
Representative from Sankanan National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Tankulan (Pob.), Manolo Fortich, Bukidnon

Name	Position
Hon. Romeo P. Dagunlay	Brgy. Captain
Hon. Lemuel Rey L. Arana	Sangguniang Barangay Member
Hon. Rene G. Abarquez	Sangguniang Barangay Member
Hon. Lee A. Albarece	Sangguniang Barangay Member
Hon. Daniel V. Onahon Jr	Sangguniang Barangay Member
Hon. Dominador L. Domo	Sangguniang Barangay Member
Hon. Alan A. Improgo	Sangguniang Barangay Member
Hon. Leopoldo S. Balanay	Sangguniang Barangay Member
Hon. Kristian Niko P. Tapales	SK Chairperson
Hon. Leonora S. Ugat	Barangay Secretary
Representative from Tankulan Elementary School	

Representative from Driver's and Operators Associations
Representative from Women's Group
Representative from Senior Citizen's Group
Representatives from Religious Groups
Representative from Agriculture/Fishermen's Association
Representative from Cultural Sector
Representative from Environmental Sector

Brgy. Ticala, Manolo Fortich, Bukidnon

Name	Position
Hon. Virgie Y. Payanan	Brgy. Captain
Hon. Kineth G. Tanto	Sangguniang Barangay Member
Hon. Telesforo P. Dawat	Sangguniang Barangay Member
Hon. Dumaquito D. Lentican	Sangguniang Barangay Member
Hon. Julito S. Tanto	Sangguniang Barangay Member
Hon. Nancita G. Yompoca	Sangguniang Barangay Member
Hon. Rufino S. Bulanta Jr.	Sangguniang Barangay Member
Hon. Ronald R. Magdalino Sr.	Sangguniang Barangay Member
Hon. Dievra Jay S. Payanan	SK Chairperson
Renato S. Coguihan Jr.	Barangay Secretary
Representative from Ticala Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	

Brgy. Mambatangan Manolo Fortich, Bukidnon

Name	Position
Hon. Angelie S. Roa	Brgy. Captain
Hon. Edward D. Dampal	Sangguniang Barangay Member
Hon. Allan T. Tinay	Sangguniang Barangay Member
Hon. Junrey P. Lagat	Sangguniang Barangay Member
Hon. Jerry R. Balaba	Sangguniang Barangay Member
Hon. Hanie P. Abris	Sangguniang Barangay Member
Hon. Evangeline T. Amansec	Sangguniang Barangay Member
Hon. Melan Dave C. Lalucan	Sangguniang Barangay Member
Hon. Neil Christian G. Tilap	SK Chairperson
Roberto A. Santiago Jr	Barangay Secretary
Representative from Mambatangan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION CAMPAIGN
List of Invitees
March 24, 2020, 10:00-12:00 PM

2nd Floor, New Building

Municipal Hall, Sumilao

Sumilao Municipal Council Members and LGU Heads*

Name	Position
Mayor Jose Antonio A. Villo	Municipal Mayor
Hon. George Jeremy Baula	Municipal Councilor
Hon. Benjamin A. Baluma	Municipal Councilor
Hon. Gary A. Del Rosario	Municipal Councilor
Hon. Nissabel T. Cańada	Municipal Councilor
Hon. Cresanto J. Apiag	Municipal Councilor
Hon. Leandro C. Bade	Municipal Councilor
Hon. Romeo B. Anoba	Municipal Councilor
Hon. Vernie N. Castillo	Municipal Councilor
Engr. Armen A. Cuenca	Municipal Local Environment and Natural Resources Officer
Engr. Isidro G. Borja	Municipal Planning & Development Coordinator
Engr. Rolando M. Pacuribot	Office of the Municipal Engineer
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representative from Agriculture/Fishermen's Association	

Brgy. Puntian, Sumilao, Bukidnon

Name	Position
Hon. Tirso B. Amistoso	Brgy. Captain
Hon. Joann B. Gaid	Sangguniang Barangay Member
Hon. Jumandy T. Salise	Sangguniang Barangay Member
Hon. Evangeline R. Cabarles	Sangguniang Barangay Member
Hon. Apolinario C. Lumaghan	Sangguniang Barangay Member
Hon. Fegie D. Nacasabog	Sangguniang Barangay Member
Hon. Felicito H. Boncait	Sangguniang Barangay Member
Hon. Gavino C. Bantog	Sangguniang Barangay Member
Hon. Rustom B. Milla	SK Chairperson
Hon. Joela D. Golosinda	Barangay Secretary
Representative from Puntian Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Villa Vista, Sumilao, Bukidnon

Name	Position
Hon. Reymar T. Gaguan	Brgy. Captain
Hon. Noland M. Caramonte	Sangguniang Barangay Member

Hon. Ernesto G. Bargo	Sangguniang Barangay Member
Hon. Jomie S. Cabactulan	Sangguniang Barangay Member
Hon. Maridel A. Goay	Sangguniang Barangay Member
Hon. Unifren B. Dahinao	Sangguniang Barangay Member
Hon. Geno O. Daluan	Sangguniang Barangay Member
Hon. Jean Sigrid S. Mat-Ao	SK Chairperson
Florence Joy S. Carbajal	Barangay Secretary
Representative from Villa Vista Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Culasi, Sumilao, Bukidnon

Name	Position
Hon. Gilbert T. Mamatan	Brgy. Captain
Hon. Deve D. Dalahigon	Sangguniang Barangay Member
Hon. Silvestre S. Dalo-An	Sangguniang Barangay Member
Hon. Lito E. Santaan	Sangguniang Barangay Member
Hon. Alberto S. Dalahigon	Sangguniang Barangay Member
Hon. Wenefredo Y. Mamatan	Sangguniang Barangay Member
Hon. Georgina D. Daganloy	Sangguniang Barangay Member
Hon. Randy I. Maata	SK Chairperson
Hezeil Ann M. Daluan	Barangay Secretary
Representative from Culasi Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Poblacion, Sumilao, Bukidnon

Name	Position
Hon. Julius Cesar A. Tan	Brgy. Captain
Hon. Nova H. Sumbalan	Sangguniang Barangay Member
Hon. Esterlita D. Cahiles	Sangguniang Barangay Member
Hon. Reynaldo C. Ducala	Sangguniang Barangay Member
Hon. Kent A. Elore	Sangguniang Barangay Member
Hon. Jimmar C. Han-Awon	Sangguniang Barangay Member
Hon. Dulce S. Doydora	Sangguniang Barangay Member
Hon. Jerome S. Cagadas	Sangguniang Barangay Member
Hon. Jarfie O. Acedilla	SK Chairperson
Louela G. De La Cerna	Barangay Secretary
Representative from Poblacion Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	

Representative from Senior Citizen's Group
Representatives from Religious Groups
Representative from Agriculture/Fishermen's Association
Representative from Cultural Sector
Representative from Environmental Sector

Brgy. Kisolon, Sumilao, Bukidnon

Name	Position
Hon. Albert Gabriel B. De Mesa	Brgy. Captain
Hon. Dominador A. Del Rosario	Sangguniang Barangay Member
Hon. Vicenta C. Manginsay	Sangguniang Barangay Member
Hon. Sherly T. Inojaldo	Sangguniang Barangay Member
Hon. Andres P. De La Cerna	Sangguniang Barangay Member
Hon. Gemmo C. Olana	Sangguniang Barangay Member
Hon. Diosdado C. Doyola	Sangguniang Barangay Member
Hon. Mark John Y. Opecio	Sangguniang Barangay Member
Hon. Vanessa Lynne D. Soliva	SK Chairperson
Alma Y. Daigon	Barangay Secretary
Representative from Kisolon Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. San Roque, Sumilao, Bukidnon

Name	Position
Hon. Jake T. Curay	Brgy. Captain
Hon. Hentherjo L. Dalit	Sangguniang Barangay Member
Hon. Ace L. Francisco	Sangguniang Barangay Member
Hon. Myrna B. Pinote	Sangguniang Barangay Member
Hon. Rodelita P. Sasusam	Sangguniang Barangay Member
Hon. Maribeth D. Suminao	Sangguniang Barangay Member
Hon. John Mark C. Sabanal	Sangguniang Barangay Member
Hon. George B. Paca Sr	Sangguniang Barangay Member
Hon. Ariel S. Torayno	SK Chairperson
Alma O. Landuay	Barangay Secretary
Representative from San Roque Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

March 23, 2020, 2:00-4:00 PM
Dome, Poblacion, Impasug-ong

Impasug-ong Municipal Council Members and LGU Heads*

Name	Position
Hon. Anthony Uy	Municipal Mayor
Hon. John A. Alvarez	Municipal Councilor
Hon. Hon. Christopher T. Beltran	Municipal Councilor
Hon. Melvin B. Santos	Municipal Councilor
Hon. Gerome DC. Reyes	Municipal Councilor
Hon. Emmanuel DC. Magtalas	Municipal Councilor
Hon. Richard P. Dela Cruz	Municipal Councilor
Hon. Jayvee C. Lacsina	Municipal Councilor
Mark David C. Maon	Municipal Local Environment and Natural Resources Officer
Nika Corinne S. Tan	Municipal Planning & Development Coordinator
Marivee M. Coronel	Office of the Municipal Engineer
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	

Brgy. Poblacion, Impasug-ong, Bukidnon

Name	Position
Von Omar P. Lagayan	Brgy. Captain
Hon. Ayagil Kilah C. Delarmente	Sangguniang Barangay Member
Hon. Clemencia M. Denzo	Sangguniang Barangay Member
Hon. Reina O. Paluga	Sangguniang Barangay Member
Hon. Diomedes D. Tulusan	Sangguniang Barangay Member
Hon. Abner L. Garcia	Sangguniang Barangay Member
Hon. Rolando E. Eguia	Sangguniang Barangay Member
Hon. Laurence Aldwin O. Olana	Sangguniang Barangay Member
Hon. Irene Kristine C. Delarmente	SK Chairperson
Shirley A. Curiba	Barangay Secretary
Representative from Poblacion Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. La Fortuna, Impasug-ong, Bukidnon

Name	Position
Hon. Nilo C. Iba	Brgy Captain
Hon. Walter B. Galasanay	Sangguniang Barangay Member
Hon. Narcisa D. Igloria	Sangguniang Barangay Member

Hon. Livelyn G. Dubongco	Sangguniang Barangay Member
Hon. Editha D. Gayonan	Sangguniang Barangay Member
Hon. Jheran P. Go	Sangguniang Barangay Member
Hon. Corazon S. Toring	Sangguniang Barangay Member
Hon. Eleonor B. Tañedo	Sangguniang Barangay Member
Hon. Lloyd Matty L. Inta	SK Chairperson
Hon. Evelyn A. Montaño	Barangay Secretary
Representative from La Fortuna Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Cawayan, Impasug-ong, Bukidnon

Name	Position
Hon. Josefino B. Manalo	Brgy. Captain
Hon. Carmelino L. Campol	Sangguniang Barangay Member
Hon. Greggy D. Labra	Sangguniang Barangay Member
Hon. Angelito D. Cawasan	Sangguniang Barangay Member
Hon. Policarpio P. Dacillo Jr	Sangguniang Barangay Member
Hon. Anie L. Tabian	Sangguniang Barangay Member
Hon. Jerry O. Avila	Sangguniang Barangay Member
Hon. Grace I. Timo	Sangguniang Barangay Member
Hon. Shiela Mae C. Urgel	SK Chairperson
Ma. Chenita T. Miras	Barangay Secretary
Representative from Cawayan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Capitan Bayong Impasug-ong, Bukidnon

Name	Position
Hon. Dawn M. Roque	Brgy. Captain
Hon. Raul D. Felicio	Sangguniang Barangay Member
Hon. Rodrigo G. Antivo	Sangguniang Barangay Member
Hon. Marven C. Mandong	Sangguniang Barangay Member
Hon. Enrique Y. Gayon	Sangguniang Barangay Member
Hon. Evangeline A. Yomonda	Sangguniang Barangay Member
Hon. Rhoda A. Napuran	Sangguniang Barangay Member
Hon. Generaldo N. Galambao	Sangguniang Barangay Member
Hon. Princess Grace L. Gayon	SK Chairperson
Hon. Bernandeth Y. Dela Peña	Barangay Secretary
Representative from Capitan Bayong Elementary School	
Representative from Driver's and Operators Associations	

Representative from Women's Group
Representative from Senior Citizen's Group
Representatives from Religious Groups
Representative from Agriculture/Fishermen's Association
Representative from Cultural Sector
Representative from Environmental Sector

Brgy. Impalutao, Impasug-ong, Bukidnon

Name	Position
Hon. Antonio O. Dominao	Brgy. Captain
Hon. Jerly D. Pacatang	Sangguniang Barangay Member
Hon. Romeo R. Abunda Sr.	Sangguniang Barangay Member
Hon. Martha G. Bustamante	Sangguniang Barangay Member
Hon. Danilo N. Micabalo	Sangguniang Barangay Member
Hon. Nicasio P. Llamoso	Sangguniang Barangay Member
Hon. Esteban G. Macapaz	Sangguniang Barangay Member
Hon. Raquel L. Buco	Sangguniang Barangay Member
Hon. Mayflor P. Paquiao	SK Chairperson
Hon. Analou L. Paul	Barangay Secretary
Representative from Impalutao Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Kibenton, Impasug-ong, Bukidnon

Name	Position
Hon.	Brgy Captain
Hon. Richard J. Pad-Ay	Sangguniang Barangay Member
Hon. Merlie G. Carlos	Sangguniang Barangay Member
Hon. Mary Ann D. Minardo	Sangguniang Barangay Member
Hon. Margie L. De Leon	Sangguniang Barangay Member
Hon. Rickie G. Silmahan	Sangguniang Barangay Member
Hon. Isidro A. Okit	Sangguniang Barangay Member
Hon. Venerando S. Balunsay	Sangguniang Barangay Member
Hon. Krizel Jane I. Lamparas	SK Chairperson
Sherlita D. Lamparas	Barangay Secretary
Representative from Kibenton Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION CAMPAIGN
List of Invitees

March 23, 2020, 10:00-12:00 PM
People's Hall, 2nd Floor Malaybalay City Hall

Malaybalay City Council Members and LGU Heads*

Name	Position
Mayor Florencio T. Flores Jr.	City Mayor
Hon. Estelito Marabe	City Councilor
Hon. Niko Aldeguer	City Councilor
Hon. Louel Tortola	City Councilor
Hon. Rendon Sangalang	City Councilor
Hon. Victor Barroso	City Councilor
Hon. Hollis Monsanto	City Councilor
Hon. Christopher Soria	City Councilor
Hon. Erwin Damasco	City Councilor
Hon. Kathleen Cecille Pagaling	City Councilor
Hon. Cromwell Kiril Dinlayan	City Councilor
Hon. Ma. Anita L. Fernandez	City Local Environment and Natural Resources Officer
Engr. Adrian R. Gamboa	City Planning & Development Coordinator
Engr. Roy A. Lapuz	Office of the City Engineer
Crispulo L. Libertad	Northern Bukidnon Free Farmer's Cooperative
Gregorio S. Tatoy	New Ilocos Irrigators Ass., Inc.
Bienvinido Landasan, Jr	Abag Kalambuan, Inc.
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	

Brgy. Patpat (Lapu-lapu), Malaybalay, Bukidnon

Name	Position
Hon. Renante M. Okit	Brgy. Captain
Hon. Lito G. Maruhom	Sangguniang Barangay Member
Hon. Ruben D. Meliston	Sangguniang Barangay Member
Hon. Freddie S. Okit	Sangguniang Barangay Member
Hon. Norien B. Meliston	Sangguniang Barangay Member
Hon. Dante L. Dumagpi	Sangguniang Barangay Member
Hon. Bles G. Gumindan	Sangguniang Barangay Member
Hon. Edwin G. Meliston	Sangguniang Barangay Member
Hon. Sharam D. Dahuloran	SK Chairperson
Liezel Joy A. Gabule	Barangay Secretary
Representative from Patpat Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Kalasungay, Malaybalay, Bukidnon

Name	Position
Hon. Rodrigo O. Niere	Brgy. Captain

Hon. Ersie C. Paano	Sangguniang Barangay Member
Hon. Joemar M. Sario	Sangguniang Barangay Member
Hon. Anthony Julian G. Rubio	Sangguniang Barangay Member
Hon. Gene M. Rojas	Sangguniang Barangay Member
Hon. Constantino T. Mendoza Jr	Sangguniang Barangay Member
Hon. Emilie R. Okit	Sangguniang Barangay Member
Hon. Essner G. Binayao	Sangguniang Barangay Member
Hon. Karl Marlone C. Manahan	SK Chairperson
Kesha Dawn M. Sewala	Barangay Secretary
Representative from Kalasungay Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. Dalwangan, Malaybalay, Bukidnon

Name	Position
Hon. Raul B. Pandong	Brgy. Captain
Hon. Wilson A. Sogocio	Sangguniang Barangay Member
Hon. Jose E. Ronolo	Sangguniang Barangay Member
Hon. Primo Jack D. Omarol	Sangguniang Barangay Member
Hon. Nieley Joy P. Martinez	Sangguniang Barangay Member
Hon. Carmelino T. Melliza Jr	Sangguniang Barangay Member
Hon. Jan Kayzer O. Lino-Ay	Sangguniang Barangay Member
Hon. Judito S. Pagaling	Sangguniang Barangay Member
Hon. Anthon Son R. Morento	SK Chairperson
Hon. Junel C. Lamadora	Barangay Secretary
Representative from Dalwangan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Brgy. 10, Malaybalay, Bukidnon

Name	Position
Hon. Nilo Q. Salga	Brgy. Captain
Hon. Herculano O. Lupiba	Sangguniang Barangay Member
Hon. Alex P. Agustin	Sangguniang Barangay Member
Hon. Armando P. Blanco	Sangguniang Barangay Member
Hon. Alejandro P. Ferrer Jr	Sangguniang Barangay Member
Hon. Francis Eddie C. Dagang	Sangguniang Barangay Member
Hon. Michael Joseph C. Galindo	Sangguniang Barangay Member
Hon. Isidro T. Desabille	Sangguniang Barangay Member
Hon. Gio Paul Z. Agustin	SK Chairperson
Hon. Tiffany C. Galindo	Barangay Secretary

Representative from Brgy. 10 Elementary School
Representative from Driver's and Operators Associations
Representative from Women's Group
Representative from Senior Citizen's Group
Representatives from Religious Groups
Representative from Agriculture/Fishermen's Association
Representative from Cultural Sector
Representative from Environmental Sector

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Attachment 2. Invitation Letters to the Stakeholders

Tagaloan LGU

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. GOMER A. SABIO
Municipal Mayor
Tagoloan, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Mayor Sabio:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

The Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) requires that the proposed project undergoes an Environmental Impact Assessment (EIA) for its Environmental Compliance Certificate (ECC) application prior to project implementation. In line with this, CTII Engineering commissioned Amet-Asia Inc., the third-party local environmental consultancy firm, to undertake the EIA. The first step in the EIA process is the Information, Education and Communication, i.e. an activity which informs the stakeholders about the project through the process of education using communication mediums.
In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 24, 2021** at the **Tagoloan Dome.** We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

LGU - T[illegible]OLOAN, MISAMIS ORIENTAL
MU[illegible]AL MAYOR'S [illegible]
RECEIVED
By: [illegible] Date: 3/23/21
10:48

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Natumolan, Tagoloan

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. RAFAEL P. VIDAL
Brgy. Captain
Natumolan, Tagoloan, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Vidal:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

LGU - TAGOLOAN, MISAMIS ORIENTAL
MUNICIPAL MAYOR'S OFFICE
RECEIVED
By: Date: 3/23/21
10:48

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Casinglot, Tagaloan

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. MARLON J. BOLANIO
Brgy. Captain
Casinglot, Tagoloan, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Bolanio:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

LGU – TAGOLOAN, MISAMIS ORIENTAL
MUNICIPAL MAYOR'S OFFICE
RECEIVED
By: Date: 3/23/21
10:44

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Cagayan De Oro City LGU

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. OSCAR S. MORENO
City Mayor
Cagayan de Oro, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Mayor Moreno:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received 3/24/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

DENR Region 10

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

ARLEIGH JUMALON ADORABLE, CESO III
Regional Executive Director, DENR-X
Cagayan de Oro, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Dir. Adorable:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

RECEIVED:
3/24/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Bugo, Cagayan de Oro

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. VIC TALINGTING
Brgy. Captain
Brgy. Bugo, Cagayan de Oro City, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Talingting:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

RECIEVED BY:
ARMANDO P. MONTIBON
BRGY LIAISON

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Balubal, Cagayan de Oro

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. PABLO M. BACTONG
Brgy. Captain
Brgy. Balubal, Cagayan de Oro City, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Bactong:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

03-2[illegible]-2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Puerto, Cagayan de Oro

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. CHRISTIAN RUSTICO M. ACHAS
Brgy. Captain
Brgy. Puerto, Cagayan de Oro City, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Achas:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received: 3-23-21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Manolo Fortich LGU

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. CLIVE D. QUIÑO
Municipal Mayor
Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Mayor Quiño:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Dulce [illegible] A. Magate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Damilag, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. ALLAN G. TORRES JR.
Brgy. Captain
Damilag, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear: Brgy. Captain Torres:

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Thank you for your cooperation in this endeavor.

Truly yours,

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Margate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Sankanan, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. DENNIS G. SALVO
Brgy. Captain
Sankanan, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Salvo:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Margate
3/22/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. San Miguel, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. BENJAMIN S. MINOZA
Brgy. Captain
San Miguel, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Minoza:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Margate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Ticala, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO–Malaybalay Section)

19 March 2021

HON. VIRGIE Y. PAYANAN
Brgy. Captain
Ticala, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Payanan:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

The Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) requires that the proposed project undergoes an Environmental Impact Assessment (EIA) for its Environmental Compliance Certificate (ECC) application prior to project implementation. In line with this, CTII Engineering commissioned Amet-Asia Inc., the third-party local environmental consultancy firm, to undertake the EIA. The first step in the EIA process is the Information, Education and Communication, i.e. an activity which informs the stakeholders about the project through the process of education using communication mediums.

In this regard, we are inviting you or your representative to attend the IEC meeting on **Monday, March 22, 2021** at **BRCI Diclum, Manolo Fortich**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Dulce Amor Margatte
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Diclum, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. NELSON S. BINAYAO
Brgy. Captain
Diclum, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Binayao:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

The Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) requires that the proposed project undergoes an Environmental Impact Assessment (EIA) for its Environmental Compliance Certificate (ECC) application prior to project implementation. In line with this, CTII Engineering commissioned Amet-Asia Inc., the third-party local environmental consultancy firm, to undertake the EIA. The first step in the EIA process is the Information, Education and Communication, i.e. an activity which informs the stakeholders about the project through the process of education using communication mediums.

In this regard, we are inviting you or your representative to attend the IEC meeting on **Monday, March 22, 2021** at **BRCI Diclum, Manolo Fortich**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Recieved by:
Dulce Amor Margate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Tankulan, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO–Malaybalay Section)

19 March 2021

HON. ROMEO P. DAGUNLAY
Brgy. Captain
Tankulan (Pob.), Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Dagunlay:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Monday, March 22, 2021** at BRCI Diclum, Manolo Fortich. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Brgy. Captain Dagunlay
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Aale, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. ERASMO CEASAR A. RAMIREZ
Brgy. Captain
Alae, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Ramirez:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Duke Mangate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Mambatangan, Manolo Fortich

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. ANGELIE S. ROA
Brgy. Captain
Mambatangan, Manolo Fortich, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Roa:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Monday, March 22, 2021** at **BRCI Diclum, Manolo Fortich.** We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by:
Margate
3/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Puntian, Sumilao

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. TIRSO B. AMISTOSO
Brgy. Captain
Puntian Sumilao, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Amistoso:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Wednesday, March 24, 2021** at **2nd Floor, New Building, Sumilao Municipal Hall.** We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 9:30 A.M. with the program promptly starting at 10:00 A.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-1335*

Rec. 3/24/21

Brgy. San Roque, Sumilao

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. JAKE T. CURAY
Brgy. Captain
San Roque, Sumilao, Bukidnon

SUBJECT: **INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)**

Dear Brgy. Captain Curay:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII)

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Wednesday, March 24, 2021 at 2nd Floor, New Building, Sumilao Municipal Hall.** We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 9:30 A.M. with the program promptly starting at 10:00 A.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

03/24/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines Tel. No. [illegible]

Brgy. Villa Vista, Sumilao

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. NOLAND M. CARAMONTE
Brgy. Captain
Villa Vista, Sumilao, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Caramonte:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Wednesday, March 24, 2021 at 2nd Floor, New Building, Sumilao Municipal Hall**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 9:30 A.M. with the program promptly starting at 10:00 A.M. Also attached is the program of the IEC meeting.

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines Tel. No. [illegible]

Brgy. Poblacion, Sumilao

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. JULIUS CESAR A. TAN
Brgy. Captain
Poblacion, Sumilao, Bukidnon

SUBJECT: **INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)**

Dear Brgy. Captain Tan:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII)

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

MR. RYUICHI UENO
JICA Study Team Leader

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-[illegible]*

Impasug-ong LGU

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. ANTHONY A. UY
Municipal Mayor
Impasug-ong, Bukidnon

OFFICE OF THE MUNICIPAL MAYOR
MAR 23 2021

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Mayor Uy:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 23, 2021** at **Impasug-ong Municipal Conference Hall**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines Tel. No. (02)8527-13331

Brgy. Poblacion, Impasug-ong

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO–Malaybalay Section)

19 March 2021

HON. VON OMAR P. LAGAYAN
Brgy. Captain
Poblacion, Impasug-ong, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Lagayan:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 23, 2021** at **Impasug-ong Municipal Conference Hall**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

RECEIVED 3/27/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-1535*

Brgy. Impalutao, Impasug-ong

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. ANTONIO O. DOMINAO
Brgy. Captain
Impalutao, Impasug-ong, Bukidnon

SUBJECT: **INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)**

Dear Brgy. Captain Dominao:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 23, 2021** at **Impasug-ong Municipal Conference Hall**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by: ANTONIO O. DOMINAO
P.B – Impalutao

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-1555*

Brgy. La Fortuna, Impasug-ong

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO–Malaybalay Section)

19 March 2021

HON. NILO C. IBA
Brgy. Captain
La Fortuna, Impasug-ong, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Iba:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII)

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

03/22/2021

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Kibenton, Impasug-ong

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. NOEL R. ROJAS
Brgy. Captain
Kibenton, Impasug-ong, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Rojas:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII)

The Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) requires that the proposed project undergoes an Environmental Impact Assessment (EIA) for its Environmental Compliance Certificate (ECC) application prior to project implementation. In line with this, CTII Engineering commissioned Amet-Asia Inc., the third-party local environmental consultancy firm, to undertake the EIA. The first step in the EIA process is the Information, Education and Communication, i.e. an activity which informs the stakeholders about the project through the process of education using communication mediums.

In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 23, 2021 at Impasug-ong Municipal Conference Hall**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Received by: [illegible] 3/23/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines Tel. No. (02)8527-1535

Brgy. Cawayan, Impasug-ong

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON JOSEFINO B. MANALO
Brgy. Captain
Cawayan, Impasug-ong, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy. Captain Manalo:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Brgy. Cawayan
3/23/21

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Brgy. Patpat, Malaybalay City

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. RENANTE M. OKIT
Brgy. Captain
Patpat (Lapu-lapu), Malaybalay, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy Captain Okit:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 23, 2021** at **Barangay Casisang Covered Court, Casisang, Malaybalay City**. We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 9:30 A.M. with the program promptly starting at 10:00 A.M. Also attached is the program of the IEC meeting.

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

Renante M. Okit
P.B
Patpat

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)852-1555*

Brgy. Kalasungay, Malaybalay City

JICA Survey Team for the Preparatory Study for Central Mindanao Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. RODRIGO O. NIERE
Brgy. Captain
Kalasungay, Malaybalay, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy Captain Niere:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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hank you for your cooperation in this endeavor.

uly yours,

R. RYUICHI UENO
A Study Team Leader

3 23 21

A Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines Tel. No. (02)8527-1551

Brgy. Dalwangan, Malaybalay City

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO–Malaybalay Section)

18 March 2021

HON. RAUL B. PANDONG
Brgy. Captain
Dalwangan, Malaybalay, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy Captain Pandong:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

3/23/2021

MR. RYUICHI UENO
JICA Study Team Leader

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-1331*

Brgy. 10, Malaybalay City

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

18 March 2021

HON. NILO Q. SALGA
Brgy. Captain
Brgy. 10 (Poblacion) Malaybalay, Bukidnon

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Brgy Captain Salga,

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

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Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-1333*

Attachment 3. IEC Program

Tagoloan, Misamis Oriental

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
March 23, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Gomer A. Sabio** *Tagoloan Municipal Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Engr. Eric Ragadang** *Municipal Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Cagayan de Oro, Misamis Oriental

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
Puerto Brgy. Hall, Puerto, Cagayan de Oro
March 24, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Oscar S. Moreno** *Cagayan de Oro City Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Ramir M. Balquin** *City Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Manolo Fortich, Bukidnon

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
BRCI Diclum, Manolo Fortich
March 22, 2021
2:00 PM – 4:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Clive D. Quiño** *Manolo Fortich Municipal Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Ms. Cherry Fe Amor Q. Magallones** *Municipal Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Sumilao, Bukidnon

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 24, 2020, 10:00-12:00 PM
2nd Floor, New Building, Municipal Hall, Sumilao

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
Sumilao Municipal Hall
March 24, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Jose Antonio Villo** *Sumilao Municipal Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Albert Gabriel De Mesa** *Brgy. Captain, Barangay Kisolon*
	Photo documentation

Ms. Amabelle A. Embornas
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Impasug-ong, Bukidnon

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 23, 2020, 2:00-4:00 PM
Impasug-ong Municipal Conference Hall

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Anthony A. Uy** *Impasug-ong Municipal Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Josefino B. Manalo** *Brgy. Captain, Barangay Cawayan*
	Photo documentation

Ms. Amabelle A. Embornas
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Malaybalay City, Bukidnon

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

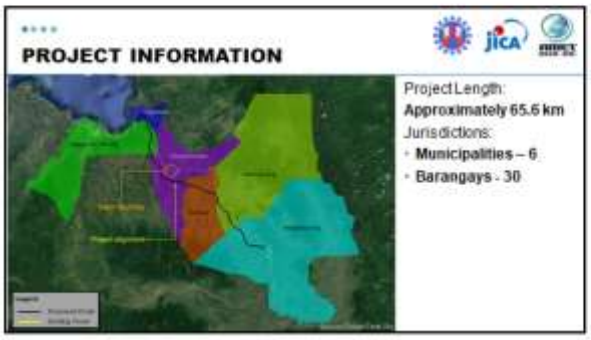
CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 23, 2020, 10:00-12:00 PM
People's Hall, 2nd Floor Malaybalay City Hall

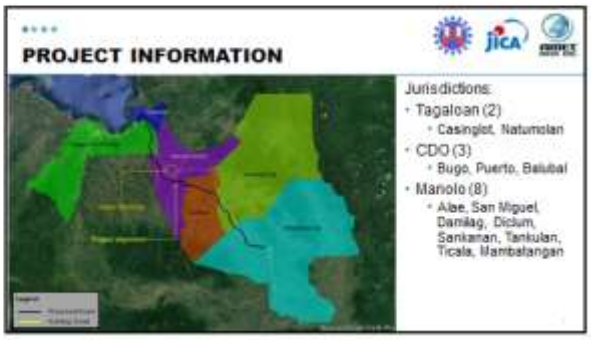
Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Florencio T. Flores Jr.** *Malaybalay City Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Adrian R. Gamboa** *City Planning and Development Officer*
	Photo documentation

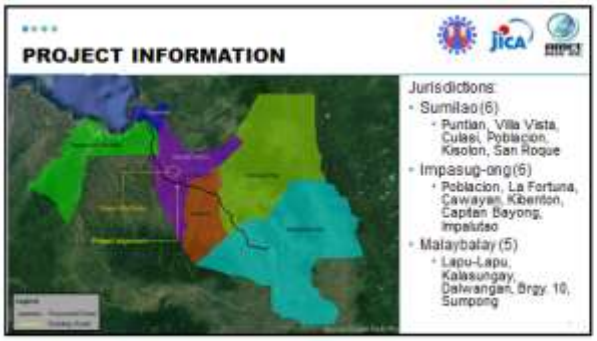
Ms. Amabelle A. Embornas
Emcee/Facilitator

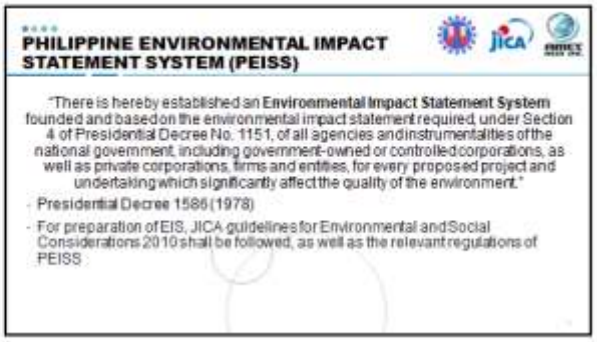
JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Attachment 4. IEC Presentation Material









ENVIRONMENTAL IMPACT ASSESSMENT

"process that involves predicting and evaluating the likely impacts of a project (including cumulative impacts) on the environment during construction, commissioning, operation and abandonment. It also includes designing appropriate preventive, mitigating and enhancement measures addressing these consequences to protect the environment and the community's welfare".

- used to enhance planning and guide decision-making

DAO 2017-15 – Guidelines on Public Participation under the PEISS

- Amidst the country's economic development initiatives, common good shall be promoted through public participation in the implementation of the Philippine EIS System

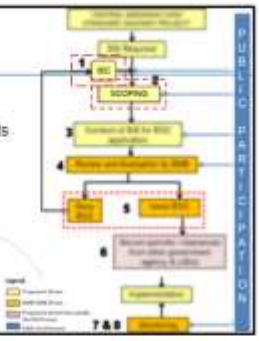
EIA PROCESS

Information, Education and Communication

- Goal is to introduce the project to the residents and LGU officials

Public Scoping

- Invite residents, LGU officials and other stakeholders to document questions, issues and opinions on the project that will be the basis of the EIA study



EIA PROCESS

Conduct of EIA

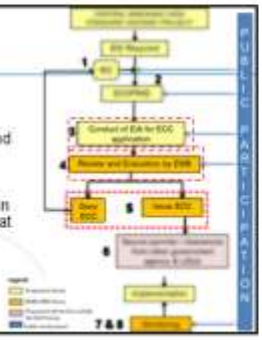
- Study on LAND, WATER, AIR, PEOPLE to assess the possible impacts of the project and prepare appropriate measures

Preparation of EIS

- Results of the EIA study will be documented in the Environmental Impact Statement (EIS) that will be reviewed by EMB-DENR

Decision

- Denial or issuance of Environmental Compliance Certificate (ECC)



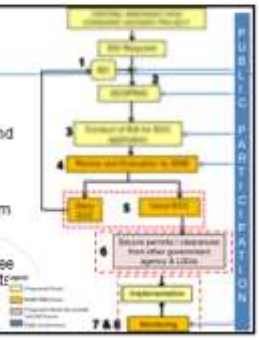
EIA PROCESS

Secure other permits and clearances

- After ECC, application of required permits and clearances from other agencies and offices

MMT and EGF

- Establishment of Multi-partite Monitoring Team (MMT) to monitor the project during the construction and operation phases
- Establishment of Environmental Guarantee Fee (EGF) as compensation for untoward incidents caused by the project



Thank you.

Attachment 5. IEC Brochure

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT

CAGAYAN DE ORO – MALAYBALAY SECTION

INFORMATION, EDUCATION AND COMMUNICATION (IEC)

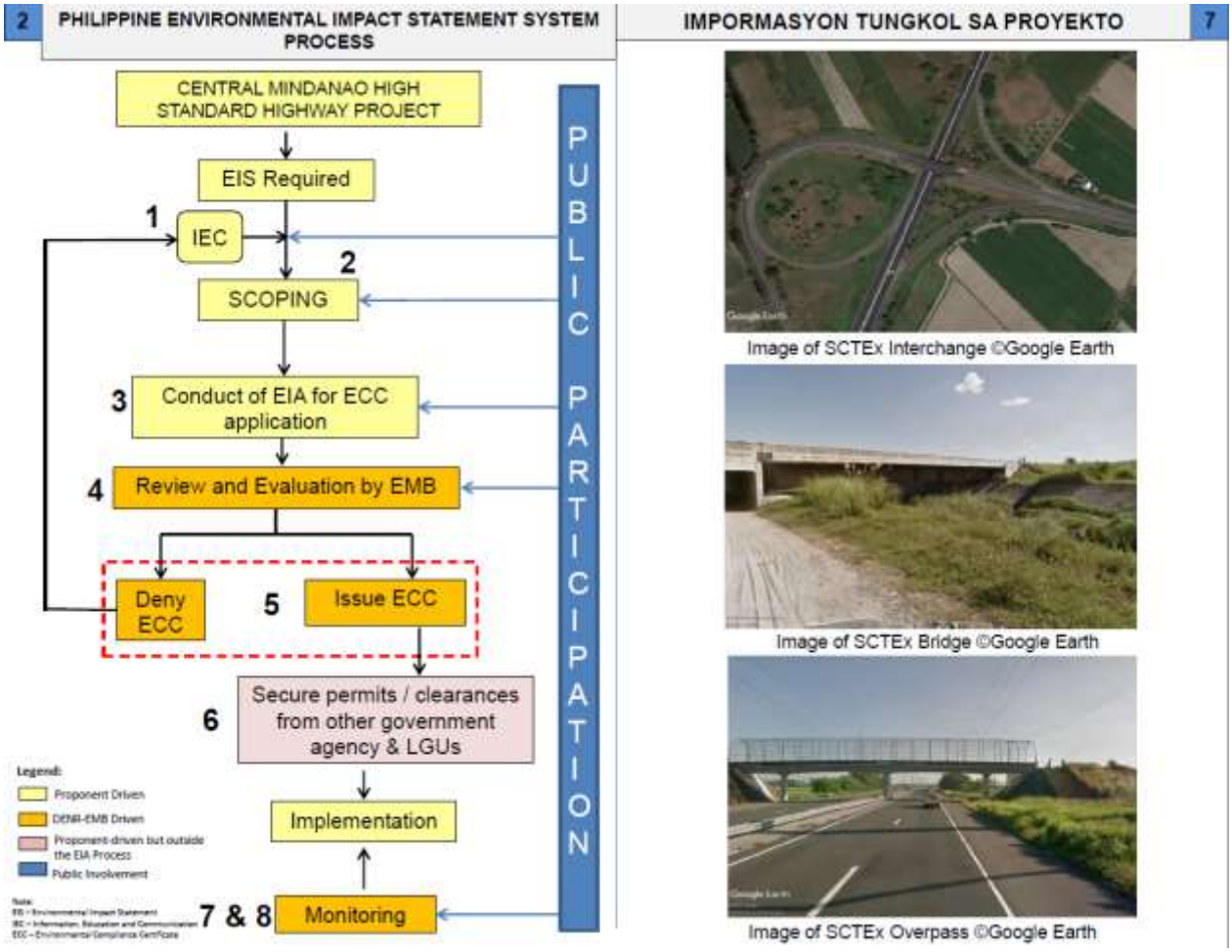
March 2021

Proponent :
Department of Public Works and Highways (Central Office)

With the assistance of:
Japan International Cooperation Agency (JICA)

Environment Consultant:
Amet-Asia Inc.
#7 Pioneer St. Brgy Highway Hills,
Mandaluyong City
02 254 0421/0906 012 6913

Annexes


2
PHILIPPINE ENVIRONMENTAL IMPACT STATEMENT SYSTEM PROCESS
CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT
EIS Required
1
IEC
2
SCOPING
3
Conduct of EIA for ECC application
4
Review and Evaluation by EMB
Deny ECC
5
Issue ECC
6
Secure permits / clearances from other government agency & LGUs
Implementation
7 & 8
Monitoring
PUBLIC PARTICIPATION
Legend:
Proponent Driven
DENR-EMB Driven
Proponent driven but outside the EIA Process
Public Involvement
IMPORMASYON TUNGKOL SA PROYEKTO
7
Image of SCTEx Interchange ©Google Earth
Image of SCTEx Bridge ©Google Earth
Image of SCTEx Overpass ©Google Earth

Annexes

6 IMPORMASYON TUNGKOL SA PROYEKTO

Jurisdictions (Municipalities, Cities, and Barangays)	Tagaloan	Casinglot, Natumolan
	CDO	Bugo, Puerto, Balubal
	Manolo	Alae, San Miguel, Damilag, Diclum, Sankanan, Tankulan, Ticala, Mambatangan
	Sumilao	Puntian, Villa Vista, Culasi, Poblacion, Kisolon, San Roque
	Impasug-ong	Poblacion, La Fortuna, Cawayan, Kibenton, Capitan Bayong, Impalutao
	Malaybalay	Lapu-Lapu, Kalasungay, Dalwangan, Brgy. 10, Sumpong
Project type	Road Project	
Initial specifications	Length = Approximately 65.6 km # of lanes = 2 or 4 Typical Road Right of Way = 60 m (minimum)	
Project components	Interchanges Bridges Overpass Underpass	
Indicative draft project timeline	**Feasibility Study**	2021
	Detailed Design	2022
	ROW Acquisition	2023 H1
	Construction Period	2023 H2 to 2025
	Operation	2026

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS 3

1. Ang **Information, Education and Communication (IEC)** ay ang unang hakbang ng **Department of Public Works and Highways (DPWH)** upang maipaalam ang proyekto sa mga residente at opisyal ng bayan at barangay.

2. Magtatakda ng isang **Public Scoping** na iimbitahan ang mga residente, mga opisyal ng munisipyo, at iba pang stakeholders. Ito ay upang matukoy ang mga katanungan, isyu, opinyon, at saloobin ukol sa proyekto na siyang isa sa magiging basehan ng pag-aaral.

3. Ang **Amet-Asia Inc.** ay ikinomisyon ng **DPWH** upang magsagawa ng **Environmental Impact Assessment (EIA)**. Ang EIA ay isang pag-aaral sa kasalukuyang kondisyong ng kapaligiran (lupa, hangin, tubig, halaman, hayop at mga tao) upang matukoy ang posibleng maging epekto ng proyekto at makapag-handa ng kaukulang solusyon.

4. Ang resulta ng EIA ay idodokumento sa **Environmental Impact Statement (EIS).** Ito ay susuriin ng mga eksperto ng EMB-DENR.

5. Base sa pagsusuri a naisagawa, ang EMB-DENR ay magdedesisyon kung ang proyekto ay bibigyan ng **Environmental Compliance Certificate (ECC).**

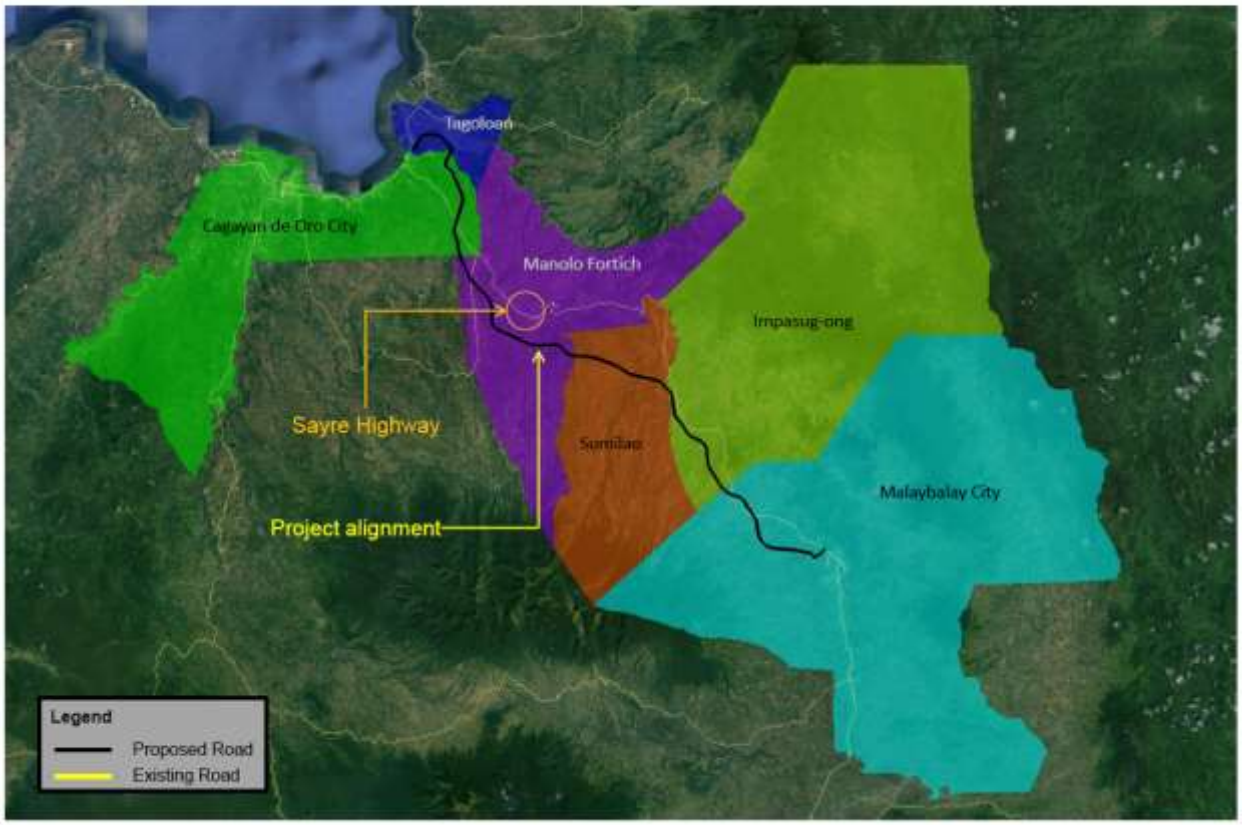
6. Kapag ang proyekto ay nabigyan ng ECC, ang **DPWH** ay magpapatuloy ng pag-apply ng iba pang permit at lisensiya mula sa ibang kawani at opisina ng DENR, ahensiya ng gobyerno, at lokal na pamahalaan.

7. Magbubuo ng **Multi-partite Monitoring Team (MMT)** upang mabantayan ang konstruksyun at operasyon ng proyekto at masigurado ang kaligtasan sa kapaligiran at sa pamayanan. Ang MMT ay bubuuin ng mga representante mula sa kumpanya, LGU, NGO, PO at EMB-DENR.

8. Ang DPWH ay magdedeposito sa bangko ng **Environmental Guarantee Fund (EGF)** para sumagot sa anumang aksidente o perwisyo sa pag-aari na direktang maidudulot ng Proyekto.

Annexes

Proposed Project Alignment
"Iminumungkahing Alignment ng Proyekto"



Annexes

Attachment 6. Initial Perception Survey Questionnaire

INITIAL PERCEPTION SURVEY (AFTER IEC)

Place of interview: BRGY. ENGLISH DIGKILAN Manolo Fortich

Date of Interview: 3-22-21

A. Sociodemographic Profile

Name: MARO C. RODRIGUEZ

Sex: F Age 36 Civil Status MARRIED

Education: COLLEGE Primary Work LGU EMPLOYEE

Community Position MUNICIPAL RECREATION OFFICER

B. AWARENESS ABOUT THE PROJECT

1. Are you aware of the plan to establish the Central Mindanao High Standard Highway project in your area? Yes ✓ No ____

2. What do you think about the project?

   It's better way for fast Transportation Development

3. Do you think your community will benefit from the project: Why or why not?

   If Yes, please state the reasons: Yes, because it is easy of marketing [illegible] a lot of [illegible] now [illegible] [illegible] [illegible] to [illegible] to [illegible] [illegible] [illegible] to local

   If No, please state the reasons: ____

4. What do you think are the issues to be encountered if the project is established in your area?: It's all about environment protection

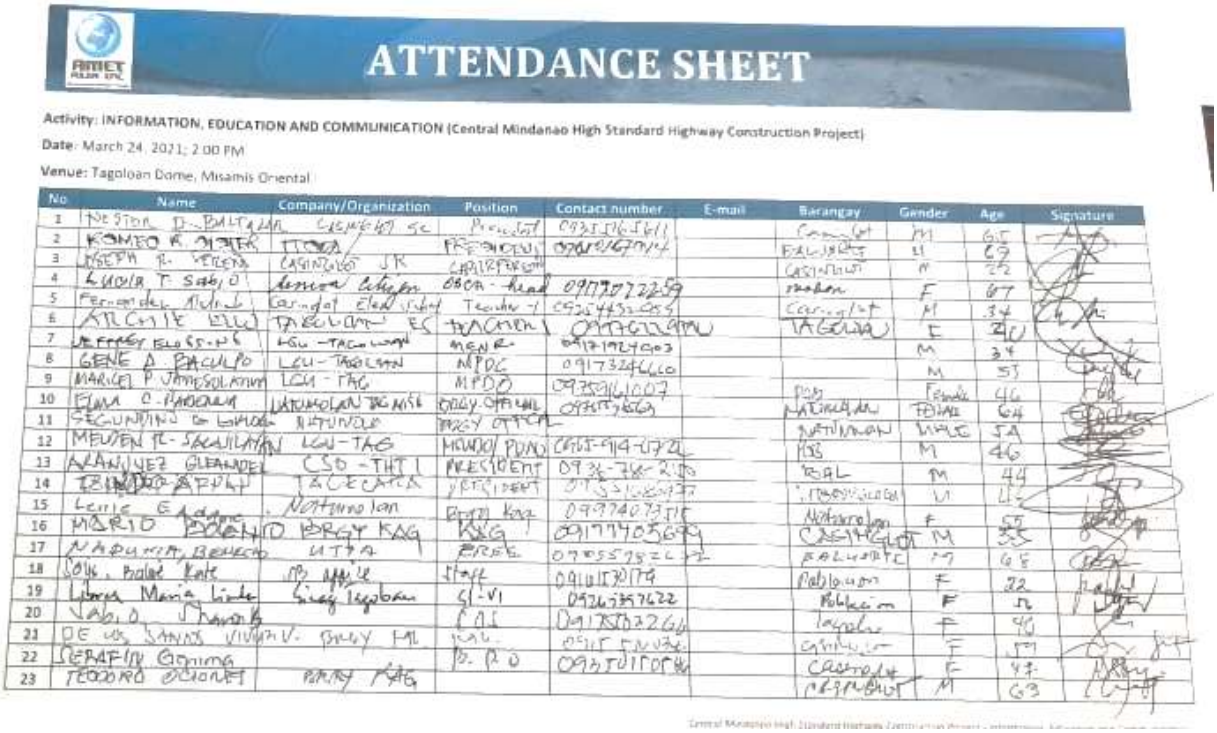
5. Other comments and suggestions

   None

Thank you for your time

Attachment 7. Attendance Sheet

Tagoloan, Misamis Oriental



ATTENDANCE SHEET

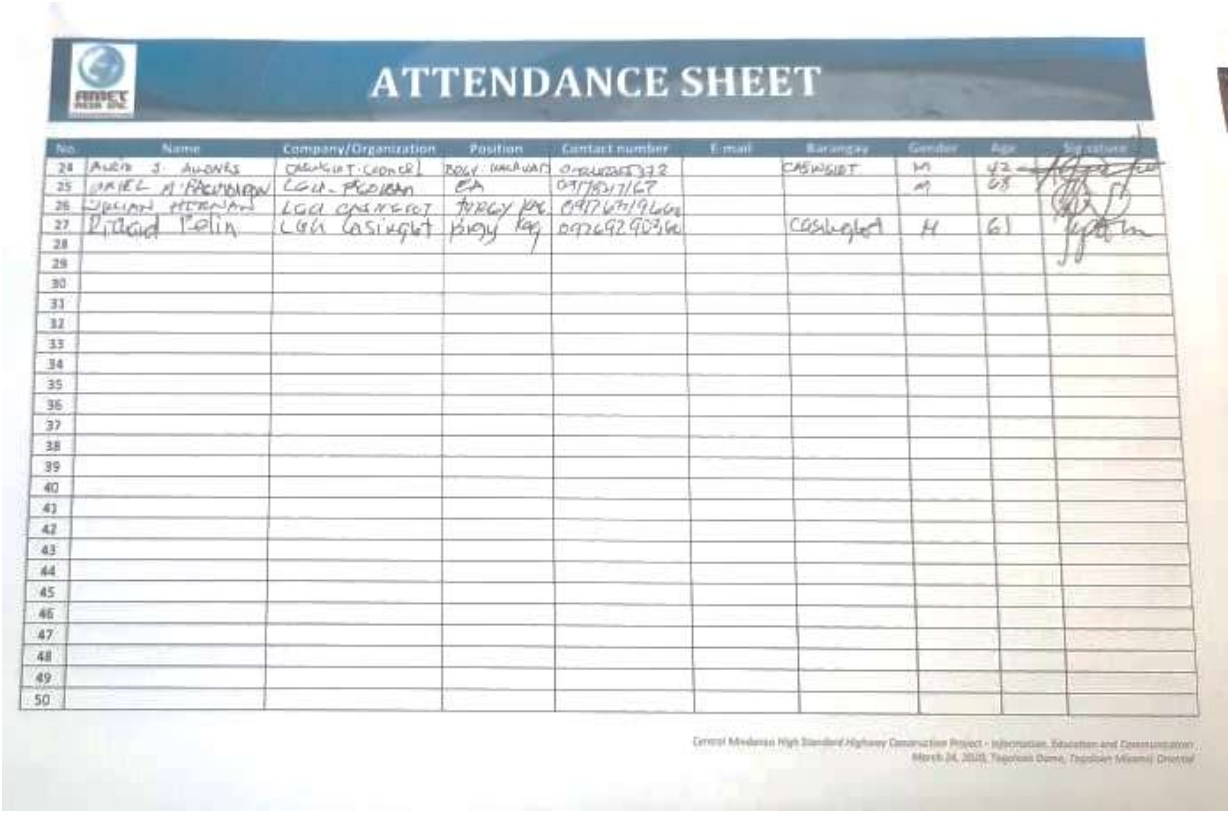
Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

Date: March 24, 2021; 2:00 PM

Venue: Tagoloan Dome, Misamis Oriental

No	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	NESTOR D. BALTAZAR	CENRO-69 SC	Provincial	09231461611		Casisiwit	M	65	
2	ROMEO R. OLIVER	ILGU	PESO	09261670114		Balubad	M	69	
3	JOSEPH R. VERGARA	CASISIWIT JR	CHAIRPERSON			Casisiwit	M	22	
4	LUCIA T. SABIO	Barangay Tagoloan	BCA - head	09177072259		Poblacion	F	67	
5	Fernando Alvin J.	Casisiwit Elementary School	Teacher I	09254432059		Casisiwit	M	34	
6	ARCHIE LELLO	TAGOLOAN ES	TEACHER I	09177022990		TAGOLOAN	F	40	
7	JEFFREY BLOSSOM	LGU - TAGOLOAN	MENRO	09179247003			M	34	
8	GENE A. PACULPO	LGU - TAGOLOAN	MPDC	09173246660			M	55	
9	MARICEL P. JAMESOLAMIN	LGU - TAG	MPDO	09359161007			Female	46	
10	ELMA C. PADERNA	MATINLOLAN BRGY	BRGY OFFICIAL	09177[illegible]6669		MATINLOLAN	FEMALE	64	
11	SECUNDINO G. LAMOLA	MATINLOLAN	BRGY OFFICIAL			MATINLOLAN	MALE	54	
12	MELVEN R. SAGUILAYAN	LGU - TAG	MENRO PUNO	0931-914-1721		MSB	M	46	
13	ALANJUEZ GLEANDEL	CSO - THT I	PRESIDENT	0936-766-2180		BAL	M	44	
14	[illegible]	TAGOLOAN	PRESIDENT	09532[illegible]		[illegible]	M	41	
15	LENIE E. [illegible]	Natimonolan	BRGY KAG	09974073[illegible]		Natimonolan	F	59	
16	MARIO BOENTO	BRGY KAG	KAG	09177405699		CASISIWIT	M	55	
17	NADUMA, BENECIO	UTTA	BRGY	09705578262		BALUBAD	M	68	
18	[illegible]	[illegible]	Staff	09101130179		Poblacion	F	22	
19	Liberia Maria Lida	Brgy Tagoloan	SI-VI	09263397622		Poblacion	F	22	
20	VABIO JAMES	CAS	CAS	09178302266		Tagoloan	F	40	
21	DE LOS SANTOS VIVIAN V.	BRGY FAL	MAL	0917 [illegible]		Casisiwit	F	39	
22	SERAFIN GONIMA		B. R. O	09171017[illegible]		Casisiwit	F	47	
23	TEODORO OCIONES	BRGY KAG				CASISIWIT	M	63	

Central Mindanao High Standard Highway Construction Project - Information, Education and Communication



ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
24	ALVIN J. ALONES	CASISIWIT COUNCIL	BRGY. KAGAWAD	09[illegible]372		CASISIWIT	M	42	
25	DANIEL A. PACULPOLAN	LGU - TAGOLOAN	CA	09178317167			M	68	
26	JULIAN HERNANI	LGU CASISIWIT	BRGY KAG	09176719666					
27	Rizalino Tolin	LGU Casisiwit	Brgy Kag	09269290366		Casisiwit	M	61	
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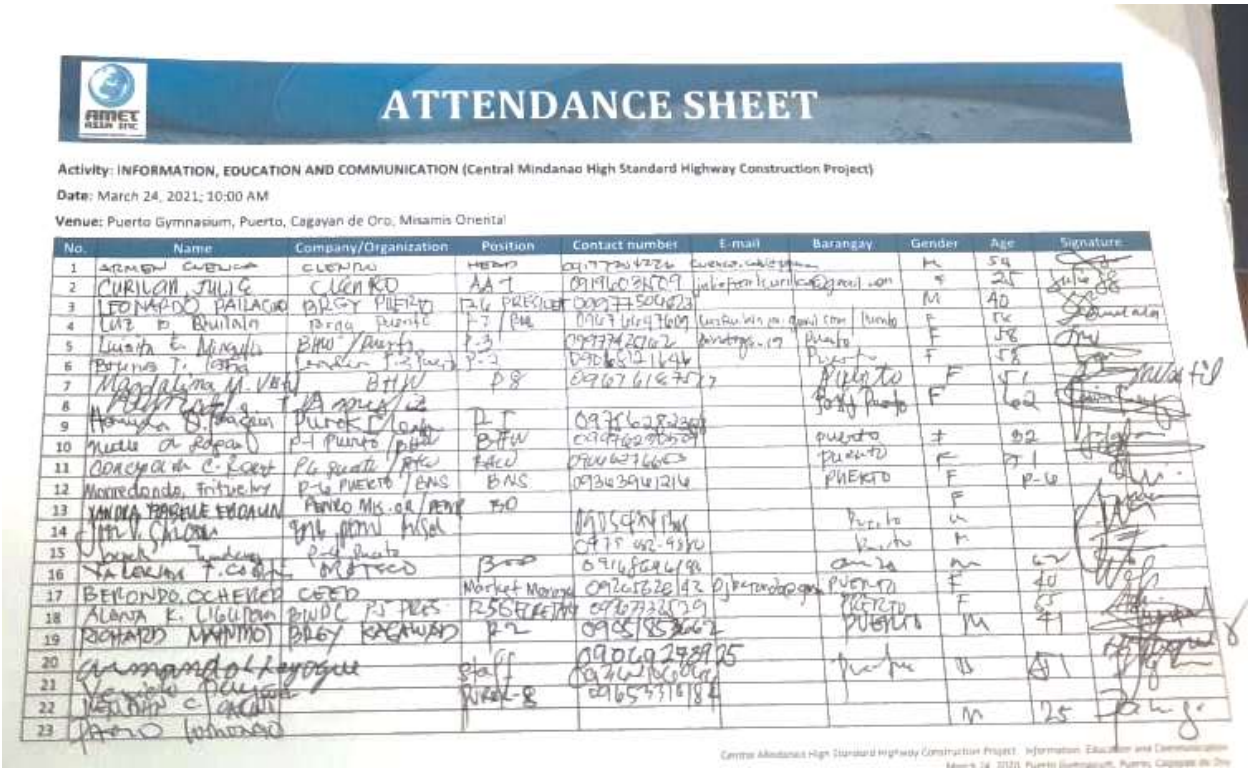
Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 24, 2021, Tagoloan Dome, Tagoloan Misamis Oriental

Annexes

Cagayan de Oro City, Misamis Orie



ATTENDANCE SHEET

Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

Date: March 24, 2021; 10:00 AM

Venue: Puerto Gymnasium, Puerto, Cagayan de Oro, Misamis Oriental

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1									
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Central Mindanao High Standard Highway Construction Project - Information, Education and Communication

ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
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Central Mindanao High Standard Highway Construction Project - Information, Education and Communication

Annexes

ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
51	[illegible]	DPWH	[illegible]	[illegible]		[illegible]	F	29	
52	[illegible]	DPWH	[illegible]	[illegible]		[illegible]	F	40	
53	ELMER C. ZAPANTA	AMET ASIA		09164274200		CDO	M	52	
54									
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Manolo Fortich, Bukidnon

ATTENDANCE SHEET

Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

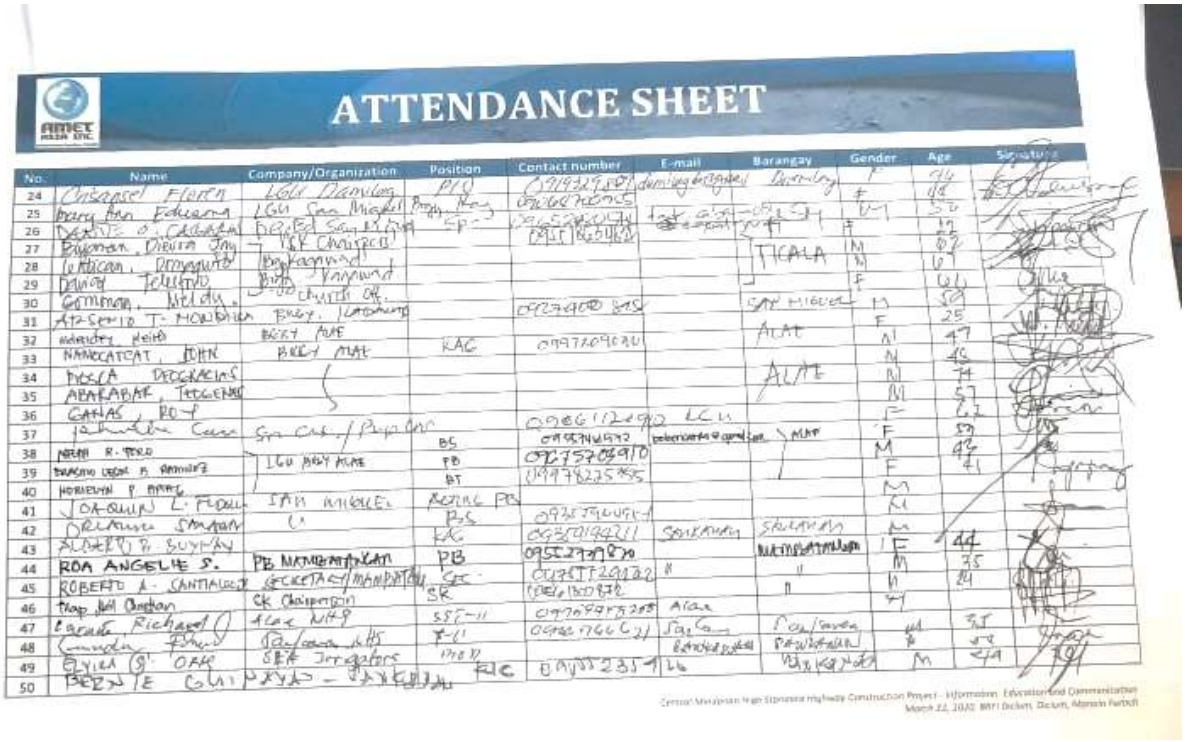
Date: March 22, 2021; 2:00 PM

Venue: BRFI Diclum, Diclum, Manolo Fortich, Bukidnon

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	[illegible]	JP	JP [illegible]	0946 743 582		Tagoloan	Male	92	
2	Maritte N. Libag		Brgy. Kag.	0906 166 8118		Kalugmanan	Female	18	
3	Jessica S. Amlagan		Brgy. Clerk			Kalugmanan	Female	40	
4	Marcial P. Gascon		Brgy. Kag.	0985 383 5425		Kalugmanan	M	47	
5	GERUNDIO A. BARRO		DSWD - PMS	09760269856		DICKLUM	M.	82	
6	PAUL RA PACAGUYA		COORDINATOR	0961 564 7995		[illegible]	M	37	
7	[illegible]		SSA			Manolo Fortich	M		
8	Dulce Amor Margate	LGU MF	RO I	0917 717 0953	lgumanolofortich@yahoo.com		F	40	
9	Virgo Montmontenegro L.	Brgy Diclum IA	DPMS	09655649975		DICLUM	M	53	
10	Henry C. Pitoc		Kag	09355397903		Kalugmanan	M	51	
11	Ethel Joan Ebiata	BRFI DICLUM	VE CHAIRPERSON	0905-147-8503	ethelmae@yahoo.com	Diclum	F	24	
12	Jessa G. Hamamon	Inc Diclum	Resident	0935 054 4976		Diclum	F	64	
13	JOSEPH C. [illegible]	RELIGIOUS SECTOR	CHAPEL PAST	09234740254		SANKANAN	M	53	
14	Simon Jerusalem	BRFI VE	PRESIDENT	09051359522		DICLUM	M	40	
15	Mona Madronero	LGU - MF	MO	0926-035-0561		Aguan Cogon	F	25	
16	Shirley G. Tocoboy	LGU-MF	MENRO	09453647619		Diclum	F	43	
17	Alan A. Impiroan	Barangay Tankulan	Kagawad	09075147878		Tankulan	M	34	
18	Jesus M. Galacio	Brgy. Kagawad		09051690076		San Miguel	M	61	
19	EDUARDO BARRIOS	BRGY KAGAWAD		0934 359 6107		[illegible]	M	53	
20	RASELID SABA	Mlak	FARMER REPS	09226967[illegible]		Alae	M	56	
21	[illegible] G. SABUD	DEPED	PRINCIPAL	09556234644		DICKLUM	F	48	
22	[illegible] JOAN [illegible]		SPT	09178124532			F	30	
23	MARIE CONE - [illegible]	SANKANAN E/S DEPED	TEACHER I	09361985659		SANKANAN	F	39	

Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 22, 2020 BRFI Diclum, Diclum, Manolo Fortich

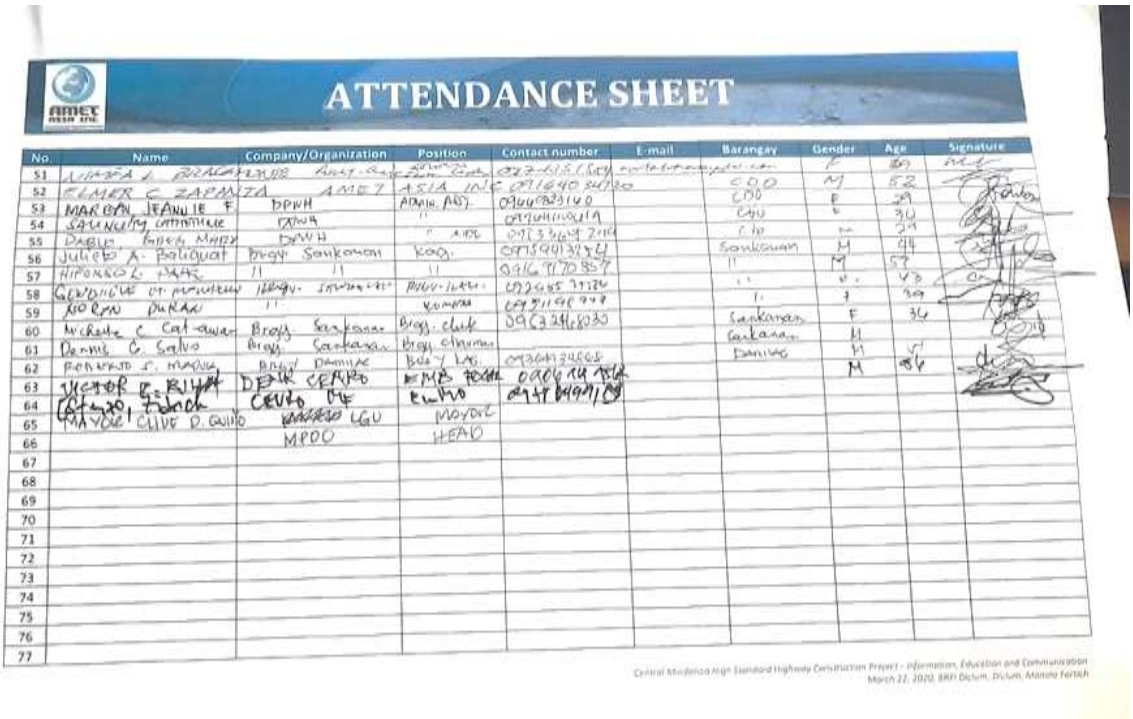
Annexes



ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
24	[illegible]	LGU Damulog	PIO	[illegible]	damulog@[illegible]	Damulog	F	44	
25	[illegible]	LGU San Miguel	Brgy. Kag	[illegible]	[illegible]	[illegible]	F	36	
26	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F	19	
27	Bugoman, [illegible]	YSK Chapter		[illegible]		TICALA	M	62	
28	[illegible]	Bukamand					M	61	
29	[illegible]	Bukamand					F	61	
30	Gemmon, [illegible]	[illegible]					M	59	
31	Atsenio T. Montalica	Brgy. Lacomang		09234080345		SAN MIGUEL	F	25	
32	[illegible]	Brgy Alae				ALAE	M	47	
33	Nangcatcat, John	Brgy Alae	KAC	09977209220			M	46	
34	Dosca Deogracias					ALAE	M	74	
35	Abarabar, Teogenes						M	57	
36	Gahas, Roy						F	62	
37	[illegible]	San Cab / Pagalungan		09261124990	LGU		F	59	
38	[illegible]		BS	09234[illegible]	[illegible]	MAP	M	42	
39	[illegible]	LGU Brgy Alae	PB	09275709910			F	41	
40	[illegible]		BT	09978225355			M		
41	Joaquin L. Flores	IAM Mikelex	Retiree PB				M		
42	[illegible]		BS	09257946541					
43	Alberto P. Suyan		KAC	09270194211	Sonkanan	Sonkanan	M		
44	Roa Angelie S.	PB Manupanlan	PB	09520790820			F	44	
45	Roberto A. Santiago	Secretary Manupanlan	Sec.	09277129132	"	"	M	35	
46	[illegible]	CK Chapter	SR	[illegible]		"	M	84	
47	Garade, Richard	Alae MHS	SSF-II	09707497208	Alae		M		
48	Camonda, [illegible]	Sonkanan MHS	T-II	09461766621	Sonkanan	Sonkanan	M	35	
49	Elyien G. Oap	DEA Irrigators	MOD		[illegible]	Sonkanan	F	39	
50	[illegible]	[illegible]	KIC	09155235916		[illegible]	M	49	

Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 22, 2020 BRI Dicium, Dicium, Manolo Fortich



ATTENDANCE SHEET

No	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
51	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CDO	M	52	
52	Elmer C. Zapanta	AMET Asia Inc	Admin Asst.	09161840347[illegible]		CDO	F	29	
53	Marbon, Jeanlie F	DPWH	"	09668[illegible]140		CDO	F	34	
54	Saunering, [illegible]	DPWH	"	09[illegible]0419		CDO	M	29	
55	Dablio, [illegible]	DPWH	"	09173[illegible]7219		CDO	M	44	
56	Julieto A. Paliguat	Brgy. Sonkanan	Kag.	09759913784		Sonkanan	M	57	
57	Hipongo L. [illegible]	"	"	09169170857		"	M	48	
58	Gendiole M. Montero	Brgy. [illegible]	Brgy. [illegible]	09265[illegible]7326		"	F	30	
59	Roron Duran	"	Kagawad	09731[illegible]949		"	F	36	
60	Michelle C. Cat-awan	Brgy. Sonkanan	Brgy. clerk	09639468030		Sonkanan	M		
61	Dennis G. Salvo	Brgy. Sonkanan	Brgy. chairman			Sonkanan	M	57	
62	Romeo S. Magno	Brgy. Damulog	Brgy. Kag.	09364734565		Damulog	M	56	
63	Victor G. Ruiz	DENR CENRO	EMS Focal	09[illegible]					
64	Cayao, Edwin	CENRO	Ecwho	09[illegible]					
65	Mayor Clive D. Quiño	LGU	Mayor						
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Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 22, 2020 BRI Dicium, Dicium, Manolo Fortich

Annexes

Sumilao, Bukidnon

ATTENDANCE SHEET

Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

Date: March 24, 2021; 10:00 AM

Venue: 2nd Flr., New Building, Sumilao Municipal Hall, Sumilao, Bukidnon

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	CHARISH R. ALUMBRO	DEPED – KCES	ESP - I	09175930379	[illegible]	Kisolon	F	37	
2	FE B. MADRANGKA	DEPED VISTA VILLA	T - 3	09063630078		Vista Villa	F	56	
3	DOMINADOR A. DEL ROSARIO	BRGY. OFFICIAL	KAGAWAD	09169274090	[illegible]	Kisolon	M	48	
4	DIGON FIDEL S.	FARMER SECTOR	BAEC	09262545324		P-1 Esplu	M	61	
5	LAPORNINA MARION	KIMODOA ASS.	P.O.D			P-3 Kisolon	M	41	
6	ANLISTON, ROSALIAD	CULTURAL SECTOR	Tribal sec	09665279760		P-4 Kisolon	F	56	
7	MARIDEL A. GOY	(Brgy. Kagawad)	KAGAWAD	09057464260		Vista Villa	F	63	
8	MAYCELLE C. TAN	NUMAP PTO. PRPS	President	09259558234		Poblacion	F	43	
9	CHARINETTE B. MUTUC	S. BAYAN REP.	RECORDS OFFICE	09178036994	[illegible]	Kisolon	F	35	
10	ANDREW O. PAYAGUE	IPMR		09165611656		Vista Villa	M	63	
11	JULIUS CESAR TAN	P.I	PB			Poblacion	M	49	
12	CUPAY, JANE T.		PB			San Roque	M	40	
13	CARBAJAL FLORENCIO	Brgy. Secretary	Brgy. Secretary			Vista Villa	F	58	
14	Glynna B. Pinote	Brgy. Kagawad		09479529331		San Roque	F	47	
15	Ann Marie Lato	Lato Gumilao	BMK "	09178096963		Kisolon	F	31	
16	Quirico Legaspi	Brgy Kag				San Vicente		65	
17	HELEN SARKUM	FISHERFOLK		09960246721		VISTA VILLA	F	40	
18	DALU-AN GENO	Brgy. Kagawad	Kagawad	09584004170		Vista Villa	M	46	
19	CORAZON BOGAD		Tanod	09269440869		Vista Villa	M	42	
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ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
23	Gemmo C. Olana	LGU Brgy Kisolon	Kagawad	09069147616		Kisolon	M	55	
24	TEODORO P. PAICONG	BLGU KISOLON	"	09381874796		"	"	70	
25	CARLITO P. LAXANAV	TRIBAL DATU	CHIEFTAIN	09352559810		"	M	61	
26	Amisoso, Tiesso	BLGU LGU	P.B.	09269514806		Poblacion	M	65	
27	Hinayon, Adilya B.	Religious				Vista Villa	F	62	
28	Magdalena, Lanida	Senior Citizen	Treasurer			Vista Villa	F	60	
29	Bantay, Carlos		BRGY			Poblacion	M	67	
30	Bonte, Florencio	Punitian	IPMR	09120535840		Punitian	M	42	
31	DALO-AN SILVESTRE		BRGY KAG	09353424023		Kisolon	M	59	
32	JOHN MARK SARKUM	San Roque	BRGY KAG	09165561132		San Roque	M	34	
33	NOLAND M. BARREMONTE	D-N	BRGY KAG	09265497260			M	49	
34	Ruth, S. Torayno	IPMR San Roque	IPMR	09169539606		San Roque	F	55	
35	ANTONIO INOCENCIO	EBTCI	SUPERVISOR	09153297573		San Roque	M	50	
36	ACE L. PEMPONCEO	SAN ROQUE	BRGY KAG	09168771112		San Roque	F	39	
37	EDGAR PEMPONCEO	E.B.T.C.I	LDC	09456001114			M	52	
38	Felicino L. Tumindao	BLGU	P.B.	09262425960		San Vicente	M	71	
39	JEROME S. CAGAPAS	BLGU POBLACION	KAGAWAD	09261990544		POBLACION	M	41	
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Annexes

Impasug-ong, Bukidnon

ATTENDANCE SHEET

Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

Date: March 23, 2021; 2:00 PM

Venue: Dome, Poblacion, Impasug-ong, Bukidnon

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	Evangeline Tomonda		Brgy. Kag	09476740701		Capt. Boyong	F	49	
2	Lumpad Emmanuel	BALGU Impasugong	MENRO	09178094312			M	56	
3	CARMELINA H. DALINO	LGU-IMPASUGONG	PDO-II	09776449469			F	58	
4	Carlton A. Martinez	Barangay - La Fortuna	Brgy. Secretary	09285697862		Brgy. La Fortuna	F	34	
5	Robson A. Sagonoy	" La Fortuna	Brgy. Kag.	09386505859		La Fortuna	M	39	
6	Rodrigo Antiro	Capt. Boyong	Brgy. Kag.	09365292989		Capt. Boyong	M	57	
7	RAUL G. FOCUSO	Capitan Boyong	Brgy. Kag.	09355812007		Capitan Boyong	M	57	
8	ARNEL L. CARRICIA	LGU - POBLACION	Brgy. Kag.	09094747024		POBLACION	M	59	
9	JOSEPINO D. MANALO	P.R - CAWAYAN		09051511398		CAWAYAN	M	67	
10	ANIE L. TANDIAN	BLGU - CAWAYAN	BLGU Kag	09751944 8042		CAWAYAN	F	42	
11	CARMELINO CAMPOL	- CAWAYAN	Kag.			Cawayan	M	60	
12	ANGELITO D. CAMPOSANO	- CAWAYAN	KAP	09756726977		POBLACION	M	70	
13	VON ONNE P. LAGAYAN	BLGU - POBLACION		09156588492			M	39	
14	Roberto T. Abejuela	Tupelay	Brgy. Kag.	09161121837		Tupelay	M	63	
15	ELEANOR A. TAMPOS	Brgy. Kag.		09978560339		La Fortuna	F	53	
16	Josephine P. Batiloan	Women Org.	Pres.	09264654140		Cawayan	F	60	
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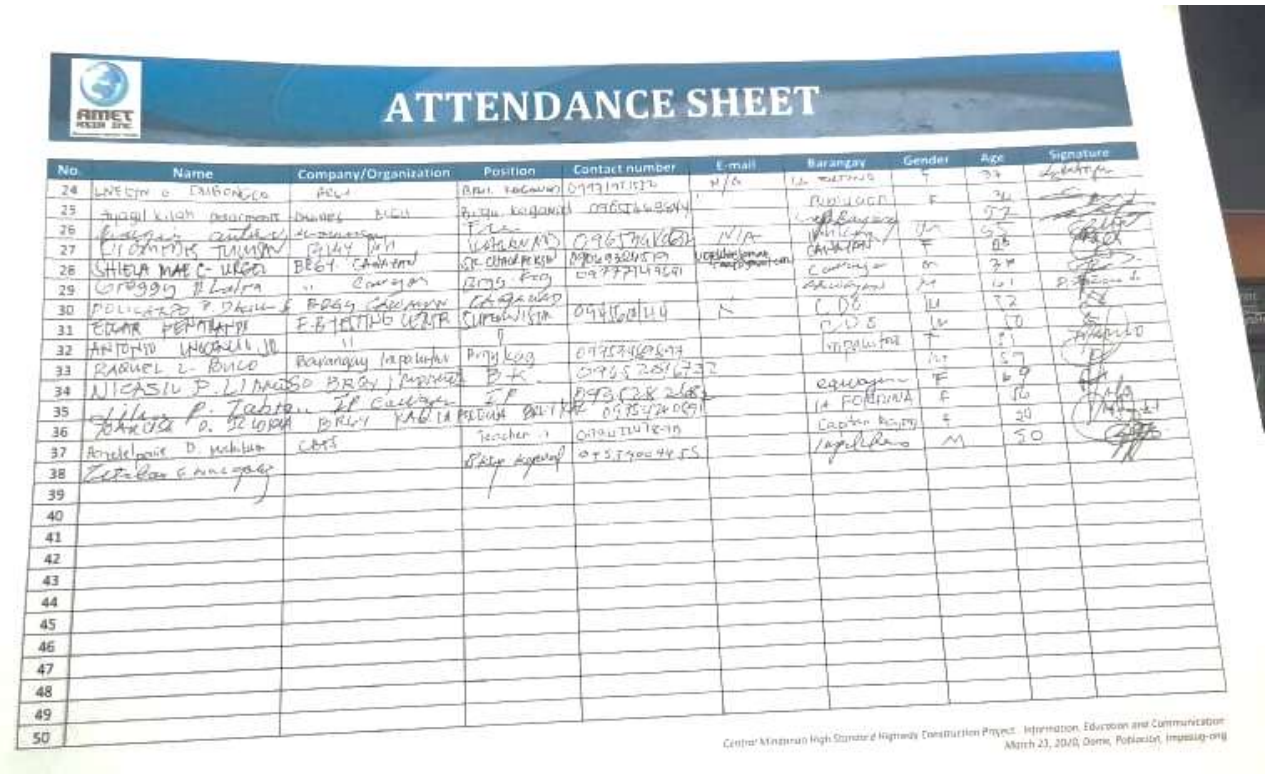
Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 23, 2021; Dome, Poblacion, Impasug-ong



ATTENDANCE SHEET

No	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
24	LNESTY O. DAMONGCO	BFW	BFW. Kagawad	09171971576	N/A	La Fortuna	F	34	
25	Angel Kilon Development	DAMEC BICH	Brgy. Kagawad	09651669594		POBLACION	F	36	
26	Barangay Cawayan	Barangay	Tres			Capt. Boyong		57	
27	LIZAMAE TAMPON	BLGU Pob	Kagawad	09675241621	N/A	Poblacion	M	65	
28	SHIELA MAE C. URGEL	BRGY. Cawayan	SK. Chairperson	09062822459	urgelshielamae@yahoo.com	CAWAYAN	F	28	
29	GREGORY H. Lalora	" Cawayan	Brgy. Kag	09777214961		Cawayan	M	61	
30	POLICARPO P. DALIL JR	BRGY. Cawayan	Kagawad			Cawayan	M	61	
31	EDGAR PENTAPATIS	F.B TESTING UNIT	SUPERVISOR	09481608114	N	C.D.O	M	72	
32	ANTONIO UNGRIN, JR	"				C.D.O	M	50	
33	RAQUEL L. ROMCO	Barangay Tupelay	Brgy Kag	09753416677		Tupelay	F	51	
34	NICASIO P. LIMACSO	BRGY. Tupelay	B.K.	09955281672			M	67	
35	Lilia P. Zabala	KP Cawayan	KP	09352820891		Cawayan	F	69	
36	MARIVIC O. SEGURA	BRGY. KAGUA	Pres.	09754260091		La Fortuna	F	56	
37	Annelpaul D. Mahilum	CMS	Teacher I	09301147819		Capitan Boyong	F	30	
38	Zenaida C. Hinagay		Brgy. Kagawad	09551904455		Tupelay	M	50	
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Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 23, 2021; Dome, Poblacion, Impasug-ong

Annexes

ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
51	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	43	
52	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	63	
53	RAMON LEGARDA	[illegible]	[illegible]	09067136648		[illegible]	M	67	
54	[illegible]	IWC	[illegible]	[illegible]		[illegible]	F	45	
55	[illegible]	[illegible]	[illegible]	09260311660		[illegible]	M	29	
56	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	54	
57	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	F	16	
58	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	28	
59	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]			
60	[illegible]	[illegible]	[illegible]	09976417955		CAPITAN BOGAN	M	50	
61	[illegible]	[illegible]	[illegible]	09669787631		[illegible]		75	
62	[illegible]	[illegible]	[illegible]	09365657137		Poblacion	F	54	
63	[illegible]	[illegible]	[illegible]						
64	[illegible]	[illegible]	[illegible]	09365667211					
65	[illegible]	[illegible]	[illegible]			[illegible]	F	65	
66	[illegible]	IPMR INPALIGTAO	[illegible]	09774095200		[illegible]	F	55	
67	[illegible]	[illegible]	(P.B)			[illegible]	F	67	
68	ANTONIO O. [illegible]	[illegible]		09557943375		[illegible]	M	78	
69	[illegible]	[illegible]	[illegible]			[illegible]	M	45	
70	[illegible]	[illegible]	[illegible]	09266486074		[illegible]	F	29	
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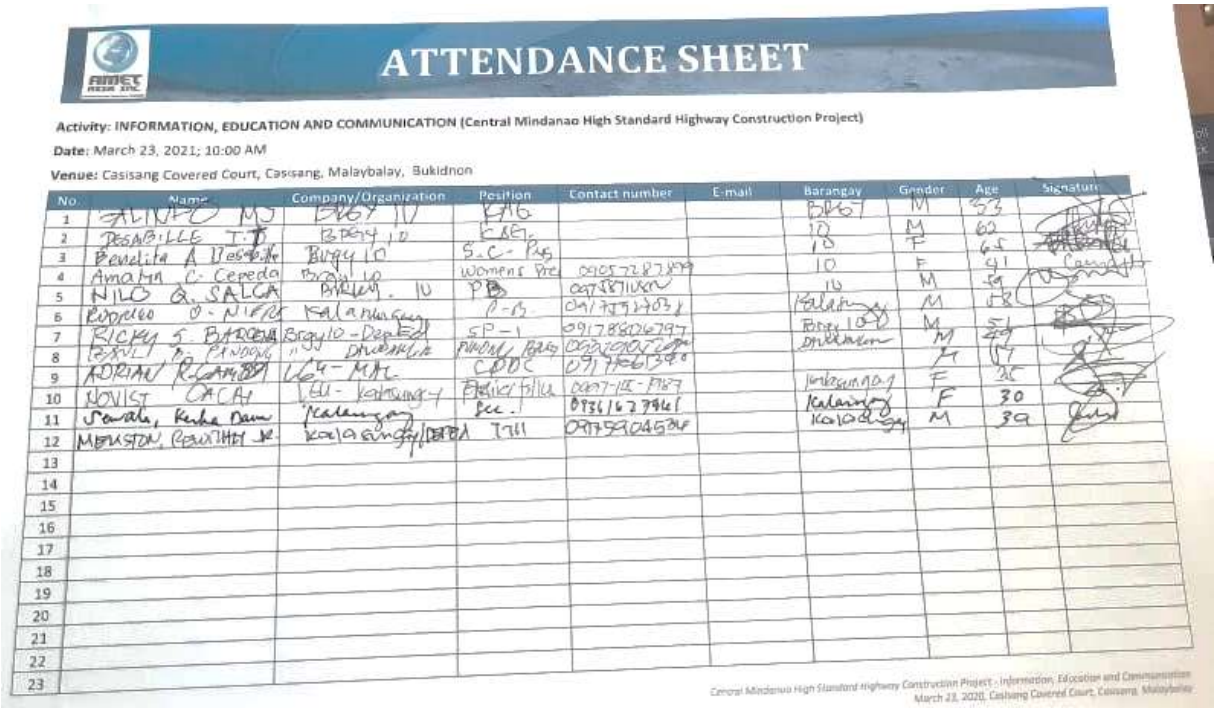
Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 23, 2020, Dame, Poblacion, Impasug-ong

Malaybalay City, Bukidnon



ATTENDANCE SHEET

Activity: INFORMATION, EDUCATION AND COMMUNICATION (Central Mindanao High Standard Highway Construction Project)

Date: March 23, 2021; 10:00 AM

Venue: Casisang Covered Court, Casisang, Malaybalay, Bukidnon

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	ALINPO MJ	BRGY 10	KAG			BRGY 10	M	53	
2	DESABILLE T. D	BRGY 10	KBE			10	M	62	
3	Benelita A Desabille	Brgy 10	S.C. Pag			10	F	65	
4	Amalia C. Cepeda	Brgy 10	Womens Pres	09057287299		10	F	41	
5	NILO Q. SALCA	BRGY. 10	PB	09788110[illegible]		10	M	59	
6	RODRIGO O. NIERE	Kalamangay	P-B	09179927031		Kalamangay	M	68	
7	RICKY S. BARCENA	Brgy 10 - DepEd	SP-1	09178806797		Brgy 10	M	51	
8	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	49	
9	ADRIAN [illegible]	LGU-MAL	CDDC	09174663[illegible]			M	47	
10	NOVIST CACAY	LGU - Kalamangay	[illegible]	0907-112-7187		Imbayao A.D.J	F	25	
11	Sarah, Kuha Dam	Kalamangay	Sec.	09361627961		Kalamangay	F	30	
12	MERLSTON, [illegible]	Kalamangay/DPWH	[illegible]	09179904534		Kalamangay	M	39	
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Central Mindanao High Standard Highway Construction Project - Information, Education and Communication
March 23, 2020, Casisang Covered Court, Casisang, Malaybalay

Annexes

ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
24	[illegible]	LGU-BRGY 10	KAG.	09061691098		10	M	57	
25	ALFANGIO [illegible]	LGU-BRGY 10	KAG.	09178729175		10	M	32	
26	[illegible]	— " —	KAG	09164155853		10	M	44	
27	Armando P. Blanco	Brgy 11	KAG	09156042778		10	M	63	
28	TIFFANY C. GALIANO	Brgy. 10	KAG	09156201968		10	F	31	
29	ALEX P. AGUSTIN	LGU-BRGY 10	KAG	09360471102		10	M	61	
30	Jaime Jack D. Omar	LGU Dalwangan	KAG	09262552808		Dalwangan	M	55	
31	JOSE E. RONDO	LGU DALWANGAN	KAG			DALWANGAN	M	6	
32	BENITO BINAYAO	LGU KALASUNG	LPMA			KALASUNGAY	M		
33	GENE M. RAMOS	Kalasungay	Brgy	09384144494		Kalasungay	M	73	
34	ANTHONY DUBLO	— " —	KAG	09176370841		— " —	M	55	
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ATTENDANCE SHEET

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
51	SIGI PAUL AGUTIN	BRGY 10	SK	09097897764		10	M	20	
52	[illegible]	Brgy 10	[illegible]	09973860969		10	M	81	
53	RITA Z. GUIANTA	Brgy 10	[illegible]	09263782261		10	F	60	
54	[illegible]	Brgy 10	IP MAR	09261460922		10	F	61	
55	RENANTE M. DIKIT	PATPAT	P. [illegible]	09638177197		PATPAT	M	42	
56	George Magnino	PATPAT		09357653894		"	M	60	
57	FERDIE SASLAGO	DENR-PENRO	RSO, CHIEF	09173157397					
58	JOEMAR SUERO	KALASUNGAY	ICAO	09163003809		KALASUNGAY	M	40	
59	Maynoy Reyly Oraa	Dalwangan	Treasury	0945 304 4798		Dalwangan	F	32	
60	Mercy Joy I. Mat[illegible]	Dalwangan	Brgy Kag	09153393972		Dalwangan	F	54	
61	JUNEL C. LAMADRIDA	Dalwangan	Secretary	09062431536		Dalwangan	M	36	
62	EDGAR DELAMATAMORA	E-99 TRAINING CENTER		09456201214			M	32	
63	JEJISHER C. BINAYAO	KALASUNGAY	SB	09163542936		KALASUNGAY	M	32	
64	[illegible] B. [illegible]	Kalasungay	Kagawad	09357945874		Kalasungay	F	66	
65	Lourdes Paw	Kalasungay		09273349188		Kalasungay	F	48	
66	Annabelle Embornas	AMET ASIA	Consultant-Admin	09750436486			F	89	
67	Jade Harley Bretaña	AMET ASIA	Consultant-Admin	09262602707			M	42	
68	Lynn Tolentino	AMET ASIA	Consultant-Admin	09451126357			F	38	
69	DARCO GREER MANER	DPWH	PMO-SECT	09173360926		LDRC	M	39	
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Central Mindanao High Standard Highway Construction Project : Information, Education and Communication

Attachment 8. Photodocumentation

Tagoloan, Misamis Oriental

Registration and receiving fliers of the attendees

During the open forum

Group picture of the participants and facilitators

Cagayan de Oro City

Annexes

Receiving the project flier during registration

During the open forum

EIA Presentation by Dr. Nimfa Bracamonte from Amet-Asia, Inc.

Closing remarks by Mr. Ramir M. Balqwin (CPDO)

Manolo Fortich, Bukidnon

Receiving the project flier during registration

The participants during the presentation of the project

Dr. Nimfa Bracamonte from Amet-Asia, Inc. presenting the Project

Open forum with Mayor Clive D. Quiño

A participant asking a question during the open forum

Group photo with the participants, facilitators, and Mayor Clive Quiňo

Sumilao, Bukidnon

Registration and distribution of Project fliers

During the open forum

A participant asking question about the Project

Photo opportunity with the participants

Impasug-ong, Bukidnon

Receiving the project flier during registration

During the open forum

A participant asking question about the alignment

Malaybalay City Bukidnon

Registration and distribution of fliers

Participants listening to the Project presentation

Mr. Alvin from CPDO addressing his question about the Project

Prof. Amabelle Embornas andressing the questions of the participants

Annexes

Attachment 9. Impasugong Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021

Republic of the Philippines
Province of Bukidnon
MUNICIPALITY OF IMPASUGONG

SANGGUNIANG BAYAN

EXCERPTS FROM THE MINUTES OF THE 81ST REGULAR SESSION OF THE 14TH SANGGUNIANG BAYAN OF IMPASUGONG, BUKIDNON HELD AT THE SANGGUNIANG BAYAN SESSION HALL ON FEBRUARY 8, 2021.

PRESENT:

Hon. Maria Norly T. Pepito	Municipal Vice Mayor, Presiding
Hon. Johnny A. Chavez	Municipal Councilor
Hon. Jonathan C. Olana	Municipal Councilor
Hon. Eutropio S. Jamilo	Municipal Councilor
Hon. Xenia Jane O. Echeminada	Municipal Councilor
Hon. Jesse Jose O. Uy	Municipal Councilor
Hon. Meriel A. Almeda	Municipal Councilor
Hon. Maxuel D. Antivo	Municipal Councilor
Hon. Jetaime O. Gumban	Municipal Councilor
Hon. Noel R. Rojas	Liga ng mga Barangay President
Hon. Shiela Mae C. Urgel	Municipal SK Federation Representative
Hon. Benny D. Cumatang	IP Mandatory Representative

ABSENT: None.

RESOLUTION NO. 2021-381(A)
(81st Regular Session)

RESOLUTION ENDORSING TO THE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH) – REGION X, RESOLUTION NO. 005, SERIES OF 2021 OF THE MUNICIPAL DEVELOPMENT COUNCIL, ENTITLED: RESOLUTION REQUESTING THE DPWH REGION X, THAT THE TOPOGRAPHIC SURVEY FOR THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CAGAYAN DE ORO – MALAYBALAY) BE CONDUCTED ALONG THESE ROUTE; FROM TAGOLOAN CAGAYAN DE ORO, TO TRAVERSE SITIO ABYAWAN AND SITIO SANTIAGO, DALIRIG, MANOLO FORTICH, BUKIDNON TO GUIHEAN, SAYAWAN, SITIO KALIPAYAN AND SITIO BUNDAAN, DUMALAGUING, BONTONGON, ALL OF IMPASUGONG, BUKIDNON AND MANALOG, MALAYBALAY CITY.

PRESENTED for consideration of this body is the Committee Report of the Committee on Public Works, Infrastructure, Communication and Transportation dealing on Resolution No. 005, Series of 2021 of the Municipal Development Council, entitled: RESOLUTION REQUESTING THE DPWH REGION X, THAT THE TOPOGRAPHIC SURVEY FOR THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CAGAYAN DE ORO – MALAYBALAY) BE CONDUCTED ALONG THESE ROUTE; FROM TAGOLOAN CAGAYAN DE ORO, TO TRAVERSE SITIO ABYAWAN AND SITIO SANTIAGO, DALIRIG, MANOLO FORTICH, BUKIDNON TO GUIHEAN, SAYAWAN, SITIO KALIPAYAN AND SITIO BUNDAAN, DUMALAGUING, BONTONGON, ALL OF IMPASUGONG, BUKIDNON AND MANALOG, MALAYBALAY CITY.

After due deliberation, the Committee hereby recommends to endorse Resolution No. 005, Series of 2021 of the Municipal Development Council to the Department of Public Works and Highways (DPWH) – Region X for appropriate action.

Annexes

Resolution No. 2021-381(A)
81st Regular Session
February 8, 2021
Page 2

WHEREFORE, on motion of Councilor Maxuel D. Antivo and all Sangguniang Bayan Members present in unanimous accord,

BE IT RESOLVED, that the committee report herein presented be adopted by this body and that Resolution No. 005, Series of 2021 of the Municipal Development Council is hereby endorsed to the Department of Public Works and Highways (DPWH) – Region X for appropriate action.

RESOLVED FURTHER, that copy of this resolution be furnished to the Department of Public Works and Highways (DPWH) – Region X for their information and appropriate action.

APPROVED.

CERTIFIED ADOPTED by the Sangguniang Bayan:

MARIA NORLY T. PEPITO
Municipal Vice Mayor
Presiding Officer

ATTESTED:

TERESA G. COMINGUIS
Secretary to the Sangguniang Bayan

Annexes

Republic of the Philippines
Province of Bukidnon
MUNICIPALITY OF IMPASUGONG

OFFICE OF THE MAYOR

RECEIVED
DATE
TIME

February 5, 2021

THE HONORABLE MEMBERS
Sangguniang Bayan
This Municipality

Your Honors;

Respectfully submitting herewith Resolution No. 005 series of 2021 dated February 3, 2021 of the Municipal Development Council entitled: RESOLUTION REQUESTING THE DPWH REGION X, THAT THE TOPOGRAPHIC SURVEY FOR THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CAGAYAN DE ORO – MALAYBALAY) BE CONDUCTED ALONG THESE ROUTE; FROM TAGOLOAN CAGAYAN DE ORO, TO TRAVERSE SITIO ABYAWAN AND SITIO SANTIAGO, DALIRIG, MANOLO FORTICH, BUKIDNON TO GUIHEAN, SAYAWAN, SITIO KALIPAYAN AND SITIO BUNDAAN, DUMALAGUING, BONTONGON, ALL OF IMPASUGONG, BUKIDNON AND MANALOG, MALAYBALAY CITY.

May I request urgent favorable action to this resolution.

Please acknowledge receipt hereof.

Very truly yours,

ANTHONY A. UY
Mayor
MDC Chairman

Annexes

Republic of the Philippines
Province of Bukidnon
MUNICIPALITY OF IMPASUGONG

MUNICIPAL DEVELOPMENT COUNCIL

EXCERPTS FROM THE MINUTES OF THE REGULAR MEETING OF THE MUNICIPAL DEVELOPMENT COUNCIL HELD AT THE MUNICIPAL CONFERENCE HALL ON FEBRUARY 3, 2021.

PRESENT:	Hon. Anthony A. Uy	- Municipal Mayor-Presiding Officer
	Hon. Remalyn D. Lagunday	- PB-Bontongon
	Hon. Celestino T. Sante, Jr.	- PB-Bulonay
	Hon. Dawn M. Roque	- PB-Capitan Bayong
	Hon. Josefino B. Manalo	- PB-Cawayan
	Hon. Raquel S. Lunda	- Barangay Kagawad - Dumalaguing
	Hon. Jesson Y. Litohon	- Barangay Kagawad - Guihean
	Hon. Eber H. Suday	- PB-Hagpa
	Hon. Antonio O. Dominao	- PB-Impalutao
	Hon. Clito S. Mediante	- Barangay Kagawad - Kalabugao
	Hon. Noel L. Rojas	- PB-Kibenton/ABC President
	Hon. Nilo C. Iba	- PB-La Fortuna
	Hon. Von Omar P. Lagayan	- PB-Poblacion
	Hon. Ornico B. Sumente	- PB Sayawan
	Ms. Annalou A. Dagangan	- Legislative Staff-(Hon. J.C. Olana Rep.)
	Dr. Amelia T. Bermejo	- CSO Representative – ANLAG ta IWO
	Mr. Frederick Nacaytuna	- CSO Representative – MAAMA
	Ms. Antonette P. Dagawasan	- CSO Representative - Balagon WO
	Pastor Julito de Gracia	- CSO Representative – MAAU
	Hon. Eleonor B. Tañedo	- CSO Representative – AMBONG-WO
	Mr. Rodel Aninloy	- Coop Representative - KSMPC
	Mr. Sunny Echavia	- MAFC Chairman
	Mr. Windyl V. Cañete	- Supply Officer II – Municipal Budget - ICO
	Mr. Alberto O. Clarito	- LRCO I/Acting Asst. Municipal Treasurer
	EnP. Eutiquia A. Bato-on	- Mun. Plng. & Dev't. Coordinator
	Ms Heidi M. Suyat, CPA	- Municipal Accountant
OTHERS PRESENT:	Mr. Ben Gabriel O. Uy	- Municipal Administrator
	Engr. Francisco D. Guinayon	- Municipal Engineer
	Mr. Jairus Ferrer	- iFarms, Inc.
	Mr. Waway Saway	- Hineleban Foundation Inc.
	Ms. Besame Inta	- SSM Applicant
	Ms. Maribeth B. Sia	- Administrative Aide I - MMO Staff
ABSENT:	Hon. Jonathan Keith T. Flores	- Congressman
	Ms. Charlotte O. Chavez	- CSO Representative – BUO WO
	Mr. Florentino Mangga	- CSO Representative – Asso. of Senior Citizen
	Ms. Norie Jean Lomanoy	- CSO Representative – Ang Bag-ong Paglaom sa Kababayen-an sa Guihean
	Ms. Erlinda T. Sayago	- NGO Representative – KFI
	Ms. Abegail Faith C. Noval	- BukSU Satellite Campus Faculty

RESOLUTION NO. 005
Series of 2021

RESOLUTION REQUESTING THE DPWH REGION X, THAT THE TOPOGRAPHIC SURVEY FOR THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CAGAYAN DE ORO – MALAYBALAY) BE CONDUCTED ALONG THESE ROUTE; FROM TAGOLOAN CAGAYAN DE ORO, TO TRAVERSE SITIO ABYAWAN AND SITIO SANTIAGO. DALIRIG. MANOLO FORTICH. BUKIDNON

Annex 16 Public Scoping

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1 BASIC PROJECT INFORMATION

1.1 Basic Project Information

PROJECT DETAILS				
Name of project	Central Mindanao High Standard Highway Project (CDO - Malaybalay Section)			
Project location	Barangay	Municipality/City	Province	Region
	Bugo, Puerto, Balubal	Cagayan de Oro	Misamis Oriental	X (Northern Mindanao)
	Casinglot, Natumolan	Tagoloan	Misamis Oriental	X (Northern Mindanao)
	Alae, San Miguel, Damilag, Diclum, Sankanan, Tankulan, Ticala, Mambatangan	Manolo Fortich	Bukidnon	X (Northern Mindanao)
	Puntian, Vista Villa, Culasi, Poblacion, Kisolon, San Roque	Sumilao	Bukidnon	X (Northern Mindanao)
	Poblacion, La Fortuna, Cawayan, Kibenton, Capitan, Bayong, Impalutao	Impasug-ong	Bukidnon	X (Northern Mindanao)
	Patpat, Kalasungay, Dalwangan, Barangay 10, Sumpong	Malaybalay	Bukidnon	X (Northern Mindanao)
Project length	65.6 km			
Project status	Proposed			
Type of project	Roads and Bridges			
Project category*	Category A:ECP (3.4.1 Roads, new construction, NATIONAL ROAD: ≥20.0 km (length with no critical slope) OR ≥10.0 km (length with critical slope))			
Project cost	Approximately PhP70,000,000,000.00			
Construction period	2.5 years			
Manpower	Construction: 50,000			

*Revised Guidelines for Coverage Screening and Standardized Requirements under the Philippine EIS System (EMB Memorandum Circular 005 July 2014)

1.2 Proponent Profile

PROPONENT DETAILS		
Name	Department of Public Works and Highways Central Office	
Authorized representative	Constante A. Llanes, Jr. Director IV, Planning Service	
Address and contact details	Bonifacio Drive Port Area, 652 Zone 068, Manila, Metro Manila +632-5304-3195	
EIA PREPARER	Amet-Asia, Inc.	
Contact person	Jan Heidel Bautista	Jethro Alden C. Hipe
Position	General Manager	EIA Technical Team Leader
Address	Unit 303 One Corporate Center, J. Vargas Ave., cor Meralco Ave., Ortigas, Pasig City, Metro Manila	
Contact details	+63 932 587 0440 email: info.ametasia@gmail.com	+63 947 556 7276 email: jethrohipe@gmail.com

2 PROJECT DESCRIPTION

The proposed Central Mindanao High Standard Highway Project (Cagayan de Oro - Malaybalay Section) ("***Project***", "***alignment***") is part of the Phase II of the Master Plan on High Standard Highway Network Development. The objectives of the plan were to improve the transport efficiency in the region and contribute to enhancing the connectivity between the cities of Cagayan de Oro and Malaybalay as well as the economic development of the surrounding area.

The proposed Project will be spearheaded by the Department of Public Works and Highways (DPWH) with the assistance of the Japan International Cooperation Agency (JICA).

2.1 Project Location and Area

The Project with a length of 65.6 kilometers will traverse 30 barangays of four municipalities and two cities in the Provinces of Misamis Oriental and Bukidnon in Region X -Northern Mindanao (Table 1). The general location and jurisdiction maps and the host barangays are shown in **Figure 1**, **Figure 2**, and **Table 1** respectively.

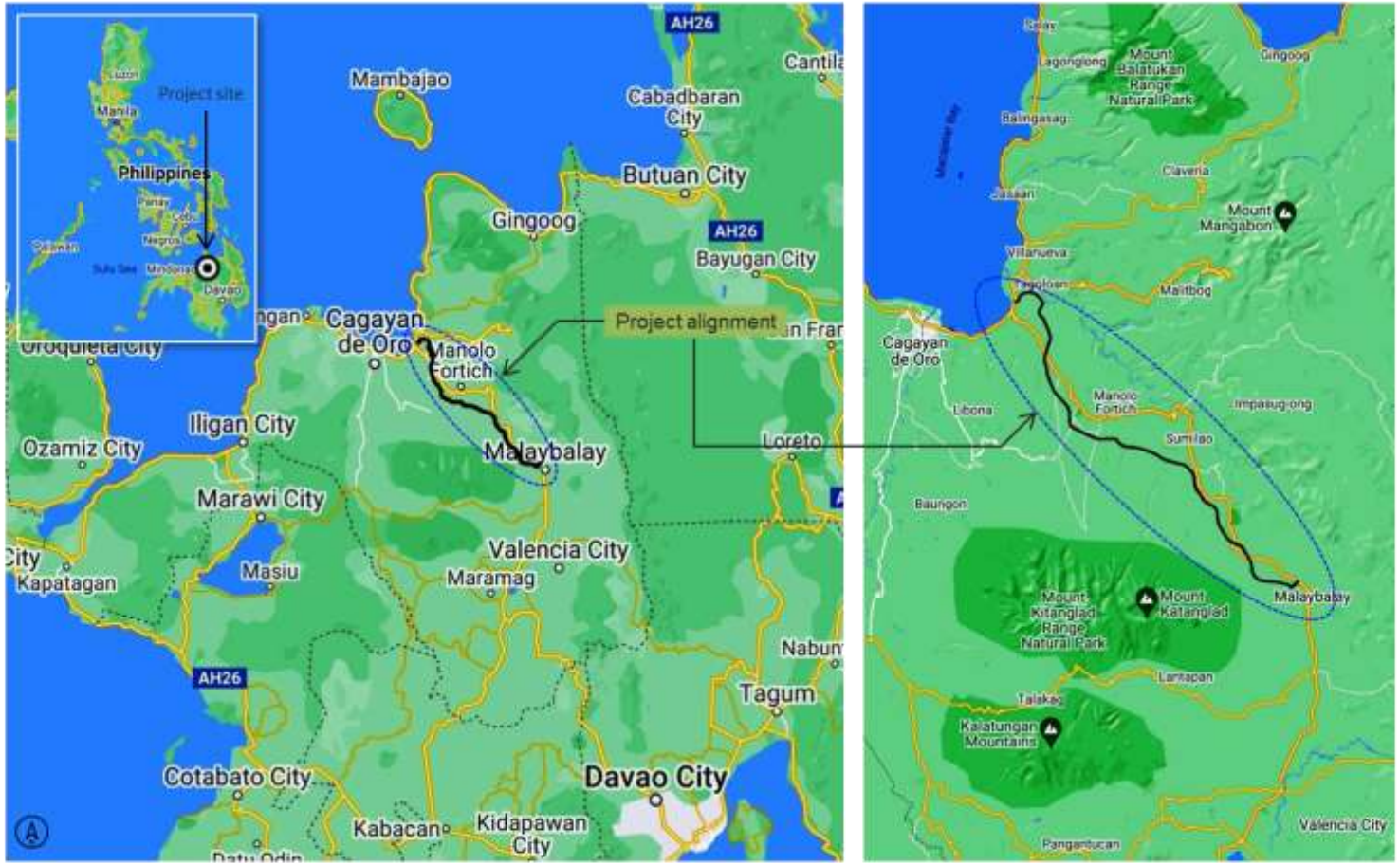
The Direct Impact Area (DIA) is the 65.6-kilometer alignment following Annex 2-2 of the Revised Procedural Manual of DAO 2003-30. The barangays listed in **Table 1** are the Direct Impact Barangays (DIB).

The Indirect Impact Area (IIA) was initially assumed as areas within one kilometer (1km) from the center of the alignment. In addition, barangays adjacent to the DIB will be considered as Indirect Impact Barangays. The initial impact areas are shown in **Figure 3**.

Table 1. Jurisdictions of the Project alignment

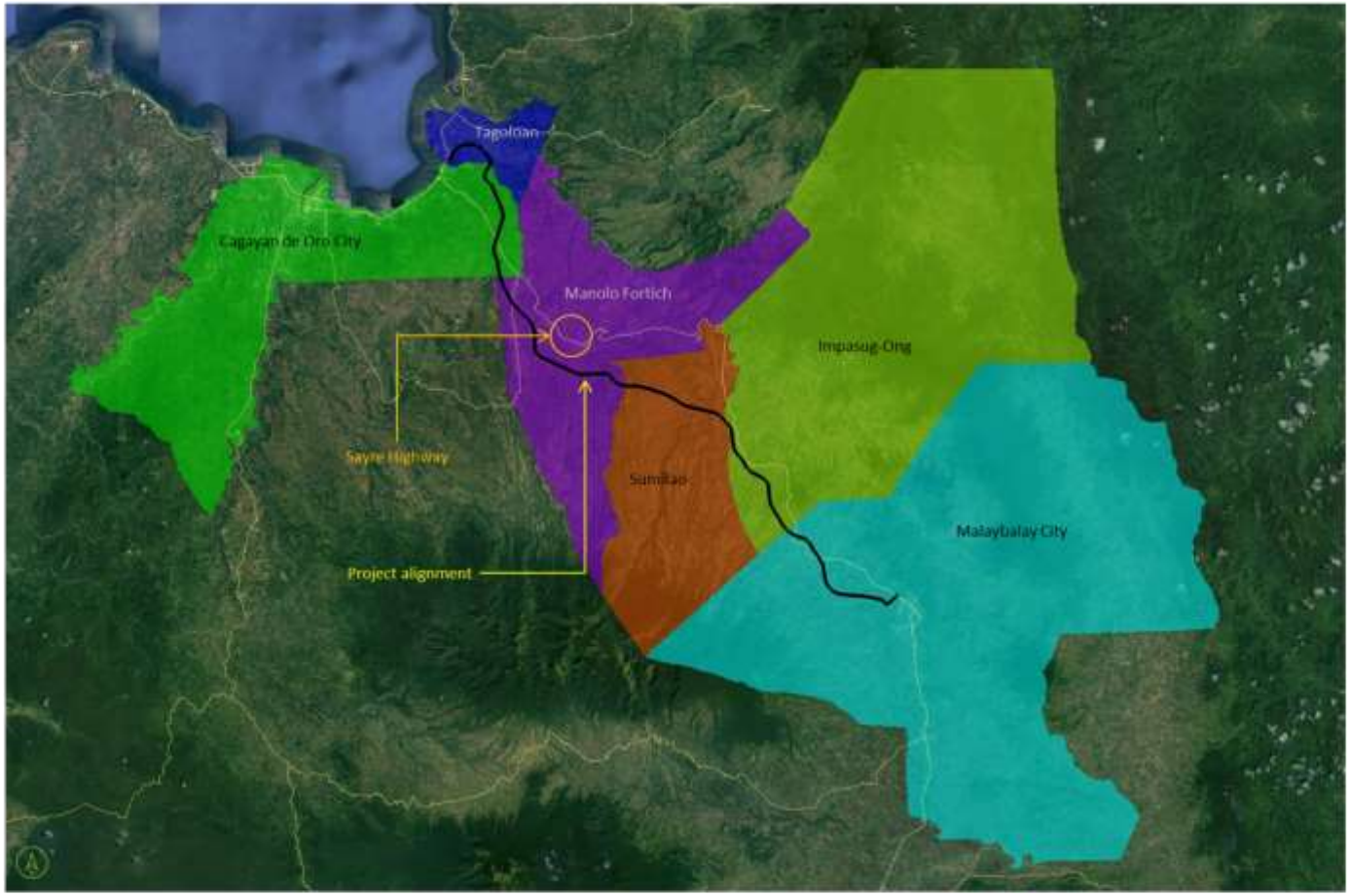
Province	City/Municipality	Barangay	Province	City/Municipality	Barangay
Misamis Oriental	Cagayan de Oro City	Bugo	Bukidnon	Impasug-ong	Poblacion
		Puerto			La Fortuna
		Balubal			Cawayan
	Tagoloan	Casinglot			Kibenton
		Natumolan			Capitan Bayong
Bukidnon	Manolo Fortich	Alae			Impalutao
		San Miguel		Malaybalay	Patpat
		Damilag			Kalasungay
		Diclum			Dalwangan
		Sankanan			Brgy. 10
		Tankulan			Sumpong
		Ticala	Total: 2	Total: 6	Total: 30
		Mambatangan	Source: JICA Study Team		
	Sumilao	Puntian			
		Vista Villa			
		Culasi			
		Poblacion			
		Kisolon			
		San Roque			

Figure 1. General location of the proposed Project



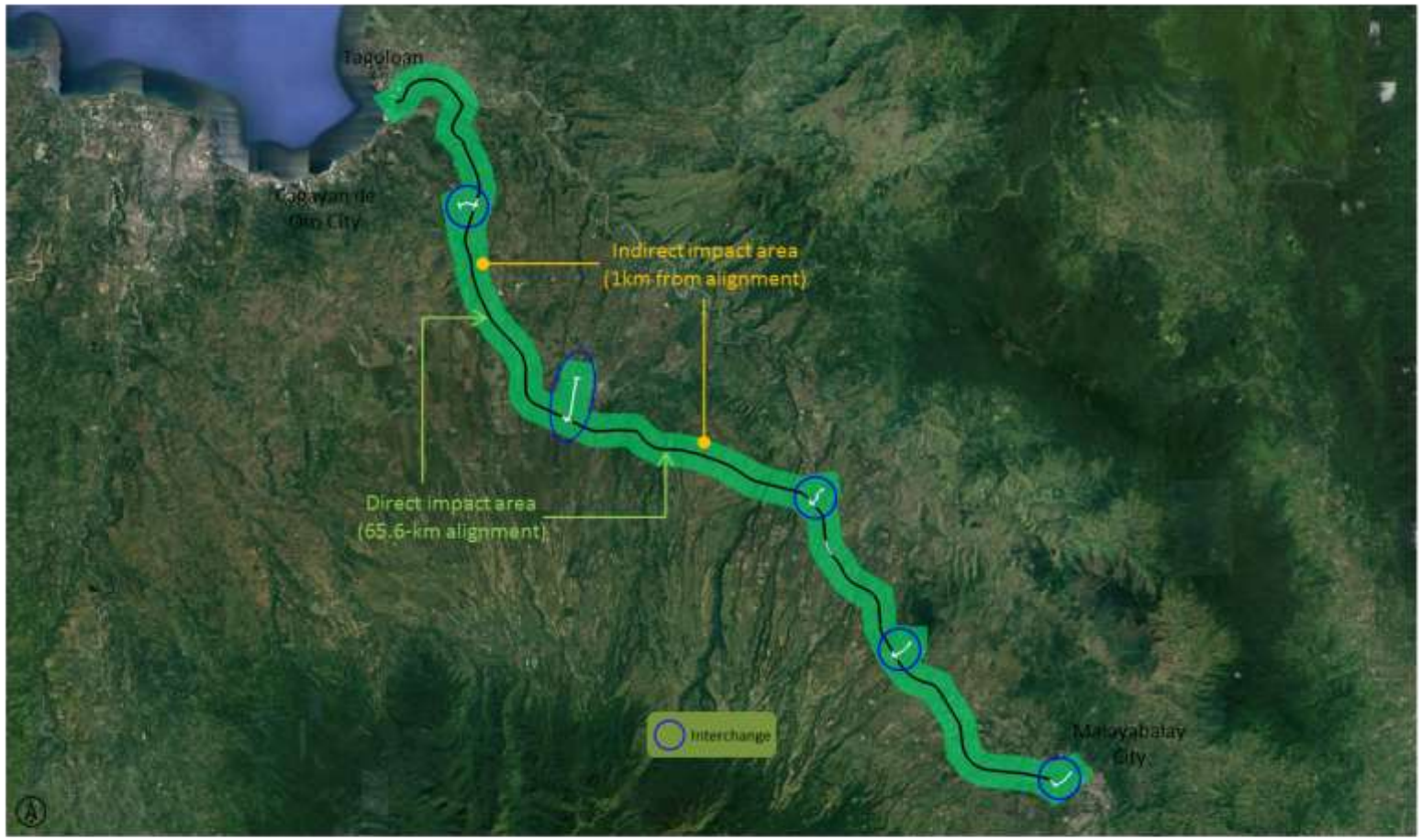
General location map of the Project	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Map data @2021 JICA		

Figure 2. Jurisdiction map the Project



Jurisdictions of the Project alignment	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Earth JICA		

Figure 3. Initial impact area map



Initial impact areas	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Earth JICA		

2.2 Project Rationale

Mindanao has lagged in terms of economic and infrastructure development and had the highest poverty incidence compared to the rest of the Philippines because of a long-standing conflict. After a comprehensive peace agreement between the Philippine government and the Moro-Islamic Liberation Front (MILF), it is expected that the economic development of Mindanao will be accelerated.

Connectivity, mobility, and safety were the three elements identified in the Northern Mindanao Regional Development Plan 2017-2022 in developing the transport infrastructure in the region. The national highways connect the various regional growth centers and four strategic development areas (SDAs) in the region. The region's connectivity resulted to increased gains in the trade and services sectors and in intra-and inter-regional efficiency of the movement of people, goods, and services.

The region however faces major challenges in the transport sector which primarily result to traffic congestion in key cities and poor connectivity in rural production and lagging areas. Traffic congestion is a primary problem in main thoroughfares in urban areas due to concentration of motor vehicles and narrow road network. Unpaved local roads cause slow growth of rural areas due to poor linkage of production areas to market centers.

In 2010, the DPWH and JICA formulated a Master Plan on High Standard Highway (HSH) Network Development Phase I to formulate various measures to address traffic congestion particularly in highly urbanized areas. Examples of these measures were development of expressway network, construction of bypasses and ring roads at regional cities, and widening of existing roads.

The Master Plan covered areas within a 200-kilometer radius from Metro Manila, Metro Cebu, and the Tagum-Davao-General Santos Corridor that has only 3,460 kilometers of HSH. In 2019, DPWH and JICA discussed the proposed second phase of the road master plan focusing on the Central Mindanao HSH as one of the high priority projects.

The proposed Project is expected to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.

2.3 Project Components

The alignment will have a 60-meter road right of way (RROW) with five interchanges constructed near urban centers (**Figure 4**). Other components of the Project are shown in **Table 2**.

Table 2. Major and number of Project components

Component	Number	Component	Number
AASHTO Girder	32	Underpass	13
Steel Bridge	3	Overpass	14
Steel Box Girder	6	Interchange	5

Source: JICA Study Team

Figure 4. Interchanges of the Project alignment

Interchanges at the Project alignment	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Earth JICA		

2.4 Project Phases, Key Environmental Aspects, Wastes, Issues, Built-In Measures

The potential key impacts and options for mitigation or enhancement during the Pre-construction, Construction, and Operation and Maintenance phases are shown in **Table 3** *to* **Table 5**. *The key impacts were based on Impact Management Plan Template in Annex 2-17 and Annex 2-7a Technical Scoping Checklist of the Revised Procedural Manual (DAO 2003-30).*

Table 3. Potential impacts and options for mitigation or enhancement (Pre-construction phase)

Environmental component likely to be affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
LAND COMPONENT		
Land Use and Classification	Compatibility with existing land use	Secure zoning clearances from LGUs
	Compatibility with classification as an ECA	Consider ECAs in the Detailed Engineering Design (DED) phase
	Land tenure issue/s	- Conduct parcellary survey - Prepare a Property Compensation Plan (PCP)
	Impairment of visual aesthetics	Prepare a Buffer Zone Plan (BZP)
	Devaluation of land value due to improper solid waste management	Prepare the following: - Spoils Management Plan (SMP) - Construction Waste Management Plan (CWMP) - Road Debris and Waste Removal Plan (RDWRP) - Road Maintenance Waste Management Plan (RMWMP)
Geology/Geomorphology	Change in surface landform and geomorphology	Consider smallest landform changes possible during the DED Prepare a Slope Protection Plan (SPP)
	Change in sub-surface geomorphology Inducement of geo-hazards	Conduct Geotechnical Investigation and consider its recommendations during the DED
	Geo-, hydrological, and meteorological hazards	Include susceptibility of the Project site to geo- and hydrological hazards at the DED
Pedology	Soil erosion	Prepare a Soil Erosion Management Plan (SEMP)
Terrestrial ecology	Vegetation removal and loss of habitat	- Complete census of flora and fauna at the RROW - Consider locations of significant vegetation types and populations during DED - Secure a Tree Cutting Permit from the DENR - Prepare the following: ▪ Construction Vegetation Removal Plan (VRP)
	Threat to existence and loss of important local species	
	Threat to abundance, frequency and distribution of important species	
	Hindrance to wildlife access	

Environmental component likely to be affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
		▪ Construction Vegetation and Tree Planting Program (CVTPP) ▪ Tree Transfer and Balling Plan (TTBP) for affected mature trees ▪ Tree Survival and Monitoring Plan (TSMP) ▪ Vegetation and Tree Planting Program during Operations (VTPPO) ▪ Biodiversity Conservation Plan (BCP) ▪ Prepare a Wildlife Monitoring Plan (WMP)
PEOPLE COMPONENT		
Displacement of settlers, property, and access	- Displacement or disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on public access	- Prepare a Property Compensation Plan (PCP) - Prepare Resettlement Action Plan (RAP)
In-migration	Proliferation of informal settlers	Prepare an Informal Settler Monitoring and Management Plan (ISMMP)
Physical cultural resources	Impacts on physical cultural resources	Prepare a Chance Find Management Plan (CFMP)
Public health and safety	Threat to public health and safety	Prepare a Construction Health and Safety Plan (CHSP) and Road Safety Plan (RSP)
Benefits from the project	Enhancement of employment and livelihood opportunities	Prepare a Local Community Hiring Plan for (LCHP)
Traffic	Traffic congestion	Prepare a Traffic Management Plan (TMP)

Table 4. Potential impacts and options for mitigation or enhancement (Construction phase)

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
LAND COMPONENT		
Land Use and Classification	Impairment of visual aesthetics	Proper implementation of the Construction Plan and BZP
	Devaluation of land value due to improper solid waste management	Proper implementation of the Construction Plan and CWMP
Geology/Geomorphology	- Change in surface landform and geomorphology - Change in sub-surface geology - Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc. - Effects of geo- and hydrological hazards - Soil erosion	- Proper implementation of the Construction Plan - Proper implementation of the Construction Plan, SEMP, SMP, and SPP
Pedology	Change in soil quality or fertility	- Proper implementation of the Construction Plan, SEMP, SMP, and CWMP - Provide oil sumps in staging areas - Proper storage and disposal of used oil and other hazardous wastes in staging areas and active construction sites
Terrestrial ecology	- Vegetation removal and loss of habitat - Threat to existence and loss of important local species - Threat to abundance, frequency and distribution of important species - Hindrance to wildlife access	- Proper implementation of the Construction Plan, CVRP, CVTPP, BZP, and TTBP - Proper compliance to Tree Cutting Permit conditions - Strict implementation of a "*No Hunting and No Collecting*" policy - Limit the development activities within the RROW.
WATER COMPONENT		
Hydrology/Hydrogeology	- Change in drainage morphology - Inducement of flooding - Depletion of water resources - Water use competition	- Proper implementation of the Construction Plan - Provide temporary drainage system - Provide detention ponds in the immediate drainage - Formulate a Flood Management Plan (FMP) for the operation phase - Implement water conservation measures
Water quality	Degradation of surface water quality	- Proper implementation of the Construction Plan - Housekeeping practices - Provide onsite sanitary facilities at the staging areas - Provide adequate drainage leading to siltation ponds
Freshwater ecology	- Threat to existence and loss of important local species	- Proper implementation of the Construction Plan, CWMP, SMP, and SEMP

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
	- Threat to abundance, frequency and distribution of important species	- Provide cover, bunds, and drainage canal leading to silt ponds for stockpiles - Provide onsite sanitation facilities at the staging areas - Provide cover on vehicles carrying construction materials - Provide oil sumps in staging areas - Proper storage and disposal of used oil and other hazardous wastes in staging areas and active construction sites
AIR COMPONENT		
Meteorology/Climatology	Change in micro climate due to greenhouse gas emissions	- Proper implementation of the Construction Plan - Regular and proper maintenance of motor vehicles and heavy equipment - Optimize schedule of vehicle use - Regular and proper maintenance of onsite power generators
Air Quality (& Noise)	Degradation of air quality	- Proper implementation of the Construction Plan - Implement dust suppression methods, e.g., water application and vehicle speed restriction - Optimize the use of heavy equipment and motor vehicles - Compacting of exposed soil surfaces - Provide tarpaulin cover on trucks loaded with construction materials - Regular maintenance of heavy equipment and motor vehicles - Regular maintenance of standby generator - Prohibit engine idling in parking areas
	Increase in ambient sound levels	- Proper implementation of the Construction Plan - Provide and maintain mufflers of gasoline or diesel engines powered equipment - Establish barriers and shielding stationary vibrating equipment
PEOPLE COMPONENT		
Displacement of settlers, property, and access	- Displacement or disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on public access	Proper implementation of the RAP and PCP
In-migration	Proliferation of informal settlers	Proper implementation of the Informal Settler Monitoring and Management Plan

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
Cultural/Lifestyle	Cultural or lifestyle changes (especially on Indigenous People)	Proper orientation of migrant workers on IP culture and lifestyle
Physical cultural resources	Impacts on physical cultural resources	Proper implementation of the Chance Find Management Plan
Delivery of basic services	Threat to delivery of basic services /resource competition	Proper implementation of the Informal Settler Monitoring and Management Plan
Public health and safety	Threat to public health and safety	Proper implementation of the Construction Plan, CWMP, CHSP, and RSP - Regular and proper maintenance of heavy equipment and vehicles
Benefits from the project	Enhancement of employment and livelihood opportunities	Proper implementation of the Local Community Hiring Plan
	- Increased business opportunities and associated economic activities - Increased revenue of LGUs	- Proper implementation of the Local Community Hiring Plan - Purchase supplies from local sources - Provide livelihood opportunities if possible - Prompt payment of taxes and other legal fees
Traffic	Traffic congestion	Proper implementation of the Traffic Management Plan

Table 5. Potential impacts and options for mitigation or enhancement (Operation and Maintenance phases)

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
LAND COMPONENT		
Land Use and Classification	Impairment of visual aesthetics	Sustained implementation of the Buffer Zone Plan
	Devaluation of land value due to improper solid waste management	Proper implementation of the RMWMP Sustained implementation of RDWRP
Geology/Geomorphology	- Change in surface landform and geomorphology - Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc.	Sustained implementation of the SPP and SEMP
	Effects of geo- and hydrological hazards	- Undertake assessment of slope protection measures after heavy rain or seismic events - Maintain drainage system - Regular inspection of road and structure integrity
Pedology	Soil erosion	Sustained implementation of the SPP and SEMP
Terrestrial ecology	- Loss of habitat - Threat to existence and loss of important local species - Threat to abundance, frequency and distribution of important species - Hindrance to wildlife access	Proper implementation of the TSMP, VTPPO, BCP and WMP
WATER COMPONENT		
Hydrology/Hydrogeology	Change in drainage morphology	Sustained implementation of the Slope Protection Plan Regular inspection and maintenance of alignment drainage
	Inducement of flooding	Proper implementation of the Flood Management Plan
Water Quality	Degradation of surface water quality	- Regular inspection and maintenance of alignment drainage - Adequate drainage system - Permanent storm water detention ponds - Slope protection or grass strips - Erosion Control Plan - Wastewater treatment (underpasses)
Freshwater ecology	- Threat to existence and loss of important local species and habitat - Threat to abundance, frequency and distribution of	- Regular inspection and maintenance of alignment drainage - Adequate drainage system - Permanent storm water detention ponds

Environmental Component Likely to be Affected	Potential Impact	Options for Prevention or Mitigation or Enhancement
	species	- Slope protection or grass strips - Erosion Control Plan - Wastewater treatment (underpasses)
AIR COMPONENT		
Meteorology/Climatology	Change in micro climate due to greenhouse gas emissions	Proper implementation of the Vegetation and Tree Planting Program during Operations
Air Quality (& Noise)	Degradation of air quality	Proper implementation of the Vegetation and Tree Planting Program during Operations and Vehicle Emission Testing Program
	Increase in ambient sound levels	Install barriers in built-up areas of the alignment (structural or vegetative)
PEOPLE COMPONENT		
In-migration	Proliferation of informal settlers	Proper implementation of the Informal Settler Monitoring and Management Plan
Public health and safety	Threat to public health and safety	Proper implementation of the Road Safety Plan
Benefits from the project	- Enhancement of employment and livelihood opportunities - Increased business opportunities and associated economic activities - Increased revenue of LGUs	Proper maintenance of the alignment
Traffic	Traffic congestion	Sustained implementation of the Traffic Management Plan

2.5 Project Cost and Duration

The Feasibility Study is currently being undertaken and planned to be finished before the end of 2021. The alignment will be opened to the public by 2026 after 2.5 years of construction (**Figure 5)**. The indicative Project cost is 70 billion pesos (PhP70,000,000,000.00).

Figure 5. Indicative Project implementation schedule

Source: JICA Study Team

3 PHOTOGRAPHS OF THE PROJECT SITE

Photographs of points along the alignment	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Earth; JICA Actual photographs (24 April 2021)		

Photographs at the locations of the interchanges	PUBLIC SCOPING REPORT	Source(s) of information	Project Proponent	EIA Preparer
	CENTRAL MINDANAO HIGH STANDARD HIGHWAY (CDO – MALAYBALAY SECTION) PROJECT Provinces of Misamis Oriental & Bukidnon	Google Earth; JICA Actual photographs (24 April 2021)		

4 PRE-SCOPING INFORMATION AND EDUCATION AND COMMUNICATION

One of the public participation requirements under the Philippine Environmental Impact Statement (PEIS) system and DAO 2017-15 is the early engagement of stakeholders in the stages of the EIA process through the pre-scoping Information, Education, and Communication (IEC).

The IEC for the Project was conducted last March 22 to 24, 2021 in Cagayan de Oro City, Malaybalay City, and municipalities of Tagoloan, Manolo Fortich, Sumilao, and Impasug-ong in the provinces of Misamis Oriental and Bukidnon.

Participants included officials and representatives of the Local Government Units (province, municipality, city, barangays), and various sectors.

The road alignment and the components of the Project were presented along with the process of the Environmental Impact Assessment (EIA). Stakeholders' issues and concerns as well as their suggestions and other inputs were discussed in the open forum.

The IEC open forum and the Initial Perception Survey revealed that majority of the stakeholders perceived the Project will improve transporting farm products to the market, mobility, and accessibility residents. The major concerns and issues were on just compensation for the affected lands and properties, detailed project design in preparation of the affected property owners, presence of CADC/CADT and sacred places in the area, toll fees, and inclusion of hinterlands in the alignment. The stakeholders suggested conducting massive information dissemination about the Project, resolution of all issues and concerns, and consensus of the owners of affected properties.

4.1 Stakeholder Identification

The initial stakeholders at the host LGUs are shown in **Table 6** using the identification matrix in Annex 2-3 of the RPM DAO2003-03. The detailed preliminary list of stakeholders is presented in **Attachment**

Table 6. Stakeholder identification matrix for the pre-scoping IEC

Potential impact area			Basis for selection of sector as a stakeholder of the project	Sectors/Sub-sectors Identified by Proponent to be Likely Stakeholders of the Project	Specific Organizations/Entities Likely to be Invited to IEC/Site Scoping as Representing the Sectoral Stakeholders
A		Direct Impact Area			
	1	Barangay: Tagoloan ▪ Natumolan ▪ Casinglot Cagayan de Oro ▪ Bugo ▪ Purto ▪ Balubal Manolo Fortich ▪ Alae ▪ San Miguel ▪ Damilag ▪ Dicklum ▪ Sankana ▪ Tankulan ▪ Ticala ▪ Mambatangan Sumilao ▪ Puntian ▪ Vista Villa ▪ Culasi ▪ Poblacion ▪ Kisolon ▪ San Roque	Local government of the barangay has direct political jurisdiction over the area	▪ Local Government Unit of the Direct impact Barangays ▪ Residents of Direct Impact Barangays	▪ Barangay officials/ Barangay Council ▪ Representative of Senior Citizen Organizations ▪ Representative of Youth Organizations ▪ Representative of Farmer Associations ▪ Representative of PWD Organizations ▪ Representative of local shopping organizations ▪ Representative of religious organizations ▪ Representative from Indigenous People's organization ▪ Representative from Women's Organizations ▪ Representative of Transportation Organizations ▪ Representative of Ecological Preservation Organizations

Potential impact area			Basis for selection of sector as a stakeholder of the project	Sectors/Sub-sectors Identified by Proponent to be Likely Stakeholders of the Project	Specific Organizations/Entities Likely to be Invited to IEC/Site Scoping as Representing the Sectoral Stakeholders
		Impasug-ong ▪ Poblacion ▪ La Fortuna ▪ Cawayan ▪ Capitan Bayong ▪ Impalutao ▪ Kibenton Malaybalay ▪ Patpat ▪ Kalasungay ▪ Sumpong ▪ Dalwangan ▪ Brgy. 10			
B		LGUs with political jurisdiction over the project area			
	1	Misamis Oriental ▪ Tagoloan ▪ Cagayan de Oro City Bukidnon ▪ Manolo Fortich ▪ Sumilao ▪ Impasug-ong ▪ Malaybalay City	The barangays are located within their respective cities and municipalities	▪ Municipal/City Office ▪ Municipal/City Administrator Office ▪ Municipal/City Disaster Risk and Management Office ▪ Municipal/City Social Welfare Development Office ▪ Municipal/City Environmental and Natural Resources Office ▪ Municipal/City Health Office ▪ Municipal/City Planning and Development Office ▪ Municipal/City Engineering Office ▪ Municipal/City Agricultural Office ▪ Municipal/City Assessor Office ▪ Municipal/City Indigenous People	▪ Mayor / Representative ▪ Municipal/City Administrator Officer/representative ▪ Municipal/City Disaster Risk and Management Officer/representative ▪ Municipal/City Social Welfare Development Officer/representative ▪ Municipal/City Environmental and Natural Resources Officer/representative ▪ Municipal/City Health Officer/representative ▪ Municipal/City Planning and Development Officer/representative ▪ Municipal/City Engineering Officer/representative ▪ Municipal/City Agricultural

Potential impact area			Basis for selection of sector as a stakeholder of the project	Sectors/Sub-sectors Identified by Proponent to be Likely Stakeholders of the Project	Specific Organizations/Entities Likely to be Invited to IEC/Site Scoping as Representing the Sectoral Stakeholders
				Mandatory Representative	Officer/representative ▪ Municipal/City Assessor Officer/representative ▪ Municipal/City Indigenous People Mandatory Representative head/member
	2	Province of Misamis Oriental and Bukidnon	The cities and municipalities are within the province of Misamis Oriental and Bukidnon	▪ Provincial Office ▪ Provincial Administrator's Office (PAO) ▪ Provincial Environmental and Natural Resources Office (PENRO) ▪ Provincial Planning and Development Office (PPDO) ▪ Provincial Engineering's Office (PEO) ▪ National Commission of Indigenous People Provincial Office (NCIP-PO)	▪ Governor/ Vice Governor / Representative ▪ PAO Offiver/representative ▪ PENRO Officer/representative ▪ PPDO Officer/representative ▪ PEO Officer/representative ▪ NCIP Provincial Officer/representative
C		Other evident pre-identified areas of potential impact (may be candidates for Indirect Impact Areas, subject to EIA Findings)			

4.2 IEC Meetings

Courtesy calls to the Municipal Mayors and Administrators were conducted prior to the IEC activities (March 11 and 12, 2021) to determine the schedules, venues, and list of stakeholders to be invited. Invitation letters were also distributed to the stakeholders prior to each scheduled IEC shown in **Table 1**. The required IEC documents reviewed and approved by the JICA Study Team are enumerated below. The brief summaries of the IEC proceedings are shown in **Attachment 6**.

a) Invitation letters to the stakeholders (**Attachment 2**)
b) Program (**Attachment 3**)
c) Presentation material (**Attachment 4**)
d) Brochure (**Attachment 5**)

Table 7. IEC meeting venues and schedules

Province	City/Municipality	Date and Time	Venue
Misamis Oriental	Tagaloan	March 24, 2021 2:00 pm	Tagoloan Central Elementary School, Tagoloan
	Cagayan De Oro	March 24, 2021 10:00 am	Puerto Barangay Hall, Cagayan De Oro
Bukidnon	Manolo Fortich	March 22, 2021 2:00 pm	BRCI Bldg., Diclum, Manolo Fortich
	Sumilao	March 24, 2021 10:00 am	Conference Hall, 2nd Floor, New Building, Sumilao
	Impasug-ong	March 23, 2021 2:00 pm	Conference Hall, Municipal Hall, Impasug-ong
	Malaybalay	March 23, 2021 10:00 am	Casisang Covered Court, Malaybalay City

4.3 Summary of Issues

The major issues gathered during the IEC activities are shown below with the detailed issues and response matrices shown in **Attachment 7**.

1. **Municipality of Tagoloan**
   - Major issues
   - Project design (whether or not the road is elevated)
   - Presence of informal settlers
   - Necessity of the Project
   - Project timeline
   - Resettlement
   - Presence of IP sacred places
   - Compensation of the affected properties and untitled lands
   - Safety
   - Formulation of the MMT and source of the EGF

2. **Cagayan de Oro City**

- Issues/Suggestions raised by stakeholder
- Compensation of affected properties
- Duration of compensation payment
- Compensation for environmental damages

3. Municipality of Manolo Fortich

- Difference between the proposed highway and the 'Build, Build, Build' project of the government
- Conflicts in boundary and right of way
- Managing opposition to the Project
- Compensation of affected properties
- FPIC application
- Political change of administration
- Existing government projects that might be affected (e.g. irrigation)
- Construction waste

4. Municipality of Sumilao

- Rationale of the Project in the presence of the existing road from Cagayan de Oro to Malaybalay
- Toll fee
- Environmental considerations in the design (e.g. landslide prone areas in San Vicente in Maluko)
- IP consent
- Public participation in the project
- Compensation of affected landowners

5. Municipality of Impasug-ong

- Reason why the Project is located in Bukidnon despite the presence of roads
- Inclusion of hinterlands in road alignment
- Connection of the road alignment to existing roads
- Alignment changes
- Request of LGU for re-alignment - The municipality have a resolution (Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021) for the road to traverse other barangays and include other barangays in the topographic survey.
- Toll fees
- Measurement of highway
- Presence of sacred lands that might be affected
- Compensation of affected properties and untitled lands

6. Malaybalay City

- Issues/Suggestions raised by stakeholder
- Source of Project funding
- Issue of eminent domain
- Property demolition and payment
- Informing affected property owners
- Compliance to FPIC
- Coordination between Regional and District DPWH
- Coordination with LGU

- Affected trees
- Secure LGU endorsement
- Change of the name of Barangay Lapu-lapu to Barangay Patpat

5 PUBLIC SCOPING

Scoping is another activity where the public can participate in the Philippine EIA process. The Public Scoping was conducted following the EMB Memorandum Circular No. 2020-30 "*Interim Guidelines on Public Participation in the Implementation of the Philippine Environmental Impact Statement System (PD 1586) During the State of National Public Health Emergency*". Participants of face-to-face meetings were according to local ordinances and the Inter-Agency Task Force (IATF) directives. The Public Scoping meetings were conducted for six days (one day for each host city/municipality). Virtual meeting rooms via Zoom™ were provided to accommodate stakeholders where internet connections are available.

Issues that caused delays of some scoping meetings were poor internet connectivity and typhoon Dante (Tropical Cyclone Choi-Wan) during the scheduled meeting on June 1, 2021 in Dicklum, Manolo Fortich which caused heavy winds and rain in the area. This delayed the start of the program and limited the number of participants in the municipality.

5.1 Schedule of the Public Scoping

The Public Scoping conducted from May 28 to June 4, 2021 at each host LGU is summarized in **Table 8**. The sample invitation letters, program, presentation, attendance sheets, and photo-documentation are presented in **Attachment 8** to **Attachment 12**. The summaries of the Public Scoping proceedings are shown in **Attachment 13**.

Table 8. Summary of the Public Scoping schedule

City/Municipality	Date & Time
Tagoloan, Misamis Oriental	May 28, 2021 10:00-12:00
Cagayan de Oro City, Misamis Oriental	May 31, 2021 10:00-12:00
Manolo Fortich, Bukidnon	June 1, 2021 10:00-12:00
Sumilao, Bukidnon	June 2, 2021 10:00-12:00
Malaybalay City, Bukidnon	June 3, 2021 10:00-12:00
Impasug-ong, Bukidnon	June 4, 2021 10:00-12:00

5.2 Public Scoping Participants

The series of Public Scoping meetings were attended by representatives of the stakeholders from the host LGUs initially identified during the pre-scoping IEC (**Table 9**).

Table 9. Summary of the public scoping participants

Stakeholder sector	Municipality											
	Cagayan de Oro		Tagoloan		Manolo Fortich		Sumilao		Malaybalay		Impasug-ong	
	OS	OL	OS	OL	OS	OL	OS	OL	OS	OL	OS	OL
LGU	20	6	18	7	16	18	12		15	14	12	26
SK			2			1				2		3
BHW			5									
BSWDV			1									
Midwife	2											
IPs					2	2	2		2	2		
NGO		2		1			1		2			
Education			1	1	1		1		1	1		
PWD						1			1			
Youth	3											
LGBT	2											
Women's Association												
Cooperative					2							
Farmer's Association							1					
Driver's Association	2	1				1	1		1		1	
DENR – EMB R10		2		2		2		2		2		2
DENR - CENRO/PENRO		2			2				1			
DPWH CO		1		1		2		2		2		2
DPWH R10		1			1					1		
DPWH Buk. 3rd District					4							
JICA Study Team		3		4		2		4		3		2
CTI	1		1		1		1					
Amet Asia	7	4	7	3	5	8	6	6	4	3	6	5
Subtotal	37	22	35	19	34	37	25	14	27	30	19	40
Total	**59**		**54**		**71**		**39**		**57**		**59**	

NOTES: OS – Onsite; OL – virtual via Zoom

5.3 Issues & Concerns

The open forum provided the avenue for the participant stakeholders to express their opinions and comments or ask questions and clarifications about the project and its potential impacts. The salient issues and concerns raised by city and municipality are summarized below with the detailed matrices shown in

Attachment 14.

Issues raised in Tagoloan, Misamis Oriental

a) Road alignment traversing the water reservoir that the community uses as a water source.
b) Water reservoir should be avoided and not be damaged during construction.
c) Compensation for affected lands and houses
d) Aggravation of flooding along the national highway in Barangay Casinglot
e) In Casinglot, our water reservoir will be affected. What will happen to our water reservoir?
f) Projects or programs for women

Issues raised in Cagayan de Oro City

a) Compensation of affected landowners
b) Compensation for the affected animals
c) Road amenities and local permits
d) Flooding due to overflowing of the canal on the hillside part of Bugo
e) Measures during construction to prevent debris to lower portions
f) Measures for rain induced landslide.

Issues raised in Manolo Fortich, Bukidnon

a) Compensation for affected residential areas and trees
b) Abiding with IP process during the detailed design
c) Mitigation for affected flora and fauna in forested areas
d) Assessment of cultural impacts

Issues raised in Sumilao, Bukidnon

a) Livelihood opportunities
b) Compensation for affected farms
c) Compliance with Free and Prior Informed Consent requirements
d) Relocation

Issues raised in Malaybalay, Bukidnon

a) Compensation of affected lands
b) Compliance with FPIC requirements
c) Identification of the affected roads
d) Classification of the High Standard Highway
e) Tool fee

Issues raised in Impasug-ong, Bukidnon

a) Noise impacts on poultry farms especially from Manolo to Malaybalay
b) Possible access hindrance along the Atugan river
c) Compensation and relocation for affected households Possible re-alignment to avoid infrastructure
d) Impact of the alignment to two irrigation canal structures in San Juan and La Fortuna proper
e) Impact on banana and pineapple plantations
f) Mitigation of impact on the main water line and reservoir
g) Compensation for affected agricultural land
h) Conduct of IP rituals prior to any Project activity

Annex 17 Public Hearing

This report documents the issues and concerns raised by the stakeholders during the conduct of the Public Hearing as part of the Environmental Impact Assessment of the proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro - Malaybalay Section) Project

Public Hearing Report for Environmental Impact Assessment

Preparatory Survey for the proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro - Malaybalay Section) Project

November 2023

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EXECUTIVE SUMMARY

The Public Hearing conducted in the affected City of Cagayan de Oro, Municipalities of Tagoloan, Manolo Fortich, Sumilao, and Impasug-ong, and City of Malaybalay achieved the following objectives: presentation of the results of the environmental impact assessment done by sector: Land, Water, Air, and People; and documentation of issues and concerns of the stakeholders on the results of the studies conducted on the proposed project. The aspects that were identified and suggested by the stakeholders during the meeting were documented.

The series of Public Hearing meetings were attended by representatives of the stakeholders from the host LGUs initially identified during the Public Scoping. A total of 175 representatives participated in the meeting.
Some of the general issues and concerns raised in the form were:

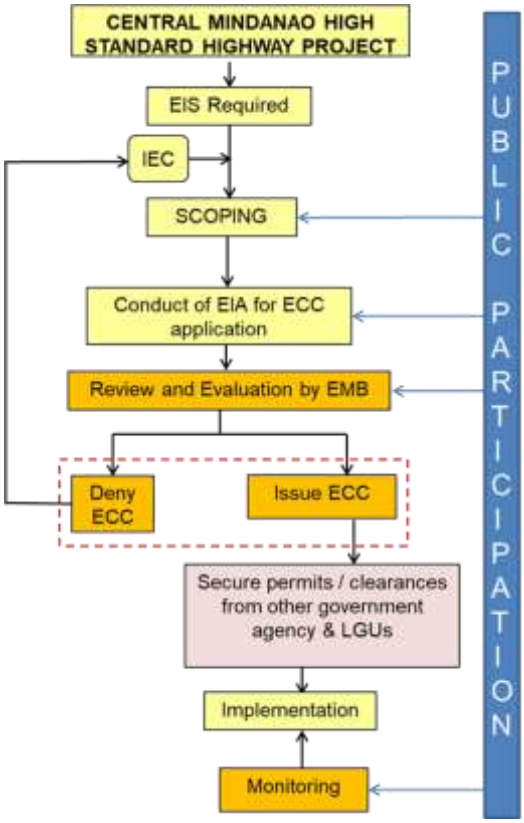
- Impact to traffic congestion
- Aggravation of flooding and landslides in some areas
- Measures for identifying the properties and families to be affected by flooding and landslide
- Multipartite Monitoring Team (MMT) purpose and function
- Compensation for the affected of untitled lands and landowners. Necessary documents and papers to be prepared for land negotiation for those to be affected
- Measures to consider for planning of drainage system: climate projection, history and amount of rainfall volume and the sea level rise.
- Suggestion to include planting strips for green spaces in highway design
- IPs' lump-sum payments should be different for several barangays and holding of rituals are believed to be protection for untoward incidents
- Request for the file of the proposed road alignment for planning purposes of LGU

1 Introduction

1.1 Public Participation in the PEISS

Public Participation is part of the Environmental Impact Assessment (EIA) process. *The Revised Procedural Manual for Department Administrative Order (DAO) 2003-30* describes the process of public participation in every stage of the EIA process (**Figure 1**). In the Pre-Scoping stage and the Information, Education and Communication (IEC), the stakeholders of the proposed project, together with the related issues in preparation for the Scoping proper, are identified. During the Scoping stage, the stakeholders are involved through Public Scoping wherein community inputs are noted and included in the Technical Scoping Checklist. During the conduct of the EIA study, local stakeholders are included and may serve as local expert sources, aides/guides and resource persons in primary data collection to optimize access to indigenous knowledge of the environment, or as interviewers/ interviewees in the socio-economic/perception surveys which shall be used as the basis for the subsequent formulation of social development plans, IEC, monitoring plans and other components of the environmental management plans. LGUs and government agencies shall specifically be consulted and involved in the drafting of the project's Social Development Plan (SDP) Framework. The stakeholders will also be part of the Public Hearing as a form of disclosure of the EIA findings. Once the ECC is issued, multi-sectoral validation of a Proponent's self-monitoring results.

Figure 1. Summary Flowchart of the EIA Process



The new guidelines pursuant to the Department Administrative Order (DAO) 2017-15 or the "*Guidelines on Public Participation Under the Philippine Environmental Impact Statement (EIS) System*" entail projects under the Philippine Environmental Impact Statement System (PEISS) to conduct meaningful public participation in

the various stages of the EIA process. As required by the guidelines, the proposed Central Mindanao High Standard Highway Construction (Cagayan de Oro-Malaybalay Section) Project was required to undertake a Public Hearing participated by various stakeholders from the impact barangays.

Representatives from the following groups were invited:

- Local government units in areas where all project facilities are proposed to be constructed/situated and where all operations are proposed to be undertaken
- Government agencies with related mandate on the type of project and its impacts
- Interest groups preferably those with mission/s specifically related to the type and impacts of the proposed undertaking/project
- Households, business activities, and industries that will be displaced
- People whose socio-economic welfare and cultural heritage are projected to be affected by the project especially vulnerable sectors and indigenous populations
- Local institutions (schools, churches, hospital)

1.2 Objective/s

The Public Hearing meeting intends to a) present the results of the environmental impact assessment done by sector: Land, Water, Air, and People; and b.) document issues and concerns of the stakeholders on the results of the studies conducted on the proposed project. The aspects that will be identified and suggested by the stakeholders during the meeting were documented and if deemed critical, will be part of the Environmental Impact Assessment (EIA).

2 Documentation of the Public Hearing

2.1 Dissemination of the Notice of Public Hearing

On September 22, 2023, the Notice of Public Hearing and the copy of the Environmental Impact Assessment (EIA) and Executive Summary for Public (ESP) in two (2) languages, Filipino and English were posted on the EMB website. The notice indicated October 11 to 13, 2023 at 9 o'clock in the morning as the date and time of the hearing to be conducted onsite and online via Zoom. It also included a brief description of the project and information on where to get a copy of the project's EIS which was made available at the EMB website. **Table 1** shows the summary of the public hearing meetings conducted.

A copy of the Notice of Public Hearing and ESPs in English and Filipino are provided as **Annex 1**.

In addition to the website posting, the notice of hearing was published in the national newspaper Daily Tribune on **September 25 and October 2, 2023.** This was done in accordance with DAO 2017-05, Guidelines on Public Participation under the Philippine Environmental Impact Statement (EIS) System. Copy of the Affidavit of Publication from Daily Tribune is provided as **Annex** 2.

Letters of invitation were also sent to the following offices/groups/organizations:

- Municipal and City Local Government Units and concerned departments
- Affected barangay LGUs
- Non-Government Organizations
- Local Groups/Organizations

Copy of the invitation letters, as well as the acknowledgements, are provided as **Annex** 4

Table 1. Public Hearing Date and Venue

Date	Time	Venue	Participants
October 11, 2023	9:00 am to 5:00 pm	Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental	Tagoloan and Cagayan De Oro Representatives and Stakeholders
October 12, 2023	9:00 am to 5:00 pm	2nd Flr., New Bldg., Sumilao Municipal Hall	Sumilao and Malaybalay Representatives and Stakeholders
October 13, 2023	9:00 am to 5:00 pm	Kaamulan Folk Arts Theatre Kaamulan	Impasug-ong and Malaybalay Representatives and Stakeholders

2.2 Public Hearing Participants

The series of Public Hearing meetings were attended by representatives of the stakeholders from the host LGUs initially identified during the Public Scoping. A total of 178 representatives participated in the meeting. The summary of the attendees is shown in the succeeding tables.

The compiled list of attendees is presented below,

Table 10. Cagayan De Oro and Tagoloan Participants

Central Mindanao High Standard Highway Construction Project Date: October 11, 2023 Venue: Congressional Office – Balay Ninotchka Tagoloan, Misamis Oriental		
	Male	**Female**
ONSITE: CDO (N=34)		
Government Agencies		
Department of Environment and Natural Resources Central/Regional	5	1
Department of Public Works and Highways Central/Regional	3	3
City Disaster Risk Reduction Management Office	-	1
Department of Agrarian Reform RFO 10	-	2
Department of Education	2	-
National Commission on Indigenous Peoples	-	1
Local Government Unit	3	2
Bugo		
Private Institution and Organizations	6	-
Local Government Unit	2	-
Private Organizations	1	-
Balubal		
Local Government Unit	1	1
Private Institution and Organizations	1	-
ONSITE: Tagoloan (N=17)		
Government Agencies		
Department of Education	2	-
Municipal Environment and Natural Resources Office	2	1

Central Mindanao High Standard Highway Construction Project Date: October 11, 2023 Venue: Congressional Office – Balay Ninotchka Tagoloan, Misamis Oriental		
	Male	**Female**
Municipal Disaster Risk Reduction Management Office	1	-
Local Government Unit	3	1
Natumolan		
Private Organizations	1	1
Casinglot		
Local Government Unit	1	-
Misamis Oriental		
Local Government Unit	1	1
Provincial Environment and Natural Resources Office	1	1
Private Institution and Organizations	1	-
ONSITE: N=7		
AMET Asia Inc.	1	4
JICA Study Team	-	1
VIRTUAL (N=2)		
AMET Asia Inc.	1	-
JICA Study Team	1	-
Total	**40**	**21**
Grand Total	**61**	

Table 11. Malaybalay and Sumilao Participants

Central Mindanao High Standard Highway Construction Project **Public Hearing** Date: October 12, 2023 Venue: 2nd Flr., New Bldg., Sumilao Municipal Hall		
	Male	**Female**
ONSITE: Malaybalay (N=25)		
Department of Environment and Natural Resources Central/Regional	3	1
Department of Public Works and Highways Central/Regional	4	2
City Disaster Risk Reduction Management Office	3	-
Environment and Natural Resources Officer	1	-
National Commission on Indigenous Peoples	1	-
Local Government Unit	6	-
Private Institution and Organizations	1	-
Barangay 10 (Poblacion)		
Government Agencies	-	-
Department of Education	1	2
Indigenous Peoples' Mandatory Representations	4	1
Local Government Unit	4	2
Kisolon		

Central Mindanao High Standard Highway Construction Project **Public Hearing** Date: October 12, 2023 Venue: 2nd Flr., New Bldg., Sumilao Municipal Hall		
	Male	**Female**
ONSITE: Malaybalay (N=25)		
Local Government Unit	-	1
Barangay Agricultural and Fishery Council	1	-
Private Institution and Organizations	1	3
Culasi		
Local Government Unit	1	-
San Roque		
Local Government Unit	1	-
Puntian		
Local Government Unit	1	-
Puntian Waterworks and Sanitation Association	-	1
Indigenous Peoples' Mandatory Representations	1	-
Vista Villa		
Local Government Unit	1	-
Poblacion		
Local Government Unit	-	1
Private Institution and Organizations	1	-
Others	3	-
ONSITE (N=7)		
AMET Asia Inc.	1	4
JICA Study Team	-	1
VIRTUAL (N=3)		
AMET Asia Inc.	2	1
JICA Study Team	1	-
Total	**46**	**20**
Grand Total	**66**	

Table 12. Impasug-ong and Manolo Fortich Participants

Central Mindanao High Standard Highway Construction Project **Public Hearing** Date: October 13, 2023 Venue: Provincial Environment and Natural Resources (Malaybalay, Bukidnon)		
	Male	**Female**
ONSITE: Impasug-ong (N=17)		
Government Agencies		
Department of Environment and Natural Resources Central/Regional	3	1
Department of Public Works and Highways Central/Regional	5	2

Central Mindanao High Standard Highway Construction Project **Public Hearing** Date: October 13, 2023 Venue: Provincial Environment and Natural Resources (Malaybalay, Bukidnon)		
	Male	**Female**
Department of Education	1	-
National Commission on Indigenous Peoples	1	-
Indigenous Peoples' Mandatory Representations	-	1
Local Government Unit	1	1
Impalutao		
Local Government Unit	-	1
ONSITE: Manolo Fortich (N=27)		
Local Government Unit	4	3
Government Agencies		
Department of Education	-	1
Indigenous Peoples' Mandatory Representations	-	1
Alae		
Local Government Unit	1	-
Damilag		
Local Government Unit	2	1
Diclum		
Private Institution and Organizations	1	2
San Miguel		
Private Institution and Organizations	-	1
Sankanan		
Local Government Unit	3	-
Tangkulan (Poblacion)		
Local Government Unit	2	-
Ticala		
Local Government Unit	2	1
Others	-	1
Bukidnon		
Provincial Environment and Natural Resources Office	1	
ONSITE (N=7)		
AMET Asia Inc.	1	4
JICA Study Team	-	1
VIRTUAL (N=3)		
AMET Asia Inc.	-	-
JICA Study Team	1	
Total	**29**	**22**
Grand Total	**52**	

2.3 Public Hearing Program

The participants were asked to register by signing the provided attendance sheet. The meetings officially started generally around 9:00 AM. The program was moderated by name of Mr. Joel Polintan and Mr. Jes Roland Camayo of the EMB Central Office, the casehandlers of the proposed project.

The details of the proposed project were presented by Ms. Mary Joyce Manuel, Engineer II of Roads Management Cluster I (Bilateral), Unified Project Management Office .The results of the Environmental Impact Assessment (EIA) were presented by Ms. Francine Balido, Environmental Specialist of AMET Asia Inc., the project's EIA Preparer. EMB Region X Regional Director Reynaldo S. Digamo moderated the open forum as the Public Hearing Officer.

A video documentation of the entire proceedings is submitted together with this report. A copy of the program is provided as **Annex 5**. The photodocumentation for the conducted meetings are provided as **Annex** 7.

3 Analysis of Issues and Concerns

Overall, the public hearing at the three clusters proceeded smoothly with the participation of EMB Region X Regional Director Reynaldo S. Digamo as the public hearing officer. There was active participation of the stakeholders and the discussion proceeded with questions and clarifications. In fact, even issues not directly related to the Central Mindanao High Standard Highway Project were freely raised in the open forum and duly responded to by the concerned experts and consultants.

Annex 3 shows the copy of the presentations during the public hearing. A transcript of the entire open forum is provided as **Annex**

3.1 Cagayan de Oro and Tagoloan Cluster

Participated in by a total of 61 stakeholders (40 males & 21 females) from pertinent government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a. Road alignment impact to the traffic congestion in Tagoloan, Misamis Oriental
b. Aggravation of flooding and landslides along Brgy. Bugo, Cagayan De Oro
c. Measures for identifying the properties and families to be affected by flooding and landslide
d. Multipartite Monitoring Team (MMT) purpose and function
e. Necessary documents and papers to be prepared for land negotiation for those to be affected
f. Measures to consider for planning of drainage system: climate projection, history and amount of rainfall volume and the sea level rise.
g. Measures on monitoring of the sand/gravel quarrying by the provincial government to safeguard the river in compliance with the standards set by MGB and EMB.
h. Suggestion to include planting strips for green spaces in highway design considering that Cagayan De Oro is one of the green cities in the country.
i. Inquiry on whether the feasibility study includes specific designated places for the electrical posts and drainage.
j. Highway structures caused also accidents since there are roads that have too many curves or zigzags
k. Incorporation of the 4 lanes to avoid posts and plants that remain as observed in the past with road widening.
l. Inquiry if this project will affect the Metro Rail Project for Mindanao
m. Other Matters: These need to be brought to the attention of the DPWH District Office.
    - There are other existing JICA projects that have caused environmental damage such as the perennial flooding problem in Bugo, CDO.

- In Bugo National High School, there is an existing pipe from which mud flows thereby filling the ground floor of the school.

In the case of the predominant flooding concern, it was underscored by DPWH Central Office and JICA consultant that while there are proposed flood mitigating plans, the specific areas and properties can only be identified once the detailed engineering design is finalized along with the parcellary survey. It was reiterated that the Feasibility Study is underway and the conduct of RAP along the RROW is on-going. The high standard highway is an expressway like NLEX /SCLEX where the user can travel 80 km/hour with comfort and the gradient is at 6%. There is 60 meters right-of-way with 4 meters to the left and 4 meters to the right dedicated to utilities such as for PLDT and electrical poles.

It is worthy to note that during the public hearing, some DPWH projects bearing negative environmental impact were inevitably raised, necessitating urgent action by the DPWH District Office.

3.2 Sumilao and Malaybalay Cluster

Participated by a total of 66 stakeholders (46 males & 20 females) coming from government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a. Road alignment traversing the specific barangays and schools
b. Compensation on affected of untitled lands and landowners
c. Issue of genuine claimant of real property
d. Request of tax declaration documents
e. Holding of rituals are believed to be protection for untoward incidents
f. Toll fee
g. Safety features of a high standard highway with 80 kilometers per hour - emergency safety area
h. Other Matters
    - Mt Kitanglad circumferential road: Observed to have environmental damage and should be monitoring of TSS in the rivers.
    - Another project near the Atugan River regarding the New Sayre highway project where private properties were included: no consultations and corresponding payments to owners have not been done

It is noteworthy that the issue of detailed engineering design has been reiterated. While there are proposed flood mitigating plans, the specific areas and properties can only be identified once the detailed engineering plan is finalized along with the parcellary survey. The Feasibility Study is underway and the conduct of RAP along the RROW is on-going. There will be another set of public hearings for this purpose.

3.3 Manolo Fortich and Impasug-ong Cluster

Participated in by a total of 51 stakeholders (29 males & 22 females) coming from government agencies, local government units, civil society organizations in the locality, the following are the general issues and concerns raised during the forum:

a. Road alignment traversing the specific barangays and houses
b. Conduct of IP rituals prior to any Project activity
c. Compensation to affected land and crops of IPs
d. Design for relocation and specific area for the relocation site of affected people
e. Clarification on the role of the DPWH District

f. Request for the file of the proposed road alignment for planning purposes of LGU
g. Basis and standard payment for land and crops.
h. Land ownership status and documents of the affected lands
i. Other Matters
    - Issue of unpaid affected lands until the present citing the case of a bridge whose landowner is demanding for a toll fee

4 PUBLIC PARTICIPATION DESIGN AND ANALYSIS OF ISSUES AND CONCERNS

Questions were raised during the open forums regarding the Project description and impacts on the environment. Some barangays raised the same concern while majority of the concerns were focused on resettlement and compensation. The issues and concerns were responded by representatives from the DPWH as the proponent, JICA Study Team, Amet Asia Inc., and DENR-EMB. The issues and concerns are enumerated below:

Project Description - With regards to the project specifications, one of the concerns is payment for the use of the highway, particularly whether there will be an imposition of toll fee. Another important concern is the alignment. The affected areas are still tentative because the project is still in the feasibility stage.

Land - The concern was on the identification of the disposal site for construction wastes. There is also a concern raised on the change of natural feature – from a lake, the area in Sumbalan, Sumilao, Bukidnon became a plantation. Another concern is the debris overflow during construction which the low elevation areas usually experience especially if there are construction activities during the rainy season.

Water - A common concern among the barangays is flooding once the project construction and operation starts. There are areas in the alignment (e.g., Tagoloan and Impasug-ong) that have flooding problems because of road projects. There are also concerns on water reservoir or water lines that might be affected because the alignment will pass through these.

People - Across the affected cities and municipalities, the primary concern of the stakeholders is compensation for the affected family, houses, lands, plantations, and animals. There were also concerns on the land rental by a private corporation once the project commences. Particularly in Impasug-ong, the stakeholders are requesting that the alignment be changed or moved to accommodate the poultry farms along the proposed alignment. The stakeholders are also requesting for the profile of the affected which, at this stage, is still unavailable.

The barangays assured that they are in full support of the Project but issues on compensation and IPs must be addressed. They want assurances of just compensation because of experiences of barangays and IP members experience with previous DPWH projects. Past experiences included improper compensation or not fully paid. Since the project will pass through IP areas, some of them with CADT, small farmers with lands along the alignment do not have proof of ownership and worry about the process.

Other issues raised were on livelihood and development for women and importance of observing IP rituals prior to doing Project activities. They emphasized that the concerns of IPs must be considered and that the FPIC process must be observed.

The municipal LGUs and its departments also expressed their concerns regarding the Project particularly on permits and policies and traffic management requirements. There was also an issue regarding sharing mitigation plans with the LGUs and public. Lastly, the LGUs expressed that there are several currently constructed and planned road projects that might conflict with the Project or make it redundant.

5 NEXT STEP

The Public Hearing accomplished its goal of documenting the issues, concerns, and suggestions from the stakeholders regarding the proposed Project. The key issues were mainly on socio-economic impacts of the project, specifically on resettlement and compensation.

The next step is the Review of the EIS meeting between the EMB Central Office, Review Committee, Proponent to finalize the EIA study. The output of the meeting will be the EIS report

ATTACHMENTS

Attachment 1. Initial list of pre-scoping IEC stakeholders
Attachment 2. Sample IEC invitation letter to the stakeholders
Attachment 3. Pre-scoping IEC program
Attachment 4. IEC presentation material
Attachment 5. IEC brochure distributed to the stakeholders
Attachment 6. Summaries of the IEC proceedings
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Attachment 8. Public scoping program
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Attachment 21. Public Hearing Photodocumentation
Attachment 22. Public Hearing Proceedings

Attachment 1. Initial list of pre-scoping IEC stakeholders

Tagoloan, Misamis Oriental

Municipal Council Members and LGU Heads

Name	Position
Mayor Gomer A. Sabio	Municipal Mayor
Roger Achas	Municipal Councilor
Cathlyn Alfante	Municipal Councilor
Ignacio Factura III	Municipal Councilor
Arturo Casiṅo	Municipal Councilor
Armando Pomar	Municipal Councilor
Audie Paduganan	Municipal Councilor
Felipe Valdehuesa	Municipal Councilor
Engr. Jeffrey Elogsong	Municipal Local Environment and Natural Resources Officer
Engr. Eric Ragadang	Municipal Planning & Development Coordinator
Engr. Gene Baculpo	Office of the Municipal Engineer
Romeo Sister	Tagoloan Tricycle Operator Drivers Association
Ferdinand Tormis	Poblacion Natumolan Mootorcycle Association
Dindo Arnan	Tagoloan Center Car Association
Ben Naduma	United Tagoloan Trisikad Association
Rainfredo Sabejon	Tagoloan Market Habal-habal Operators/Drivers Multi-purpose Cooperative
Benjamin Ellarina	Municipal Senior Citizen Federation of the Philippines Tagoloan Chapter
Melden Saguilayan	Tagoloan Federation Differently Able Person Organization
Gleandel Arajuez	Tago-Ulohan Higaonon Tribe
Rose Jean Labajo	Talogan Ta Balatukan ancestral Domain Tagoloan Higaonon Tribal
Matilde Gamba	Philippine Tribal Governance Administration
Ms. Linda F. Libres	Sinag Tagoloan
Carlito Quilang	Tagoloan River Concessionaires Association
Nole Che Guevarra	Tagoloan Sand and Gravel
Client Ray Cosin	Green Heads
Maricor Torres	Save Tagoloan River and its Estuaries and Aquatlife Movement

Barangay Natumolan

Name	Position
Rafael P. Vidal	Brgy. Captain
Elma C. Paderna	Sangguniang Barangay Member
Eugene A. Palapo	Sangguniang Barangay Member
Jocelyn A. Lim	Sangguniang Barangay Member
Marivic B. Ajon	Sangguniang Barangay Member
Segundino Q. Galorio	Sangguniang Barangay Member
Lenie E. Adame	Sangguniang Barangay Member
Janea Maura M. Mencias	Sk Chairperson
Ivy L. Asiñero	Barangay Secretary
Representative from Natumolan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Casinglot

Name	**Position**
Marlon J. Bolanio	Brgy. Captain
Julian M. Hernan	Sangguniang Barangay Member
Richard P. Pelin	Sangguniang Barangay Member
Oona Karen L. Emano	Sangguniang Barangay Member
Teodoro N. Ociones	Sangguniang Barangay Member
Vivian V. De Los Santos	Sangguniang Barangay Member
Alrie J. Allones	Sangguniang Barangay Member
Joseph R. Sereño	Sk Chairperson
Doris O. Maghanoy	Barangay Secretary
Representative from Casinglot Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Cagayan de Oro City, Misamis Oriental

City Council Members and LGU Heads (at least four representatives from the City Council Members)

Name	**Position**
Mayor Oscar S. Moreno	City Mayor
Hon. Teodolfo Lao	City Councilor
Hon. Enrico Salcedo	City Councilor
Hon. Zaldy Ocon	City Councilor
Hon. Lordan Suan	City Councilor
Hon. Jocelyn Rodriguez	City Councilor
Hon. Maria Lourdes Gaane	City Councilor
Hon. Romeo Calizo	City Councilor
Hon. George Gualberto Goking	City Councilor
Hon. Joyleen Mercedes Balaba	City Councilor
Hon. Jay Pascual	City Councilor
Hon. Ian Mark Nacaya	City Councilor
Hon. Edna Dahino	City Councilor
Hon. Suzette Daba	City Councilor
Hon. Reuben Daba	City Councilor
Hon. Edgar Cabanlas	City Councilor
Hon. Roger Abaday	City Councilor
Hon. Teodolfo Lao	City Councilor
Engr. Armen A. Cuenca	City Local Environment and Natural Resources Officer
Mr. Ramir M. Balquin, EnP	City Planning & Development Coordinator
Engr. Rolando M. Pacuribot	Office of the City Engineer

Barangay Bugo

Name	**Position**
Ho. Vic Talingting	Brgy. Captain
Hon. Presley C. Emano	Sangguniang Barangay Member
Hon. Ronald Rey S. Cabana	Sangguniang Barangay Member
Hon. Marie Anne G. Gironella	Sangguniang Barangay Member
Hon. Ariel Igot	Sangguniang Barangay Member
Hon. Alan D. Igot	Sangguniang Barangay Member
Hon. Ricarte V. Codilla	Sangguniang Barangay Member
Hon. Ponciano J. Dawal	Sangguniang Barangay Member
Mr. Noel Nober O. Perpetua	Sk Chairperson
Mr. Paul Jordan S. Morial	Barangay Secretary
Ms. Anita B. Yaeso	Federation of Zone Five Bugo Neighborhood Incorporated (FEZOFIBUNI)
Mr. Avelino M. Sario, Sr.	Federation of Bugo Zone 6 Association, Incorporated
Ms. Venus H. Galdo	Villa Trinitas Phase 2, Homeowner's Association, Incorporated
Sitio/Purok Leaders	
Representative from Upper Puerto Carp Beneficiary Association, Inc.	
Representative from Bugo - Puerto - Cogon Operators & Drivers Association (Bpcoda), Inc.	
Representative from Cugman - Bugo Tricycle Operators and Drivers Association, Inc.	
Representative from Bugo Motorized Operators and Drivers Association (Bumotoda), Inc	
Representative from Bugo Central School	
Representative from Bugo Christian School	
Representative from Bugo National High School	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representative from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Puerto

Name	**Position**
Hon. Christian Rustico M. Achas	Brgy. Captain
Hon. Presley C. Emano	Sangguniang Barangay Member
Hon. Ronald Rey S. Cabana	Sangguniang Barangay Member
Hon. Marie Anne G. Gironella	Sangguniang Barangay Member
Hon. Ariel Igot	Sangguniang Barangay Member
Hon. Alan D. Igot	Sangguniang Barangay Member
Hon. Ricarte V. Codilla	Sangguniang Barangay Member
Hon. Ponciano J. Dawal	Sangguniang Barangay Member
Mr. Noel Nober O. Perpetua	Sk Chairperson
Mr. Paul Jordan S. Morial	Barangay Secretary
Representative from Puerto Elementary School	
Representative from Puerto National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Balubal

Name	**Position**
Hon. Bactong Pablo	Brgy. Captain
Hon. Ervic Bade	Sangguniang Barangay Member
Reynante Razalo	Sangguniang Barangay Member
Renato Agabalog	Sangguniang Barangay Member
Patrina Malingin	Sangguniang Barangay Member
Richard Razalo	Sangguniang Barangay Member
Dionedes Rosel	Sangguniang Barangay Member
Larry Pajo	Sangguniang Barangay Member
Mary Nel Saguban	Sk Chairperson
Mirasol Yutuc	Barangay Secretary
Representative from Balubal Elementary School	
Representative from Balubal National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Manolo Fortich, Bukidnon

Municipal Council Members and LGU Heads

Name	**Position**
Mayor Clive D. Quiño	Municipal Mayor
Christy L. Sabale	Municipal Councilor – Committee on Livelihood, Women and family relations, Child care and nutrition
Alberto B. Tinoy	Municipal Councilor – Human rights, trade and commerce/ cooperative
Warleo A. Goayan	Municipal Councilor– Peace and order, public safety, senior citizen/ PWD
Alex D. Payangga	Municipal Councilor– Indigenous cultural communities
Nelson S. Binayao	Municipal Councilor– Barangay affairs
John Anthony G. Leyson	Municipal Councilor– Sports, youth development
Sharon Tacbobo – 0915-365 4649	Municipal Local Environment and Natural Resources Officer
Cherry Fe Amor Q. Magallones	Municipal Planning & Development Coordinator
Engr. Bernabe Auxtero – 0936-195 5285	Office of the Municipal Engineer
Carlos A. Dumas	CENRO Manolo Fortich
Marie Superales	NCIP Manolo Fortich Community Service Center
Judith Dinsag	Representative from Cultural Sector
	Representative from Environmental Sector
Luigi Amoin	Representative from Driver's and Operators Associations
Ceceil Sajonia	Representative from Women's Group
Phoebe Cau	Representative from Senior Citizen's Group

Barangay Alae

Name	**Position**
Hon. Erasmo Ceasar A. Ramirez	Brgy. Captain
Hon. Jocelyn A. Legaspi	Sangguniang Barangay Member
Hon. John Marvin C. Namocatcat Sr.	Sangguniang Barangay Member
Hon. Roy L. Ganas	Sangguniang Barangay Member
Hon. Deborah Y. Marinay	Sangguniang Barangay Member
Hon. Junidini J. Artajo	Sangguniang Barangay Member
Hon. Teogenes R. Abarabar Sr.	Sangguniang Barangay Member
Hon. Deogracias O. Piosca	Sangguniang Barangay Member
Hon. Keith Emilian C. Melendez	SK Chairperson
Nelfa R. Tero	Barangay Secretary
Representative from Alae Elementary School	
Representative from Alae National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay San Miguel, Manolo Fortich, Bukidnon

Name	**Position**
Hon. Benjamin S. Miṅoza	Brgy. Captain
Hon. Joaquin L. Fudolin	Sangguniang Barangay Member
Hon. John Windel J. Gallenero	Sangguniang Barangay Member
Hon. Mary Ann D. Edusma	Sangguniang Barangay Member
Hon. Jesus M. Galagar	Sangguniang Barangay Member
Hon. Sabina E. Babion	Sangguniang Barangay Member
Hon. Sanny D. Badelic	Sangguniang Barangay Member
Hon. Arsenio T. Mondilla	Sangguniang Barangay Member
Hon. Pauline Grace B. Gonzaga	SK Chairperson
Orlando S. Sarabia	Barangay Secretary
Representative from San Miguel Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Damilag, Manolo Fortich, Bukidnon

Name	**Position**
Hon. Allan G. Torres Jr.	Brgy. Captain
Hon. Allan E. Cahoy	Sangguniang Barangay Member
Hon. Anthony G. Inihao	Sangguniang Barangay Member
Hon. Jonathan S. Demata	Sangguniang Barangay Member
Hon. Lorenza I. Madjus	Sangguniang Barangay Member
Hon. Roberto S. Madula	Sangguniang Barangay Member
Hon. Eduardo Ralph S. Bagayas	Sangguniang Barangay Member

Name	**Position**
Hon. Edmond A. Licuanan	Sangguniang Barangay Member
Alejandro B. Arenal	SK Chairperson
Arlene B. Arenal	Barangay Secretary
Representative from Damilag Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Diclum

Name	**Position**
Hon. Nelson S. BInayao	Brgy. Captain **Captain**
Hon. Tomasito A. Coquilla	Sangguniang Barangay Member
Hon. Pablo A. Jimenez Jr.	Sangguniang Barangay Member
Hon. Ildefonso O. Pablo Jr.	Sangguniang Barangay Member
Hon. Shirley L. Tagapulot	Sangguniang Barangay Member
Hon. Brian T. Lozada	Sangguniang Barangay Member
Hon. Benito V. Bantilan	Sangguniang Barangay Member
Hon. Roque A. Balcos	Sangguniang Barangay Member
Hon. Ethel Jean Q. Emata	SK Chairperson
Charito A. Villegas	Barangay Secretary
Representative from Diclum Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Sankanan, Manolo Fortich, Bukidnon

Name	**Position**
Hon. Dennis G. Salvo	Brgy. Captain
Hon. Ariel L. Jenisan	Sangguniang Barangay Member
Hon. Genevieve M. Monopollo	Sangguniang Barangay Member
Hon. Julieto A. Baliguat	Sangguniang Barangay Member
Hon. Alfonso L. Dahe	Sangguniang Barangay Member
Hon. Bernie D. Guinayao	Sangguniang Barangay Member
Hon. Jesus M. Vitor	Sangguniang Barangay Member
Hon. Alberto B. Buynay	Sangguniang Barangay Member
Hon. Kyrr Heinritz N. Quiray	SK Chairperson
Hon. Charity D. Cajilla	Barangay Secretary
Representative from Sankanan Elementary School	
Representative from Sankanan National High School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	

Name	Position
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Tankulan (Pob.)

Name	Position
Hon. Romeo P. Dagunlay	Brgy. Captain
Hon. Lemuel Rey L. Arana	Sangguniang Barangay Member
Hon. Rene G. Abarquez	Sangguniang Barangay Member
Hon. Lee A. Albarece	Sangguniang Barangay Member
Hon. Daniel V. Onahon Jr	Sangguniang Barangay Member
Hon. Dominador L. Domo	Sangguniang Barangay Member
Hon. Alan A. Improgo	Sangguniang Barangay Member
Hon. Leopoldo S. Balanay	Sangguniang Barangay Member
Hon. Kristian Niko P. Tapales	SK Chairperson
Hon. Leonora S. Ugat	Barangay Secretary
Representative from Tankulan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Ticala

Name	Position
Hon. Virgie Y. Payanan	Brgy. Captain
Hon. Kineth G. Tanto	Sangguniang Barangay Member
Hon. Telesforo P. Dawat	Sangguniang Barangay Member
Hon. Dumaquito D. Lentican	Sangguniang Barangay Member
Hon. Julito S. Tanto	Sangguniang Barangay Member
Hon. Nancita G. Yompoca	Sangguniang Barangay Member
Hon. Rufino S. Bulanta Jr.	Sangguniang Barangay Member
Hon. Ronald R. Magdalino Sr.	Sangguniang Barangay Member
Hon. Dievra Jay S. Payanan	SK Chairperson
Renato S. Coguihan Jr.	Barangay Secretary
Representative from Ticala Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	

Barangay Mambatangan

Name	Position
Hon. Angelie S. Roa	Brgy. Captain
Hon. Edward D. Dampal	Sangguniang Barangay Member
Hon. Allan T. Tinay	Sangguniang Barangay Member
Hon. Junrey P. Lagat	Sangguniang Barangay Member
Hon. Jerry R. Balaba	Sangguniang Barangay Member
Hon. Hanie P. Abris	Sangguniang Barangay Member
Hon. Evangeline T. Amansec	Sangguniang Barangay Member

Name	Position
Hon. Melan Dave C. Lalucan	Sangguniang Barangay Member
Hon. Neil Christian G. Tilap	SK Chairperson
Roberto A. Santiago Jr	Barangay Secretary
Representative from Mambatangan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	

Sumilao, Bukidnon

Municipal Council Members and LGU Heads

Name	Position
Mayor Jose Antonio A. Villo	Municipal Mayor
Hon. George Jeremy Baula	Municipal Councilor
Hon. Benjamin A. Baluma	Municipal Councilor
Hon. Gary A. Del Rosario	Municipal Councilor
Hon. Nissabel T. Cańada	Municipal Councilor
Hon. Cresanto J. Apiag	Municipal Councilor
Hon. Leandro C. Bade	Municipal Councilor
Hon. Romeo B. Anoba	Municipal Councilor
Hon. Vernie N. Castillo	Municipal Councilor
Engr. Armen A. Cuenca	Municipal Local Environment and Natural Resources Officer
Engr. Isidro G. Borja	Municipal Planning & Development Coordinator
Engr. Rolando M. Pacuribot	Office of the Municipal Engineer
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representative from Agriculture/Fishermen's Association	

Barangay Puntian

Name	Position
Hon. Tirso B. Amistoso	Brgy. Captain
Hon. Joann B. Gaid	Sangguniang Barangay Member
Hon. Jumandy T. Salise	Sangguniang Barangay Member
Hon. Evangeline R. Cabarles	Sangguniang Barangay Member
Hon. Apolinario C. Lumaghan	Sangguniang Barangay Member
Hon. Fegie D. Nacasabog	Sangguniang Barangay Member
Hon. Felicito H. Boncait	Sangguniang Barangay Member
Hon. Gavino C. Bantog	Sangguniang Barangay Member
Hon. Rustom B. Milla	SK Chairperson
Hon. Joela D. Golosinda	Barangay Secretary
Representative from Puntian Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Vista Villa

Name	**Position**
Hon. Reymar T. Gaguan	Brgy. Captain
Hon. Noland M. Caramonte	Sangguniang Barangay Member
Hon. Ernesto G. Bargo	Sangguniang Barangay Member
Hon. Jomie S. Cabactulan	Sangguniang Barangay Member
Hon. Maridel A. Goay	Sangguniang Barangay Member
Hon. Unifren B. Dahinao	Sangguniang Barangay Member
Hon. Geno O. Daluan	Sangguniang Barangay Member
Hon. Jean Sigrid S. Mat-Ao	SK Chairperson
Florence Joy S. Carbajal	Barangay Secretary
Representative from Vista Villa Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Culasi

Name	**Position**
Hon. Gilbert T. Mamatan	Brgy. Captain
Hon. Deve D. Dalahigon	Sangguniang Barangay Member
Hon. Silvestre S. Dalo-An	Sangguniang Barangay Member
Hon. Lito E. Santaan	Sangguniang Barangay Member
Hon. Alberto S. Dalahigon	Sangguniang Barangay Member
Hon. Wenefredo Y. Mamatan	Sangguniang Barangay Member
Hon. Georgina D. Daganloy	Sangguniang Barangay Member
Hon. Randy I. Maata	SK Chairperson
Hezeil Ann M. Daluan	Barangay Secretary
Representative from Culasi Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Poblacion

Name	**Position**
Hon. Julius Cesar A. Tan	Brgy. Captain
Hon. Nova H. Sumbalan	Sangguniang Barangay Member
Hon. Esterlita D. Cahiles	Sangguniang Barangay Member
Hon. Reynaldo C. Ducala	Sangguniang Barangay Member
Hon. Kent A. Elore	Sangguniang Barangay Member
Hon. Jimmar C. Han-Awon	Sangguniang Barangay Member
Hon. Dulce S. Doydora	Sangguniang Barangay Member
Hon. Jerome S. Cagadas	Sangguniang Barangay Member
Hon. Jarfie O. Acedilla	SK Chairperson

Name	Position
Louela G. De La Cerna	Barangay Secretary
Representative from Poblacion Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Kisolon

Name	Position
Hon. Albert Gabriel B. De Mesa	Brgy. Captain
Hon. Dominador A. Del Rosario	Sangguniang Barangay Member
Hon. Vicenta C. Manginsay	Sangguniang Barangay Member
Hon. Sherly T. Inojaldo	Sangguniang Barangay Member
Hon. Andres P. De La Cerna	Sangguniang Barangay Member
Hon. Gemmo C. Olana	Sangguniang Barangay Member
Hon. Diosdado C. Doyola	Sangguniang Barangay Member
Hon. Mark John Y. Opecio	Sangguniang Barangay Member
Hon. Vanessa Lynne D. Soliva	SK Chairperson
Alma Y. Daigon	Barangay Secretary
Representative from Kisolon Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay San Roque

Name	Position
Hon. Jake T. Curay	Brgy. Captain
Hon. Hentherjo L. Dalit	Sangguniang Barangay Member
Hon. Ace L. Francisco	Sangguniang Barangay Member
Hon. Myrna B. Pinote	Sangguniang Barangay Member
Hon. Rodelita P. Sasusam	Sangguniang Barangay Member
Hon. Maribeth D. Suminao	Sangguniang Barangay Member
Hon. John Mark C. Sabanal	Sangguniang Barangay Member
Hon. George B. Paca Sr	Sangguniang Barangay Member
Hon. Ariel S. Torayno	SK Chairperson
Alma O. Landuay	Barangay Secretary
Representative from San Roque Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Impasug-ong, Bukidnon

Municipal Council Members and LGU Heads

Name	**Position**
Hon. Anthony Uy	Municipal Mayor
Hon. John A. Alvarez	Municipal Councilor
Hon. Hon. Christopher T. Beltran	Municipal Councilor
Hon. Melvin B. Santos	Municipal Councilor
Hon. Gerome DC. Reyes	Municipal Councilor
Hon. Emmanuel DC. Magtalas	Municipal Councilor
Hon. Richard P. Dela Cruz	Municipal Councilor
Hon. Jayvee C. Lacsina	Municipal Councilor
Mark David C. Maon	Municipal Local Environment and Natural Resources Officer
Nika Corinne S. Tan	Municipal Planning & Development Coordinator
Marivee M. Coronel	Office of the Municipal Engineer
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	

Barangay Poblacion

Name	**Position**
Von Omar P. Lagayan	Brgy. Captain
Hon. Ayagil Kilah C. Delarmente	Sangguniang Barangay Member
Hon. Clemencia M. Denzo	Sangguniang Barangay Member
Hon. Reina O. Paluga	Sangguniang Barangay Member
Hon. Diomedes D. Tulusan	Sangguniang Barangay Member
Hon. Abner L. Garcia	Sangguniang Barangay Member
Hon. Rolando E. Eguia	Sangguniang Barangay Member
Hon. Laurence Aldwin O. Olana	Sangguniang Barangay Member
Hon. Irene Kristine C. Delarmente	SK Chairperson
Shirley A. Curiba	Barangay Secretary
Representative from Poblacion Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay La Fortuna

Name	**Position**
Hon. Nilo C. Iba	Brgy Captain
Hon. Walter B. Galasanay	Sangguniang Barangay Member
Hon. Narcisa D. Igloria	Sangguniang Barangay Member
Hon. Livelyn G. Dubongco	Sangguniang Barangay Member
Hon. Editha D. Gayonan	Sangguniang Barangay Member
Hon. Jheran P. Go	Sangguniang Barangay Member
Hon. Corazon S. Toring	Sangguniang Barangay Member

Name	Position
Hon. Eleonor B. Tañedo	Sangguniang Barangay Member
Hon. Lloyd Matty L. Inta	SK Chairperson
Hon. Evelyn A. Montaño	Barangay Secretary
Representative from La Fortuna Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Cawayan

Name	Position
Hon. Josefino B. Manalo	Brgy. Captain
Hon. Carmelino L. Campol	Sangguniang Barangay Member
Hon. Greggy D. Labra	Sangguniang Barangay Member
Hon. Angelito D. Cawasan	Sangguniang Barangay Member
Hon. Policarpio P. Dacillo Jr	Sangguniang Barangay Member
Hon. Anie L. Tabian	Sangguniang Barangay Member
Hon. Jerry O. Avila	Sangguniang Barangay Member
Hon. Grace I. Timo	Sangguniang Barangay Member
Hon. Shiela Mae C. Urgel	SK Chairperson
Ma. Chenita T. Miras	Barangay Secretary
Representative from Cawayan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Capitan Bayong

Name	Position
Hon. Dawn M. Roque	Brgy. Captain
Hon. Raul D. Felicio	Sangguniang Barangay Member
Hon. Rodrigo G. Antivo	Sangguniang Barangay Member
Hon. Marven C. Mandong	Sangguniang Barangay Member
Hon. Enrique Y. Gayon	Sangguniang Barangay Member
Hon. Evangeline A. Yomonda	Sangguniang Barangay Member
Hon. Rhoda A. Napuran	Sangguniang Barangay Member
Hon. Generaldo N. Galambao	Sangguniang Barangay Member
Hon. Princess Grace L. Gayon	SK Chairperson
Hon. Bernandeth Y. Dela Peña	Barangay Secretary
Representative from Capitan Bayong Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	

Name	Position
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Impalutao

Name	Position
Hon. Antonio O. Dominao	Brgy. Captain
Hon. Jerly D. Pacatang	Sangguniang Barangay Member
Hon. Romeo R. Abunda Sr.	Sangguniang Barangay Member
Hon. Martha G. Bustamante	Sangguniang Barangay Member
Hon. Danilo N. Micabalo	Sangguniang Barangay Member
Hon. Nicasio P. Llamoso	Sangguniang Barangay Member
Hon. Esteban G. Macapaz	Sangguniang Barangay Member
Hon. Raquel L. Buco	Sangguniang Barangay Member
Hon. Mayflor P. Paquiao	SK Chairperson
Hon. Analou L. Paul	Barangay Secretary
Representative from Impalutao Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Kibenton

Name	Position
Hon.	Brgy Captain
Hon. Richard J. Pad-Ay	Sangguniang Barangay Member
Hon. Merlie G. Carlos	Sangguniang Barangay Member
Hon. Mary Ann D. Minardo	Sangguniang Barangay Member
Hon. Margie L. De Leon	Sangguniang Barangay Member
Hon. Rickie G. Silmahan	Sangguniang Barangay Member
Hon. Isidro A. Okit	Sangguniang Barangay Member
Hon. Venerando S. Balunsay	Sangguniang Barangay Member
Hon. Krizel Jane I. Lamparas	SK Chairperson
Sherlita D. Lamparas	Barangay Secretary
Representative from Kibenton Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Malaybalay City, Bukidnon

City Council Members and LGU Heads

Name	**Position**
Mayor Florencio T. Flores Jr.	City Mayor
Hon. Estelito Marabe	City Councilor
Hon. Niko Aldeguer	City Councilor
Hon. Louel Tortola	City Councilor
Hon. Rendon Sangalang	City Councilor
Hon. Victor Barroso	City Councilor
Hon. Hollis Monsanto	City Councilor
Hon. Christopher Soria	City Councilor
Hon. Erwin Damasco	City Councilor
Hon. Kathleen Cecille Pagaling	City Councilor
Hon. Cromwell Kiril Dinlayan	City Councilor
Hon. Ma. Anita L. Fernandez	City Local Environment and Natural Resources Officer
Engr. Adrian R. Gamboa	City Planning & Development Coordinator
Engr. Roy A. Lapuz	Office of the City Engineer
Crispulo L. Libertad	Northern Bukidnon Free Farmer's Cooperative
Gregorio S. Tatoy	New Ilocos Irrigators Ass., Inc.
Bienvinido Landasan, Jr	Abag Kalambuan, Inc.
Representative from Cultural Sector	
Representative from Environmental Sector	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	

Barangay Patpat

Name	**Position**
Hon. Renante M. Okit	Brgy. Captain
Hon. Lito G. Maruhom	Sangguniang Barangay Member
Hon. Ruben D. Meliston	Sangguniang Barangay Member
Hon. Freddie S. Okit	Sangguniang Barangay Member
Hon. Norien B. Meliston	Sangguniang Barangay Member
Hon. Dante L. Dumagpi	Sangguniang Barangay Member
Hon. Bles G. Gumindan	Sangguniang Barangay Member
Hon. Edwin G. Meliston	Sangguniang Barangay Member
Hon. Sharam D. Dahuloran	SK Chairperson
Liezel Joy A. Gabule	Barangay Secretary
Representative from Patpat Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Kalasungay

Name	**Position**
Hon. Rodrigo O. Niere	Brgy. Captain
Hon. Ersie C. Paano	Sangguniang Barangay Member
Hon. Joemar M. Sario	Sangguniang Barangay Member
Hon. Anthony Julian G. Rubio	Sangguniang Barangay Member
Hon. Gene M. Rojas	Sangguniang Barangay Member
Hon. Constantino T. Mendoza Jr	Sangguniang Barangay Member
Hon. Emilie R. Okit	Sangguniang Barangay Member
Hon. Essner G. Binayao	Sangguniang Barangay Member
Hon. Karl Marlone C. Manahan	SK Chairperson
Kesha Dawn M. Sewala	Barangay Secretary
Representative from Kalasungay Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay Dalwangan

Name	**Position**
Hon. Raul B. Pandong	Brgy. Captain
Hon. Wilson A. Sogocio	Sangguniang Barangay Member
Hon. Jose E. Ronolo	Sangguniang Barangay Member
Hon. Primo Jack D. Omarol	Sangguniang Barangay Member
Hon. Nieley Joy P. Martinez	Sangguniang Barangay Member
Hon. Carmelino T. Melliza Jr	Sangguniang Barangay Member
Hon. Jan Kayzer O. Lino-Ay	Sangguniang Barangay Member
Hon. Judito S. Pagaling	Sangguniang Barangay Member
Hon. Anthon Son R. Morento	SK Chairperson
Hon. Junel C. Lamadora	Barangay Secretary
Representative from Dalwangan Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Barangay 10

Name	**Position**
Hon. Nilo Q. Salga	Brgy. Captain
Hon. Herculano O. Lupiba	Sangguniang Barangay Member
Hon. Alex P. Agustin	Sangguniang Barangay Member
Hon. Armando P. Blanco	Sangguniang Barangay Member
Hon. Alejandro P. Ferrer Jr	Sangguniang Barangay Member
Hon. Francis Eddie C. Dagang	Sangguniang Barangay Member
Hon. Michael Joseph C. Galindo	Sangguniang Barangay Member
Hon. Isidro T. Desabille	Sangguniang Barangay Member

Name	**Position**
Hon. Gio Paul Z. Agustin	SK Chairperson
Hon. Tiffany C. Galindo	Barangay Secretary
Representative from Brgy. 10 Elementary School	
Representative from Driver's and Operators Associations	
Representative from Women's Group	
Representative from Senior Citizen's Group	
Representatives from Religious Groups	
Representative from Agriculture/Fishermen's Association	
Representative from Cultural Sector	
Representative from Environmental Sector	

Attachment 2. Sample IEC invitation letter to the stakeholders

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

19 March 2021

HON. GOMER A. SABIO
Municipal Mayor
Tagoloan, Misamis Oriental

SUBJECT: INFORMATION, EDUCATION, AND COMMUNICATION PROGRAM OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION)

Dear Mayor Sabio:

The Department of Public Works and Highways (DPWH) with the assistance of Japan International Cooperation Agency (JICA) is proposing to construct and operate the Central Mindanao High Standard Highway Construction Project which will traverse the Municipalities of Tagoloan, Cagayan de Oro, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, and Malaybalay, Bukidnon. JICA entrusted the conduct of this study to CTI Engineering International Co., Ltd. (CTII).

The Environmental Management Bureau of the Department of Environment and Natural Resources (EMB-DENR) requires that the proposed project undergoes an Environmental Impact Assessment (EIA) for its Environmental Compliance Certificate (ECC) application prior to project implementation. In line with this, CTII Engineering commissioned Amet-Asia Inc., the third-party local environmental consultancy firm, to undertake the EIA. The first step in the EIA process is the Information, Education and Communication, i.e. an activity which informs the stakeholders about the project through the process of education using communication mediums.
In this regard, we are inviting you or your representative to attend the IEC meeting on **Tuesday, March 24, 2021** at the **Tagoloan Dome.** We are also requesting the presence of the people (or their representatives) in the attached list. The purpose of the activity is to give information about the project and understanding of the EIA process.

Registration starts at 1:30 P.M. with the program promptly starting at 2:00 P.M. Also attached is the program of the IEC meeting

Kindly contact us for questions and clarifications through Dr. Nimfa L. Bracamonte at 09171351584 or Prof. Amabelle A. Embornas at 09750438488.

Thank you for your cooperation in this endeavor.

Truly yours,

上野隆一

MR. RYUICHI UENO
JICA Study Team Leader

LGU - T[illegible]OLOAN, MISAMIS ORIENTAL
MU[illegible]AL MAYOR'S [illegible]
RECEIVED
By: [illegible] Date: 3/23/21
10:48

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

Attachment 3. Pre-scoping IEC att

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
March 23, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Gomer A. Sabio** *Tagoloan Municipal Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Engr. Eric Ragadang** *Municipal Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
Puerto Brgy. Hall, Puerto, Cagayan de Oro
March 24, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Oscar S. Moreno** *Cagayan de Oro City Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Ramir M. Balquin** *City Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
BRCI Diclum, Manolo Fortich
March 22, 2021
2:00 PM – 4:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Clive D. Quiño** *Manolo Fortich Municipal Mayor*
Presentation of the Proposed Project	**Dr. Nimfa L. Bracamonte** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Ms. Cherry Fe Amor Q. Magallones** *Municipal Planning and Development Officer*
	Photo documentation

Dr. Nimfa L. Bracamonte
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 24, 2020, 10:00-12:00 PM
2nd Floor, New Building, Municipal Hall, Sumilao

INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
Sumilao Municipal Hall
March 24, 2021
10:00 AM – 12:00 PM

Invocation	
National Anthem	
Opening Remarks	**Hon. Jose Antonio Villo** *Sumilao Municipal Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Albert Gabriel De Mesa** *Brgy. Captain, Barangay Kisolon*
	Photo documentation

Ms. Amabelle A. Embornas
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15552*

JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 23, 2020, 2:00-4:00 PM
Impasug-ong Municipal Conference Hall

Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Anthony A. Uy** *Impasug-ong Municipal Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Josefino B. Manalo** *Brgy. Captain, Barangay Cawayan*
	Photo documentation

Ms. Amabelle A. Embornas
Emcee/Facilitator

JICA Study Team, 3rd Floor, DPWH Central, Bonifacio Drive, Port Area, Manila, Philippines *Tel. No. (02)8527-15551*

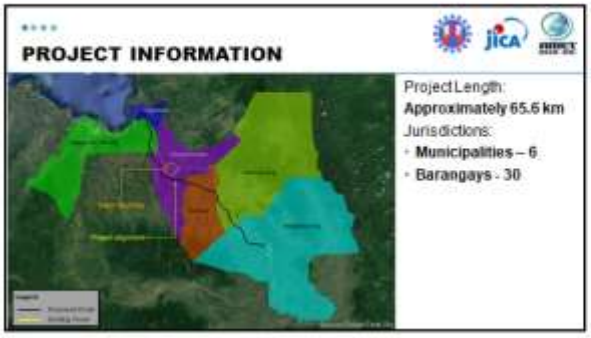
JICA Survey Team for the Preparatory Study for Central Mindanao High Standard Highway Construction Project (CDO-Malaybalay Section)

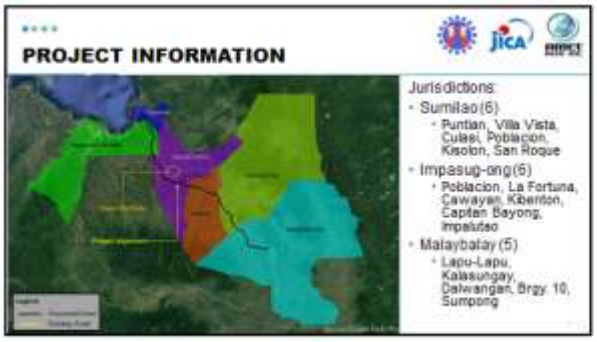
CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT
INFORMATION, EDUCATION AND COMMUNICATION PROGRAM
List of Invitees
March 23, 2020, 10:00-12:00 PM
People's Hall, 2nd Floor Malaybalay City Hall

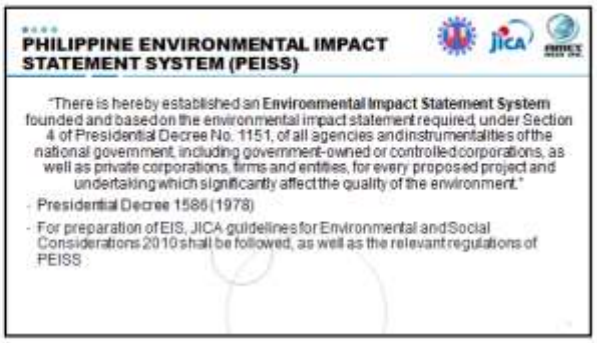
Invocation	
National Anthem	
Opening Remarks	**Hon. Mayor Florencio T. Flores Jr.** *Malaybalay City Mayor*
Presentation of the Proposed Project	**Ms. Amabelle A. Embornas** *Amet-Asia, Inc. – People Consultant*
	Open Forum
Closing Remarks	**Adrian R. Gamboa** *City Planning and Development Officer*
	Photo documentation

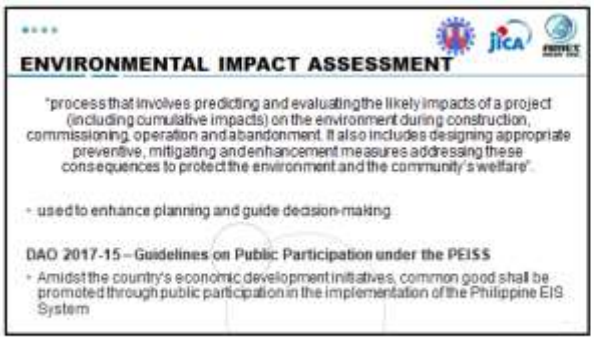
Ms. Amabelle A. Embornas
Emcee/Facilitator

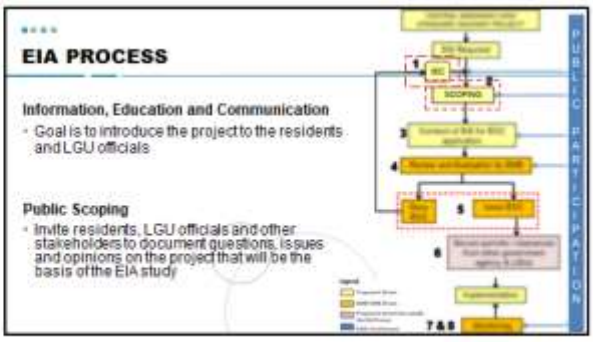
Attachment 4. IEC presentation material

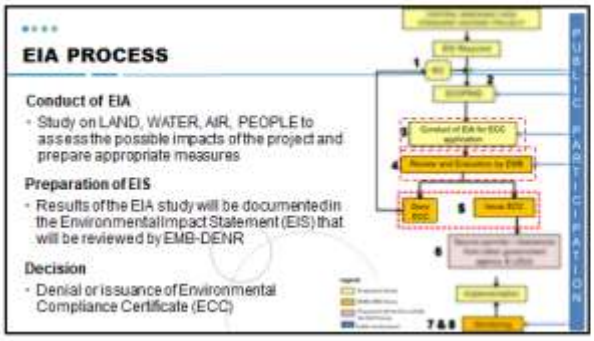


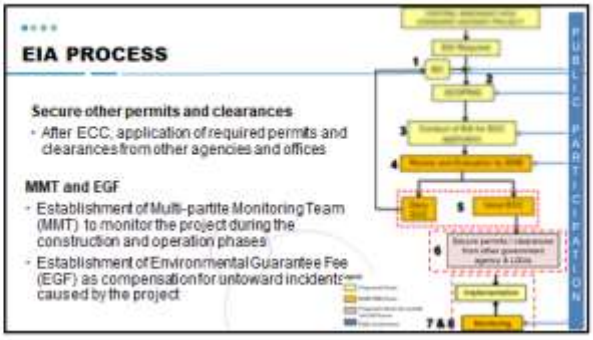





ENVIRONMENTAL IMPACT ASSESSMENT
"process that involves predicting and evaluating the likely impacts of a project (including cumulative impacts) on the environment during construction, commissioning, operation and abandonment. It also includes designing appropriate preventive, mitigating and enhancement measures addressing these consequences to protect the environment and the community's welfare".
• used to enhance planning and guide decision-making
DAO 2017-15 – Guidelines on Public Participation under the PEISS
• Amidst the country's economic development initiatives, common good shall be promoted through public participation in the implementation of the Philippine EIS System


EIA PROCESS
Information, Education and Communication
• Goal is to introduce the project to the residents and LGU officials
Public Scoping
• Invite residents, LGU officials and other stakeholders to document questions, issues and opinions on the project that will be the basis of the EIA study
SCOPING
PUBLIC PARTICIPATION


EIA PROCESS
Conduct of EIA
• Study on LAND, WATER, AIR, PEOPLE to assess the possible impacts of the project and prepare appropriate measures
Preparation of EIS
• Results of the EIA study will be documented in the Environmental Impact Statement (EIS) that will be reviewed by EMB-DENR
Decision
• Denial or issuance of Environmental Compliance Certificate (ECC)
PUBLIC PARTICIPATION


EIA PROCESS
Secure other permits and clearances
• After ECC, application of required permits and clearances from other agencies and offices
MMT and EGF
• Establishment of Multi-partite Monitoring Team (MMT) to monitor the project during the construction and operation phases
• Establishment of Environmental Guarantee Fee (EGF) as compensation for untoward incidents caused by the project
PUBLIC PARTICIPATION

Thank you.

Attachment 5. IEC brochure distributed to the stakeholders

CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT

CAGAYAN DE ORO – MALAYBALAY SECTION

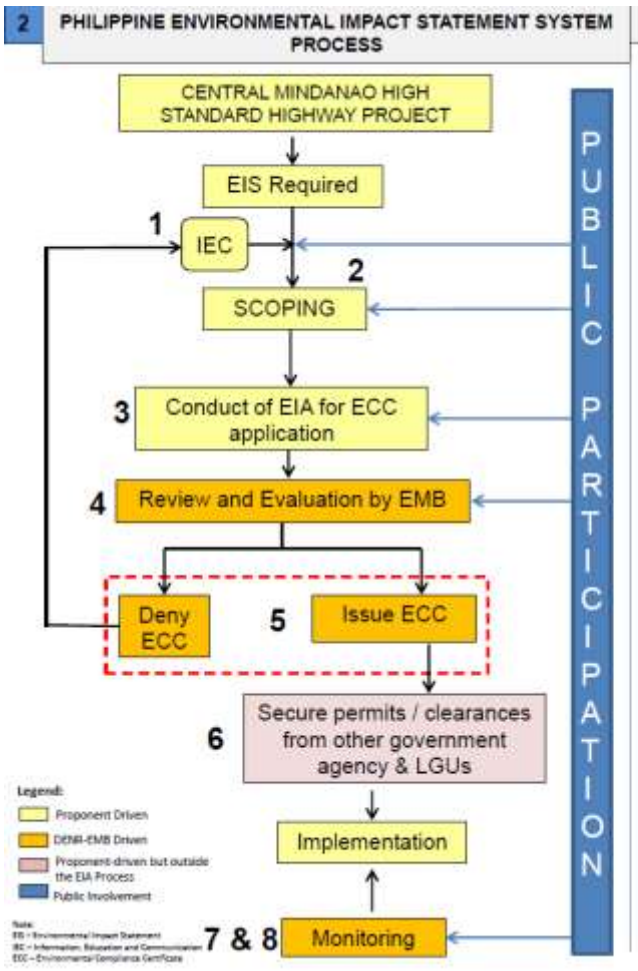
INFORMATION, EDUCATION AND COMMUNICATION (IEC)

March 2021

Proponent :
Department of Public Works and Highways (Central Office)

With the assistance of:
Japan International Cooperation Agency (JICA)

Environment Consultant:
Amet-Asia Inc.
#7 Pioneer St. Brgy Highway Hills, Mandaluyong City
02 254 0421/0906 012 6913


2
PHILIPPINE ENVIRONMENTAL IMPACT STATEMENT SYSTEM PROCESS
CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT
EIS Required
1
IEC
2
SCOPING
3
Conduct of EIA for ECC application
4
Review and Evaluation by EMB
Deny ECC
5
Issue ECC
6
Secure permits / clearances from other government agency & LGUs
Implementation
7 & 8
Monitoring
PUBLIC PARTICIPATION
Legend:
Proponent Driven
DENR-EMB Driven
Proponent driven but outside the EIA Process
Public Involvement

IMPORMASYON TUNGKOL SA PROYEKTO
7
Image of SCTEx Interchange ©Google Earth
Image of SCTEx Bridge ©Google Earth
Image of SCTEx Overpass ©Google Earth

6	IMPORMASYON TUNGKOL SA PROYEKTO	
Jurisdictions (Municipalities, Cities, and Barangays)	Tagaloan	Casinglot, Natumolan
	CDO	Bugo, Puerto, Balubal
	Manolo	Alae, San Miguel, Damilag, Diclum, Sankanan, Tankulan, Ticala, Mambatangan
	Sumilao	Puntian, Villa Vista, Culasi, Poblacion, Kisolon, San Roque
	Impasug-ong	Poblacion, La Fortuna, Cawayan, Kibenton, Capitan Bayong, Impalutao
	Malaybalay	Lapu-Lapu, Kalasungay, Dalwangan, Brgy. 10, Sumpong
Project type	Road Project	
Initial specifications	Length = Approximately 65.6 km # of lanes = 2 or 4 Typical Road Right of Way = 60 m (minimum)	
Project components	Interchanges Bridges Overpass Underpass	
Indicative draft project timeline	**Feasibility Study**	2021
	Detailed Design	2022
	ROW Acquisition	2023 H1
	Construction Period	2023 H2 to 2025
	Operation	2026

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS	3

1. Ang **Information, Education and Communication (IEC)** ay ang unang hakbang ng **Department of Public Works and Highways (DPWH)** upang maipaalam ang proyekto sa mga residente at opisyal ng bayan at barangay.

2. Magtatakda ng isang **Public Scoping** na iimbitahan ang mga residente, mga opisyal ng munisipyo, at iba pang stakeholders. Ito ay upang matukoy ang mga katanungan, isyu, opinyon, at saloobin ukol sa proyekto na siyang isa sa magiging basehan ng pag-aaral.

3. Ang **Amet-Asia Inc.** ay ikinomisyon ng **DPWH** upang magsagawa ng **Environmental Impact Assessment (EIA)**. Ang EIA ay isang pag-aaral sa kasalukuyang kondisyong ng kapaligiran (lupa, hangin, tubig, halaman, hayop at mga tao) upang matukoy ang posibleng maging epekto ng proyekto at makapag-handa ng kaukulang solusyon.

4. Ang resulta ng EIA ay idodokumento sa **Environmental Impact Statement (EIS).** Ito ay susuriin ng mga eksperto ng EMB-DENR.

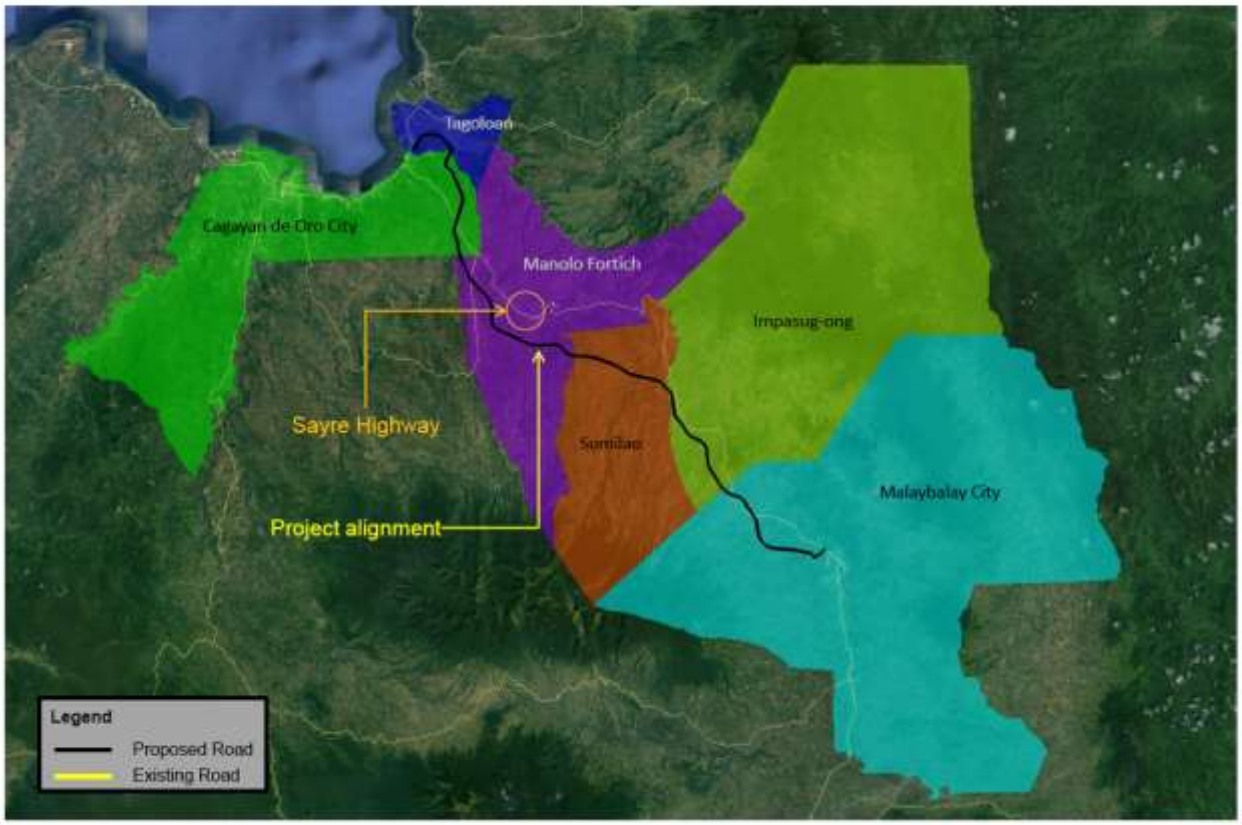
5. Base sa pagsusuri a naisagawa, ang EMB-DENR ay magdedesisyon kung ang proyekto ay bibigyan ng **Environmental Compliance Certificate (ECC).**

6. Kapag ang proyekto ay nabigyan ng ECC, ang **DPWH** ay magpapatuloy ng pag-apply ng iba pang permit at lisensiya mula sa ibang kawani at opisina ng DENR, ahensiya ng gobyerno, at lokal na pamahalaan.

7. Magbubuo ng **Multi-partite Monitoring Team (MMT)** upang mabantayan ang konstruksyun at operasyon ng proyekto at masigurado ang kaligtasan sa kapaligiran at sa pamayanan. Ang MMT ay bubuuin ng mga representante mula sa kumpanya, LGU, NGO, PO at EMB-DENR.

8. Ang DPWH ay magdedeposito sa bangko ng **Environmental Guarantee Fund (EGF)** para sumagot sa anumang aksidente o perwisyo sa pag-aari na direktang maidudulot ng Proyekto.

Proposed Project Alignment
"Iminumungkahing Alignment ng Proyekto"



Attachment 6. Summaries of the IEC proceedings

Municipality of Tagoloan

The Project brochures were given to the participants during registration. The program started at 2:00 PM and ended at 3:30 PM. The opening prayer given by Mr. Benecio Naduma, Purok Leader of Baluarte followed by the singing of the National Anthem led by Ms. Lucila Sabio, Office for the Senior Citizen's Affairs President. The opening remarks was given by Sharon Sabio, Chief Executive Officer of the Mayor. This was followed by the presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Region 10 office.

The presentation of the important features of the project was given by Dr. Nimfa L. Bracamonte and then the open forum followed. After the open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Maranda. The closing remarks given by Eng. Gene Baculpo from Municipal Planning and Development Office.

Cagayan de Oro City

The brochures were given to each of the participants during registration. The program started at 10:00 AM and ended at 11:40 AM. The opening prayer was given by Julie Pearl Curilan, a City Local Environment and Natural Resources Office (CLENRO) staff. This was followed by the singing of the National Anthem led by Ms. Shara Angelie (CLENRO staff). The opening remarks was given by Engr. Armen A. Cuenca (CLENRO, Head).

The presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Regional office followed. The presentation of the important features of the Project was given by Dr. Nimfa L. Bracamonte followed by open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Alma Maranda. Closing remarks was given by Mr. Ramir M. Balqwin from City Planning and Development Office.

Municipality of Manolo Fortich

The fliers were given to the participants during registration. The program started at 2: 00 PM and ended at 4:30 PM. The opening prayer was given by Datu Macabulig followed by the singing of the national anthem led by Ms. Jessica Anlagan. The opening remarks was given by Brgy. Councilor Warleo A. Goayon. The presentation of the participants and the Research Team along with two representatives (Ms. Jeannie Marban and Ms. Catherine Salingay) from the Planning Office of DPWH Regional office followed. The presentation of the important features of the Project by Dr. Nimfa L. Bracamonte ensued. Manolo Fortich Mayor Hon. Clive D. Quino accompanied by the Municipal Planning gave a brief message and appreciated the project as this will help ease the movement of people and goods. After the open forum that was facilitated by Dr. Bracamonte with the assistance of Dr. Maranda, the closing remarks was given by Municipal Environment and Natural Resources (MENRO) head, Ms. Sharon Tacbobo.

Municipality of Sumilao

The program started with registration and distribution of Project brochure. The program started at 10:00 AM with a prayer from Ms. Bae Ruti Toreno and the national anthem by Ms. Marife Modrangko. This was followed by the opening remarks by Barangay Captain of Poblacion Mr. Julius Cesar Tan. Prof. Embornas presented the Project information and then followed by the open forum where participants asked questions and provided suggestions for the Project. The closing remarks was given by the Barangay Captain Jose T. Curay from Barangay San Roque.

Municipality of Impasug-ong

Fliers were distributed to each of the participants during registration. The program started at 2:30 PM with the prayer led by Brgy. Councilor Abner Garcia from Brgy. Poblacion and national anthem conducted by Brgy. Councilor Ikee Quines. The opening remarks was given by Municipal Administrator, Mr. Ben Gabriel Uy. The project presentation was given by Prof. Embornas and the open forum followed with some questions and suggestions from the participants. The closing remarks was given by Barangay Captain Josefino Manalo of Brgy. Cawayan. The program ended at 4:00 PM.

Malaybalay City

The fliers were distributed to each of the participants during registration. The program started at 10:15 AM with the invocation led by Brgy. Councilor Francis Eddie Dagang from Brgy. 10 (Poblacion) followed by the national anthem led by Ms. Rita Gumita. The opening remarks was given by the Barangay Captain of Casisang Capt. Bonifacio Valiente who was positive about the project. Afterwards Prof. Embornas presented the project and the flow of the EIA. The open forum followed and then the closing remarks by the CENRO Valencia Representative Mr. Ferdie Sususcо.

Attachment 7. Summary of issues and responses during the IEC

Municipality of Tagoloan

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Municipality of Tagoloan Barangay - Casinglot - Natumolan	**Project Design** - Is this Project an elevated road? - There might be informal settlers who will inhabit the area down.	Engr. Gene Baculpo – Municipal Planning and Development Office	*Dr. Nimfa Bracamonte (Amet-Asia)* The Project is still in the feasibility stage and at this time.
	Necessity of the Project - Is it necessary to build another road and not contrary to other roads that are already congested? - Would it be recommendable that this be continuous to the existing road since once constructed there will be those who will be affected?	Mr. Rogelio – Casinglot Brgy. Councilor	*Ms. Catherine Salingay (DPWH R10)* - CMH is a high standard highway. There is a high-speed movement of vehicles with speed reaching 200 kph. - This will be useful as the existing road is not good for fast moving vehicles and there will be interchanges and connection of the roads.
	Project Timeline and Relocation - Where does the Project start? - If our house will be affected and we are not prepared, where should we go?	Mr. Nestor Baltazar - President of KASINLOP)	*Ms. Catherine Salingay (DPWH R10)* - There is no final engineering design yet. - There will be another team that will go and explain regarding the relocation.
	Presence of IP sacred places - Will there be royal grounds and sacred places that will be affected? - If yes, how can you prevent the impacts and what will be the last option?	Mr. Wendell - IP secretary	*Dr. Nimfa Bracamonte (Amet-Asia)* - The Project is still in the feasibility stage and at this time. The issues and concerns will be addressed in the public scoping - The proponent is aware of the IPRA Law, RA 7381 and FPIC. In case that there will be affected IPs, the proponent will apply for FPIC. - This project is not only culture- sensitive but also gender- sensitive.
	Compensation to the affected properties - What are the benefits that will be provided to those who are affected by loss of houses and lands? - Will you provide a relocation area?	OSCA Senior Citizen	*Dr. Nimfa Bracamonte (Amet-Asia)* - Any properties that will be affected by a development Project, they should be duly compensated based on current fair market value as embodied in the Philippine Constitution Article III, Section 9

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
			- Another team will be sent to the barangay and will determine the affected properties.
	Untitled Lands Compensation Most of those from the area does not possess a title to their respective properties.	Mr. Rogelio – Casinglot Brgy. Councilor	*Prof. Amabelle Embornas (Amet-Asia)* - There will be a team that will be sent to the area and negotiate regarding affected properties. - There is a memorandum order that even those without titles to their properties will still be compensated. - The proponent will assure you that they will follow the right process.
	Safety Most of us reside near traffic lights which is accident prone area. We have problems with precautions, it would be a prominent zone.	Mr. Rogelio – Casinglot Brgy. Councilor	*Engr. Angelita Balid (JICA Study Team)* - The proponent is proposing CMH because Sayre is an accident-prone highway with steep slopes - CMH will be designed with a gradient of 4-5% compared to Sayre with about 15% gradient which is more dangerous
	MMT and EGF - Is MMT part of the EIA? We are looking forward for the monitoring and evaluation. - The EGF will be coming from the DPWH?	Mr. Jeffrey – Sanguniang Kabataan Member	*Dr. Nimfa Bracamonte (Amet-Asia)* - MMT is part of the process. There is MMT not only from the public officials/ LGUs, but also with the stakeholders' participation. DPWH will also be part of the monitoring team - The proponent of the project is the DPWH in assistance with JICA.
	Comment - We are thankful with this project as this will have a big impact to Barangay Casinglot. - We have a plan identifying this as a growth area in the upper part. - This road will have big impact as this invites the investors	Engr. Gene Baculpo – Municipal Planning and Development Office	
	Others There is the road Malaiba, is it not part of DPWH?	Mr. Rogelio – Casinglot Brgy. Councilor	*Dr. Nimfa Bracamonte (Amet-Asia)* CMH is another highway, parallel to Sayre

Cagayan de Oro City

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Cagayan de Oro City Barangay - Bugo - Puerto - Balubal	**Compensation of Affected Properties** Is there a payment for the land, house and trees that will be affected by the Project?	Mr. Presley C. Emano – Brgy. Councilor, Bugo	*Dr. Nimfa Bracamonte (Amet-Asia)* Private properties that will be taken for public use should be done upon payment of just compensation (power of eminent domain) *Engr. Armen Cuenca (CLENRO)* There are 3 modes: through donation, negotiation or expropriation.
	Payment for Compensation of Properties Can compensation payment be done before the start of the Project?	Mr. Renante Rosalo – Brgy. Balubal Resident	*Mr. Armen Cuenca (CLENRO)* - Before the project implementation, the owner of the affected properties should already demand for payment. - The DPWH Contractors would not start the project unless there is consent from the owner of the properties - Based on experience, 50% would be paid in advance, and the remaining 50% would be paid after the property would be demolished. For the plants /trees affected, 30% would be paid in advance and the remaining 70% would be paid after the plants/trees will be cut.
	Duration of Payment for Compensation If ever the owner of the land/house/plants /trees will not be paid before the project will be implemented, how long will they be paid?	Mr. Renante Rosalo – Brgy. Balubal Resident	*Ms. Catherine Salingay (DPWH R10)* We are not really sure as to how long will the owner of the land/house/plants will be paid, but in our experience, I think it would be 5 years
	Benefits from the affected properties If ever even after the implementation of this project, the owner of the land/house/plants/ trees will suffer from flood, mud or water-soaked soil due to Project, what benefits would they receive?	Mr. Venido Payana- Barangay Puerto Staff	*Ms. Jan Bautista (Amet-Asia)* The ROW Team will make a report and based from their report will know the number of affected persons and how much will be paid for the damages incurred.

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
			Mr. Armen Cuenca (CLENRO) - EIA will include in the report the needed actions if ever the owner of the land will suffer from flood, mud or water-soaked soil after the project implementation - MMT will be responsible in monitoring the project implementation to avoid this occurrence to happen. - Even after due monitoring by the MMT, this still happens, Government Compensation Fund will be used to pay the affected owners.

Municipality of Manolo Fortich

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Municipality of Manolo Fortich Barangays: - Alae - San Miguel, Damilag - Diclum - Sankanan, Tankulan - Ticala, Mambatangan	**Project Design** Difference between the proposed highway and the 'Build, Build, Build' project of the government?	Mr. Warleo A. Goayon – Brgy. Councilor, Diclum	*Engr. Greg Dablo (DPWH R10)* - 'Build Build Build' is focused on construction of not just roads but also other buildings and more on civil works and structural. - It is the same because it is an implementing government projects
	Detailed Engineering Design Can we ask for specifics of the Project?	Mr. Chris Loren -Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - There is still no detailed design. The Project is still in the feasibility study phase, and the impact will be learned once the EIA is conducted.
	Ground Work/Soil Testing Why is soil testing commencing without properly informing the lot owners?	Mr. Joaquin L. Fudolin – Brgy. Councilor of San Miguel	*Mr. Paul Paraguya (EB Soil Testing Inc.)* - The soil testing group was granted permission by the father of the owner of the land. However, they are not aware that the land was already subdivided. - The purpose of the group is to identify the coordination grid points for the design/plan. - Mayor Quiňo and Brgy. Joaquin acknowledged the apology of Mr. Paraguya
	Oppositions of the Project What if there are oppositions in the specifics of the road like conflict in boundary and right of way?	Mr. Chris Loren -Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - The proponent will look at your issues and suggestions. - If there are issues that remain unresolved, there will be a public hearing which is a part of the whole process
	Presence of conflict/opposition - Will this project still be implemented if there are oppositions from the unconcerned people? - Will the issues/concerns of the affected people be considered?	Mr. Chris Loren -Public Information Officer of Manolo Fortich	*Dr. Nimfa Bracamonte (Amet-Asia)* - This project will follow the guidelines set by DAO 2017-15 and the PEISS. - If there are oppositions raised by concerned people, a public hearing will be conducted in the presence of appropriate government agencies.

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	Compensation of Properties to be affected What will be done to the affected houses and trees?	Datu of Sankanan	*Dr. Nimfa Bracamonte (Amet-Asia)* - According to 1987 Philippine Constitution, particularly in Section 7 of Article III, private properties that will be taken for public use should be done only upon payment of just compensation (power of eminent domain)
	FPIC Application Will this project procure the needed FPIC?	Mr. Datu Macabulig	*Dr. Nimfa Bracamonte (Amet-Asia)* - If the detailed design will affect the CADT/CADC of the cultural communities, definitely yes. - This is still the initial phase of the feasibility study
	Political change of administration There should be proper communication channel during transition if case there is a political change of admin for the proper project implementation.	Damulag Public Information Officer	*Dr. Nimfa Bracamonte (Amet-Asia)* The Project will go through proper procedures where transparency and due courtesy will be conducted in coordination with the LGU concerned during project implementation.
	Existing government projects that might be affected If the irrigation project will be affected, what should be done?	Ms. Elyiza Orap, SEA Irrigators	*Dr. Nimfa Bracamonte (Amet-Asia)* There should be due courtesy with DPWH to the municipality regarding the plans of the project.
	Construction waste - Problem with hired contractors whose diggings and excavations of soil are carelessly thrown elsewhere. - Arbitrarily throwing of cut/fallen trees - a behavior problem	Ms. Sharon Tacbol, MENRO Staff	*Dr. Nimfa Bracamonte (Amet-Asia)* Hired contractors will coordinate with LGU in terms of proper waste disposal, spoil area, and taking care of environment.
	Suggestion - The project is good and we need to go through the process. - If the project is good, we support it. - If there are areas which will be affected with CADT or CADC we should respect them. - The public should be made to understand about the processes involved in this project	Hon. Mayo Clive Quiňo – Manolo Fortich Mayor	*Dr. Nimfa Bracamonte (Amet-Asia)* - If the cultural communities will be affected the FPIC will be undertaken. - There will be a public scoping which will present the EIA process in detail and the impacts of the Project. - The IEC is to inform the public about the plan of the Central Mindanao High Standard Highway project and gather various issues/concerns.

Municipality of Sumilao

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Municipality of Sumilao Barangays: - Culasi - Kisolon Poblacion Puntian - San Roque	**Project purpose** What is the main objective of this project since there is already an existing road from Cagayan de Oro to Malaybalay?	Mr. Gemmo Olana – Brgy. Councilor, Kisolon	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* The Project aims to increase the speed of travel from Cagayan de Oro to Malaybalay.
	Issuance of toll fee Will there be a toll fee for this road?	Mr. Daloais Silvestre – Brgy. Captain, Kulasi	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The project is still in the feasibility stage. - The establishment of toll fee will still be studied.
	Suggestion - There is a circumferential road to Dahilayan, why not connect these roads? So the roads are connected and it will not be cut since some barangays are not included in the project. - Why not connect the road from Mutia to Likuan?	Mr. Gemmo Olana – Brgy. Councilor, Kisolon	*Engr. Greg Dablo (DPWH R10)* Based on the alignment, the Sayre Highway Parallel Road 1 will be the one connected to Dahilayan.
	Environmental considerations - Can the project consider the landslide prone areas such as in San Vicente in Maluko? They built a road but there is always landslide. - Why don't they build a tunnel under the mountains to make the road straight instead of curved?	Mr. Jerome Cagawas – Brgy. Councilor, Poblacion	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The project is still in the feasibility stage. - The suggestion is duly noted.
	Consent to the IPs - Before anyone from the Proponent will go to the area, they should contact the IPs and seek consent to enter the area especially the Chieftain and Municipal IPMR. - The proponent should also ask for local IP guides in the area so to avoid the sacred places and other dangerous areas	Mr. Anliston Rosaliad – Tribal Secretary, Cultural Sector	*Engr. Greg Dablo (DPWH R10)* - The team will follow the protocol in informing the LGU and Barangay Captains before entering the area. *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The team will also seek the consent of the IPs/ tribal sector before entering the area.

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	Participation in the project We are in San Vicente and far from the project. What is our participation in this project?	Paterno Tuminlag – Brgy. Captain, San Vicente	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We are informing the public about the new project. - We are making the IPs and everyone aware of this project in Sumilao.
	Informing affected landowners and compensation - How will you inform the affected landowners/ people? - Will they be receiving compensation?	Nolandf Caramonte, Brgy. Councilor, San Roque	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The scheme about the land affected will be attended by another team the Right-of-Way Action Plan team. - There will be another consultation/ negotiation about this.

Municipality of Impasug-ong

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Municipality of Impasug-ong Barangays: Capitan Bayong Cawayan Impalutao La Fortuna Poblacion	**Rationale of the Project** - Why is the project established in Bukidnon? What are the reasons? - There many roads established here	Mr. Romeo Abunda Sr. - Brgy. Councilor, Impalutao	*Engr. Greg Dablo (DPWH R10)* - There are existing roads in Bukidnon but they are not high standard highways. - A high standard highway can make travelling faster since the roads allow for faster movement of vehicles. - Bukidnon is seen as an area for economic growth and there is a need to improve the connectivity of Bukidnon and Cagayan de Oro. *Ms. Jan Bautista (Amet-Asia)* - There is an existing road (Sayre) but not a high standard highway *Engr. Angelita Balid (JICA Study Team)* - Malaybalay has a high potential of attracting traffic - The existing roads are designed with slow mobility
	Inclusion of hinterlands in road alignment - Can other barangays be included in the highway project. - The proposed Project is near the national highway but those in the hinterland do not have roads?	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Engr. Maria Victoria Lofamia (DPWH ESSD)* - There were several considerations – social, environmental, and economic. - The project will still undergo further study for the final alignment.
	Road alignment - Will this road connect to other existing roads or is this different?	Mr. Emmanuel Lumayod – MENRO Staff	*Engr. Greg Dablo (DPWH R10)* - This Project is different. - There will be interchanges in the project which will allow connection of the different roads.
	Changes of Alignment - There were projects in the past which the alignment presented is different to the one that is implemented and we are not informed in the re-alignment. - We want a clear alignment so people will know who will be affected.	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - This is still the FS stage and finalization of the detailed design will still undergo more studies and discussion. - If there will be changes in the alignment it will not be very far from what is presented here. - Right of Way Action Plan team will present the scheme for land acquisition compensation.

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	LGU Resolutions for the request of re-alignment - The municipality have a resolution (Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021) for the road to traverse other barangays and include other barangays in the topographic survey **(**Attachment 9. Impasugong Resolution No. 2121-381 (A) and Municipal Development Council Resolution No. 005 S. 2021 - The is requested for the need of roads and also for the peace and order situation in the area.	Municipal LGUs	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* This is duly noted and will inform the proponent about this.
	Toll fee Issuance Will this project also require the users to pay toll fee?	Mr. Arnel Garcia – Brgy. Councilor Poblacion	*Engr. Angelita Balid (JICA Study Team)* - This is still the Feasibility Study stage. - Toll or Non-toll will still be studied during the detailed design stage
	Measurement of highway What is the measurement of the highway, so the people will know especially those who will be affected?	Mr. Diomedes Tunasan – Brgy/ Kagawad Poblacion	*Engr. Maria Victoria Lofamia (DPWH ESSD)* - The road alignment is still in FS stage - There will be a detailed design in which analytical study has been conducted for the finality of the road alignment. *Engr. Greg Dablo (DPWH R10)* - The road will be 65.6 km and 60 meters wide including the canal and shoulder. - The details are not yet final and would still undergo further studies.
	Presence of sacred lands There might be sacred land affected by the project.	Mr. Arnel Garcia – Brgy. Councilor Poblacion	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - The Project is still in the feasibility stage - In case that there will be CADT/CADC affected, FPIC process will be undertaken. This is a separate process.

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	Compensation for affected properties - If the house or lot is affected by the Project, will there be payment? - What is the process of just compensation to those affected?	Mr. Nicasio Llamoso – Brgy. Councilor, Impalutao	*Engr. Greg Dablo (DPWH R10)* and *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - RAP team will assess the affected property and there will be a consultation/ negotiation about this. - RAP is a separate process and another team will come for this activity. - There will be just compensation to those properties that will be affected - This is the next process if the alignment is finalized during the detailed engineering design.
	Compensation to untitled lands - Impasug-ong is 82% timberland and people do not have land titles or there is no proof of ownership. What will happen to them? - What will happen to those who have planted trees and have made improvements?	Mr. Arnel Garcia – Brgy. Councilor, Poblacion	*Engr. Greg Dablo (DPWH R10)* - There will be a RAP team that will coordinate to the affected owners - There will be negotiation on just compensation for the affected areas.

Malaybalay City

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
Malaybalay City Barangay 10, Dalwangan, Kalasungay, Patpat, Sumpong	**Project Fund** What is this project, grant or loan from JICA?	Mr. Rodrigo O. Niere, Brgy. Captain, Kalasungay	*Engr. Angelita Balid (JICA Study Team)* - This is an assistance from JICA in the FS part. But the project construction will be discussed further whether it will be a grant or a loan. - Detailed design and Feasibility study would depend on the study result if it is going to be a loan project
	Issue of Eminent Domain - What is the process of just compensation? - We experienced before where the owners were not paid. They had to file a case or file a legal action before they were paid.	Mr. Nilo Salga, Brgy. Captain, Patpat	*Ms. Michiko Quiachon (DPWH-ESSD)* - There will be a report called Right of Way Action Plan which will cover the affected persons, what properties will be affected and the payment scheme for their compensation. - The RAP team is currently coordinating with the LGUs and the Mayors and explain about these things. - There will be a survey to know about the details of the properties which will be affected. - This is the next process if the alignment is finalized during the detailed engineering design. - There is discussion/ consultation between the landowners and the proponent before the project starts. - We will comply with the provisions of RA 10752 *Engr. Angelita Balid (JICA Study Team)* There is a separate group for RAP *Engr. Maria Victoria Lofamia (DPWH ESSD)* The Project is still in the feasibility stage.
	Property demolition and payment - Will DPWH help to demolish the people's houses as these are mostly poor people who cannot afford to do so? - The affected people should be relocated or paid first before the demolition.	Mr. Nilo Salga, Brgy. Captain, Patpat	*Engr. Greg Dablo (DPWH R10)* - The suggested guidelines for the contractor include coordinating with the affected house owners in the demolition. - This can also be discussed in the Right of Way Action Plan between the landowners/house owners and the proponent.
	Informing affected property owners	Mr. Rodrigo O. Niere, Brgy.	*Engr. Greg Dablo (DPWH R10)*

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	- You should inform affected land owners, especially those with conflict regarding ownership. - During this stage, the property owners should already know.	Captain, Kalasungay	The project is still in the feasibility stage there is a possibility of the change of alignment *Prof. Amabelle Embornas (Amet-Asia, Inc.)* - A separate team will come in. They will be the one who will inform the affected lands and houses - There should be just compensation based on RA 10752
	FPIC Issue The FPIC should be followed for those with CADT or CADC areas.	Mr. Rodrigo O. Niere, Brgy. Captain, Kalasungay	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - Those with CADT and CADC lands that will be affected will be consulted and this process will also be followed by DPWH and JICA. - This is a separate study from the EIS
	Coordination between Regional and District DPWH There should be coordination of the regional and district DPWH about the projects they are implementing.	Mr. Adiran Gamboa - City Planning and Development Coordinator	*Engr. Greg Dablo (DPWH R10)* This is noted and will be reported to DPWH.
	Coordination with LGU - Local planning councils should be informed before the project begins - We are updating our CLUP and we want to know about the projects so we can incorporate this.	Mr. Adiran Gamboa - City Planning and Development Coordinator	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We will take note of all the suggestions and recommendations from the LGU and submit a report to the proponent
	Affected Trees - To consider the areas where the protected trees can be avoided - Previous projects have disregarded and did not consider first with the local government. There is no coordination between the agencies. - Request for inventory before the project - There is also a need to clarify the cut and field. DENR clearance before the start of	Mr. Ferdie Sususco – DENR PENRO	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* We will take note of the concerns and make a report to the proponent

LGU covered	Issues/Suggestions raised by stakeholder	Sector or Representative	Response
	the project.		
	LGU Endorsement Endorsement by the concerned barangays and LGU needs to be acquired.	Mr. Nilo Salga - Brgy. Captain, Patpat	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - This is noted as part of the process.
	Change of the name of Barangay Lapu-lapu to Patpat - Please change the barangay name of Lapu-Lapu to Patpat - Lapu-Lapu is not yet recognized as a barangay	Mr. Nilo Salga - Brgy. Captain, Patpat	*Prof. Amabelle Embornas (Amet-Asia, Inc.)* - We will edit the powerpoint presentation. - The invitation letters were addressed to Brgy. Patpat

Attachment 8. Public scoping program

Tagoloan, Misamis Oriental

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	May 28, 2021, 10:00 AM
Venue/Address:	Casinglot Barangay Hall Multipurpose Hall and Natumolan Barangay Multipurpose Hall, Tagoloan, Misamis Oriental

Time	**Program of Activities**	**Person Responsible**
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Brgy. Kag. Richard Pilin Brgy. Casinglot
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Brgy. Capt. Marlo Bolanio Brgy. Casinglot
10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Engr. Rowena Dorato EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Brgy. Kag. Marivic Ajon Brgy. Casinglot

Cagayan de Oro City, Misamis Oriental

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	May 31, 2021, 10:00 AM
Venue/Address:	Bugo Covered Court, Bugo, Cagayan de Oro, Misamis Oriental

Time	**Program of Activities**	**Person Responsible**
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Mr. Charlo Badal Brgy. Bugo
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Brgy. Kag. Presly Emano Brgy. Bugo

10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Atty. Abbas I. Lao EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Brgy. Kag. Ariel Igot Brgy. Bugo

Manolo Fortich, Bukidnon

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	June 1, 2021, 10:00 AM
Venue/Address:	BRFI Dicklum, Manolo Fortich, Bukidnon

Time	**Program of Activities**	**Person Responsible**
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Datu Cresinod Guhaynon Brgy. Tankulan, IPMR
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Mr. Danny Salvador Head, Municipal Assessor Office
10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Atty. Abbas I. Lao EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Mr. Danny Salvador Head, Municipal Assessor Office

Sumilao, Bukidnon

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	June 2, 2021, 10:00 AM
Venue/Address:	2nd Fl., New Bldg., Sumilao Municipal Hall, Bukidnon

Time	Program of Activities	Person Responsible
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Brgy. Capt. Roanld Caramonte Brgy. Vista Villa
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Brgy. Kag. Dominador Del Rosario Brgy. Kisolon
10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Atty. Abbas I. Lao EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Brgy. Capt. Gilbert Mamatan Brgy. Culasi

Malaybalay, Bukidnon

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	June 3, 2021, 10:00 AM
Venue/Address:	People's Hall, 2nd Floor, New City Hall, Malaybalay City, Bukidnon

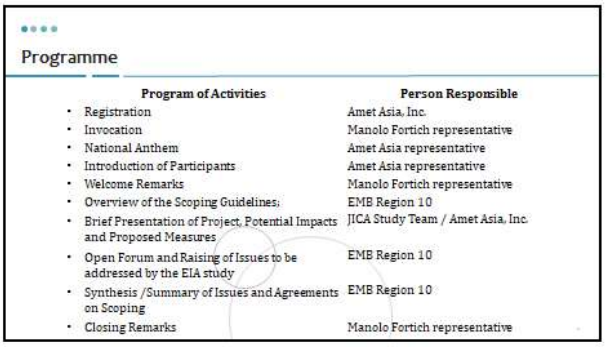
Time	Program of Activities	Person Responsible
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Video Presentation
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Vice Mayor Atty. Warren Pabillaran LGU Malaybalay
10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Atty. Abbas I. Lao EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Ms. Arbel Sulinay KADIMA Kalasungay

Impasug-ong, Bukidnon

Project Title:	Proposed Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)
Project Location:	Provinces of Misamis Oriental & Bukidnon
Project Proponent:	Department of Public Works and Highways (Central Office) through the assistance of Japan International Cooperation Agency (JICA)
Date and Time:	June 1, 2021, 10:00 AM
Venue/Address:	Function Hall, Capitan Bayong, Impasug-ong, Bukidnon

Time	Program of Activities	Person Responsible
9:30 am-10:00 am	Registration	
10:00 – 10:10 am	Invocation	Video Presentation
	National Anthem	Video presentation
10:10 – 10:15 am	Acknowledgement of Participants	Dr. Nimfa Bracamonte Amet-Asia, Inc.
10:15 – 10:20 am	Welcome Remarks and Message	Brgy. Kap. Dawn Roque Brgy. Capitan Bayong
10:20 – 10:30 am	Overview of EIA and Scoping; Mechanics of Scoping for the Project	Engr. Nonette Atasan EMB Region 10
10:30 – 10:40 am	Brief Presentation of the Proposed Project	Engr. Angelita Balid JICA Study Team
10:40 – 10:50 am	Presentation of Potential Impacts and Measures	Ms. Patricia Erika Marie Lim, En.P Amet-Asia, Inc.
10:50 – 11:50 am	Open Forum	Atty. Abbas I. Lao EMB Region 10
11:50 am - 12:00 pm	Closing Remarks	Brgy. Capt. Generaldo Galambo Brgy. Capitan Bayong

Attachment 9. Public scoping presentation



Program of Activities	Person Responsible
Registration	Amet Asia, Inc.
Invocation	Manolo Fortich representative
National Anthem	Amet Asia representative
Introduction of Participants	Amet Asia representative
Welcome Remarks	Manolo Fortich representative
Overview of the Scoping Guidelines;	EMB Region 10
Brief Presentation of Project, Potential Impacts and Proposed Measures	JICA Study Team / Amet Asia, Inc.
Open Forum and Raising of Issues to be addressed by the EIA study	EMB Region 10
Synthesis /Summary of Issues and Agreements on Scoping	EMB Region 10
Closing Remarks	Manolo Fortich representative

Overview of the Scoping Guidelines; Mechanics of the Scoping for the project

EMB Region 10

Brief Presentation of the Proposed Project

Amet Asia, Inc

EIA PUBLIC SCOPING

MAY 2021

CENTRAL MINDANAO HIGH (CMH) STANDARD HIGHWAY CONSTRUCTION PROJECT

CAGAYAN DE ORO – MALAYBALAY SECTION

CONTENTS

1. Proponent Information
2. Project Information
3. Project Rationale
4. Project Location
5. Project Background
6. Alternative Alignment Study
7. Project Impact Area
8. Project Coverage
9. Project Components
10. Photographs of the PS
11. Project Benefits
12. Project Implementation Schedule
13. Potential Project Impacts and Mitigation

PROPONENT INFORMATION

Proponent:
Department of Public Works and Highways (DPWH) – Central Office

With the assistance of:
Japan International Cooperation Agency (JICA)

Environmental Consultant:
Amet Asia Inc.

PROJECT RATIONALE

- Mindanao lagged in terms of economic and infrastructure development due to peace and security issues
- Economic development seen to accelerate after comprehensive peace agreement with armed groups
- Infrastructure development crucial to attaining inclusive and sustainable economic growth
- Proposed project expected to improve the road transport network in Mindanao
- Improve the economic situation of surrounding municipalities

PROJECT INFORMATION

Project Name:
Central Mindanao High Standard Highway Project (CDO - Malaybalay Section)

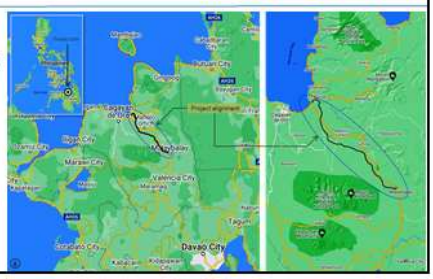
Length: **65.6 km**
Number of Lanes: **2 or 4**
Road Right-of-Way: **60 meters**
Construction phase: **2.5 years**
Manpower requirements: Approximately **50,000** during construction
Indicative Project Cost: Approximately **PhP70 Billion**

PROJECT LOCATION

Cities & Municipalities:
Cagayan de Oro City, Tagoloan, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay City

Provinces:
Misamis Oriental & Bukidnon

Region:
Region X
(Northern Mindanao)

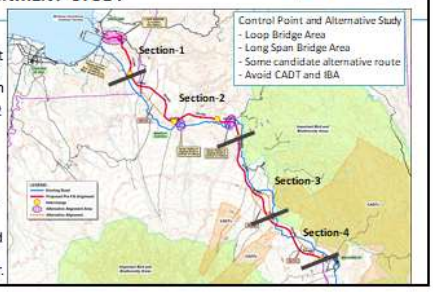


PROJECT BACKGROUND

- CMH is a high Priority Project chosen from amongst the four (4) priority Pre-Feasibility Projects from the Phase II of the Master Plan on High Standard Highway Network Development which started in March 2019.
- A Pre-Feasibility Study of the Central Mindanao Highway which was conducted last March 2020 has proposed an alignment which was presented in a series of Stakeholders Meetings last February 2021.
- We are now at the Feasibility Stage, where we carefully studied the alternative alignments minimizing environmental impacts and avoiding CADT and IBA, and above all, to have a high standard highway design
- **Goal: Improving the transport efficiency of the region.**

ALTERNATIVE ALIGNMENT STUDY

- There is a zigzag section on the current Sayre Highway, which is the biggest problem
- This section is about 2 km, but you have to climb 150 m
- Gradient of 10% or more is continuous, and sharp curves are likewise continuous
- As a result, low-speed driving is forced and traffic accidents occur.



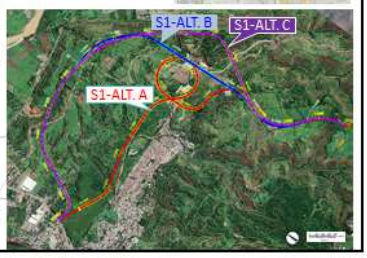
Alternative Alignment Section-1

Three route alternatives from Cagayan de Oro (CDO) to the IC (about 12 km)

S1-Alt. A
- A loop bridge goes up about 100m high from the ground, keeping not over vertical gradient, 4%.
- Longitudinal curved line becomes longer (R=320m), giving the low drivability.
- Superstructure of bridge is with steel elements and needs to be supported on 100m high or taller piers, not much cost effective and technically unfavored.

S1-Alt. B
- A long span bridge includes steel box girder (L=1.4km) and prestressed concrete box girder (L=0.2km) in length.
- Steel typed bridge costs higher than prestressed concrete bridge
- Steel box girder bridge accounts for over 80%, so it increases construction cost.

S1-Alt. C (Recommend)
- A long span bridge includes steel box girder (L=0.8km) and prestressed concrete girder (L=0.8km)
- More cost-effective than S1-ALT.B.



Comparison of Alternative Alignments at Section 1

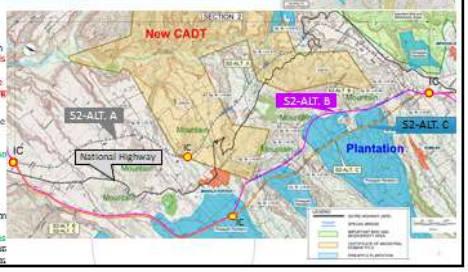
Main item1	S1-ALT. A		S1-ALT. B		S1-ALT. C	
Length (km)	12.0 km	-	11.7 km	-	12.0 km	-
Drivability and Detour rate (r)	1.8 km long horizontal curve section, r=140.3%	3.0	1.8 km long horizontal curve section, r=136.8%	5.5	No horizontal curve section, r=140.3%	5.0
Traffic vol. and Travel time	16,500 veh/day and 9.0min	10.0	16,500 veh/day and 8.78 min	10.0	16,500 veh/day and 9.0 min	10.0
Project Cost (mil.peso)	38,693	22.4	28,754	30.1	24,761	35.0
Environment	1.0 km long high-cut section, a river crossing and 53% forest affected	8.5	1.1 km long high-cut section, a river crossing and 56% forest affected	8.5	1.2 km long high-cut section, a river crossing and 58% forest affected	8.5
Social	28% agriculture section and 54 houses affected.	14.0	27% agriculture section and 32 houses affected.	16.0	25% agriculture section and 32 houses affected.	16.0
Constructability	Bridge L=4.3km	2.0	Bridge L=2.8km	5.0	Bridge L=2.7km	5.0
Total		59.9		75.1	**Recommended**	**79.5**

Alternative Alignment Section-2

ALT. A (planned in the Pre-F/S) is the northbound route not much far away from the existing road, passing through parts of CADT. However, this is *excluded* from the route evaluation because this route does not comply with avoiding CADT.

ALT. B is the southbound route relatively stretching far away from the existing road and avoiding mountains and urban areas as well as CADT but needs to pass through some plantation areas.

ALT. C is also the southbound route going rather straighter on the flat terrain and avoiding mountains and urban areas as well as CADT but needs to pass through some plantation areas.

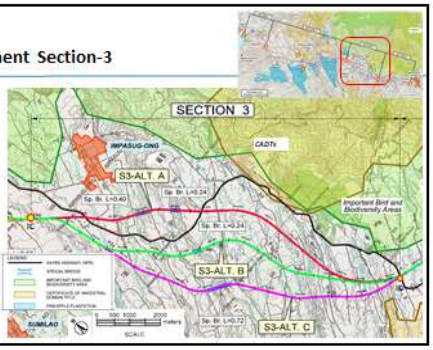


Comparison of Alternative Alignments at Section 2

Main item	S2-ALT. A		S2-ALT. B		S2-ALT. C	
Length (km)	31.3 km	-	30.7 km	-	29.8 km	-
Drivability and Detour rate (r)	Less than 4% vert. gradient, r=72.9%	-	Relatively flat, r=71.4%	8.0	Relatively flat, r=69.4%	8.5
Traffic vol. and Travel time	17,700 veh/day and 23.81 min	-	18,000 veh/day and 23.35 min	9.8	18,500 veh/day and 22.72 min	10.0
Project Cost (mil.peso)	22,559	-	25,514	30.9	25,515	30.9
Environment	No high cut section, 15 river crossings and 18% forest affected	-	2.2 km long high cut section, 18 river crossings and 23% forest affected	8.2	0.8 km long high cut section, 18 river crossings and 21% forest affected	10.2
Social	75% agriculture section and 98 houses affected.	-	72% agriculture section and 61 houses affected.	10.5	74% agriculture section and 72 houses affected.	9.5
Constructability	3 long-span bridges (> L=300m)	-	Bridge L=5.9 km	0.0	Bridge L=5.8 km	0.0
Total				67.4	**Recommended**	**69.1**

Alternative Alignment Section-3

- **ALT. A** is going through the existing road and laid out in less curved direction, avoiding IBA and CADT areas.
- **ALT. B** is moving to the south from the existing road, which was presented in the Pre-F/S with the purpose of improving the accessibility from the southern region.
- **ALT. C** is laid out to go further southbound from the existing road and improve the accessibility to the southern region.



Comparison of Alternative Alignments at Section 3

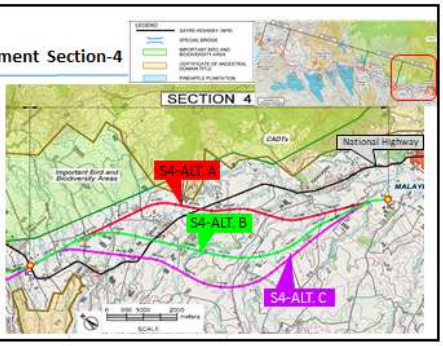
Main item	S3-ALT. A		S3-ALT. B		S3-ALT. C	
Length (km)	12.5 km	-	12.5 km	-	12.6 km	-
Drivability and Detour rate (r)	Good, r=79.9%	9.0	Good, r=79.5%	9.0	Good, r=80.3%	8.5
Traffic vol. and Travel time	17,400 veh/day and 9.52 min	10.0	17,400 veh/day and 9.48 min	10.0	17,400 veh/day and 9.59 min	10.0
Project Cost (Mil. peso)	10,358	30.7	9,092	35.0	11,884	26.8
Environment	2.0 km long high-cut section, 16 river crossings and 22% forest affected	9.0	No high-cut section, 22 river crossings and 11% forest affected	13.1	No high-cut section, 21 river crossings and 17% forest affected	13.3
Social	75% agriculture section and 16 houses affected.	15.5	84% agriculture section and 49 houses affected.	12.0	82% agriculture section and 25 houses affected.	13.0
Constructability	Bridge L=2.6 km	5.0	Bridge L=2.6 km	2.0	Bridge L=4.4km	2.0
Total		79.2	**Recommended**	**84.1**		74.6

Alternative Alignment Section-4

ALT. A is going straight along with the boundary of IBA and CADT and then crossing the existing road.

ALT. B is making a detour south and going through the existing road, as planned in the Pre-F/S.

ALT. C is making a detour south further and curving gently down to the terrain.



Comparison of Alternative Alignments at Section 4

Main Item	S4-ALT. A		S4-ALT. B		S4-ALT. C	
Length (km)	10.6 km	-	10.8 km	-	11.3 km	-
Drivability and Detour rate (r)	Good, r=78.9%	9.0	Good, r=80.4%	8.5	Good, r=84%	8.5
Traffic vol. and Travel time	17,100 veh/day and 8.06 min	10.0	17,000 veh/day and 8.17 min	9.9	16,800 veh/day and 8.56 min	9.6
Project Cost (Mil.peso)	9,681	27.7	8,358	32.0	7,651	35.0
Environment	No high-cut section, 22 river crossings and 13% forest affected	12.7	No high-cut section, 14 river crossings and 18% forest affected	14.5	0.2 km long high-cut section, 15 river crossings and 15% forest affected	13.2
Social	84% agriculture section and 15 houses affected	15.0	78% agriculture section and 12 houses affected	15.5	77% agriculture section and 8 houses affected	16.5
Constructability	Medium-size bridge section (L=3.7 km)	3.0	Medium-size bridge section (L=2.9 km)	5.0	Medium-size bridge section (L=1.9 km)	7.0
Total		77.3		85.4	Recommended	89.8

SUMMARY OF ALIGNMENT STUDY

The selected alternative route is passing toward the southward in the total length of **65.6 km** and having 161 houses in total affected to be relocated.

PROJECT IMPACT AREA

DAO 2003-30

- **Direct Impact Area (DIA)**
  65.6-kilometer alignment
- **Direct Impact Barangay (DIB)**
  30 barangays
- **Indirect Impact Area (IIA)**
  Initially assumed as areas within one kilometer (1km) from the center of the alignment

PROJECT COVERAGE

Jurisdictions:

- **Tagaloan** (2)
  Barangays Casinglot, Natumolan
- **CDO** (3)
  Barangays Bugo, Puerto, Balubal
- **Manolo Fortich** (8)
  Barangays Alae, San Miguel, Damilag, Didum, Sankanan, Tankulan, Ticala, Mambatangan

PROJECT COVERAGE

Jurisdictions:

- **Sumilao** (6)
  Barangays Puntian, Villa Vista, Culasi, Poblacion, Kisolon, San Roque
- **Impasug-ong** (6)
  Barangays Poblacion, La Fortuna, Cawayan, Kibenton, Capitan Bayong, Impalutao
- **Malaybalay** (5)
  Barangays Lapu-Lapu, Kalasungay, Dalwangan, Brgy. 10, Sumpong

PROJECT COMPONENTS

Component	Number
AASHTO Girder	32
Steel Bridge	3
Steel Box Girder	6
Underpass	13
Overpass	14
Interchange	5

AASHTO Girder

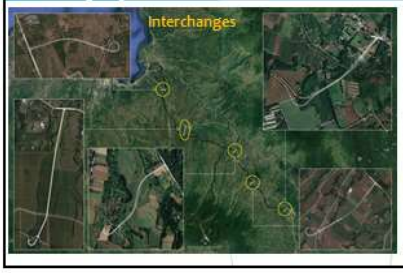
Steel Bridge

Steel Box Girder

Overpass & Underpass

Interchange

PROJECT COMPONENTS



Five (5) interchanges to be located near urban centers

PHOTOGRAPHS OF THE PROJECT SITE

PHOTOGRAPHS OF THE PROJECT SITE

PROJECT BENEFITS

- Employment opportunities
- Economic growth
- Alternative route during road closures of existing routes
- Access to surrounding areas
- Reduced travel time
- Road safety
- Comfortable travel

PROJECT IMPLEMENTATION SCHEDULE

Year	2021	2022	2023	2024	2025
Feasibility Study					
Detailed Design					
ROW Acquisition					
Road Construction					

Brief Presentation of Potential Impacts and Measures

Amet Asia, Inc.
EIA Consultant

ENVIRONMENTAL ASPECT

Potential Project Impacts & Mitigation
- ✓Pre-Construction Phase
- ✓Construction Phase
- ✓Operation and Maintenance Phase

POTENTIAL PROJECT IMPACTS & MITIGATION (*Pre-Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Land Use and Classification	Compatibility with existing land use	Secure zoning clearances from LGUs
	Compatibility with classification as an ECA	Consider ECAs in the Detailed Engineering Design (DED) phase
	Land tenure issue/s	- Conduct parcellary survey - Prepare a Property Compensation Plan (PCP)
	Impairment of visual aesthetics	Prepare a Buffer Zone Plan (BZP)
	Devaluation of land value due to improper solid waste management	Prepare the following: - Spoils Management Plan (SMP) - Construction Waste Management Plan (CWMP) - Road Debris and Waste Removal Plan (RDWRP) - Road Maintenance Waste Management Plan (RMWMP)

POTENTIAL PROJECT IMPACTS & MITIGATION (*Pre-Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Geology/ Geomorphology	Change in surface landform and geomorphology	- Consider smallest changes possible during the DED - Prepare a Slope Protection Plan (SPP)
	Change in sub-surface geomorphology	Conduct Geotechnical Investigation and consider its recommendations during the DED
	Inducement of geo-hazards	
	Geo-, hydrological, and meteorological hazards	Include susceptibility of the Project site to geo- and hydrological hazards at the DED
Pedology	Soil erosion	Prepare a Soil Erosion Management Plan (SEMP)

POTENTIAL PROJECT IMPACTS & MITIGATION (*Pre-Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Terrestrial ecology	- Vegetation removal and loss of habitat - Threat to existence and loss of important local species - Threat to abundance, frequency and distribution of important species - Hindrance to wildlife access	- Complete census of flora and fauna at the RROW - Consider locations of significant vegetation types and populations during DED - Secure a Tree Cutting Permit from the DENR - Prepare the following: ▪ Construction Vegetation Removal Plan (VRP) ▪ Construction Vegetation and Tree Planting Program (CVTPP) ▪ Tree Transfer and Balling Plan (TTBP) for affected mature trees ▪ Tree Survival and Monitoring Plan (TSMP) ▪ Vegetation and Tree Planting Program during Operations (VTPPO) ▪ Biodiversity Conservation Plan (BCP) ▪ Prepare a Wildlife Monitoring Plan (WMP)

POTENTIAL PROJECT IMPACTS & MITIGATION (*Pre-Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Displacement of settlers, property, and access	- Displacement or disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on public access	- Prepare a Property Compensation Plan (PCP) - Prepare Resettlement Action Plan (RAP)
In-migration	Proliferation of informal settlers	Prepare an Informal Settler Monitoring and Management Plan (ISMMP)
Physical cultural resources	Impacts on physical cultural resources	Prepare a Chance Find Management Plan (CFMP)
Public health and safety	Threat to public health and safety	Prepare a Construction Health and Safety Plan (CHSP) and Road Safety Plan (RSP)

POTENTIAL PROJECT IMPACTS & MITIGATION (*Pre-Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Benefits from the project	Enhancement of employment and livelihood opportunities Movement of people/goods Existence of road structures	Prepare a Local Community Hiring Plan for (LCHP)
Traffic	Traffic congestion	Prepare a Traffic Management Plan (TMP)

POTENTIAL PROJECT IMPACTS & MITIGATION (*Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Land Use and Classification	Impairment of visual aesthetics Devaluation of land value due to improper solid waste management	Proper implementation of the Construction Plan and BZP Proper implementation of the Construction Plan and CWMP
Geology/ Geomorphology	- Change in surface landform and geomorphology - Change in sub-surface geology - Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc. - Effects of geo- and hydrological hazards - Soil erosion	- Proper implementation of the Construction Plan - Proper implementation of the Construction Plan, SEMP, SMP, and SPP
Pedology	Change in soil quality or fertility	- Proper implementation of the Construction Plan, SEMP, SMP, and CWMP - Provide oil sumps in staging areas - Proper storage and disposal of used oil and other hazardous wastes in staging areas and active construction sites
Terrestrial ecology	- Vegetation removal and loss of habitat - Threat to existence and loss of important local species - Threat to abundance, frequency and distribution of important species - Hindrance to wildlife access	- Proper implementation of the Construction Plan, CVRP, CVTPP, BZP, and TTBP - Proper compliance to Tree Cutting Permit conditions - Strict implementation of a "*No Hunting and No Collecting*" policy - Limit the development activities within the RROW.

POTENTIAL PROJECT IMPACTS & MITIGATION (*Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Hydrology/ Hydrogeology	- Change in drainage morphology - Inducement of flooding - Depletion of water resources - Water use competition	- Proper implementation of the Construction Plan - Provide temporary drainage system - Provide detention ponds in the immediate drainage - Formulate a Flood Management Plan (FMP) for the operation phase - Implement water conservation measures
Water quality	Degradation of surface water quality	- Proper implementation of the Construction Plan - Housekeeping practices - Provide onsite sanitary facilities at the staging areas - Provide adequate drainage leading to silation ponds
Freshwater ecology	- Threat to existence and loss of important local species and habitat - Threat to abundance, frequency & distribution of species	- Proper implementation of the Construction Plan, CWMP, SMP, and SEMP - Provide cover, bunds, and drainage canal leading to silt ponds - Provide onsite sanitation facilities at the staging areas - Provide cover on vehicles carrying construction materials - Provide oil sumps in staging areas - Proper storage and disposal of used oil and other hazardous wastes in staging areas and active construction sites

POTENTIAL PROJECT IMPACTS & MITIGATION (*Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Meteorology/ Climatology	Change in micro climate due to greenhouse gas emissions	- Proper implementation of the Construction Plan - Regular and proper maintenance of motor vehicles and heavy equipment - Optimize schedule of vehicle use - Regular and proper maintenance of onsite power generators
Air Quality (& Noise)	Degradation of air quality	- Proper implementation of the Construction Plan - Implement dust suppression methods - Optimize the use of heavy equipment and motor vehicles - Compacting of exposed soil surfaces - Provide tarpaulin cover on trucks loaded with construction materials - Regular maintenance of heavy equipment, motor vehicles, and, standby generators - Prohibit engine idling in parking areas
	Increase in ambient sound levels	- Proper implementation of the Construction Plan - Provide and maintain mufflers of gasoline or diesel engines powered equipment - Establish barriers and shielding stationary vibrating equipment

POTENTIAL PROJECT IMPACTS & MITIGATION (*Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Displacement of settlers, property, and access	- Displacement or disturbance of properties - Change/conflict in land ownership - Change/conflict Right of way - Impact on public access	Proper implementation of the RAP and PCP
In-migration	Proliferation of informal settlers	Proper implementation of the Informal Settler Monitoring and Management Plan
Cultural/Lifestyle	Cultural or lifestyle changes (especially on Indigenous People)	Proper orientation of migrant workers on IP culture and lifestyle
Public health and safety	Threat to public health and safety	- Proper implementation of the Construction Plan, CWMP, CHSP, and RSP - Regular and proper maintenance of heavy equipment and vehicles

POTENTIAL PROJECT IMPACTS & MITIGATION (*Construction Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Benefits from the project	Enhancement of employment and livelihood opportunities - Increased business opportunities and associated economic activities - Increased revenue of LGUs	Proper implementation of the Local Community Hiring Plan - Proper implementation of the Local Community Hiring Plan - Purchase supplies from local sources - Provide livelihood opportunities if possible - Prompt payment of taxes and other legal fees
Traffic	Traffic congestion	Proper implementation of the Traffic Management Plan

POTENTIAL PROJECT IMPACTS & MITIGATION (Operation and Maintenance *Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Land Use and Classification	Impairment of visual aesthetics	Sustained implementation of the Buffer Zone Plan
	Devaluation of land value due to improper solid waste management	Proper implementation of the RMWMP Sustained implementation of RDWRP
Geology/ Geomorphology	· Change in surface landform and geomorphology · Inducement of subsidence, liquefaction, landslides, mud/debris flow, etc.	Sustained implementation of the SPP and SEMP
	Effects of geo- and hydrological hazards	· Regular assessment of slope protection measures · Maintain drainage system · Regular inspection of road and structure integrity
Pedology	Soil erosion	Sustained implementation of the SPP and SEMP
Terrestrial ecology	· Loss of habitat · Threat to existence and loss of important local species · Threat to abundance, frequency and distribution of important species · Hindrance to wildlife access	Proper implementation of the TSMP, VTPPO, BCP and WMP

POTENTIAL PROJECT IMPACTS & MITIGATION (Operation and Maintenance *Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Hydrology/ Hydrogeology	Change in drainage morphology	Sustained implementation of the Slope Protection Plan Regular inspection and maintenance of alignment drainage
	Inducement of flooding	Proper implementation of the Flood Management Plan
Water Quality	Degradation of surface water quality Degradation of groundwater quality	· Regular inspection and maintenance of alignment drainage · Adequate drainage system · Permanent storm water detention ponds · Slope protection or grass strips · Erosion Control Plan · Wastewater treatment (underpasses)
Freshwater ecology	· Threat to existence and loss of important local species and habitat · Threat to abundance, frequency and distribution of species	· Regular inspection and maintenance of alignment drainage · Permanent storm water detention ponds · Slope protection or grass strips · Erosion Control Plan · Wastewater treatment (underpasses)

POTENTIAL PROJECT IMPACTS & MITIGATION (Operation and Maintenance *Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
Meteorology/ Climatology	Change in micro climate due to greenhouse gas emissions	Proper implementation of the Vegetation and Tree Planting Program during Operations
Air Quality (& Noise)	Degradation of air quality	Proper implementation of the Vegetation and Tree Planting Program during Operations and Vehicle Emission Testing Program
	Increase in ambient sound levels	Install barriers in built-up areas of the alignment (structural or vegetative)

POTENTIAL PROJECT IMPACTS & MITIGATION (Operation and Maintenance *Phase*)

Environmental component	Potential Impact	Options for Prevention or Mitigation or Enhancement
In-migration	Proliferation of informal settlers	Proper implementation of the Informal Settler Monitoring and Management Plan
Public health and safety	Threat to public health and safety	Proper implementation of the Road Safety Plan
Benefits from the project	- Enhancement of employment and livelihood opportunities - Increase in economic activities - Increased revenue of LGUs	Proper maintenance of the alignment
Traffic	Traffic congestion	Sustained implementation of the Traffic Management Plan

Open Forum

EMB Region 10

Open Forum

EMB Region 10

Closing Remarks

EIA PUBLIC SCOPING
MAY 2021

CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT

CAGAYAN DE ORO – MALAYBALAY SECTION

Thank you! ☺

Attachment 10. Sample public scoping invitation letters and notices

EMB Central Office notice to the general public

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

RECEIVED
DATE
BY
SUMILAO, BUKIDNON

NOTICE OF PUBLIC SCOPING

The **Department of Public Works and Highways** proposed the a 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon.

Notice is hereby given to interested and concerned parties who wish to participate in the Public Scoping Activity that is scheduled on:

Date / Time	Participants	Venue
28 May 2021 (Friday) /10:00 AM *(Registration starts at 9:30 AM)*	Tagoloan	Tagoloan Dome, Tagoloan, Misamis Oriental
31 May 2021 (Monday) /10:00 AM *(Registration starts at 9:30 AM)*	Cagayan de Oro City	Puerto Gymnasium, Puerto, Cagayan de Oro City, Misamis Oriental
01 June 2021 (Tuesday) /10:00 AM *(Registration starts at 9:30 AM)*	Manolo Fortich	BRCI Dicklum, Dicklum, Manolo Fortich, Bukidnon
02 June 2021 (Tuesday) /10:00 AM *(Registration starts at 9:30 AM)*	Sumilao	2nd Fl., New Bulding, Sumilao, Municipal Hall
03 June 2021 (Tuesday) /10:00 AM *(Registration starts at 9:30 AM)*	Malaybalay City	People's Hall, 2nd Flr, Malaybalay City
04 June 2021 (Tuesday) /10:00 AM *(Registration starts at 9:30 AM)*	Impasug-ong	Impasug-ong Tree Park Function Hall, Impasug-ong, Bukidnon

The public scoping is an early stage in the Environmental Impact Assessment Process where the proponent aims to provide an overview of the proposed project, present proposed action, gather issues and concerns, and other relevant information to provide the scope of work and terms of reference for the preparation of Environmental Impact Statement.

All interested parties, organizations and agencies are encourage to provide inputs during the Public Scoping and public review periods and provide comments to admin@amet-asia.com copy furnished EMB Central Office through email at eia@emb.gov.ph.

A copy of the Project Description Report for Scoping is downloadable at our website: **www.eia.emb.gov.ph** *(kindly access the Notice of Public Scoping link found at the lower right portion of our website).*

Protect the environment... Protect life...

Tagoloan, Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

May 18, 2021

Hon.Gomer A Sabio
Municipal Mayor
Office of the Municipal Mayor
Claro M Recto Avenue, Poblacion, Tagoloan, Misamis Oriental

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Hon. Sabio:**

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
28 May 2021 (Friday) /10:00 AM *(Registration starts at 9:30 AM)*	Tagoloan	Tagoloan Dome, Tagoloan, Misamis Oriental

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.eia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Very truly yours,

LGU - TAGOLOAN, MISAMIS ORIENTAL
MUNICIPAL MAYOR'S OFFICE
RECEIVED
By: Date: 5/24/2021 11:00AM

ENRIC. WILLIAM P. CUÑADO
Director

Protect the environment... Protect life...

Cagayan de Oro, Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

May 18, 2021

OFFICE OF THE GOVERNOR
RECEIVED ON: 5/20/2021
RECEIVED BY: Reynaud Lumpay
DTS No. 04881 11:30 am
0967-645-1609

Mr. Yevgeny Vicente B Emano
Governor
Office of the Governor
Provincial Capitol, Don Apolinar Velez Street
Cagayan de Oro City, Misamis Oriental

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Mr. Emano**:

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumilao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
31 May 2021 (Monday) /10:00 AM (Registration starts at 9:30 AM)	Cagayan de Oro City	Puerto Gymnasium, Puerto, Cagayan de Oro City, Misamis Oriental

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.eia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Very truly yours,

ENRIC. WILLIAM P. CUÑADO
Director

Protect the environment... Protect life...

Manolo Fortich, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

May 18, 2021

Rev. Fr Felix B Abadies Abadies
Parish Priest
St. Jude Thaddeus Parish
Damilag
Manolo Fortich, Bukidnon

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Rev. Fr Abadies**:

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
01 June 2021 (Tuesday) /10:00 AM *(Registration starts at 9:30 AM)*	Manolo Fortich	BRCI Dicklum, Dicklum, Manolo Fortich, Bukidnon

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.cia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Received by
Rona R. Ensencio
5/21/21

Very truly yours,

ENRG. WILLIAM P. CUÑADO
Director

Sumilao, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordeco@emb.gov.ph

May 18, 2021

Datu Carlito Lalanan
Tribal Chief
Brgy. Kisolon
Sumilao, Bukidnon

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Datu Lalanan**:

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
02 June 2021 (Wednesday) /10:00 AM *(Registration starts at 9:30 AM)*	Sumilao	2nd FL, New Bldg., Sumilao Municipal Hall Sumilao, Bukidnon

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.eia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Very truly yours,

ENRG. WILLIAM P. CUÑADO
Director

Protect the environment... Protect life...

5/24/21

Impasug-ong, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

May 18, 2021

Ms. Julieta Zulieta
Head
KAYU Women's Organization
Impasug-ong, Bukidnon

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Ms. Zulieta**:

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
04 June 2021 (Friday) /10:00 AM *(Registration starts at 9:30 AM)*	Impasug-ong	Impasug-ong Tree Park Function Hall, Impasug-ong, Bukidnon

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.eia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Very truly yours,

ENRG. WILLIAM P. CUÑADO
Director

MENRO
RECEIVED
DATE: 05/26/2021
BY 10:27

Protect the environment... Protect life...

Malaybalay City, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632)927-1517; 928-3725; Fax No.(632)920-2258
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

May 18, 2021

Hon. Nilo Q Salga
Punong Barangay
LGU-Brgy. 10
Brgy. 10
Malaybalay City, Bukidnon

BARANGAY TEN RECEIVED BY: DATE: 5/25/21 MALAYBALAY CITY

0935 373 0491

SUBJECT : **PUBLIC SCOPING FOR THE PROPOSED 65.6 KILOMETERS CENTRAL MINDANAO HIGH STANDARD HIGHWAY PROJECT (CAGAYAN DE ORO-MALAYBALAY SECTION)**

Dear **Hon. Salga**:

We are pleased to invite you or your representative to attend the **Public Scoping** for the **Department of Public Works and Highways** proposed 65.6 kilometers **Central Mindanao High Standard Highway Project (Cagayan de Oro-Malaybalay Section)** traversing Cagayan de Oro City, Tagaloan, Province of Misamis Oriental and Manolo Fortich, Sumlao, Impasug-ong, Province of Bukidnon. The said Scoping is scheduled on:

Date / Time	Participants	Venue
03 June 2021 (Thursday) /10:00 AM *(Registration starts at 9:30 AM)*	Malaybalay City	People's Hall, 2nd Flr, Malaybalay City

The Public Scoping will be conducted as part of the requirements of the Philippine Environmental Impact Statement System in relation to the proponent's application for Environmental Compliance Certificate. Representatives from the proponent will present about the proposed project activities, its potential impacts, and the proposed measures to address these impacts. Project stakeholders within the concerned local communities will be given the opportunity to express freely their concerns, support, opposition or questions about the project in order to identify the most significant issues and impacts of the Proposed Project that need to be addressed in the project's Environmental Impact Assessment study.

A copy of the Project Description Report for Scoping is downloadable at our website: www.eia.emb.gov.ph (kindly access the Notice of Public Scoping link found at the lower right portion of our website). For more details, you may contact this Office at telephone numbers (02) 8920-2240 to 41.

Thank you and we look forward to your participation.

Very truly yours,

ENRC. WILLIAM P. CUÑADO
Director

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Attachment 11. Public scoping attendance sheets (onsite and virtual via Zoom)

Tagoloan, Misamis Oriental

On-site participants

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: May 28, 2021; 10:00 AM

Venue: Municipal Hall, Cauayan, Tagoloan, Misamis Oriental

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
Noel J. Igno		Barangay Kagawad	09064262202		Cauayan	male	58	
Elie P. Suasco		BDRRMU	09362895580		Cauayan	Male	51	
Romeo Z. MESA		Brgy Kagawad	09394748962		Cauayan	Male	67	
Ronald Villamor		Brgy Tanod	09757686890		"	"	48	
Paul Ka Pambayad		OTI	09652642795		Impasugong	M	58	
Jayson Namocot		Brgy Cauayan	09551092239		"	M	31	
Rosana C. Pacunada		Brgy. Cauayan	09853465029		Cauayan	Female	36	
[illegible]		[illegible]	09627902188		"	M	67	
[illegible]			09285072587					
Donedei, Cabigas		Brgy Tanod	09352006874		"		53	
GADAGA, NINGER G.		Sk Kagawad			"		33	
[illegible], Cauayan Malaybalay		Job Order	09265987190		"		40	
[illegible] J. ROLANIO		PNONG BRGY.			CAUAYAN	M	18	
[illegible], Lucelle		BHW	09262924374		"	F	51	
Garcia, Maurel S.		PNOW	09367955042		"	F	39	
Fernandez, Abdul Rul S.		Teacher	09254432265		"	M	35	
Alexandrino, Ma. Lourdes		BHW Barangay Health Worker	09359062372		CAUAYAN	F	36	
Dingalasa, Jessie D.		BSWDO	09280256102		"	F	42	
Richard P. Palm Sr.		BDRRMU	09262290360		Cauayan	M	62	
[illegible]	Mun Hon	Fire Guard	09265489362			M	37	
[illegible]	[illegible]	Purok Leader	09245155854			F	21	
Rosa, Maranda	[illegible]	Purok Leader	09176201941					

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: May 28, 2021; 10:00 AM

Venue: Natumolan, Brgy Hall, Natumolan, Tagoloan, Misamis Oriental

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
DAISY R. LEAD	BARANGAY	LUPON	09763207914		NATUMOLAN	F	50	
ESTRELLA R. PINOTES	BRGY	S.R.S.O	09257949308		NATUMOLAN	F	46	
SEGUNDINO G. GALDAN	BRGY	KAGAWAD			NATUMOLAN	M	47	
Venerandra V. Sudino	BHW		09681216113		Natumolan	F	70	
ROSIO T. MORENO	BHW	BHW			Natumolan	F	41	
Mercedes, Teresa Necum B.	[illegible]	OK Barangay	09217294401		Natumolan	F	41	
JANE A. CAYAM	BRGY NATUMOLAN	BPO	09355748681		Natumolan	F	39	
MARVIC M. ASIN	BRGY NATUMOLAN	KAGAWAD	09352409399		"	F	35	
[illegible]	AMET ASIA	Admin	09273082161			M	24	

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasan		EMB Region 10 - Clearance and Permitting Division
2	Rowena Dorato		EMB Region 10 - Clearance and Permitting Division
3	Fe L. Dalugdug		Tagoloan National High School
4	Gene Baculpo	MPDC	LGU Tagoloan - MPDO
5	Jonathan Paulo C. del Rosario	MDRRMO	LGU Tagoloan
6	Zenaida	Assessor	LGU Tagoloan - Municipal Assessor's Office
7	Freeand brent	Assessor	LGU Tagoloan - Municipal Assessor's Office
8	Roy Hugo Pagtalunan		LGU Tagoloan - Municipal Agriculture's Office
9	Gomer A Sabio	Mayor	LGU Tagoloan
10		Engineering Office	LGU Tagoloan
11	Neal Vincent Fernando	RA	North Planners INC
12	Tomoaki Tanabe	Environmental Specialist	JICA Study Team
13	Tomoko Ota	RAP Specialist	JICA Study Team
14	Ryuichi Ueno	Project Team Leader	JICA Study Team
15	Angelita Balid	Office Engineer and Project Coordinator	JICA Study Team
16	Maria Victoria Lofamia	Engineer III	DPWH
17	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
18	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
19	Mark Greg Dablo		DPWH R10

Cagayan de Oro City, Misamis Oriental

On-site participants

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: May 31, 2021; 10:00 AM

Venue: Bugo Gym, Cagayan de Oro, Misamis Oriental

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
Sheina Mae Lacaoo	Barangay staff	Encoder	09957398487		Bugo	F	27	
Francisca Potelmoing	Barangay Worker	Caretaker	09357814039		Bugo	F	44	
Bryan Odion	BRGY. ADMIN	Administrator	09179455390		Bugo	M	42	
Chang Baez	BIO / BWC	BIO	09178425088		Bugo	M	45	
MEJALA JOHN FORD B.	BRGY SUMMON OFFICER	SUMMON OFFICER	09363370384		"	M	30	
Dogoloan, Gilbert	BUGO LGBTQ BRGS	PRESIDENT			BUGO	GAY	43	
Cabalhug/Arquia	Tanod							
ODIS Janet	Midwife							
NAVARROZA, LESLIE	MIDWIFE				BUGO			
FRANCISCO B. ABRACAN	BRGY TANOD	CAMEF	09051674893		BUGO	M	55	
Johnpaul Patolcralwa	BRGY TANOD				BUGO	M	29	
Giovanne J. ABALOS	BRGY TANOD				BUGO	M	40	
EDWARD D. CLEMA	BRGY TANOD				BUGO	M		
[illegible]	AMET ASIA		09615472161			M	24	

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: May 31, 2021; 10:00 AM

Venue: Bugo Gym, Cagayan de Oro, Misamis Oriental

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
[illegible]	[illegible]	[illegible]	09167655515					
PAUL PARAGUYA	CTI - LIDA	COORDINATOR	09682662195	[illegible]		M	47	
Odion Buyan	BRGY. ADMIN	ADMINISTRATOR	09179455390		BUGO	M	44	
VIC C. TALINGTING	BUGO	BRGY. LAP.	09175207975		BUGO	M	56	
[illegible]	Kagandi	BRGY TANOD	09178907767		BUGO	M	58	
BENCIANO J. DAWAL	KAGAWAD	" "	09177193618		BUGO	M	73	
ELISA B. MABELIN	LGU-CDO / CLENRO	BFP. CLENRO	09177477996	[illegible]	[illegible]	F	45	
[illegible]	LGU-CDO/CLENRO	PCI - J	09756491266		CONCEPCION	M	31	
ERIC FAT U	CLENRO LGU	HEO II	09268027942		BONACOSIM	M	45	
Samboan, Benjamin Jr.	CLENRO	CDA-1	09350947696		Cugman	M	41	
CUENCA ARMEN	CLENRO	PDAT HEAD	09177968769	cuenca.[illegible]	[illegible]	M	54	
[illegible]		DRIVER	09126423837					
VIC TALINGTING								
ANTONIO BOCUS	BRGY BUGO	DRIVER	N/A	N/A	BUGO	M	60	
TAMION JOVIL	BRGY BUGO	YOUTH LEADER	N/A	N/A	BUGO	M	19	
MAGAD, NEIL JOHN		LGBT			BUGO	LGBT	30	
[illegible]	BRGY Bugo	YOUTH			Bugo	F	20	
Aquila Morcoyo	BRGY. BUGO	YOUTH			BUGO	F	26	
[illegible]	AMET ASIA	Admin	09171203716			F	29	
[illegible]	Amet	Exa Coordinator	09171448367			F	27	
Patricia Faith Lim	Amet	Asst Team Leader				F	26	
ALYSSA KOLIN MANALASTAS	AMET ASIA	RA	09060983287	[illegible]				
[illegible]	[illegible]	Team Leader	09712516584	[illegible]		F	39	

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasan		EMB Region 10
2	Atty. Labas Lao	Division Chief	EMB Region 10
3	Engr. Valmoria		Misamis Oriental ENRO
4	Eugene Magto		LGU Cagayan de Oro - CSWD
5	Joshua del Bando		LGU Cagayan de Oro - City Assessor's Office
6	Manny Ramonal		
7	Rolando Damaolao		
8	Jocelyn Penalosa		East and West Bound Terminals and Public Market
9	Edward		Traffic Engineering Division - RTA
10	Tomoaki Tanabe	Environmental Specialist	JICA Study Team
11	Ryuichi Ueno	Project Team Leader	JICA Study Team
12	Angelita Balid	Office Engineer and Project Coordinator	JICA Study Team
13	Maria Victoria Lofamia	Engineer III	DPWH
14	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
15	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
16	Patricia Erika Lim	Assistant Team Leader	Amet Asia, Inc.
17	Darwin Gaba	Consultant	Amet Asia, Inc.
18	Samuel Sendon	Consultant	Amet Asia, Inc.
19	PENRO Mis Or		PENRO Mis Or
20	Eugene		CWSD
21	Oliver		Office of the City Administrator
22	Landcare Foundation		
23	Mark Greg Dablo		DPWH R10

Manolo Fortich, Bukidnon

On-site participants

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 1, 2021; 10:00 AM

Venue: BRFI Dicklum, Dicklum, Manolo Fortich, Bukidnon

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
DABLO, GREGA MARK	DPWH	ADMIN	[illegible]	[illegible]	[illegible]	M	[illegible]	
MARONTE, DULCE AMOR	LGU MANOLO FORTICH	RECORDS OFFICER	0919 717 0953	[illegible]	[illegible]	F	41	
[illegible]	LGU MANOLO FORTICH	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
ALFONSO [illegible]	LGU MANOLO	SERVICES [illegible]	0935 149 4178		CDO	M	41	
DANILO L. MANCAGAK	LGU MANOLO	WE SERVICE [illegible]	[illegible]		[illegible]	M	36	
[illegible]	AMET ASIA	Consultant	0915 347 5488			F	40	
EDUARDO G. COLEST	BRGY CHAIRMAN		0905 [illegible] 92		[illegible]	M	55	
[illegible] D. Pride	DPWH	E2	0915 [illegible] 6015		DICKLUM	F	39	
[illegible]	VENTRAY		0917 [illegible] 773		[illegible]	M	39	
Magpalia, Jonas P.	VENTRAY		0956 [illegible] 135			M	28	
[illegible]	DPWH		[illegible]		DICKLUM	M	33	
[illegible]	[illegible]	MA	[illegible]		[illegible]	M	57	
SHIRLEY TAGAPUCOT	BRGY DICKLUM	BRGY [illegible]	0926 [illegible]	[illegible]	[illegible]	F	[illegible]	
[illegible]	LGU-MF / MENRO	FAC 1	[illegible]	[illegible]	TAGAULOAN	F	28	
[illegible]	LGU-MF / [illegible]	[illegible]	0916 [illegible] 30	[illegible]	DICKLUM	F	40	
[illegible]	LGU-MF / GSO		0955 [illegible] 694			M	32	
[illegible]	LGU MF GSO					M	40	
[illegible]	AMET	Envi Specialist	[illegible]	[illegible]		[illegible]	27	
[illegible]	IPHC Tankulan	IPHC	—		Tankulan	M	32	
[illegible]	[illegible]	[illegible]	0959 [illegible] 715	[illegible]	CAN ONELEL	M	48	
CEDRIC DAVE G. ARES			0916 [illegible] 6941		TOG-LONGLONG	M	25	
[illegible]	AMET ASIA	Admin	0961 [illegible] 061			M	24	
[illegible]	AMET ASIA (Contractor)	[illegible]	0917-[illegible] 156	[illegible]		F	29	

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: [illegible]

Venue: BRFI [illegible]

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
						~~M~~	56	
VICTOR P. BILLAN	DENR CENRO	Surveyor	0906 944 0864			M	56	
ERROL ONRAIT SALVANIDA	-〃-	PT-I	0916 901 4324			M	45	

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: [illegible] 10:00 AM

Venue: BRFI Dicklum, Manolo Fortich Bukidnon

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
[illegible]	CTI - CMDC	[illegible]	[illegible]	[illegible]	[illegible]	M	57	[illegible]
Richard D. Lavaño	[illegible]	SSF-II	[illegible]	[illegible]	[illegible]	M	48	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	F	65	[illegible]

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 1, 2021; 10:00 AM

Venue: BRFI Dicklum, Dicklum, Manolo Fortich, Bukidnon

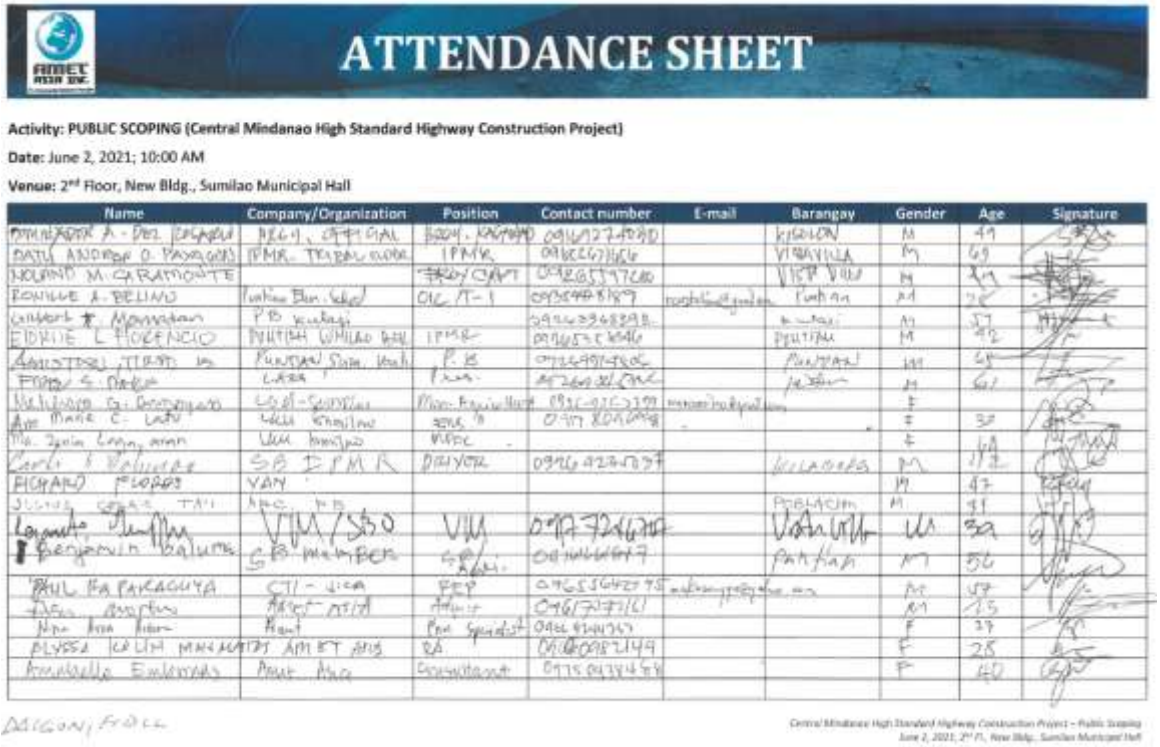
Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
PABLO JIMENEZ JR	[illegible]	[illegible]	[illegible]		DICKLUM	M	66	[illegible]
VIERNES, JAMETH	[illegible]	PRES	[illegible]		TANKULAN	F	43	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	37	[illegible]
[illegible]	S.B. Office	[illegible]	[illegible]		Tankulan	M	58	[illegible]

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasan		EMB Region 10 - Clearance and Permitting Division
2	Atty. Labas Lao	Division Chief	EMB Region 10 - Clearance and Permitting Division
4	Datu Amay Elfranco Linsahay	MPUMATRIC	Higaonon-Talaandig Ancestral Domain - Barangay Ticala
5	Arlene B. Arenal	Barangay Secretary	Barangay Damilag
6	Tomoaki Tanabe		JICA Study Team
7	Angelita Balid		JICA Study Team
8	Maria Victoria Lofamia	Engineer III	DPWH
9	Michiko Quiachon		DPWH
10	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
11	Patricia Erika Lim	Assistant Team Leader	Amet Asia, Inc.
12	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
12	Ron Capili	Consultant	Amet Asia, Inc.
14	Neil Johannes Botor	Consultant	Amet Asia, Inc.
15	Shirley L. Tagapulot	Barangay Councilor	Barangay Diclum
16	Jun Pablo Jimenez	Barangay Councilor	Barangay Diclum
17	Teogenes Abarabar	Barangay Councilor	Barangay Alae
18	Nelfa Tero	Barangay Secretary	Barangay Alae
19	Nancita Yompoca	Barangay Councilor	Barangay Ticala
20	Ronald Magdaleno	Barangay Councilor	Barangay Ticala
21	Rufino Bulanta Jr.	Barangay Councilor	Barangay Ticala
22	Dievra Jay Payanan	Barangay SK	Barangay Ticala
23	Renato Coguihsn Jr.	Barangay Secretary	Barangay Ticala
24	Elfranco Linhasay	Barangay IPMR	Barangay Ticala
25	Romeo P. Dagunlay	Barangay Captain	Barangay Tangkulan
26	Lemuel Rey I. Arana	Barangay Councilor	Barangay Tangkulan
27	alan A. Improgo	Barangay Councilor	Barangay Tangkulan
28	Daniel V. Onahaon Jr.	Barangay Councilor	Barangay Tangkulan
29	Reve G Abarquez	Barangay Councilor	Barangay Tangkulan
30	Diomedes Pinalas	PWD	Barangay Tangkulan
31	Danny Banyogan	Habal-habal operator	Barangay Tangkulan
32	Fe Lahayon	Purok Leader	Barangay Tangkulan
33	Lee Alberece	Barangay Councilor	Barangay Tangkulan
34	Angeli Roa	Barangay Captain	Barangay Mambatangan
35	Melan Dave Lalucan	Barangay Councilor	Barangay Mambatangan
36	Neal Fernandez	Research Assistant	Amet Asia
37	Jaime Namocatcat	Consultant	Amet Asia

Sumilao, Bukidnon

On-site participants



ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 2, 2021; 10:00 AM

Venue: 2nd Floor, New Bldg., Sumilao Municipal Hall

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	49	
DATU ANDRES O. PAYAGUIS	IPMR. TRIBAL [illegible]	IPMR	[illegible]		VIRAYULA	M	69	
[illegible] M. CARAMONTE		[illegible]	[illegible]		[illegible]	M	[illegible]	
RONILLE A. BELIAO	[illegible]	OIC M-1	[illegible]	[illegible]	[illegible]	M	[illegible]	
[illegible]	PB [illegible]		[illegible]		[illegible]	M	57	
EDRIE L. FLORENCIO	[illegible]	IPMR	[illegible]		[illegible]	M	42	
[illegible]	[illegible]	P. B	[illegible]		[illegible]	M	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	M	61	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		F		
[illegible]	[illegible]	[illegible]	[illegible]			F	30	
[illegible]	[illegible]	[illegible]				F	[illegible]	
[illegible]	SB IPMR	DRIVER	[illegible]		[illegible]	M	[illegible]	
RICHARD [illegible]	VAN					M	43	
[illegible]	[illegible]				[illegible]	M	31	
[illegible]	VM/SBO	VM	[illegible]		[illegible]	M	30	
[illegible]	SB MEMBER	[illegible]	[illegible]		[illegible]	M	56	
PAUL FA PAKACHYA	CTI - LICA	REP	[illegible]	[illegible]		M	57	
[illegible]	[illegible]	[illegible]	[illegible]			M	15	
[illegible]	[illegible]	[illegible]	[illegible]			F	37	
ALYSSA [illegible]	AMET ASIA	RA	[illegible]			F	28	
[illegible]	[illegible]	[illegible]	[illegible]			F	40	

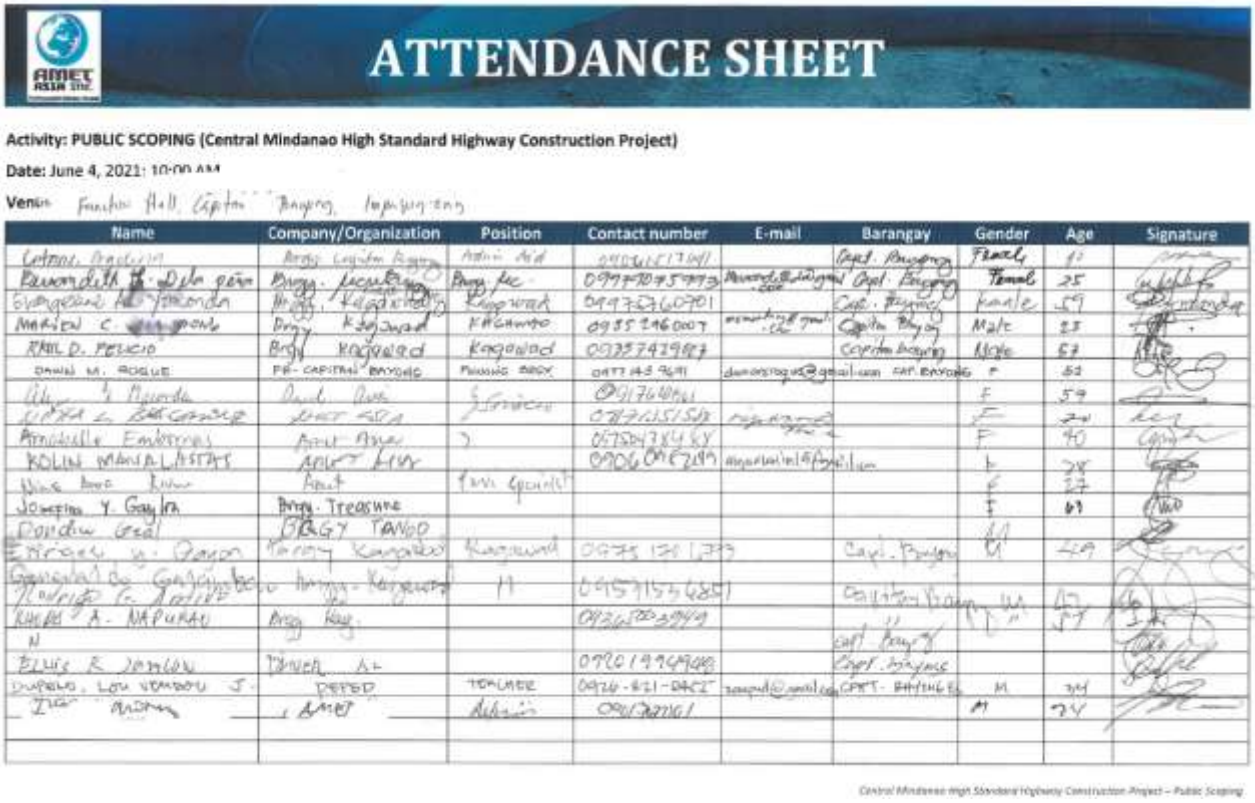
Central Mindanao High Standard Highway Construction Project – Public Scoping
June 2, 2021; 2nd Fl., New Bldg., Sumilao Municipal Hall

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasan		EMB Region 10 - Clearance and Permitting Division
2	Rowena Dorato		EMB Region 10 - Clearance and Permitting Division
3	Tomoaki Tanabe	Environmental Specialist	JICA Study Team
4	Ryuichi Ueno	Project Team Leader	JICA Study Team
5	Angelita Balid	Office Engineer and Project Coordinator	JICA Study Team
6	Maria Victoria Lofamia	Engineer III	DPWH ESSD
7	Michiko Quiachon		D DPWH ESSD
8	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
9	Patricia Erika Lim	Assistant Team Leader	Amet Asia, Inc.
10	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
11	Ron Capili	Research Assistant	Amet Asia, Inc.
12	Hideo Sugiyama		JICA Study Team
13	Samuel Sendon	Geology Consultant	Amet Asia, Inc.
14	Gella Abella	Traffic consultant	Amet Asia, Inc.

Impasug-ong, Bukidnon

On-site participants



ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 4, 2021: 10:00 AM

Venue: Function Hall, Capitol Barangay, Impasugong

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	25	
[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	59	
MARIEN C. [illegible]	[illegible]	[illegible]	0935 246 0007	[illegible]	[illegible]	Male	23	
RAUL D. PEÑICIO	[illegible]	Kagawad	0935 742 9987		Capitol Barangay	Male	57	
DANIEL M. ROGUE	PR - CAPITOL BARANGAY	[illegible]	0977 143 9691	[illegible]	CAP. BARANGAY	[illegible]	62	
[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	59	
[illegible]	[illegible]		[illegible]			[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	40	
KOLIN MANALASTAS	[illegible]		[illegible]	[illegible]		[illegible]	28	
[illegible]	[illegible]	[illegible]				[illegible]	27	
JOWELLA Y. GAYLA	Brgy. Treasure					[illegible]	61	
[illegible]	BRGY TANOD					[illegible]		
[illegible]	[illegible]	Kagawad	[illegible]		Capt. Barangay	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	
[illegible] A. NAPURAN	[illegible]		[illegible]			[illegible]	[illegible]	
[illegible]					[illegible]			
ELLIS R. [illegible]	[illegible]		[illegible]		[illegible]			
DUPENO, LOU VENSON J.	DPWH	TEACHER	0926-821-0462	[illegible]	CAPT. BAYUNG	M	34	
[illegible]	AMET	[illegible]	[illegible]			M	34	

Central Mindanao High Standard Highway Construction Project – Public Scoping

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasa		EMB Region 10
2	Atty. Labas Lao	Division Chief	EMB Region 10 - Clearance and Permitting Division
3	Idylla Jane Juaniza	Engineer I	LGU Impasugong - MEO
4	Eutiquia A. Bato-on	MPDC	LGU Impasug-ong - MPDO
5	Jocelyn J. Binasag-MASSO-LGU,Impasugong,Buk.-		LGU Impasug-ong - Municipal Assessor Office
6	Von Omar P. Lagayan	Punong Barangay	Barangay Poblacion
7	Shirley A. Curiba	Barangay Secretary	Barangay Poblacion
8	Rolando E. Eguia	Barangay Councilor	Barangay Poblacion
9	Ayagil Kilah D. Quines	Barangay Councilor	Barangay Poblacion
10	Reina O. Paluga	Barangay Councilor	Barangay Poblacion
11	Irene Kristine D. Quines	SK Chairperson	Barangay Poblacion
12	Edison E. Bondoc	Municipal Engineering Office	LGU Impasug-ong
13	Ayagil Kilah D. Quines	Barangay Councilor	Barangay Poblacion
14	Alexander Dupeno		LGU Impasugong
15	Antonio O. Dominao	Barangay Captain	Barangay Impalutao
16	Jeryl D. Pacatang	Barangay Councilor	Barangay Impalutao
17	Romeo R. Abunda	Barangay Councilor	Barangay Impalutao
18	Narizza S. Rivera	Barangay Councilor	Barangay Impalutao
19	Martha G. Bustamante	Barangay Councilor	Barangay Impalutao
20	Esteban G. Macapaz	Barangay Councilor	Barangay Impalutao

	Name	Position	Company/Organization
21	Raquel L. Buco	Barangay Councilor	Barangay Impalutao
22	Alberto Sarento	Barangay Tanod	Barangay Impalutao
23	Rene Rey M. Angel	Barangay Tresurer	Barangay Impalutao
24	Rene Galvez	Driver	Barangay Impalutao
25	Rey U. Lumacang	Barangay Tanod	Barangay Impalutao
26	Danilo N. Micabalo	Barangay Councilor	Barangay Impalutao
27	Analou L. Paul	Barangay Secretary	Barangay Impalutao
28	Nicasio P. Llamoso	Barangay Councilor	Barangay Impalutao
29	Mayflor P. Santos	SK Chairperson	Barangay Impalutao
30	Sheila May C. Urgel	SK Chairperson	Barangay Cawayan
31	Ma. Chenita R. Miras	Barangay Secretary	Barangay Cawayan
32	Renie Rey Ange		
33	Tomoaki Tanabe	Environmental Specialist	JICA Study Team
34	Angelita Balid	Office Engineer and Project Coordinator	JICA Study Team
35	Maria Victoria Lofamia	Engineer III	DPWH
36	Michiko Quiachon		DPWH
37	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
38	Patricia Erika Lim	Assistant Team Leader	Amet Asia, Inc.
39	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
40	Ron Capili	Consultant	Amet Asia, Inc.

City of Malaybalay, Bukidnon

On-site participants

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 3, 2021; 10:00 AM

Venue: People's Hall, 2nd Fl., New City Hall, Malaybalay City

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1. Marjorie A. Lanao	PMAG (PWD)	President	09679115276	[illegible]	Casisang	F	62	[illegible]
2. Benjamin L. Nabcha Jr.	Brgy Kalamboan	Kagawad	09364348937	[illegible]	Kalamboan	Male	62	[illegible]
3. George Monteniro		Resource Person	09359968896	representative	Patpat	Male	66	[illegible]
4. [illegible]	City Agriculture Office	Tech. Staff	09273497366		Casisang	Male	36	[illegible]
5. Ronald D. Nigre	Brgy. Kalamboan	K.B.	09194783792	[illegible]	Kalamboan	M	57	[illegible]
6. Jose Paton De La Cruz	PGB - PEO	PGB-IV				M		[illegible]
7. Albert D. Galo	PGB - PEO	Planning Engr.				M		[illegible]
8. Madrid, Earl Marie P.	City Accountant's Office	LAO-I	09178245559	[illegible]	Carmen	M	26	[illegible]
9. Eliseo Yonge			09077225019		Casisang		35	[illegible]
10. Lanillo, Nereo D.	BPTTC - MLBBT		09169010003	[illegible]	Poblacion	M	52	[illegible]
11. Lamorca Junel C.	Secretary - Barangay		09067477576		Dalwangan	M	36	[illegible]
12. Abdul Gaon Jamin	Cagayan Hayley	Laborer	09057749912	[illegible]		M	37	[illegible]
13. Bae Lourdtaven Adelina Tariao	Barangay Incentive	CADT Holder	09358057483		Dalwangan	F	59	[illegible]
14. Joselle S. Yonnig	DepED Bukidnon - Dalwangan	Principal	09353893277	[illegible]		F	47	[illegible]
15. Brian Floyd	CHO	Engr. Dev. I	0917 [illegible]		9	M	45	[illegible]
16. Paul B. Pendong		Punong Brgy	09369082430		Damulanglang	M	49	[illegible]
17. Matthew Pabillaran	LGU - Vice Mayor	Vice Mayor	0917 327 7575		Nine	M	42	[illegible]
18. Reylan Dale Leyna	CED - MCPEM	Engr. II	09178891537			M	57	[illegible]
19. Arbie G. Suwayay	Kamuning - Kavasuan	President	0935 556 2200		Kamuning	F	42	[illegible]
20. Hermes S. Sumpacado	City Tribal Chieftain	Chieftain			Managsam	M		[illegible]
21. Nina Rose Rivera	Amet Asia	Civil Engineer	09064784976			F	27	[illegible]
22. [illegible]	[illegible]	[illegible]	09264[illegible]			F	22	[illegible]
23. Aline R. Hernandez	Amet Asia	Project Coordinator	09176101861			F	59	[illegible]

Central Mindanao High Standard Highway Construction Project – Public Scoping
June 3, 2021, People's Hall, 2nd Fl., New City Hall, Malaybalay City

ATTENDANCE SHEET

Activity: PUBLIC SCOPING (Central Mindanao High Standard Highway Construction Project)

Date: June 3, 2021; 10:00 AM

Venue: People's Hall, 2nd Fl., New City Hall, Malaybalay City

Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1. Julie Ann A. Balcom	City Engr.	Engr. I	09457217719	[illegible]	Casisang	F	37	[illegible]
2. [illegible]	CHO	[illegible]	09173079146	[illegible]	[illegible]	F	46	[illegible]
3. [illegible]	AMET Asia	[illegible]	09761[illegible]			M	26	[illegible]
4. Fr. Rennel T. Dayday	Diocese - EMS / Prov. Bukidnon	Sup. EMS	09197370521		Casisang, NC	M	40	[illegible]

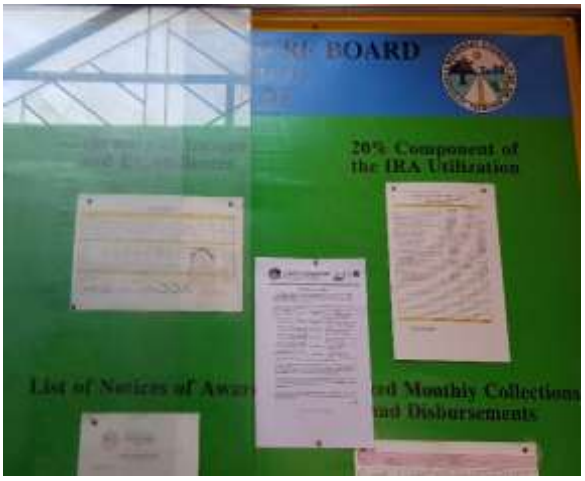
Central Mindanao High Standard Highway Construction Project – Public Scoping
June 3, 2021, People's Hall, 2nd Fl., New City Hall, Malaybalay City

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Nonette Atasa		EMB Region 10 - Clearance and Permitting Division
2	Atty. Labas Lao	Division Chief	EMB Region 10 - Clearance and Permitting Division
3	Anthon Son R. Morento	SK Chairman	Barangay Dalwangan
4	Nilo Q. Salga	Punong Barangay	Barangay 10
5	Renato O. Binayao	IPMR	Barangay Kalasungay
6	Karl Marlone Manahan	SK Chairman	Barangay Kalasungay
7	Herculano Lupiba	Barangay Councilor	Barangay 10
8	Alex Agustin	Barangay Councilor	Barangay 10
9	Armando Blanco	Barangay Councilor	Barangay 10
10	Alejandro Ferrer Jr.	Barangay Councilor	Barangay 10
11	Francis Eddie Dagang	Barangay Councilor	Barangay 10
12	Isidro Desabille	Barangay Councilor	Barangay 10
13	Winefreda Dahumay	IPMR	Barangay 10
14	Tiffany Galindo	Secretary	Barangay 10
15	Vanessa Revisado	Secretary	Barangay 10
16	Cedric Nacua	Barangay Councilor	Barangay 10
17	Adrian Gamboa		LGU Malaybalay - CPDO
18	Roberto Solito Sr	Punong Barangay	Barangay Sumpong
19	Phoebe Petalcorin		PPDO Bukidnon
20			Malaybalay City Agriculture's Office
21	Leslie T. Fontanilla	Division Engineer	DepED Malaybalay City Division
22	Tomoaki Tanabe	Environmental Specialist	JICA Study Team
23	Ryuichi Ueno	Project Team Leader	JICA Study Team
24	Angelita Balid	Office Engineer and Project Coordinator	JICA Study Team
25	Maria Victoria Lofamia	Engineer	DPWH
26	Michiko Quiachon		DPWH
27	Jan Heidel Bautista	General Manager	Amet Asia, Inc.
28	Patricia Erika Lim	Assistant Team Leader	Amet Asia, Inc.
29	Pamelle Andrea Pomida	Environmental Specialist	Amet Asia, Inc.
30	Emeraldo		
31	Mark Greg Dablo		DPWH R10

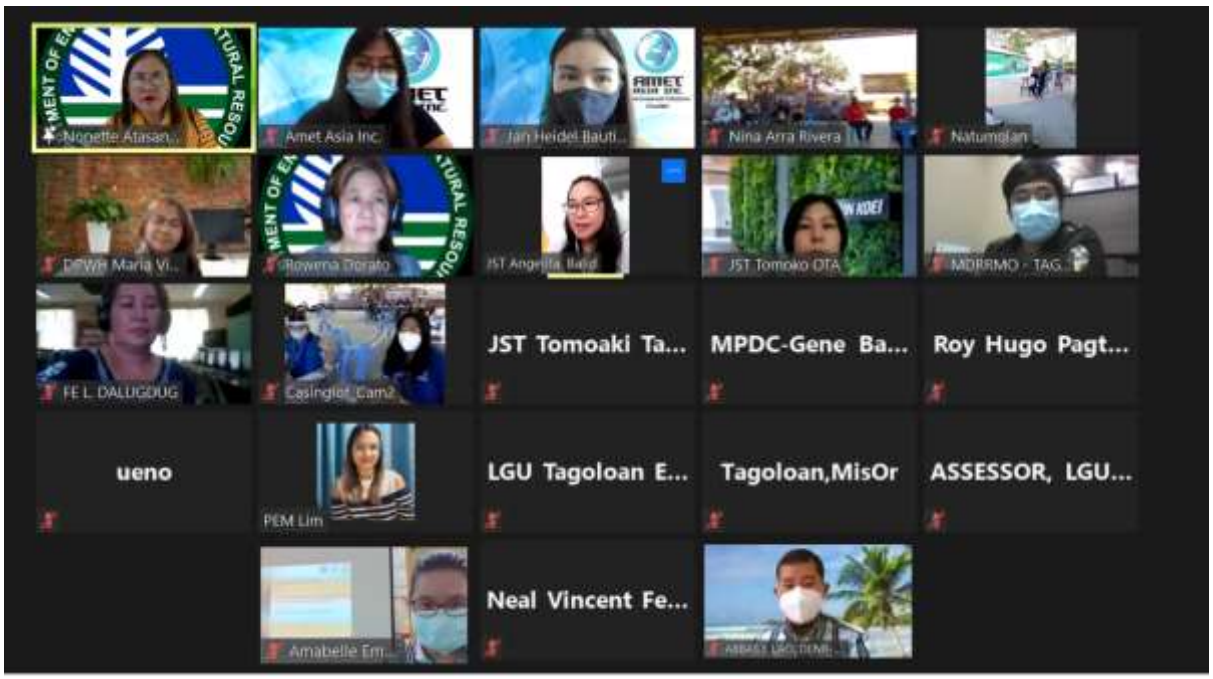
Attachment 12. Public scoping photo documentation

Tagoloan, Misamis Oriental



Notice of Posting in Brgy. Natunolan (left) and Casinglot (right), Tagoloan

Posted banners in Brgy. Natunolan (left) and Casinglot (right),



Online attendees

On-site Attendees (Brgy. Casinglot)

On-site Attendees (Brgy. Natumolan)

Engr. Nonette Atasan from EMB R10 on the overview of EIA

Engr. Angelita Balid from JICA Study Team on the presentation of the Project

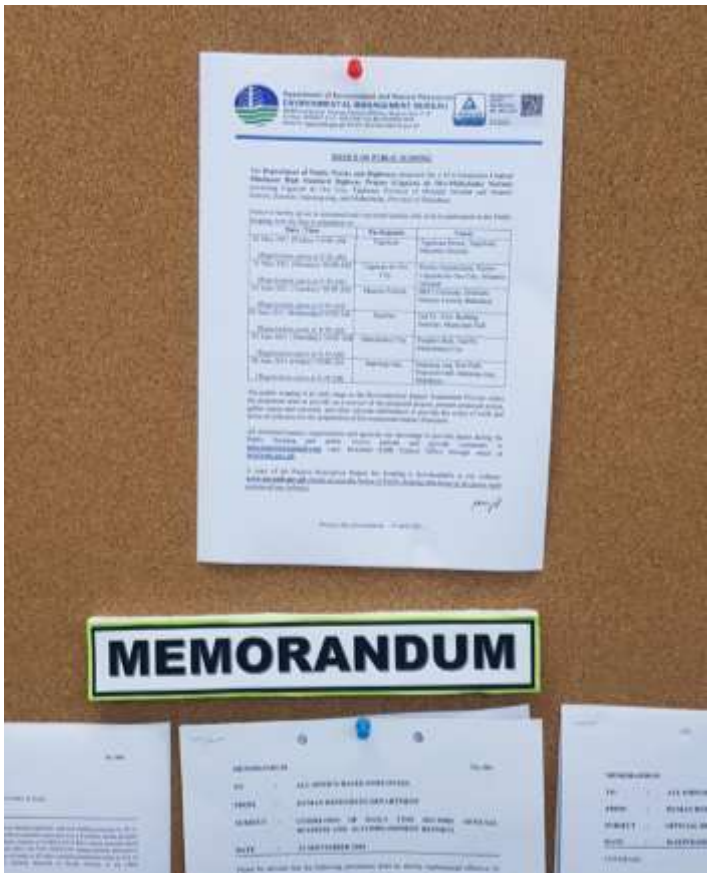
Ms. Patricia Erika Lim discussing the potential project impacts and mitigation

Engr. Rowena Dorato from EMB Region 10 facilitating the Open Forum

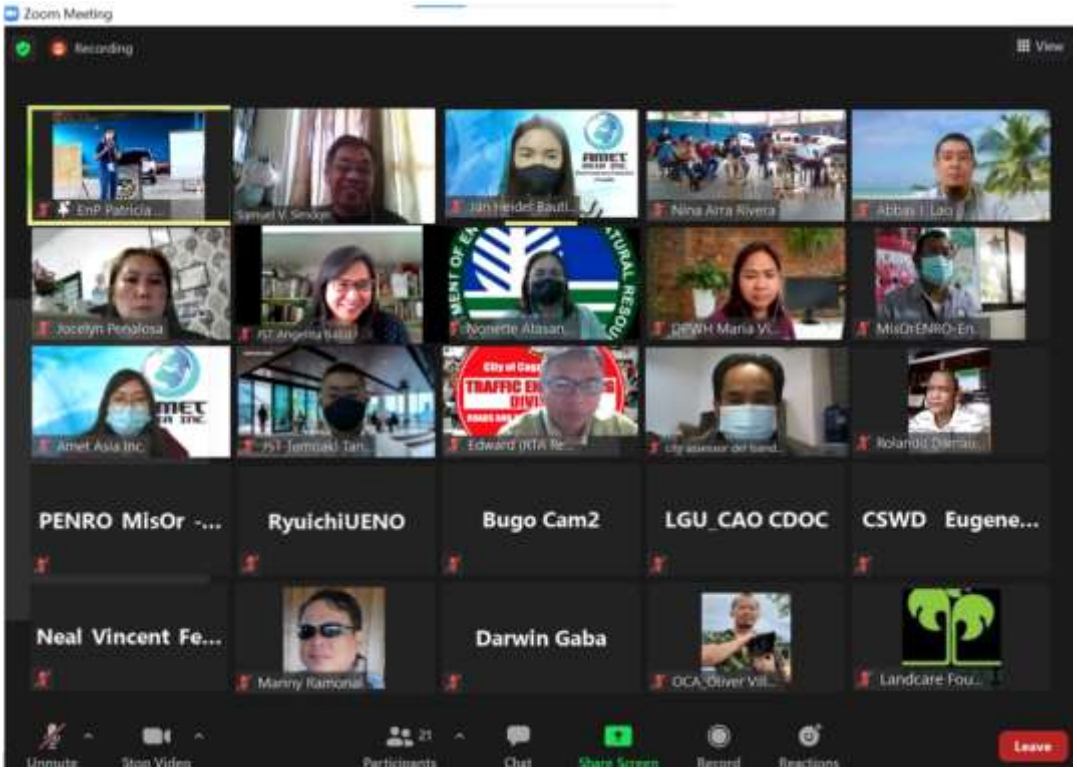
Brgy. Captain Marlon Bolanio from Casignlot raising his concern during the open forum

Cagayan de Oro City

Posting of banner in public places

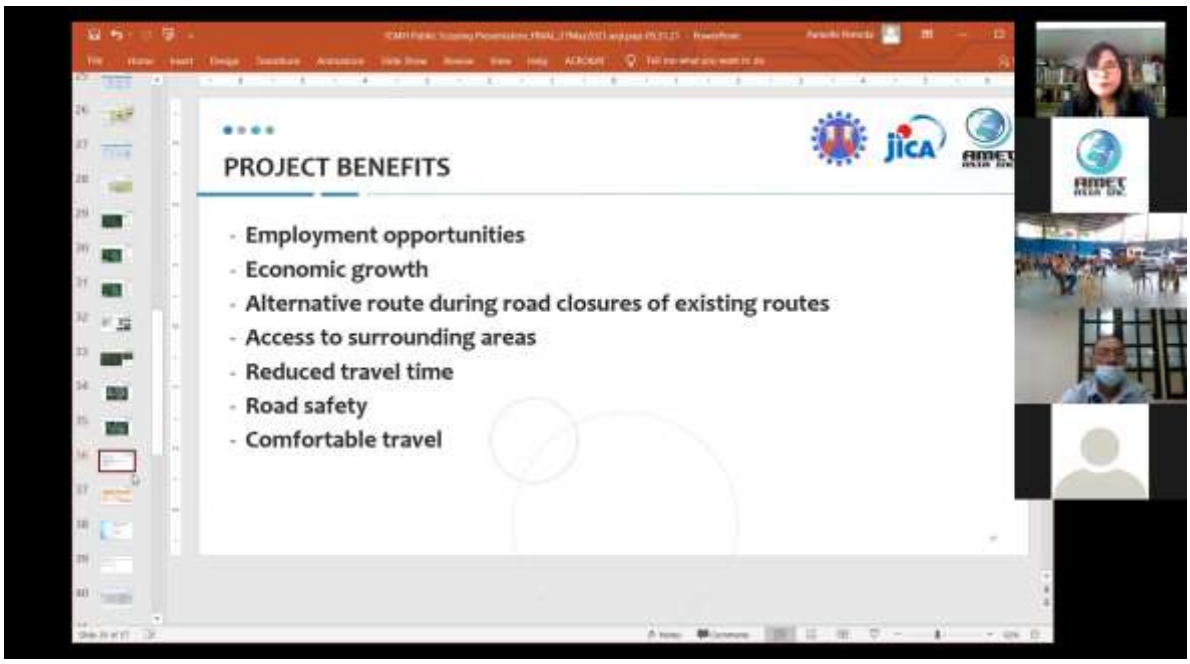


Notice of posting in Cagayan de Oro City Hall



Online Attendees

On-site Attendees



Engr. Angelita Balid on the presentation of the Project benefits

Ms. Patricia Erika Lim from Amet-Asia presenting the potential project impacts and mitigation

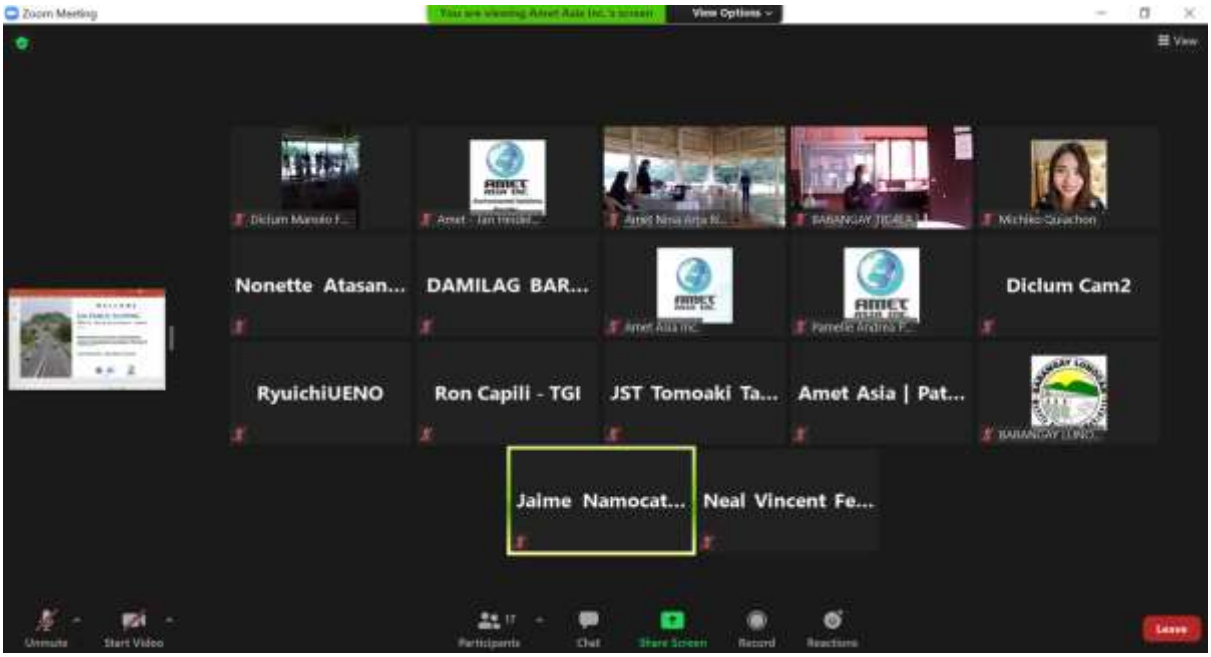
Atty. Abbas Lao facilitating the open forum

Brgy. Capt Vic Talingting from Bugo during the open forum

Manolo Fortich

Posting of banner in BRFI Dicklum, Manolo Fortich

Notice of Public Scoping posted in Manolo Fortich Municipal Hall



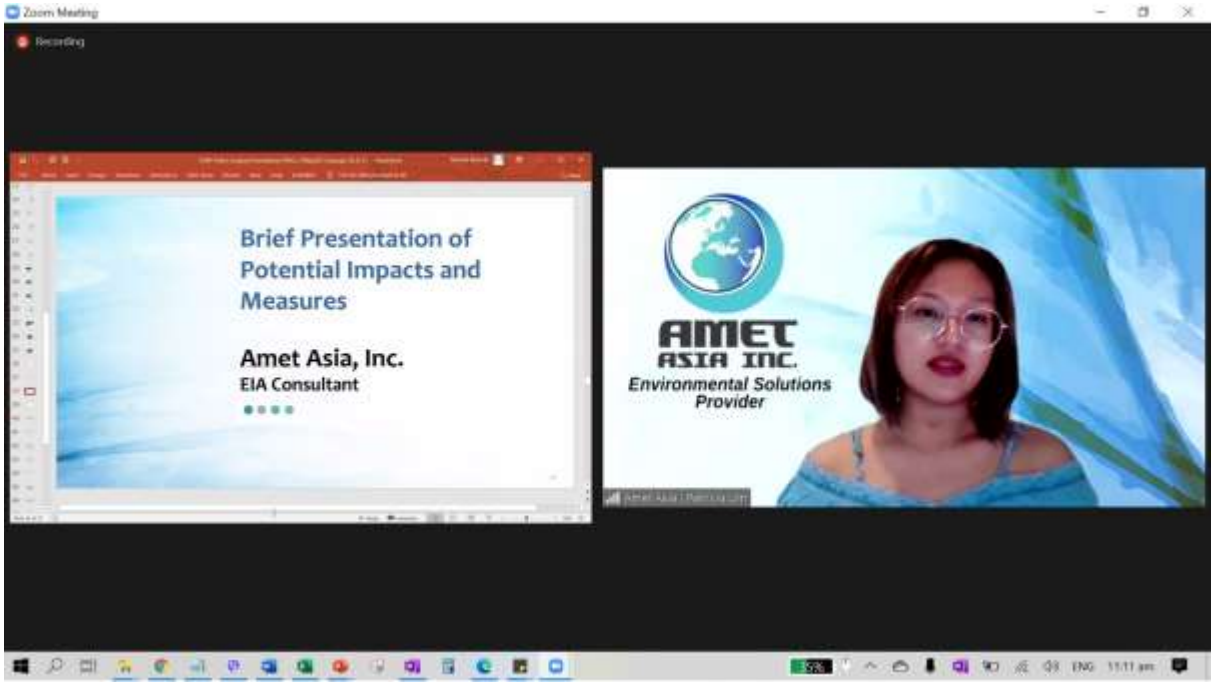
Online attendees

On-site registration

On-site attendees

Engr. Nonette Atasan on the overview of EIA

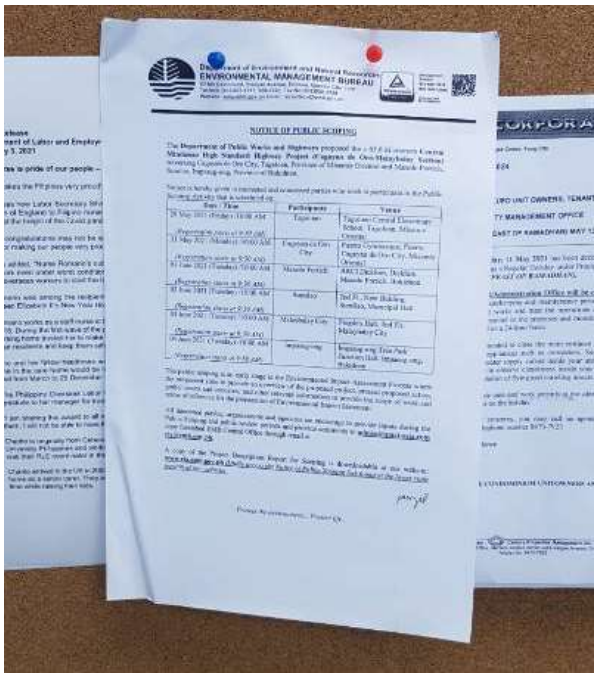
Presentation of project components by Engr. Angelita Balid



Amet-Asia, Inc. represented by Ms. Patricia Lim on the potential impacts and measures

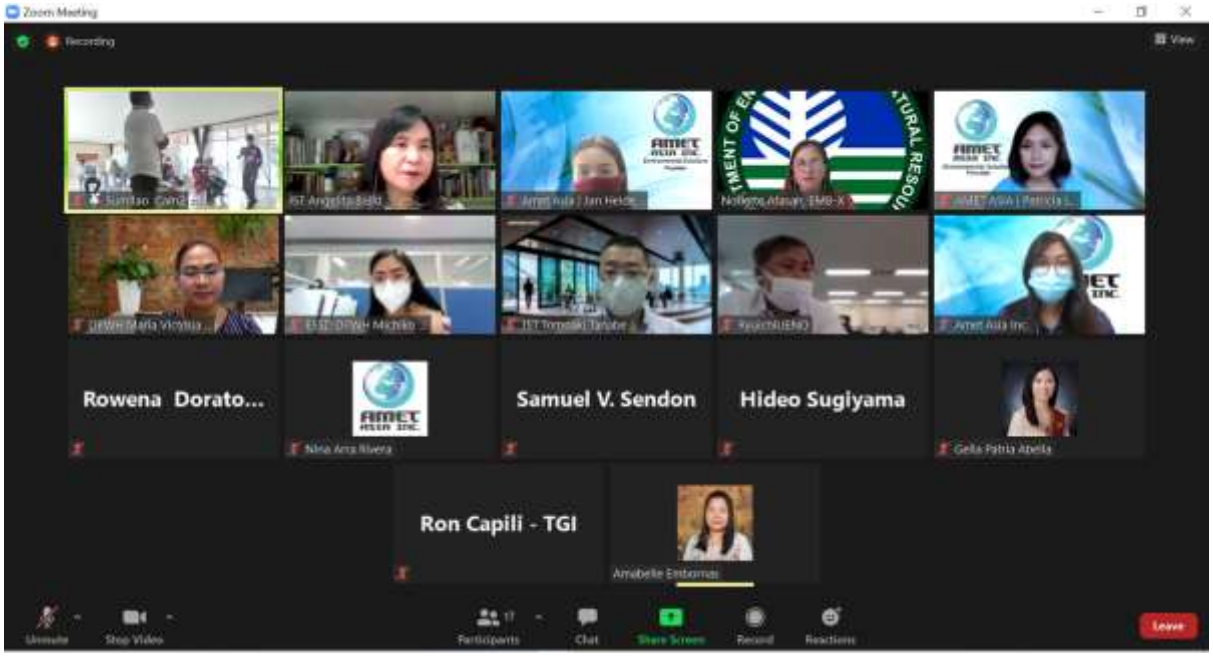
Ms. Rosie Lyn P. del Rosario from MPDO raising her question regarding the project

Sumilao, Bukidnon



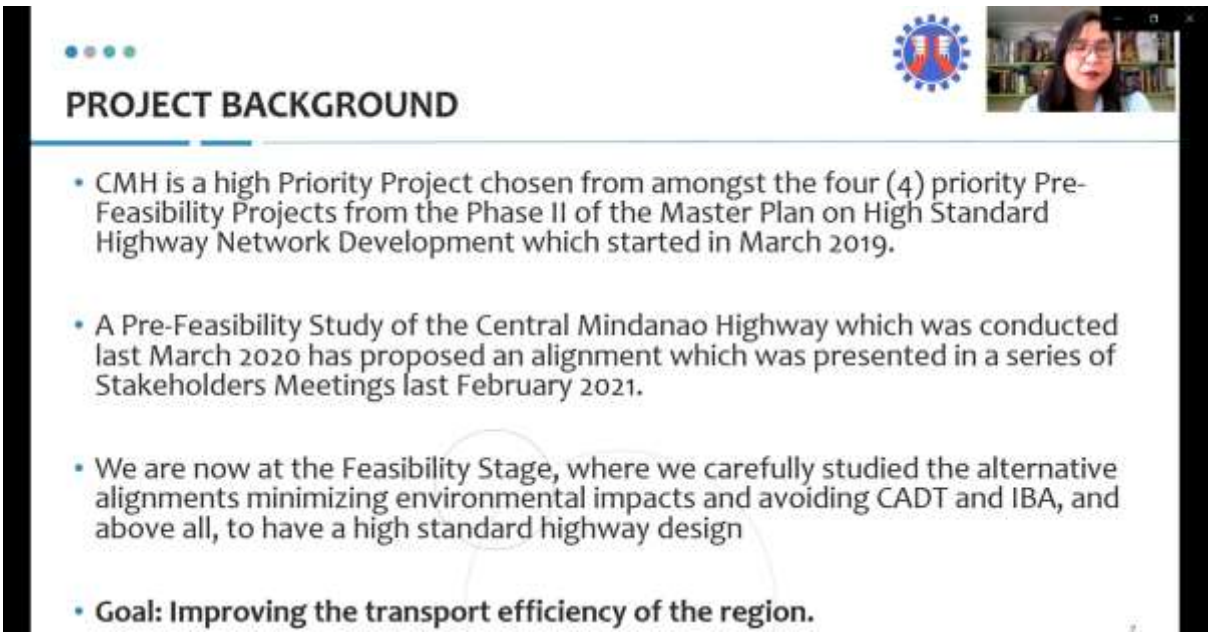
Notice of public scoping posted in Sumilao Municipal Hall

Banner posting in Sumilao Municipal Hall

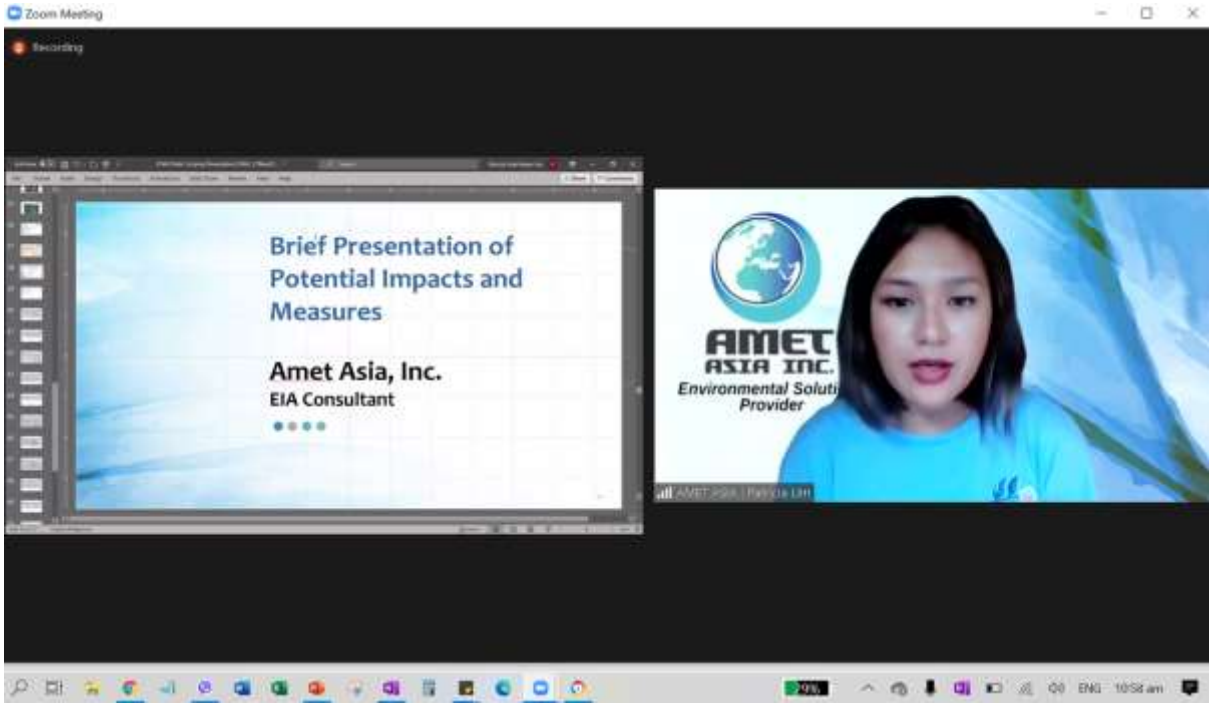


On-line attendees

On-site Attendees



Presentation of Project Background by Engr. Angelita Balid



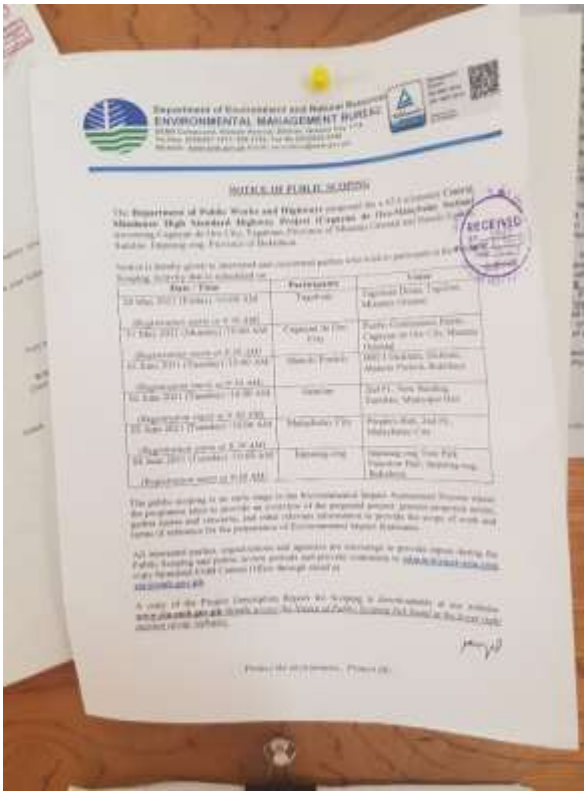
Presentation of potential impacts and measures by Ms. Patricia Erika Lim

Engr. Rowena Dorato facilitating the open forum

Vice Mayor Jhun Dhee Leparto raising his question about the project

Engr. Victoria Lofamia of DPWH ESSD addressing the issues and concern about the project

Malaybalay, Bukidnon



Notice of public scoping posted in Malaybalay City Hall

Posting of banner in Malaybalay City Hall

On-line attendees

On-line attendees

On-site Attendees

Vice Mayor Atty. Warren Pabillaran giving his opening remarks

Project information being presented by Engr. Angelita Balid

Potential Impacts and Mitigation being discussed by Ms. Patricia Lim

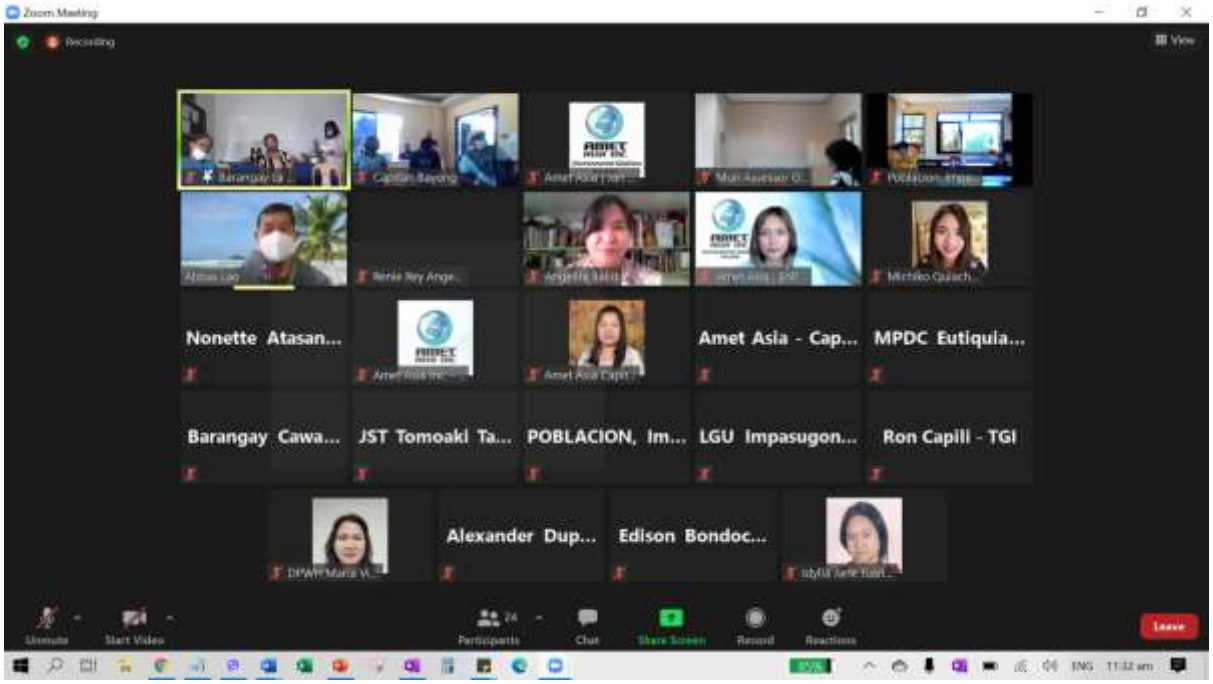
Atty. Abbas Lao explaining the mechanics of the open forum

Ms. Arbel Sulinay from KADUMA Kalasungay asking a question during the open forum

Impasug-ong, Bukidnon

Notice of public scoping posted in public areas

Project banner posted in Brgy. Capitan Bayong barangay hall



On-line attendees

On-site Attendees

On-site Attendees

Brgy. Capt. Dawn Roque from Capitan Bayong delivering her opening remarks

Engr. Nonette Atasan introducing the speaker

Potential impacts and mitigations being discussed by Ms. Patricia Erika Lim

Brgy. Kag. Enrique Gayon (Capitan Bayong) addressing his concern

Ms. Michiko Quiachon from DPWH ESSD addressing the question regarding right-of-way

Attachment 13. Summaries of the Public Scoping proceedings

Cagayan de Oro City

The program started at 10AM at Bugo Gymnasium, Bugo, Cagayan de Oro City. It was started with a prayer from Charlo Badal and followed by the singing of the national anthem. Dr. Nimfa L. Bracamonte, Amet Asia, EIA Consultant, introduced the participants on-site and online through zoom.

Engr. Nonette Atasan – EMB X served as the emcee/facilitator and articulated the EIA process. Overview of public scoping guidelines and mechanics of the scoping project were also presented by Engr. Atasan.

Opening remarks by Kagawad Presly Emano who said that the project will pave the way for easy travel to Bukidnon which is about 28 kilometers and takes more than two hours without traffic.

Engr. Angelita Balid from DPWH-JICA presented the project through zoom. Ms. Patricia Lim from Amet Asia presented the potential impacts of the project and mitigation measures.

Open Forum was moderated by Atty Abbas I. Lao of EMB 10, Division Chief, Clearance and Permit Division. After the open forum Atty Lao mentioned that the presentation includes the mitigations measures. This study will also be presented after it is done. There will also be a public hearing after the study and after it is submitted to EMB.
Closing Remarks was given by Kagawad Ariel Igot who said that they are thankful for all the agencies, and they are clarified with the possible effects of the project. They said that they all support the project.

Municipality of Tagoloan

The program started at 10AM in two barangays in Casinglot Barangay Hall Multipurpose Hall and Natumolan Barangay Multipurpose Hall, Tagoloan, Misamis Oriental. The program started with a prayer and then was followed by the singing of the national anthem. Introduction of participants was made by Dr. Nimfa L. Bracamonte, Amet Asia Consultant.
Engr. Nonette Atasan – EMB Region X served as the emcee/facilitator and articulated the EIA process. She also gave an overview of scoping guidelines and mechanics of the scoping project. She reminded the participants to observe the health protocols.
Opening remarks was given by Marlo Bolanio, Barangay Captain of Casinglot who welcomed the participants to the public scoping.

Engr. Angelita Balid from DPWH-JICA presented the project through zoom. Ms. Patricia Lim from Amet Asia presented the potential impacts of the project and mitigation measures on-site

The Open Forum was moderated by Engr. Rowena Dorato, EMB Region X. The latter gave a brief synthesis of the issues and concerns after which she reiterated the whole process. The report will be submitted to include the public scoping issues/concerns to the Central Office of EMB and Technical Scoping will be set to determine the focus of study. EIS as a document will be prepared by Amet Asia that will be further reviewed by a Technical Committee of third party consultants.

Closing remarks given by Kagawad Marivic Ajon, a proxy of Kagawad Segundino Galorio thanking the organizers and all. Economic growth and good opportunities are cited as impact.

Municipality of Manolo Fortich

The public scoping was held on June 1, 2021 at BRFI Dicklum, Manolo Fortich. It was started with a prayer from Datu Guhaynon followed by the singing of the national anthem. Dr. Nimfa L. Bracamonte, Amet Asia, EIA Consultant, introduced the participants, those on-site at the zoom.

Engr. Nonette Atasan – EMB X emcee/facilitator and articulated the EIA process and presented the overview of scoping guidelines and mechanics of the scoping project/

Opening remarks was given by Danny Salvador R. Bucon, LGU Manolo Fortich who said that it is a privilege that the meeting is held here. He also thanked the participants and the coordinators for coming to the program which will enhance their knowledge about the project.

Engr. Angelita Balid –JICA Study Team presented the project through zoom. Ms. Patricia Lim – Amet Asia- presented the potential impacts of the project and mitigation measures through zoom.

The Open Forum was moderated by Atty Abbas I. Lao, Division Chief, Clearance and Permit Division, EMB X. After the open forum, DPWH-Engr. Lofamia thanked the participants for airing out their concerns in this activity. It is appreciated to enhance this project.

The closing remark was given by Danny Salvador R. Bucon, LGU Manolo Fortich – who said that he did the opening and also the closing. In behalf of LGU Manolo Fortich, he thanked the organizers for clarifying the project. Hopefully everything that was discussed will be implemented.

Municipality of Sumilao

The public scoping started at 10:00 AM held at the 2nd Floor New Building, Sumilao Municipal Hall. The meeting started with a prayer and then the national anthem was sung. Then the acknowledgement of the participants by Dr. Nimfa Bracamonte followed. The opening remarks was given by Kag. Dominador Del Rosario from Kisolon. After which Engr. Nonette Atasan from DENR EMB X who was the facilitator of the program gave the overview of the scoping guidelines, mechanics of the scoping for the project.

Kag. Dominador Del Rosario (Kisolon) gave the opening remarks. He thanked the participants from all barangays, from the MENRO and Municipal IPMR and from other sectors such as the teachers, as well as the facilitators for this public consultation. He also said that the people of Kisolon are thankful for this project. They would have easier transport of products. Travel time will be shortened from Cagayan to Malaybalay - 65.6. km of road project that is high standard. It can accommodate faster travel time. He welcomed everyone. Engr. Angelina Balid from JICA Study Team presented the project through powerpoint presentation in the zoom. Ms. Patricia Lim from Amet Asia presented the potential impacts and mitigation measures for the project via zoom.

Engr. Rowena Dorato – Section Chief of EIA moderated the open forum.

Barangay Captain Gilbert Mamatan (Brgy. Kulasi) gave the closing remarks. He thanked the proponents for making them understand and have the issues and concerns addressed. He also said that this is a good project but if the process is not followed, especially for the IPs with no legal documents, what will happen to them if their land and livelihood are affected. He mentioned that they might go to the other group instead. The LGU can help the people in Sumilao to understand the project.

City of the Malaybalay

The public scoping was held on June 3, 2021 at 10:00 AM at the People's Hall, 2nd Floor, New City Hall, Malaybalay City. The meeting started with a prayer and the singing of the national anthem. Then Dr. Nimfa L. Bracamonte acknowledged the participants on-site and online.

Vice Mayor Atty Jay Warren Pabillaran gave the opening remarks. He said that he is happy that this project is following the procedure, this public consultation, so people can state their concerns. He welcomed everyone to Malaybalay City.

Engr Nonette Atasan stated the purpose of this public scoping. She said that the group would want to hear the participants' concerns when this project will be implemented. It is important to reach out to everyone for their concerns.

Engr. Angelita Balid presented the project through powerpoint slides through zoom. Ms. Patricia Lim presented the project potential impact and mitigation through powerpoint slides through zoom.

The open forum was moderated by Atty Abbas Lao. Before starting the open forum Atty Lao set some rules. He emphasized that the project is still in the feasibility study. One of the stages is the public scoping. The purpose of the public scoping is to know the concerns of the stakeholders about the project in the CMH. The areas that will be affected and the mitigation measures. The mitigation measures were presented that could be required for the ECC. He said that he will be presiding in the open forum. Wait to be recognized. Please state the name and the sector of the participants. Participants may also send questions in the chat box. This is a recorded proceeding. Everything will be recorded during the meeting.

Ms Arbel Sulinay from KADUMA Kalasungay gave the closing remarks. She said that in behalf of everyone, they are happy that the proponents are here. On behalf of the different barangay councils that represent everyone, so we will know about the high standard highway project. She also thanked the DENR.

Municipality of Impasug-ong

The meeting was held on June 4, 2021 at 10:00 AM in Capitan Bayong Barangay Hall, Impasug-ong, Bukidnon. The meeting started with a prayer and the singing of the national anthem. Dr. Nimfa L. Bracamonte acknowledged the participants on-site and online. Engr. Nonette Atasan, the facilitator of the program presented the overview of the scoping guidelines, mechanics of the scoping for the project. According to Engr Atasan, this project requires an ECC because this is a category A project. Amet Asia already conducted the IEC and now they need to conduct this public scoping. Even during the pandemic, we still have to conduct these activities. Issues in terms of land, water, people, and the economic aspect need to be discussed. Participants are encouraged to raise questions, suggestions in order to document this public scoping. It will form part of the documents that the contractor will submit for evaluation. There is no right or wrong answer. The people are asked to raise concerns and what will be affected. The participants are residents here and the team need your concerns.

Brgy Captain Dawn M. Roque gave the welcome remarks. He said that they are happy about this project, especially with the representatives from DENR and JICA. He hoped this will be an enlightening activity for everyone, especially the issues about the environment.

Engr. Angelina Balid – project presentation through powerpoint using zoom. Ms. Patricia Lim presented the potential impacts and mitigation measures through powerpoint through zoom.

Atty Abbas Lao presided the open forum and stated its rules. Only those recognized by the presiding officer are allowed to talk. The following were emphasized: State your name and affiliation before asking the question; Participants may also send questions in the chat box so the presiding officer can read the question and ask the proponent to answer; Also turn off the microphone when not recognized.

Kagawad Generaldo Galambo (Capitan Bayong) gave the closing remarks. He said that they are thankful that the public scoping is held here in their barangay. And for the project, even with the pandemic, participants are here through zoom. They heard the issues and concerns. He also said thank you to all who asked questions and those that answered. If we have problems that are not raised today, we will forward this to your office.

Attachment 14. Issues raised during the Public Scoping and responses

Issues raised in Tagoloan, Misamis Oriental

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Noel Igno, Barangay Administrator	Recognized the benefits of the road access system that will accrue to the people. But the issue of road alignment will hit the water reservoir that benefits the whole community as source of water. In Casinglot, we have a problem during rainy season. We get flooded in Casinglot. The water reservoir should be avoided and should not be damaged during construction.	Engr. Maria Victoria Lofamia - DPWH ESSD	- Environmental concerns are important inputs to the platform and design and this will be studied to know more and understand the situation. The water reservoir will not be hit and will be avoided. This is a good venue to mention for the flood mitigating measures Casinglot as catch basin will be included in the report so proper mitigating mechanisms will be put in place.
2	Rosa Moreno, BHW, Barangay Natumolan	Payment of affected lands and houses- For those of us who have houses and land that will be affected, what will happen to us?	Engr. Angelita Balid - JICA Study Team Engr. Maria Victoria Lofamia - DPWH ESSD Rowena Dorato- EMB Region X	This study is still on feasibility phase indicative of affected areas. The detailed design will be adjusted and done later and houses and lands to be affected will be discussed in RAP (resettlement action plan) meetings. In this public scoping, environmental issues are to be discussed. Just compensation is provided by law. There will be a separate team to go to the area. The RAP team will offer detailed explanation, e.g, compensation. Invited are those who are affected. During implementation, there will be a detailed design Noted that sometimes the DPWH valuing is smaller such as those that happened somewhere in Misamis Oriental that the owner had a high blood pressure. This is important. There is a need to focus on the concept as this also affects the people's health, if properties are not fully paid.
3	Paul Paraguya CTI Consultant	There are 3 groups: 1.Amet Asia for the environmental concerns and issues to be noted 2. EB Testing Center to take sample soil as input to the		Comment only, not an issue

No.	Name/Position	Question/Concern	Name/Position	Answer
		detailed design. 3. RASA group to determine the drawing design applies to the actual. Who are really affected in terms of properties will be discerned. This forum is underscored as the venue to raise the environmental issues and concerns to know the environmental impact of air, water, and land to the people	.	
4	Marlon Bolanio Casinglot Barangay Captain	Casinglot is a catch basin and there is the issue of flooding along the national highway due to heavy rains impacting on the drainage system. The newly constructed project may add and aggravate the problem. In Casinglot, our water reservoir will be affected. What will happen to our water reservoir?	Engr. Angelita Balid – JICA Study Team	The issue is valid and good that this is brought up. Water reservoir is important and this is subject for study Assurance given that the water reservoir will not be affected
5	Tessie Dinglasa Women sector Barangay Social Welfare & Development	If the project will be approved, what about the women? Are there possible projects or programs for their livelihood?	Engr. Angelita Balid – JICA Study Team Ms. Patricia Lim – Amet-Asia	Livelihood project for the women sector will be considered along side with other sectors in line with GAD. This will be included in the study. It is not only women's concerns, but also the PWDs are included. The sensitive sectors are to be included in the study to have a GAD plan. No need to worry since this is included in the plan

Issues raised in Cagayan de Oro City

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Vic C. Talingting Bugo Barangay Captain	I want to assure the support of the barangay to the project. I want to hear the settlement of the affected private/titled property. I was not able to hear about how to settle the owners. We have gathered the affected residents and I think there are no problems. They are just asking about the settlement. The law says that we cannot prevent a government project, but they want to know what will be the compensation for the trees, land, houses and development affected.	Engr. Angelita Balid – JICA Study Team Paul Paragoya– CTI JICA	There is a separate team that will conduct the RAP study. The affected people will be invited for discussion. Hopefully this is the end of meetings. But unfortunately not. There are several studies that will be conducted. We have the soil sampling, EB Testing, RASA for the RAP and this is EIA study.Based on the plan, this year is still the feasibility studyThere is no final list of who will be affected. But the people are very positive towards the highway project.
2	Eugene Magto CSWD	Is there no profile yet of the 3 barangays that will be affected? For Bugo, Balubal and Puerto. Payment for the animals affected by the project?	Engr. Angelita Balid – JICA Study Team	There is still no list. We have the RAP Study that will be conducted
3	Sherwin Cabactulan RTA, CDO LGU	Do you have the policy/ordinances for the road highway construction? Are there lighting facilities, warning signs and other requirement included in the budget? We have requirements like road permit. We have traffic management requirements, especially if it intersects with Balubal and Puerto city roads. Excavation permit is required for city roads. Is there a policy with hierarchy of arterial? Tthere is no policy to direct opening to enter the super highway that requires speed.	Engr. Maria Victoria Lofamia - DPWH ESSD	Thank you for the issue on ordinances. We will get the information and during the engineering design that is where we will look at the traffic and coordinate with you about your concerns of hierarchy of arterial.
4	Ariel Igot Kagawad of Bugo	In the hillside part of Bugo, the canal might overflow down to the barangay to cause flooding. There might be flooding. It must be part of engineering to look at the flooding.	Engr. Angelita Balid – JICA Study Team Ms. Patricia Lim, Amet Asia	-This expressway is a high standard highway. We have hydraulic engineers who will study the water flow. Rest assured that we ensure that if your area is flood prone, we will study the design of the road. – We have a hydrology expert who will study the water flow of the area and look at the bodies of

No.	Name/Position	Question/Concern	Name/Position	Answer
			Mr. Samuel Sendon - Amet Asia	water and check the effect of flooding and provide recommendations if there is a need for drainage. In the detailed engineering design, we will look at the issue of flooding in the area. There will be experts who will look at the area of the road We are designing which area is prone to flooding. Road alignment is usually in the highlands and not affected by flooding due to extreme weather conditions. Mostly run off, we will address in the detailed engineering design through detailed hydrology and check the flooding aspect in the area.
5	Armien Cuenca - CLENRO Head	My concern during construction. What measures should be done so that the debris will not go to the lower portion? Apprehension during rain-induced landslide. There should be mitigation for rain induced landslide. I think there will be no problems after the construction.	Engr. Angelita Balid – JICA Study Team Samuel Sendon - Amet Asia	– Your concern is valid. We have a public scoping so we know your concerns, rest assured that since this is a category A project. We will look at the environmental impacts such as the debris during construction, it was presented in the Envi that there are mitigation measures during construction. Don't worry there are a lot of people looking at the project. Landslide is not just during heavy rains, we are looking at the areas whether it is earthquake-induced or rain- induced. We will make the geohazard assessment. Hydraulic concerns will be studied very well to include the areas prone to flooding. The existing road has a lot of landslide prone areas. But there are mitigation measures that can be done.

Issues raised in Manolo Fortich, Bukidnon

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Shirley Tagapulot Kagawad, Dicklum Barangay DRRM	Our concern is if the road will pass through the trees and residential lots. This is because there was a DPWH project before and they were not paid/ Will the affected lots be paid?	Ms. Michiko Quiachon - DPWH ESSD	We are preparing a RAP that will reflect the affected lots and trees. There is a plan for that with estimated compensation. The design is still preliminary, not final
2	Datu Alex D. Payangga Municipal IPMR Tangkulan	I would like to inform the body that Amet Asia has complied with the rituals of the IPs. But I have also a knowledge that this activity has 3 contracting parties: Amet Asia, RASA and EB. The two other parties have already passed through the IP process - RASA and Amet Asia. I talked with EB representative that they should comply with the requirements of the municipalities since they have CADT. That is why we request the contracting party to abide with the IP process. When the detailed design is done, the concern is there are areas that are rented by Del Monte, what if the project will pass through here and the land will be reduced and deducted from the rentals? Forest areas - flora and fauna, how can we mitigate? There must be mitigation procedures to maintain the environmental diversity Follow up Suggestion Another concern is the houses - if you do not follow up the contractor and DPWH, the owners are not paid. This is the common problem among IPs. It is suggested that before the ROW, all areas should already be fully settled and paid before 2023. There are benefits and it can help them.		Information, suggestions and comments
3	Datu Amay Iwag – MPUMATRIC Talaandig Chieftain	Why are there a lot of rituals? The rituals are required before other people are allowed inside our area. So it is one of the requirements of the IPs. We tried to avoid the CADTs but based on the presentation, all of these are in Ticala, San Roque, Vista Villa – these are ancestral	Engr. Maria Victoria Lofamia - DPWH ESSD Dr. Nimfa Bracamonte	We have another discussions with another group. Thank you for sharing your concerns that will be included in the discussion in the public scoping. We always take consideration of culture sensitivity

No.	Name/Position	Question/Concern	Name/Position	Answer
		domains of Higaunon-Talaandig. We want to emphasize that the discussion of the cultural impact of the project should be undertaken. The cultural impact assessment will include not just the rituals, but the 1.belief system/spirituality 2.IKS impact 3. impact of the project to the customary governance, justice system 4.indigenous economic 5. health system (the forest is source of herbal medicines) 6.peace and security of the tribe. These are not part of EIA when these are part of RA 8371. When we talk about construction, big considerations be afforded to these, as these are done only after the construction is almost done and damages are already incurred by the contractors. These impacts should be a component of the project. This will lead to the FPIC of the project. These issues in DPWH complying with the FPIC, usually the projects are already done before they ask for consent. It should be part of the study of JICA. I hope the concerns of the IPs will be included – both the positive and negative impacts.	– Amet-Asia	and we are aware that Manolo Fortich is sprinkled with the IPs – Talaandig cultural identity. We are also conducting KII and part of it is determining the lifestyle and practices of the cultural communities – regarding the cultural impact assessment as mentioned by Datu Iwag. This is embodied in RA 8371 or IPRA
4	Ma. Theresa Dampal - MENRO	Is it included in the plan to identify and present the disposal site before the construction? There have been incidents of disposal issues that have reached the office.	Ms. Jan Bautista – Amet-Asia Engr. Angelita Balid – JICA Study Team	– We will include the disposal in the plan. – It is part of the factors that is being studied on how waste will be disposed. Rest assured that we will look into this issue. It is one of the pointers being closely looked into.
5	Rosie Lyn P. del	The various potential impacts and mitigation were	Atty. Abbas Lao – EMB	The reason behind public scoping is to determine

No.	Name/Position	Question/Concern	Name/Position	Answer
	Rosario LGU Manolo Fortich MPDG	broadly presented. Re waste management plan and other plans concerns - will this plans be presented to the LGU? Will the details of the plans be discussed in the public?	RX Patricia Lim – Amet-Asia Atty. Abbas Lao – EMB RX Engr. Maria Victoria Lofamia - DPWH ESSD	the scope -the baseline studies of this EIA will be disclosed to the public and through the public hearing. The chosen representatives from different sectors who will be invited in a public hearing are to disclose, in turn, the details of the study to their respective communities. The results will also be reviewed by the EMB central office. The presentation earlier was potential impact and general since we have not done the study yet. The potential impact was presented and it depends on the result of the assessment. It depends on the actual data gathered and these will be presented to the community during the public hearing. The results and recommendations will likewise be presented during the public hearing. Results of the study will be presented during the public hearing. All the recommendations for the proposed project will be presented during the public hearing. The concern about several plans – slope protection plan, right of way plan. This is part of the scoping. From this scoping, we will have the baseline data from the ground and we will see what concerns need to be answered like slope protection and drainage. This is because of the scoping that there is flooding in certain areas. We capture the issues for the consultant and look at the mitigating measures for every impact seen and evaluated.

No.	Name/Position	Question/Concern	Name/Position	Answer
				All management plans and other baseline studies that will be conducted as part of the EIS will be discussed and disclosed to the public thru the public hearing.
6	Ma.Theresa Dampal MENRO	Is it possible during construction phase to inform the LGU so we can check the identified disposal site if it is a good site because others dispose their wastes in the creek.	Atty. Abbas Lao – EMB RX Patricia Lim – Amet-Asia	They will identify the disposal site. This study will be reviewed by REVCOM comprising of different experts from different institutions to review the plans and disposal site. The REVCOM will also check the concern of LGU Manolo Fortich to check if the disposal site is appropriate. We can also check if the identified disposal site is appropriate and there are no environmental impacts. The request of MENRO that they will be consulted during the baseline study they can inform – closely coordinate with the LGU to directly inform the consultant about the issues. Regarding the construction phase, the LGU will be part of the MMT in monitoring the issues like in the construction site they can suggest to recommend what can be done. It is one of the safeguards of the project.
7	Paul Paragoya JICA- CTI Consultant	I would like to apologize for yesterday, no intention. In the creation of the MMT, where is the level? Is it at the national, regional, provincial or municipal? It is good but the participants are from the barangay. At what level is the monitoring team?	Atty. Abbas Lao – EMB RX	There are guidelines for the MMT. In this project, with different municipalities, there should be levels of representatives from the different municipalities and sectors affected like Bukidnon. The concerned barangays will also have representatives in the sectors. The creation of the MMT has guidelines. Rest assured that all the concerns of the different level of the LGU – from barangay to municipal will be considered. The provincial government will also consider the issues of the municipality. It is composed of different sectors pursuant to the guidelines of DENR

Issues raised in Sumilao, Bukidnon

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Datu Carlo Dahinao – IPMR Sumilao	Our mayor is very supportive. In Vista Villa, the road will be there. In Dalirig, the land and properties affected in the Higaunon-Talandig ancestral domain were not paid. The lands are rented by Del Monte, Del Monte reduced the payments since the land were added in 30 meters of road. Now with the JICA project, all of the land in the area will be taken so no more land. So we are asking for livelihood in the area.	Engr. Angelita Balid – JICA Study Team	It was already presented last time that the land are rented by Del Monte. Rest assured that we will take into consideration regarding this. The DPWH has a procedure for that
2	Datu Carlo Dahinao - IPMR Sumilao	Our land is already rented by Del Monte - the landowners already advanced the payment. What could be done? Thank you.	Engr. Maria Victoria Lofamia - DPWH ESSD Engr. Rowena Dorato- EMB Region X Engr. Maria Victoria Lofamia - DPWH ESSD Patricia Lim – Amet-Asia	There is a RASA who can discuss during the public consultation. There are some things that cannot be avoided, RASA will discuss this with them. We will take this into consideration. The land was already paid by Del Monte, so nothing will be left for them in the payment. This is still an initial phase so we cannot tell if the payment will be lacking. It is good that we get their concerns during the public scoping and we know how to deal with the issues. For the EIA consultant, we are applying to the environmental compliance certificate. We take note of the issues and include this in the EIS and submit this to DENR. At this stage, we will recommend and the project alignment might change later. So we recommend the FPIC, the project will not start if the permits are not given. For the comment of representatives – we will really try to have this in the area. For the problem with rent – as mentioned by Engr Balid and Engr. Lofamia – there are other venues for talking, discussing the issues.
3	Fidel Daigon -	There are 2 categories of farmers - small and big. Small	Engr. Maria Victoria	For the small farmers maybe this was discussed in

No.	Name/Position	Question/Concern	Name/Position	Answer
	Kisolon Farmer's Association	farmers are in the slope area. My question is, will they be paid since they don't have any legal document. How do we address the small farmers with no legal documents?	Lofamia - DPWH ESSD Engr. Rowena Dorato- EMB Region X	RASA. There are certain processes on how to address small and big farmers. But as mentioned by Pam Lim, we will get their issues and concerns so we can place the mitigating measures that we have these issues and how to address them. But for now, we cannot answer directly if they are entitled or not. What if I say yes but they will not be affected. It is after the detailed engineering design where we can say that they will be affected. This are initial issues and concerns and we want to hear them so we can look at the mitigating measures. Even if you do not have the legal documents, what is compensated are the improvements in the land and the trees. But during the detailed engineering for the final alignment. They will call for another meeting where the compensation will be discussed.
4	Julius Tan - Poblacion Barangay Captain	Follow up question for Sir Fidel Daigon. All the slopes are owned by the IPs but they do not have papers. In the IP tradition we have certain signs that this is owned by someone. There are trees and other improvements. Thank you	Engr. Rowena Dorato- EMB Region X	This cannot be answered right now. But we have the procedure for the compensation of the land and improvements.
5	Julius Tan - Poblacion Barangay Captain	In the Sumbalan - it was a previous lake and was planted with pineapple by Del Monte. The lake was 4 hectares I have a map in 1930 and I can show you the area.	Engr. Angelita Balid – JICA Study Team	Thank you for the information for the previous lake. Do you have a map when the lake was shown?
6	Datu Carlo Dahinao - IPMR Sumilao	Compliance with Free and Prior Informed Consent. We are not against the road - during the RASA meeting, we understood the project. But the problem is that they were talking in English and Tagalog. An IPMR representative must be present to translate to the IPs. The project proponents must go through the barangay for public hearing and consultation. They were speaking in English and Tagalog and the people could not understand so I translated for the	Engr. Angelita Balid – JICA Study Team	We required that those who go to the field bring someone who can translate. For RASA who were not able to provide a translation, rest assured that in the next meetings there will be someone who will translate.

No.	Name/Position	Question/Concern	Name/Position	Answer
		people.		
7	Vice Mayor of Sumilao – Jhun Dhee Leparto	In VIsta Villa, they presented the road project. There were many comments and issues. We are building a community in the area who were relocated from danger zone areas - 77 households in Sitio Basag. We invested and allocated funds to build that community. A JICA personnel showed a map and that the road will pass through the community. There are farm areas which are their source of livelihood. We presented to JICA a proposal. We presented a proposed road to them and they will only deal with Del Monte. The road you are proposing is more than the existing road. This is a redundant road. According to the JICA representative we talked to - they like our proposed road alignment. We hope it reached your office. So we can go with the project. The existing road is almost 90% done and it is really close to the proposed JICA road. That is why we proposed another alignment for the road. You only talk with Del Monte. You can visit our office so we can show the area.	Engr. Rowena Dorato-EMB Region X	The contractor and JICA should conduct a survey and you can see the road. The budget can be added to the livelihood instead.

Issues raised in Malaybalay, Bukidnon

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Bae Inatlawan Adelina Tarino – Daraghuyan Ancestral Domain – CADT Holder	If our land which is CADT is affected, will we be paid and how much?	Ms. Michiko Quiachon – DPWH ESSD Atty. Abbas Lao – EMB RX	The RAP will be undertaken for those with lands that are affected. We cannot answer how much because the process is not yet finished and we are still in the FS. The project is still in the FS and they cannot answer yet.
2	Arbel Sulinay from KADUMA Kalasungay	As heard from the presentation, we are not sure if the project will pass through our ancestral domain, the FPIC should be followed in partnership with the NCIP.	Ms. Michiko Quiachon – DPWH ESSD	The FPIC with NCIP will be complied
3	Josette Ygonia – Principal, Dalwangan Elementary School	Are the Department of Education Malaybalay City represented in this public scoping?	Ms. Patricia Lim – Amet-Asia Atty. Abbas Lao – EMB RX	The representatives from different areas are invited to the public scoping. The representatives from DepEd are also represented here.
4	Leslie T. Fontanilla - Division Engineer- DepED Malaybalay City Division (through zoom)	Good morning po! This is from DepEd Malaybalay City. The schools -Kalasungay Central School and Dalwangan Elementary School, received letters directly from the DENR-EMB. We will wait for the finalization of the project if ever our school property will be affected, or there will be utilization of the school area for the proposed project. We hope that the Office will be informed if there are activities like this.	Atty. Abbas Lao – EMB RX Engr. Angelita Balid – JICA Study Team	We will coordinate with the concerned offices regarding this project. Any other concerns about this project? They are invited so they will know about the project. They are not affected because the project might not pass through the school. We want to avoid that the project will affect establishments.
5	Mary Fe C. Gumayao, SP1 of Kalasungay Central School (through zoom)	The highway might pass through our area. The DPWH went through our school and they did not coordinate with the School Superintendent. I told the School Superintendent to look into the situation.	Atty. Abbas Lao – EMB RX	There should be proper coordination with the concerned officials. Thank you for the information.
6	Josette Ygonia – Principal, Dalwangan Elementary School	Can we have a copy of the proposed alignment of the project? There might be school structures that will be affected. We have to know how the project will affect our school so we can make initial requests.I would like to ask	Atty. Abbas Lao – EMB RX	We cannot provide the map because there is still no detailed design. But there will be coordination with the concerned agencies so you will be informed for the final detailed design.

No.	Name/Position	Question/Concern	Name/Position	Answer
		where in Dalwangan the project will pass through - the Elementary and High School might be affected. Thank you.		
7	Phoebe B. Petalcorin, Engineer II, Provincial Planning and Development Office –Bukidnon (through zoom)	Please also identify if the affected roads will be barangay road or the classification of that road.	Engr. Maria Victoria Lofamia - DPWH ESSD	Rest assured that we will have proper coordination with the LGUs regarding this project. High Standard Highway – all our concerns during the public scoping will be taken into consideration. Like in the education sector, and the road classification will be coordinated so we will have a smooth flow.
8	Phoebe B. Petalcorin, Engineer II, Provincial Planning and Development Office –Bukidnon (through zoom)	Regarding the High Standard Highway what is the classification?	Engr. Angelita Balid – JICA Study Team Atty. Abbas Lao – EMB RX	This is an express highway project design. But we still need to study the detailed design of the project. This project is an express highway and different from the provincial road.
9	Arbel Sulinay from KADUMA Kalasungay	From Tagoloan to Malaybalay – is this the dead-end of the project or will it continue to Davao City so there will be more barangays which will be affected in Malaybalay City.	Engr. Angelita Balid – JICA Study Team	Thank you for the question. The project is CDO-Malaybalay, for the road in Davao City that is another project. The affected barangays in Malaybalay are only those listed. For the Davao City highway project that is another study.
10	Phoebe B. Petalcorin, Engineer II, Provincial Planning and Development Office –Bukidnon (through zoom)	There are a lot of on-going DPWH projects, so it is important to clarify the areas.	Engr. Angelita Balid – JICA Study Team	Thank you. We are trying to design the expressway to coordinate with the roads projects. So we are asking for the plans, so there is no conflict with the current projects of DPWH.
11	Jonar Yanggo – Brgy Secretary, Cabanglasan	After the project, will this be turned over to big companies and will there be toll fee?	Engr. Angelita Balid – JICA Study Team	We still cannot answer that. We will study if we can fund the expressway and not ask for the toll fee.

Issues raised in Impasug-ong, Bukidnon

No.	Name/Position	Question/Concern	Name/Position	Answer
1	Dawn Roque, Barangay Captain, Capitan Bayong	We received the map of the project. And the highway will pass beside the poultry. Our concern is that the chicks will be affected by the noise. This is a highway and there will be a lot of cars passing by. Even the helicopter passing by will affect the chicks. We are requesting that the road will be moved a few meters – still within our land. We are happy with the project but can it be moved further from the poultry? Thank you. I don't have the exact number for the site – but the existing plan is just 5 meters from the highway. Maybe 30 meters away from the highway. Our access road of the highway is along the Atugan river. Is the highway going to be elevated? Our delivery might be impeded if the highway is along the way. The access road and the highway cross each other.	Engr. Angelita Balid – JICA Study Team Atty. Abbas Lao – EMB RX Engr. Angelita Balid – JICA Study Team Atty. Abbas Lao – EMB RX	We will take note of the concern in Capitan Bayong. Thank you for relating your concern. The map is still initial and the consultant will conduct a detailed investigation on the alignment of the project. What is the appropriate distance of the highway for the poultry? This will be included in the proponent recommendation. That is a good question. But I cannot imagine the access road and the highway. Will the highway be elevated to allow trucks to pass? This is an expressway and will be elevated. But we will see in Capitan Bayong to show in the map where the poultry is located. It will be one of the concern in the baseline and this will be included in the detailed design in consideration of the poultry.
2	Kag. Rolando E. Eguia Brgy Poblacion (through zoom)	From Manolo to Malaybalay there are a lot of poultry farms. The consideration of Kap Roque is not just in their area but also for Bukidnon. Can this be considered?	Atty. Abbas Lao – EMB RX	If possible all poultry farms within the direct impact area of the proposed project will be considered. I think it will be included in the actual site survey. That is actually one of the purpose of the environmental impact assessment to look at the directly and indirectly affected areas. To relocate the road alignment to pass by the poultry farms. It depends on the mitigation of the proponent. And your concern will be considered in the environmental impact assessment.
3	Brgy. Cawayan (through zoom)	For the affected houses, will there be any compensation and relocation? If there will be infrastructure in the area	Atty. Abbas Lao – EMB RX	There will be a compensation plan – any other structure will be included in the inventory and will be

No.	Name/Position	Question/Concern	Name/Position	Answer
		that will be affected, can the alignment be moved to avoid the infrastructures already in the area?	Engr. Angelita Balid – JICA Study Team	discussed in the compensation. This is the work of RASA – you can include that in their discussion. But this is good that it is raised in this forum that there is a concern in this barangay. There is a compensation for the affected residents.
4	Brgy La Fortuna – Kagawad (through zoom)	There are two irrigation canal structures in San Juan and La Fortuna proper	Engr. Angelita Balid – JICA Study Team	We will take note and study so that the survey team will see how the alignment will be adjusted. Please accompany the survey team so they will know the area.
5	Kag. Enrique Gayon – Capitan Bayong	I was the one who accompanied in the survey and saw that many banana and pineapple plantation will be affected. What will happen to them?	Engr. Angelita Balid – JICA Study Team Atty. Abbas Lao – EMB RX	Like the other farms that will be affected by the alignment, rest assured that we will consider these affected areas. Please inform us so we can validate these areas that will be possibly affected by the alignment. It will be included in the inventory. That aspect will be included in the impact evaluation of the review committee. All your issues will be addressed before the ECC is given.
6	Kag. Enrique Gayon (Capitan Bayong)	I think our source of water - main line and reservoir - will be affected. What will be the solution for this?	Atty. Abbas Lao – EMB RX Engr. Angelita Balid – JICA Study Team Atty. Abbas Lao – EMB RX	This is the projected alignment of the road. This is not the final alignment. The proponent will still do a study for the final alignment. It is good that you mentioned that concern. So if there are reservoirs we try not to affect them. We will ensure that the design will not affect the reservoir. We will make sure that the alignment will not be affecting your water line and reservoir If there is a possibility to re-align the project and not affect the reservoir then it will be done. This study will look at the directly and indirectly affected and make mitigation measures. Like if the reservoir is

No.	Name/Position	Question/Concern	Name/Position	Answer
				affected, they will find ways to look for economically probable solutions. This meeting is documented and your concern will be included.
7	Brgy Poblacion (through zoom)	Will we be paid for the agricultural land that will be affected? Will there be a relocation for the affected?	Ms. Michiko Quiachon – DPWH ESSD	We will follow RA 10752 – ROW Act – this will be included in the RAP. It is also included there the relocation site in coordination with the LGUs. In terms of payment of affected land, we will strongly adhere with the provisions of RA 10752.
8	Kag. Thoda Napuran (Capitan Bayong)	If there is a project like this, we conduct a ritual. We are part of the tribal group. We have a ritual before the start of the activity. The proponent will pay for the expenses. Thank you.	Ms. Patricia Lim – Amet-Asia Atty. Abbas Lao – EMB RX	Actually, before we went to the site, our team in the envi – we attended the ritual. Nina, Ivan and I attended the ritual in Manolo Fortich. We also followed the procedure in following the rituals, if it is required. We sponsored the ritual. Rest assured Kagawad that the proponent will follow the rituals required.
9	Kag. Rodrigo Antivo (Capt Bayong)	What was mentioned was in Manolo only. In our area, we also require the conduct of rituals.	Atty. Abbas Lao – EMB RX	What was mentioned by Patricia Lim is that they have already conducted rituals in other areas. Rest assured that in Capitan Bayong the proponent will follow the rituals.

Attachment 155. Public Disclosure

Notice of Public Hearing for the project in newspaper

Tuesday, 25 September 2023
Daily Tribune

MONEY | B11

PCCI, DTI forms free trade front

PCCI has always been a reliable partner in shaping trade and investment policies

BY RAFFY AYENG
@tribunephl_raf

The Philippine Chamber of Commerce and Industry, the country's biggest trade group, and the Department of Trade and Industry, or DTI, have combined forces to push for the promotion and utilization of the country's trade agreements.

Trade Secretary Alfredo Pascual and PCCI president George Barcelon on Monday sealed the memorandum of understanding, which will complement the department's trade education and advocacy campaign to ensure that stakeholders are aware of the opportunities that these trade agreements bring and that they are able to utilize the FTAs.

"The MoU is another concrete step to help boost the competitiveness of domestic industries. We aim to undertake initiatives that will empower our stakeholders to compete in a bigger market and seize the available opportunities therein. Through these FTAs, it will provide an enabling environment for businesses, particularly as we advocate the utilization of these FTAs and build the capacity of our stakeholders," according to Pascual.

Sokor free trade

The latest FTA was sealed by the Philippines and South Korea, aimed to significantly contribute to the Philippines' value proposition as a strong market for smart and sustainable investments, especially as a manufacturing and export hub in the region, a milestone to further enhance the Philippines and South Korea partnership through increased trade and investment relations as well as job generation.

Barcelon said PCCI has always been a reliable partner in shaping trade and investment policies.

He said with its extensive network and partnerships with various industry associations, and business councils, PCCI is significant in empowering the export sector through the trade agreements.

The partnership is aligned with DTI's objective to strengthen the competitiveness of Philippine businesses, particularly the micro, small, and medium enterprises.

and its local chambers. Further, building on a holistic approach, the PCCI and other industry associations will be provided with capacity-building and mentorship programs to strengthen their capability to utilize trade agreements and arrangements effectively.

Likewise, regular trade-related dialogues and consultations will be held for local business communities, especially those with export potential.

The PCCI and DTI both said the partnership is timely with the recent entry into force of the Regional Comprehensive Economic Partnership agreement for the Philippines that will seize opportunities in the RCEP region.

JOB VACANCY
ENDO LIGHTING (THAILAND) PUBLIC COMPANY LIMITED PHILIPPINES BRANCH
UNIT 1 BUILDING 11 LA FUERZA COMPOUND, 2241 CHINO ROCES AVENUE, MAKATI CITY
Tel. No. 5310 0521

MANAGER (1)

Job description
- Responsible for improving brand of the product, efficiency and increasing department profits.

Qualification
- Years of service experience as Manager.
- Excellent organizational and project management skills.

JOB OPENING
COUNTRY HEAD (1)

Job description:
1. Business Development
2. Sourcing and screening candidate
3. Meeting with clients and candidates
4. Providing a career advice to candidate
5. Planning and other task as required by the management

Qualifications:
1. Official business skill test in japanese word processing 3 level
2. Business skill proficiency test japanese 3 level
3. Hotelier proficiency test 1 level

REERACOEN PHILIPPINES INC
Unit 4102, 41st floor GT tower International 6813 Ayala ave. Cor. H.V Dela Costa street, Bel-air. Makati city
09992664157

D'HOOVER RESIDENCES DEVELOPMENT CORP.
115 Hoover St., Cor. Lloyd George St., Brgy. Addition Hills, San Juan City, Metro Manila

(18) JOB VACANCIES:
- 3 Mandarin Operation Manager
- 3 Mandarin Finance Manager
- 3 Mandarin Human Resources Supervisor
- 3 Mandarin Marketing/Sales Coordinator
- 3 Mandarin General Manager
- 3 Mandarin Quality Inspector

REQUIREMENTS:
*Must be 18-55 y/o.
*With at least 1 yr. experience in the related field.
*With good verbal & written skills, specifically English & Mandarin.
*Knowledge in field/real estate works.

Interested applicants may submit their application thru ***dhoovercorp@gmail.com.***

PHOTOGRAPH COURTESY OF DTI

TRADE Secretary Alfredo Pascual (left) and PCCI president George Barcelon shake on Monday a memorandum of understanding they signed to formalize a partnership in the promotion and utilization of trade agreements and other preferential arrangements to boost the economy.

Focus of cooperation

One of the main cooperation activities to be undertaken under the MoU is the establishment of international trade assistance centers or help desks in key regions or provinces with the help of PCCI

It's imperative to rise in the Life Sciences and Global Innovation Index

From page 9

Another important factor is the establishment of trust among crucial players in the life sciences value chain, allowing them to collaborate and co-create. In fact, it was collaboration that paved the way for the world's new and brave story of survival and recovery from the Covid-19 pandemic.

In his opening remarks, Alejandro Campaña, senior director at WIPO's IP for Innovators Department, highlighted collaboration as making possible the development and launch of vaccines in one and a half years, a far cry from the average 10 to 15 years.

This was supported by WIPO's patent applications data in which almost a quarter named more than one inventor as the patent holder.

Rising in the GII

In the Philippines, collaboration takes center stage in our innovation efforts with the creation of the National Innovation Council, created by the Philippine Innovation Act of 2019.

The 25-member NIC, which IPOPHL is a member of, aims to transform Philippine innovation with more and better quality outputs. It also aims to elevate the country's ranking in the Global Innovation Index from 59th to the top third of economies.

The 16th edition of WIPO's GII will be released on Wednesday, 27 September, during a hybrid event from 13:00 to 15:00 p.m. CEST (Geneva time). Centered on a very timely theme, "Innovation in the face of uncertainty," the report will be discussed in greater detail in a panel discussion which will also talk about the way forward for global innovation.

Alejandro Campaña, senior director at WIPO's IP for Innovators Department

Ferronoux Holdings, Inc.
Notice of Annual Stockholders' Meeting

To All Stockholders

Notice is hereby given that the Annual Stockholders Meeting of **FERRONOUX HOLDINGS, INC. (the "Corporation")** will be held virtually via remote communication (through Zoom facility) on **October 20, 2023 (Friday) at 1:00** in the afternoon.

The agenda for the said meeting shall be as follows:

1. Call to Order
2. Secretary's Proof of Due Notice of the Meeting and Determination of Quorum
3. Approval of the Minutes of the Stockholders' Meeting held on November 14, 2022
4. Management's Report
5. Ratification of Acts of the Board of Directors and Management during the Previous Year
6. Election of Directors (including Independent Directors)
7. Appointment of External Auditor
8. Other Matters
9. Adjournment

Only stockholders of record as of the close of business on **September 20, 2023**, are entitled to notice and to vote at the meeting.

A brief explanation of the agenda item which requires stockholders' approval is provided in the Information Statement. The Information Statement, Management Report, the Annual Report (SEC Form 17A) and Quarterly Report will be uploaded to the Corporation's website (https://www.ferronouxholdings.com/sec2023) and PSE EDGE.

Stockholders may attend the meeting and vote via remote communication only. Stockholders may attend the meeting and vote via remote communication in accordance with the procedure set forth in **Appendix 1** of the Information Statement.

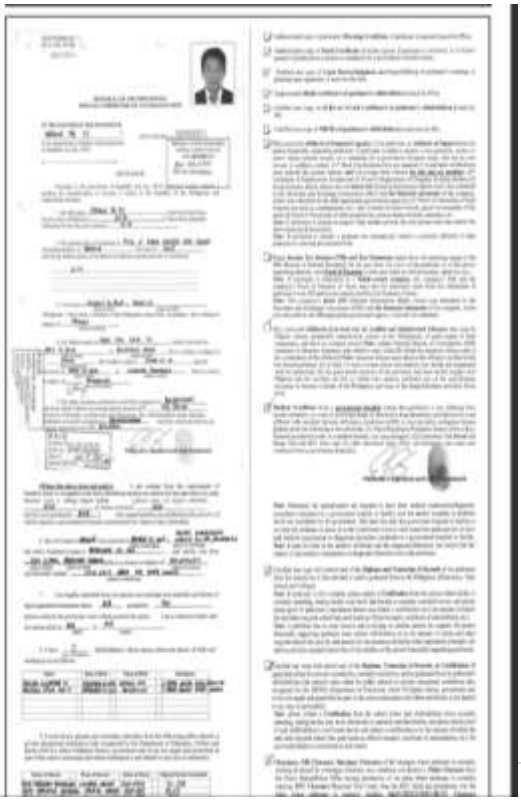
Stockholders shall pre-register at this link: https://www.ferronouxholdings.com/sec2023 beginning **September 14, 2023 until 5:00 p.m. of October 18, 2023**. Stockholders who will join by proxy shall download, fill out and sign the proxy found in the foregoing link and in accordance with the procedure set forth in **Appendix 1** of the Information Statement. The Company does not solicit your proxy.

Deadline for registration and submission of voting forms and proxies is at **5:00 p.m. on October 18, 2023**. Validation of proxies shall be made on October 19, 2023 at the principal office of the Corporation at the 6th Floor Hanston Building, F. Ortigas, Jr. Road, Ortigas Center, Pasig City.

Stockholders cannot record the meeting. However, a request for the recording of the ASM may be made to asm2023@ferronouxholdings.com. Stockholders may also send related inquiries to asm2023@ferronouxholdings.com.

Pasig City, September 14, 2023.

(Originally signed)
MANUEL Z. GONZALEZ
Corporate Secretary



IP for Innovators Department, highlighted collaboration as making possible the development and launch of vaccines in one and a half years.

Aside from driving innovation in an imperative sector like the life sciences, the Philippines has been relentless in making the country's overall innovation ecosystem more vibrant and productive. Our efforts must be reflected and justified in this next GII report where we hope to see the Philippines rise up and soar.

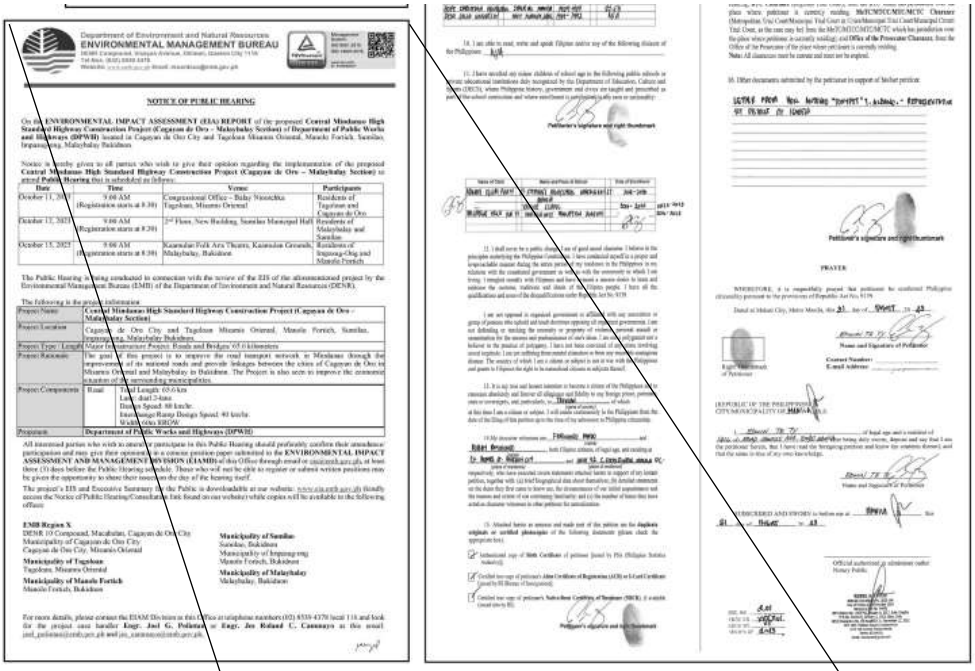
JOB OPENING

HOST, PREMIUM MARKETING SERVICES

Job Description:
1. Conducts the daily membership enrollment process, ensuring patrons are well-informed about the advantages and exclusive privileges of becoming a Rewards Circle Club member.
2. Maintains and updates patron account information to efficiently respond to inquiries regarding membership status.
3. Actively promotes Rewards collection items to patrons, aiming to achieve revenue targets established by management.

Job Qualification:
1. Possesses a minimum of ten years of residency, education, and work experience in Malaysia, demonstrating a deep understanding and familiarity with its cultural diversity.
2. Proficiently speaks and writes the Malay language, both as a natural communicator and as a professional skill.
3. Qualified applicants may submit their resume and cover letter to ***recruitment@okadamanila.com***

TIGER RESORT LEISURE & ENTERTAINMENT, INC.
Okada Manila, New Seaside Drive, Entertainment City, Barangay Tambo, Parañaque City



Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

NOTICE OF PUBLIC HEARING

On the **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT** of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon.

Notice is hereby given to all parties who wish to give their opinion regarding the implementation of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** to attend **Public Hearing** that is scheduled as follows:

Date	Time	Venue	Participants
October 11, 2023	9:00 AM (Registration starts at 8:30)	Congressional Office – Balay Niseschka Tagoloan, Misamis Oriental	Residents of Tagoloan and Cagayan de Oro
October 12, 2023	9:00 AM (Registration starts at 8:30)	2nd Floor, New Building, Sumilao Municipal Hall	Residents of Malaybalay and Sumilao
October 13, 2023	9:00 AM (Registration starts at 8:30)	Kaamulan Folk Arts Theatre, Kaamulan Grounds, Malaybalay, Bukidnon	Residents of Impasug-Ong and Manolo Fortich

The Public Hearing is being conducted in connection with the review of the EIS of the aforementioned project by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

The following is the project information:

Project Name	**Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)**
Project Location	Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon
Project Type / Length	Major Infrastructure Project: Roads and Bridges/ 65.6 kilometers
Project Rationale	The goal of this project is to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.
Project Components	Road: Total Length: 65.6 km Lane: dual 2-lane Design Speed: 80 km/hr. Interchange Ramp Design Speed: 40 km/hr. Width: 60m ROW
Proponent	**Department of Public Works and Highways (DPWH)**

All interested parties who wish to attend or participate in this Public Hearing should preferably confirm their attendance/ participation and may give their opinion(s) in a concise position paper submitted to the **ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT DIVISION (EIAMD)** of this Office through email or ... at least three (3) days before the Public Hearing schedule. Those who will not be able to register or submit written positions may be given the opportunity to share their issues on the day of the hearing itself.

The project's EIS and Executive Summary for the Public is downloadable at our website: ... (kindly access the Notice of Public Hearing/Consultation link found on our website) while copies will be available in the following offices:

EMB Region X
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Municipality of Cagayan de Oro City
Cagayan de Oro City, Misamis Oriental

Municipality of Tagoloan
Tagoloan, Misamis Oriental

Municipality of Manolo Fortich
Manolo Fortich, Bukidnon

Municipality of Sumilao
Sumilao, Bukidnon
Municipality of Impasug-ong
Manolo Fortich, Bukidnon

Municipality of Malaybalay
Malaybalay, Bukidnon

For more details, please contact the EIAM Division at this Office at telephone numbers (02) 8539-4178 local 116 and look for the project case handler **Engr. Joel G. Polintan** or **Engr. Jes Roland C. Cammayo** at this email ...

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

NOTICE OF PUBLIC HEARING

On the **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT** of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon.

Notice is hereby given to all parties who wish to give their opinion regarding the implementation of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** to attend **Public Hearing** that is scheduled as follows:

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October 11, 2023	9:00 AM (Registration starts at 8:30)	Congressional Office – Balay Niseschka Tagoloan, Misamis Oriental	Residents of Tagoloan and Cagayan de Oro
October 12, 2023	9:00 AM (Registration starts at 8:30)	2nd Floor, New Building, Sumilao Municipal Hall	Residents of Malaybalay and Sumilao
October 13, 2023	9:00 AM (Registration starts at 8:30)	Kaamulan Folk Arts Theatre, Kaamulan Grounds, Malaybalay, Bukidnon	Residents of Impasug-Ong and Manolo Fortich

The Public Hearing is being conducted in connection with the review of the EIS of the aforementioned project by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

The following is the project information:

Project Name	**Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)**
Project Location	Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon
Project Type / Length	Major Infrastructure Project: Roads and Bridges/ 65.6 kilometers
Project Rationale	The goal of this project is to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.
Project Components	Road: Total Length: 65.6 km Lane: dual 2-lane Design Speed: 80 km/hr. Interchange Ramp Design Speed: 40 km/hr. Width: 60m ROW
Proponent	**Department of Public Works and Highways (DPWH)**

All interested parties who wish to attend or participate in this Public Hearing should preferably confirm their attendance/ participation and may give their opinion(s) in a concise position paper submitted to the **ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT DIVISION (EIAMD)** of this Office through email or ... at least three (3) days before the Public Hearing schedule. Those who will not be able to register or submit written positions may be given the opportunity to share their issues on the day of the hearing itself.

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Malaybalay, Bukidnon

For more details, please contact the EIAM Division at this Office at telephone numbers (02) 8539-4178 local 116 and look for the project case handler **Engr. Joel G. Polintan** or **Engr. Jes Roland C. Cammayo** at this email ... and ...

Notice of Public Hearing for the project in newspaper

Komfie Manalo, *Editor*

Monday, 2 October 2023
Daily Tribune

INDUSTRY 4.0 | B11

PHOTOGRAPH COURTESY OF MERALCO

CONTRACT was inked among (from left): ePLDT Head Service Delivery and Operations for Data Center Dave Simon, ePLDT chief data center officer Gary F. Ignacio, MSERV president and chief executive officer Ronaldo R. Torres, and Smardt general manager for Greater Asia Kan Lim.

MSERV bags contract to supply energy efficient chillers to ePLDT

Meralco Energy Inc. or MSERV, a rapidly emerging contractor in the hyperscale data center industry, has been awarded the contract to supply highly efficient and oil-free Smardt magnetic chillers and chiller management system for ePLDT, Inc.'s Vitro Sta. Rosa Hyperscale Data Center in Laguna.

MSERV, a wholly-owned subsidiary of Meralco, provides energy efficient and innovative solutions. It is known as a reliable and trusted choice for companies in the energy industry that aims to achieve optimal performance and sustainability.

Answering the call for digitalization

At Microsoft, we think about this as having a copilot to help navigate any task

"Digitalization is the call of today; not the call of the future – but of the present. It is here. It is needed, and it is needed today." These words of President Ferdinand R. Marcos Jr. during his 2023 State of the Nation Address couldn't ring more true, especially with the state of digitalization in national government institutions.

While much has been said about the need for micro, small, and medium businesses to upgrade their digital facilities, it may very well be that the biggest (and most pressing) beneficiary of digitalization today is the government itself.

"In addition to catering to the needs of Filipino households and businesses, Converge has always envisioned harnessing our fiber technology in the service of government. We've long considered government frontline services as an area badly in need of transformation," said Converge CEO and co-founder Dennis Anthony Uy.

In South Korea, a digital-forward economy, the government took its cue from the private sector in coming up with the 'Digital Platform Government.' This platform aims at "fundamentally innovating government operations" by utilizing new technologies like AI and cloud computing, among other strategies.

In the Philippines, government bodies are slowly (but surely) realizing their role in leading e-governance projects, especially those that facilitate the delivery of public service.

Converge has been a staunch proponent of 'e-governance', helping various government agencies and local government units, or LGUs, in realizing their smart initiatives and digital transformation, especially in response to the global pandemic.

At the height of the pandemic in 2021, with distance learning weighing heavily on students shuttered at home, Converge supported the Department of Education's Public Education Network and enabled learning management systems that carried DepEd TV and DepEd Commons content to supplement the learners' modules.

In 2022, with the country's tourism back on the upswing and Filipino travelers' up-sized needs to connect in the country's gateways, Converge partnered with the Department of Transportation and airport operators to extend free public WiFi services in the passenger terminals of nine international and domestic airports across the country. This project is currently underway.

The Department of Information and Communications Technology, or DICT, the main regulating agency in the industry, gave the green light to Converge this past month to provide free Wi-Fi services in various municipalities across Ilocos Norte, Ilocos Sur and La Union. This falls under the 'Free WiFi for All' program of the DICT.

And just this September, Converge once again offered its fiber broadband in the service of the government as it closed another agreement, this time in collaboration with the Department of Science and Technology – Science and Technology Information Institute. This collaboration will make DoST's TV programs and content accessible on Converge's free streaming service, as well as affiliate PKN Group's Vision and Fiber TV.

At the local government level, this urgency to go digital is even more urgent as basic public services are devolved to cities and municipalities.

Again, in response to the difficulties of distance learning, Converge fiber-powered the e-learning of 12,000 public school students and teachers in San Juan City in 2021. In partnership with the local government of San Juan and Converge's parent company CamClark, a suite of learning tools was made available to students and teachers, all made possible by the fiber connection supplied by Converge.

In 2021, as the government strived to meet vaccination goals, Converge powered up LGU vaccination sites and centers; it powered up FilOil Flying V Arena and Theater Mall in Greenhills in San Juan, the City College of Angeles, and the Angeles National High School vaccination sites in Angeles, The Philippine Red Cross' testing site in SM Baguio, and more sites in Laguna and Valenzuela.

During the launch of Converge fiber broadband in Boracay, CEO and co-founder Dennis Anthony Uy vowed to boost order and safety in the top tourist destination, promising to build a resilient digital infrastructure to support the island's surveillance system and command center.

As the government heeds the call of the administration to embrace digitalization, Converge stands ready to support its broader aims of using technology not just to ease doing business in the country but to finally modernize the functioning of government, especially for front-line public services.

Bayad seals partnership with Tala for convenient bill payment

We continue to strengthen our digital footprint by co-creating payment innovations with forward-thinking fintech institutions like Tala

Two fintech innovators – CIS Bayad Center Inc. (Bayad), the country's pioneer brand in the outsourced payment collection system, and Tala Financing Philippines Inc. (Tala) – a global leading money app for the underbanked, have officially sealed their partnership, sharing the same goal of elevating the financial experience of Filipinos.

Since 2017, Tala has been providing financial tools that help its customers manage their household expenses and help them navigate opportunities to invest in small businesses. Tala has recently reached one million wallet users on its mobile application since its official launch earlier this year.

Through its partnership with Bayad, Tala now enables Meralco bill payments in its mobile application, while also offering quick and easy ways to pay loans, allowing its customers to settle their bills on time.

Today, Tala customers can now pay their bills in real-time using their credit of up to P25,000 all within the Tala app. With its flexible credit terms, customers have the freedom to choose when to repay within 61 days, aligning with their respective income cycles.

Bayad President and CEO Lawrence Y. Ferrer shared, "We continue to strengthen our digital footprint by co-creating payment innovations with forward-thinking fintech institutions like Tala. We are one with Tala as we help boost the financial well-being of our *kababayanan*. We are keen on expanding our biller ecosystem as we bring our one-stop bill payment solution to the Tala App. With this, Tala will also soon be able to accept payments for other electric and water utilities, telecommunications, cable, internet, insurance, online shopping, and many others."

Tala's chief business officer Jori Pearsall added, "We believe everyone deserves access to financial services, regardless of their background or circumstances. As the Philippines is Tala's innovation hub and its largest market in Asia, we view this collaboration with Bayad as part of our ongoing commitment to financial inclusion as we step up to help revive our economy."

PHOTOGRAPH COURTESY OF BAYAD

Championing digital financial inclusion Executives of Bayad and Tala on their partnership signing. Seen in the photo are (from left) Tala president and head of Finance Charisse Alvarez, Tala chief business officer Jori Pearsall, Bayad president and CEO Lawrence Y. Ferrer, and Bayad chief commercial and marketing officer Dennis Galuolao.

Union Bank celebrates quadruple victory at the 2023 Stevie Awards

This award recognizes UnionBank's successful acquisition of Citibank's consumer banking business in the Philippines which was greatly driven by its promise of continuity and care for its people

Union Bank of the Philippines celebrated a remarkable victory at the 2023 Stevie Awards for Great Employers, or SAGE, held at the Marriott Marquis Hotel in New York City. This impressive achievement signifies the Bank's commitment to its employees and its growing influence as a financial institution.

The SAGE is internationally acclaimed for recognizing outstanding achievements in business and has been a symbol of excellence since its inception in 2002. These awards celebrate organizations and individuals across more than 60 nations who excel in various aspects of business, including human resources, innovation, and corporate culture.

UnionBank took home four significant awards at the event:

Gold Stevie Award for HR Thought Leader of the Year: Ms. Michelle Rubio, chief human resource officer at UnionBank, was honored with this top accolade. Her pivotal role as the lead driver of people transformation and culture optimization was instrumental in the Bank's successful digital transformation journey.

This contributed to UnionBank's prestigious six-year streak as the Digital Bank of the Year and its consecutive three-year recognition as one of the Most Recommended Banks.

As a thought leader, she has been invited to numerous speaking engagements, podcasts, and learning sessions on the future of work, People Tech, and digital transformation.

Silver Stevie Award for Achievement in New Employee Onboarding: This award recognizes UnionBank's successful acquisition of Citibank's consumer banking business in the Philippines which was greatly driven by its promise of continuity and care for its people. Central to this success was OnewithU, a collaborative effort involving multiple workstreams.

OnewithU played a pivotal role by providing essential support and resources, ensuring a seamless and successful transition for all employees. 1,700 employees made the transition to UnionBank, constituting an impressive 88 percent of the eligible population and surpassing the 85 percent target.

PHOTOGRAPH COURTESY OF UNION BANK OF THE PHILIPPINES

UNIONBANK bags SAGE recognition.

This turned out to be the highest percentage of employees who accepted the job offer to transfer to the acquiring company across all Citi consumer bank acquisitions worldwide.

UnionBank also became the 2nd to complete the Citi acquisition worldwide among 14 consumer markets that are part of the strategy refresh.

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

NOTICE OF PUBLIC HEARING

On the **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT** of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon.

Notice is hereby given to all parties who wish to give their opinion regarding the implementation of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** to attend **Public Hearing** that is scheduled as follows:

Date	Time	Venue	Participants
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October 13, 2023	9:00 AM (Registration starts at 8:30)	Kaamulan Folk Arts Theatre, Kaamulan Grounds, Malaybalay, Bukidnon	Residents of Impasug-Ong and Manolo Fortich

The Public Hearing is being conducted in connection with the review of the EIS of the aforementioned project by the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR).

The following is the project information:

Project Name	**Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)**	
Project Location	Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon.	
Project Type / Length	Major Infrastructure Project: Roads and Bridges/ 65.6 kilometers	
Project Rationale	The goal of this project is to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also seen to improve the economic situation of the surrounding municipalities.	
Project Components	Road	Total Length: 65.6 km Lane: dual 2-lane Design Speed: 80 km/hr. Interchange Ramp Design Speed: 40 km/hr. Width: 60m ROW
Proponent	**Department of Public Works and Highways (DPWH)**	

All interested parties who wish to attend or participate in this Public Hearing should preferably confirm their attendance/participation and may give their opinion(s) in a concise position paper submitted to the **ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT DIVISION (EIAMD)** of this Office through email or [illegible] at least three (3) days before the Public Hearing schedule. Those who will not be able to register or submit written positions may be given the opportunity to share their issue on the day of the hearing itself.

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Municipality of Manolo Fortich
Manolo Fortich, Bukidnon

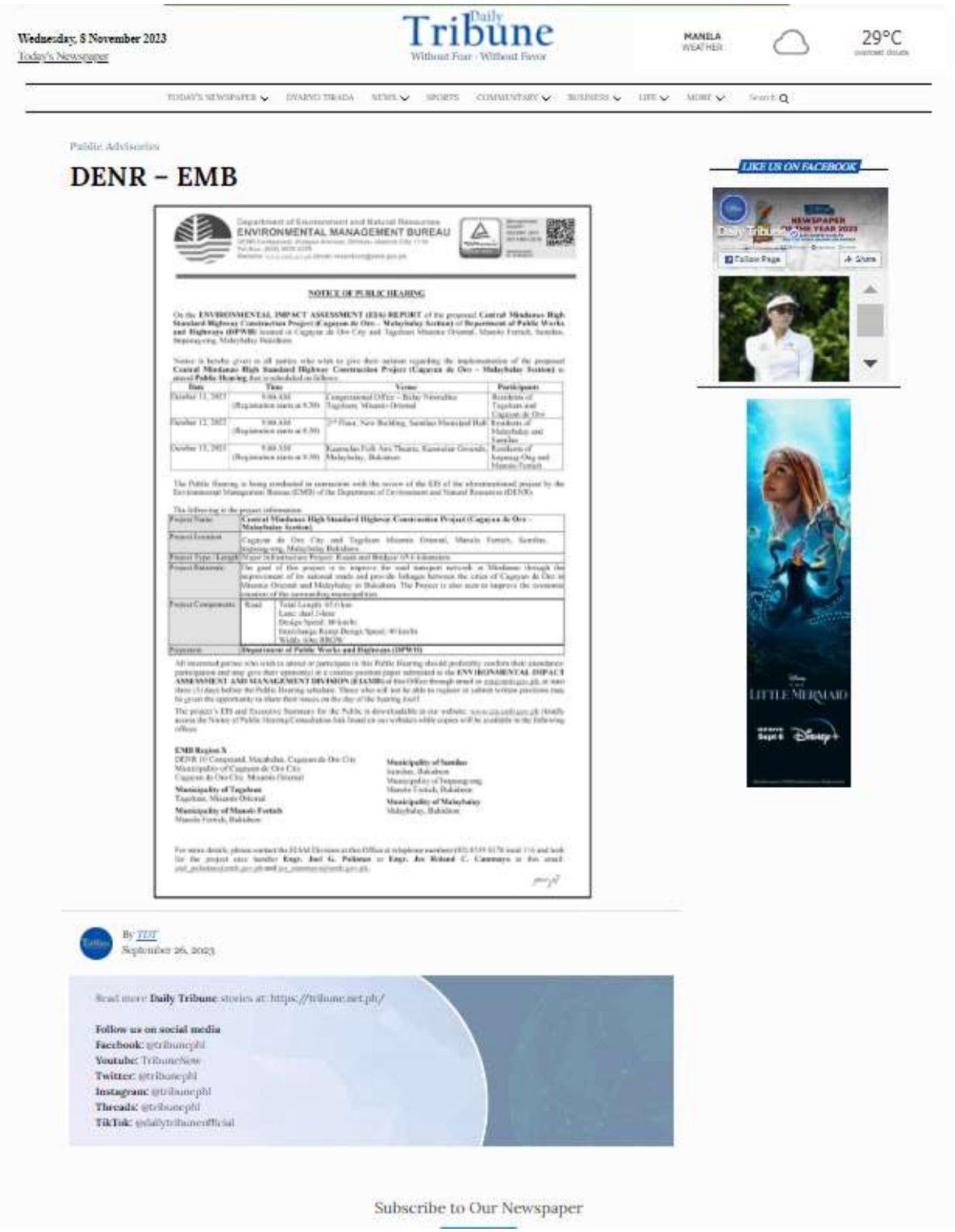
Municipality of Sumilao
Sumilao, Bukidnon
Municipality of Impasug-ong
Manolo Fortich, Bukidnon

Municipality of Malaybalay
Malaybalay, Bukidnon

For more details, please contact the EIAM Division at this Office at telephone numbers (02) 8929-6278 local 110 and look for the project case handler **Engr. Joel G. Polintan** or **Engr. Jes Roland C. Camenzo** at this email: joel_polintan@emb.gov.ph and jes_camenzo@emb.gov.ph.

Protect the environment... Protect life...

Notice of Public Hearing for the project in website



Wednesday, 8 November 2023
Today's Newspaper

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MANILA WEATHER 29°C

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Public Advisories

DENR – EMB

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

NOTICE OF PUBLIC HEARING

On the **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REPORT** of the proposed **Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** located in Cagayan de Oro City and Tagoloan, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay, Bukidnon.

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October 13, 2023	9:00 AM (Registration starts at 8:30)	Kamanlao Folk Arts Theatre, Kamanlao Grounds, Malaybalay, Bukidnon	Residents of Impasug-Ong and Manolo Fortich

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Project Location	Cagayan de Oro City and Tagoloan, Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay, Bukidnon	
Project Type / Length	Type: Infrastructure Project; Length and Width: [illegible]	
Project Rationale	The goal of this project is to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also aim to improve the economic situation of the surrounding municipalities.	
Project Components	Road	Total Length: [illegible] km Lane: dual 2-lane Design Speed: [illegible] km/h Interchange Ramp Design Speed: [illegible] km/h Width: [illegible]
Proponent	**Department of Public Works and Highways (DPWH)**	

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Malaybalay, Bukidnon

For more details, please contact the EIAMD Division at this Office at telephone number [illegible] and look for the project area Sumilao **Engr. Joel G. Pelicano** or **Engr. Jes Roland C. Cammayo** in this email: [illegible]

By TDT
September 26, 2023

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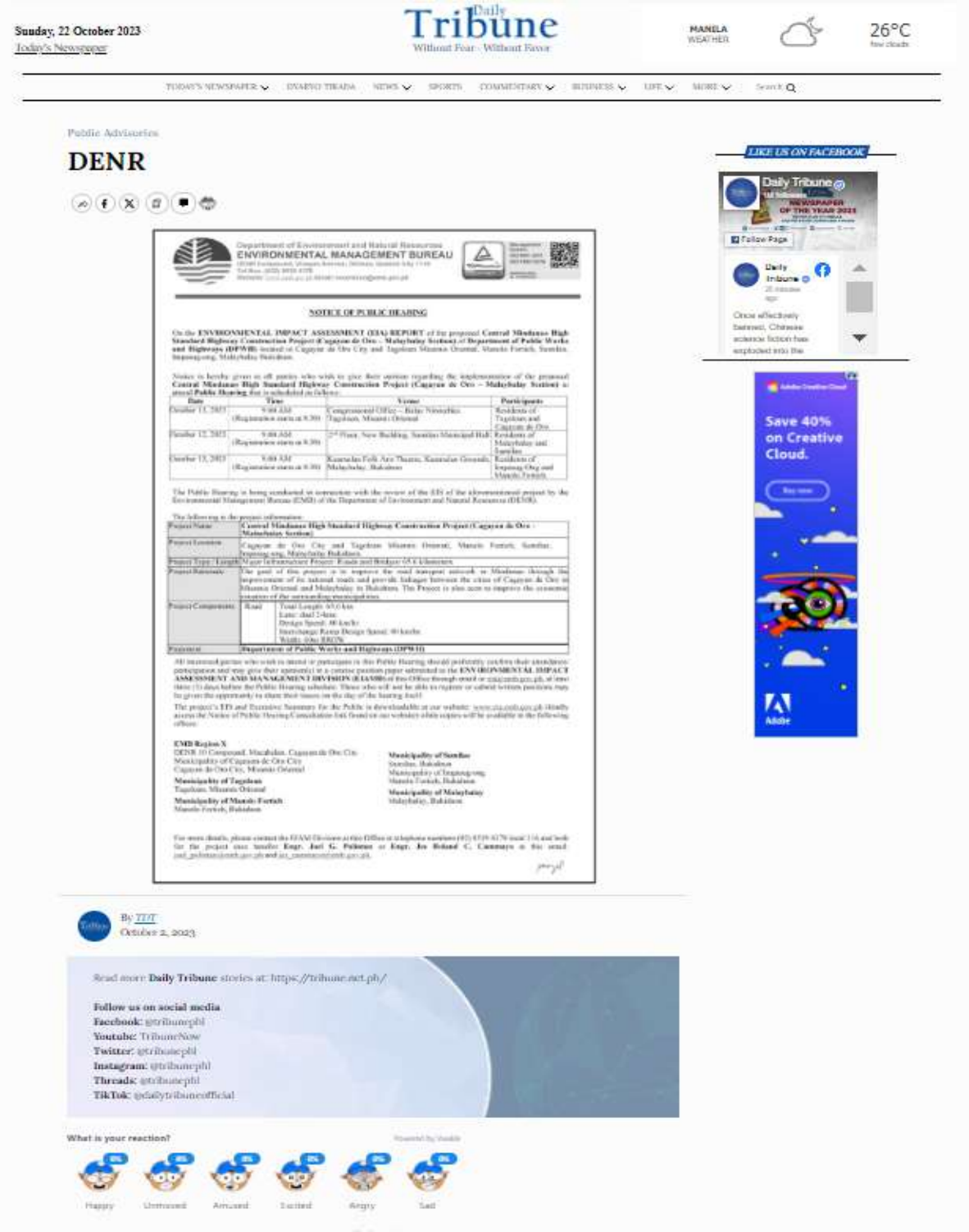

Sunday, 22 October 2023
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MANILA WEATHER 26°C

Public Advisories

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Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

NOTICE OF PUBLIC HEARING

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Project Location	Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon	
Project Type / Length	Major Infrastructure Project / Roads and Bridges / 67.1 Kilometers	
Project Rationale	The goal of this project is to improve the road transport network in Mindanao through the improvement of its national roads and provide linkages between the cities of Cagayan de Oro in Misamis Oriental and Malaybalay in Bukidnon. The Project is also aim to improve the economic vitalities of the surrounding municipalities.	
Project Components	Road	Total Length: 67.1 km Lane: dual 2-lane Design Speed: 40 km/hr Interchange Ramp Design Speed: 40 km/hr Width: 6.0m RROW
Proponent	**Department of Public Works and Highways (DPWH)**	

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By TDT
October 2, 2023

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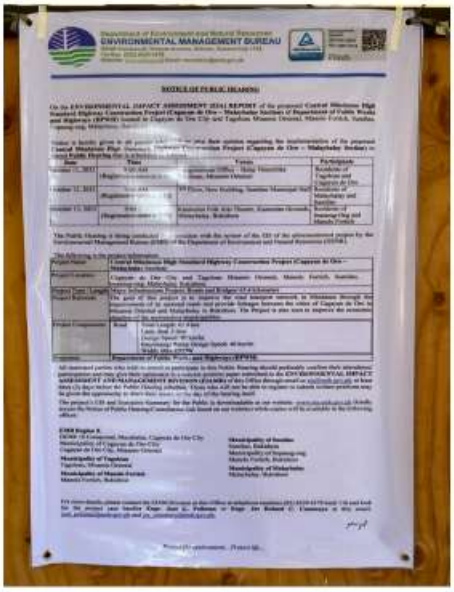

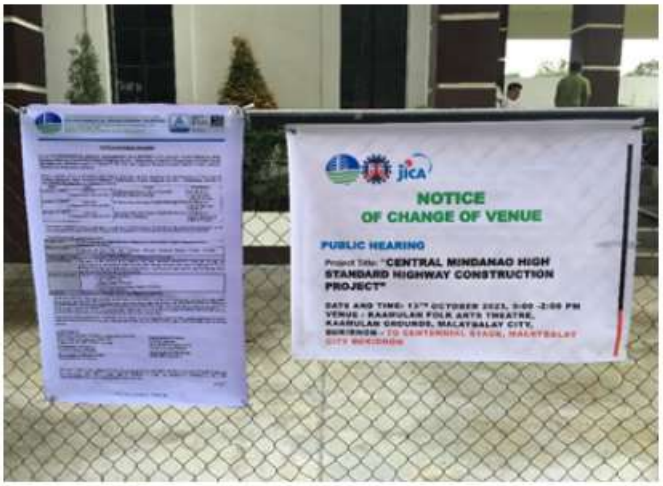

Attachment 166. Affidavit of Public Disclosure

Daily Tribune
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AFFIDAVIT OF PUBLICATION

I, **Rucel S. Meneses** legal age, Filipino and residing at c/o **Concept and Information Group, Inc.** Concept Bldg., 3450 Florida St., Makati City, Philippines, after having been duly sworn to in accordance with the law, hereby declare and testify:

That I am the **Accounting Assistant of Concept and Information Group Inc.** publisher of the **DAILY TRIBUNE** a newspaper which is published in English, edited and printed in Metro Manila, and circulated nationwide from Monday to Sunday, with editorial and business address at Concept Bldg.,3450 Florida St., Makati City, Manila, Philippines.

That the
NOTICE OF PUBLIC HEARING

APPLICANT/PETITIONER
AMET ASIA INC.

text of which could be read/described as follows:

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has been published in Daily Tribune in it issue

SEPTEMBER 25 & OCTOBER 2, 2023

AFFIANT FURTHER SAYETH NAUGHT
Manila, Philippines

Rucel S. Meneses
Affiant

SUBSCRIBED and SWORN to before me this ___ day of OCT 2 0 2023 at Makati City , Philippines.

Affiant exhibited to me her TIN # 219-330-020-000 bearing her photograph and signature.

Doc. No. 26
Page No. 6
Book No. 7
Series of 2023.

ATTY. JOSELINO N. SUCION
NOTARY PUBLIC FOR MAKATI CITY
UNTIL DECEMBER 31, 2023
2746 ZENAIDA ST. POBLACION MAKATI
IBP NO. 257032/01/02/23
PTR NO. 956233/01/03/23
MCLE COMPLIANCE NO. VII-0013028/04/14/2025
ROLL NO. 60799
APPOINTMENT NO. M-075

Attachment 17. Public Hearing Program

Public Hearing Program

CLUSTER 1: Cagayan de Oro and Tagoloan

Public Hearing on the Central Mindanao High Standard Highway Project

Congressional Office, Balay Ninotchka, Tagoloan, Misamis Oriental

October 11, 2023 ; 9:30-12:00 NN

Registration	
National anthem	Mr. Alwin T. Olina, Casinglot Elementary School
Invocation	Mr. Gedion Buyan, Bugo, Cagayan de Oro
Briefing and orientation on the purpose of Public Hearing and the Philippine EIS system	Engr. Jes Roland Cammayo, DENR Central Office
Project Description	Engr. Mary Joyce Ann Manuel, DPWH Central Office
Presentation of EIS output	Ms. Francina Balido, Amet Asia
Open Forum	Regional Director Reynaldo Digamo, DENR Region 10
Next steps in the EIA Process	Engr. Jes Roland Cammayo, DENR Central Office

Program Facilitator: Engr. Joel Polintan, DENR Central Office

CLUSTER 2: SUMILAO AND MALAYBALAY

Public Hearing on the Central Mindanao High Standard Highway Project

Sumilao New Building, Sumilao, Bukidnon

October 12, 2023 ; 9:10-12:00 NN

Registration	
National anthem	Josephine Patarlas, DepEd Vista Villa
Invocation	Datu Fidel Daigon, BAFC, Kisolon
Briefing and orientation on the purpose of Public Hearing and the Philippine EIS system	Engr. Joel Polintan, DENR Central Office

Project Description	Engr. Mary Joyce Ann Manuel, DPWH Central Office
Presentation of EIS output	Ms. Francina Balido, Amet Asia
Open Forum	Regional Director Reynaldo Digamo, DENR Region 10
Next steps in the EIA Process	Engr. Jes Roland Cammayo, DENR Central Office

Program Facilitator: Engr. Jes Roland Cammayo, DENR Central Office

CLUSTER 3: IMPASUG-ONG AND MANOLO FORTICH

Public Hearing on the Central Mindanao High Standard Highway Project

PENRO Conference Room, Malaybalay City

October 13, 2023 ; 9:45-12:00 NN

Registration	
National anthem	Eleanor Agan, DepEd Manolo Fortich
Invocation	Kagawad Alberto Buynay, Sankanan
Briefing and orientation on the purpose of Public Hearing and the Philippine EIS system	Engr. Joel Polintan, DENR Central Office
Project Description	Engr. Mary Joyce Ann Manuel, DPWH Central Office
Presentation of EIS output	Ms. Francina Balido, Amet Asia
Open Forum	Regional Director Reynaldo Digamo, DENR Region 10
Next steps in the EIA Process	Engr. Jes Roland Cammayo, DENR Central Office

Program Facilitator: Engr. Jes Roland Cammayo, DENR Central Offic

Attachment 18. Public Hearing Presentation

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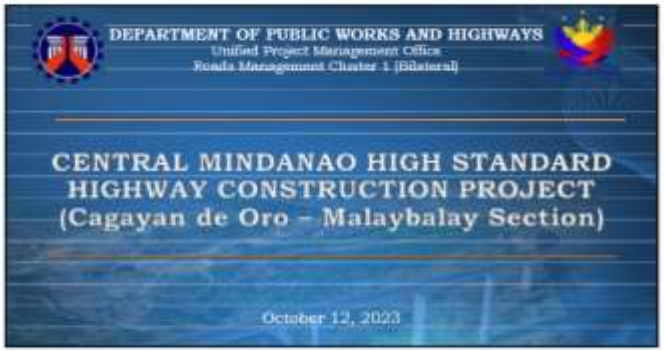

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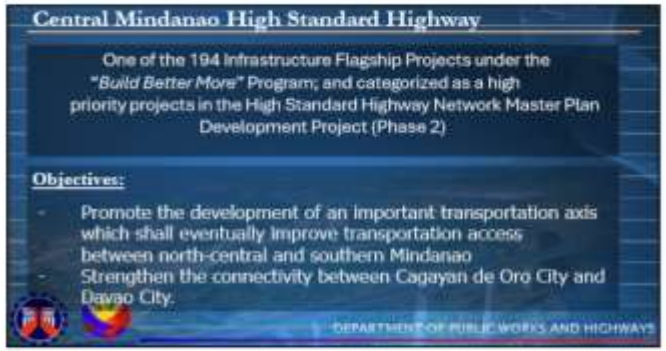

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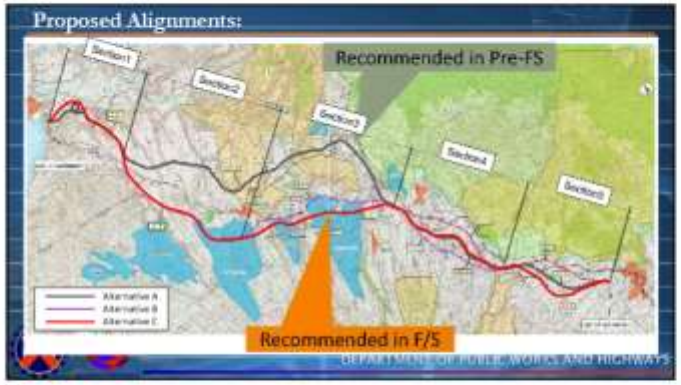

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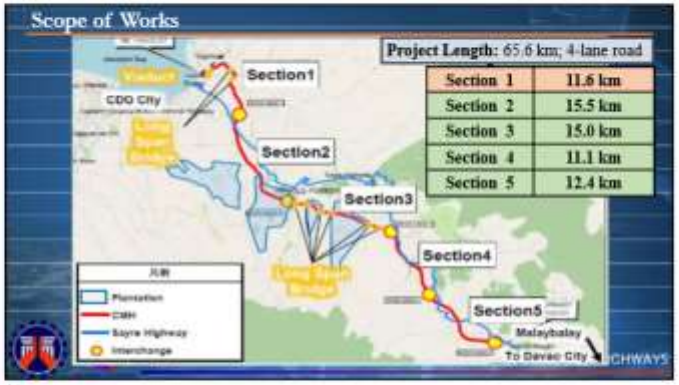

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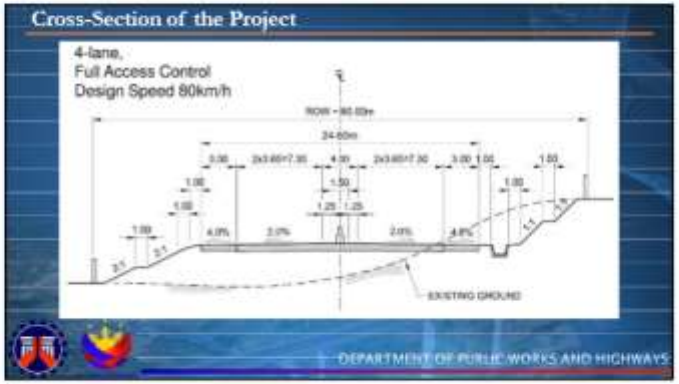

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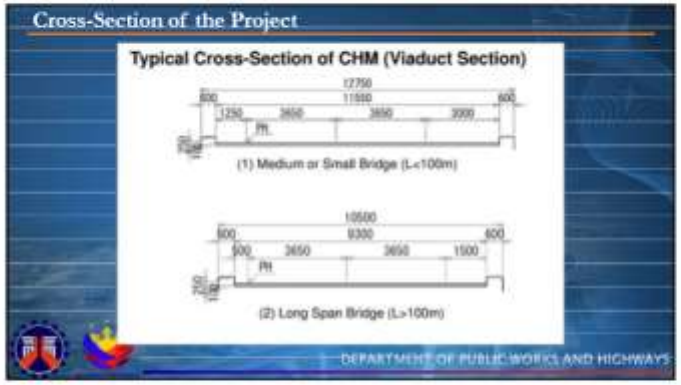

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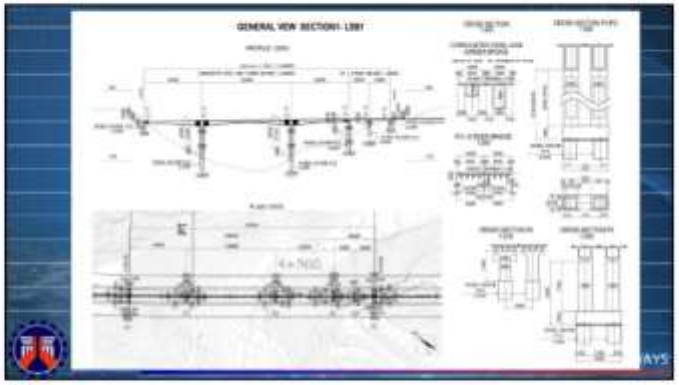

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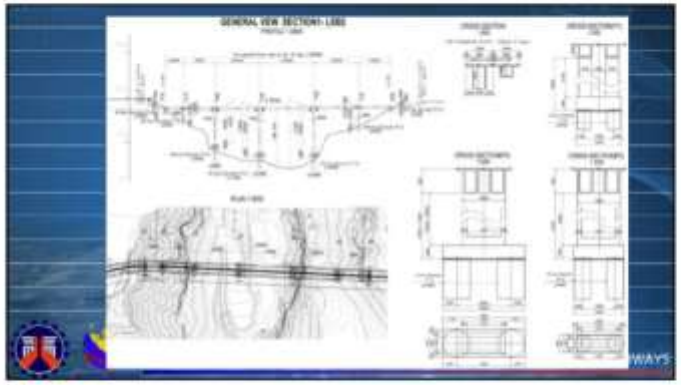

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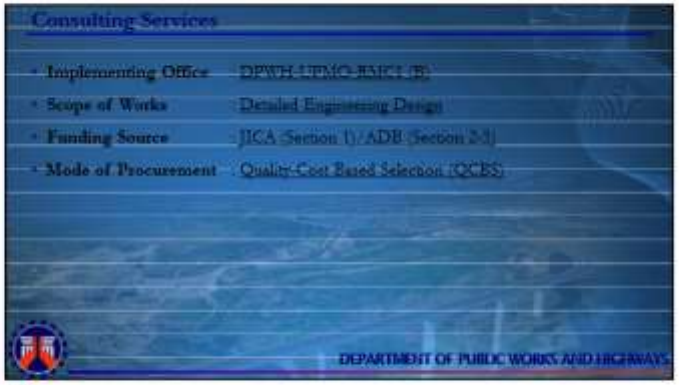

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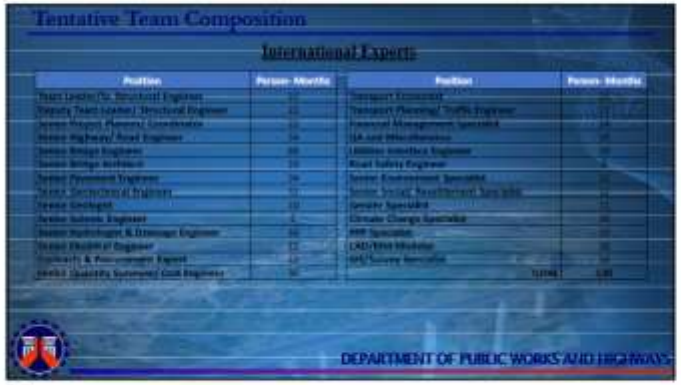

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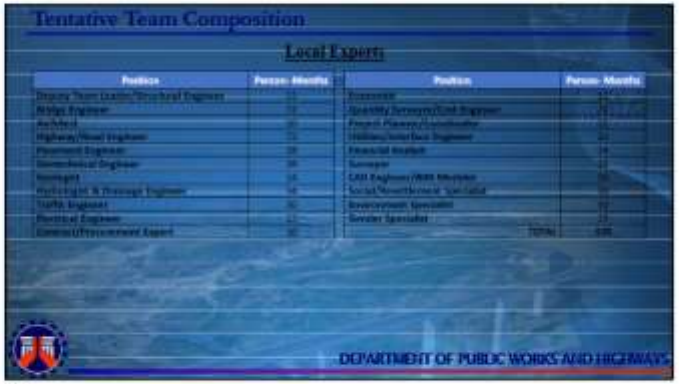

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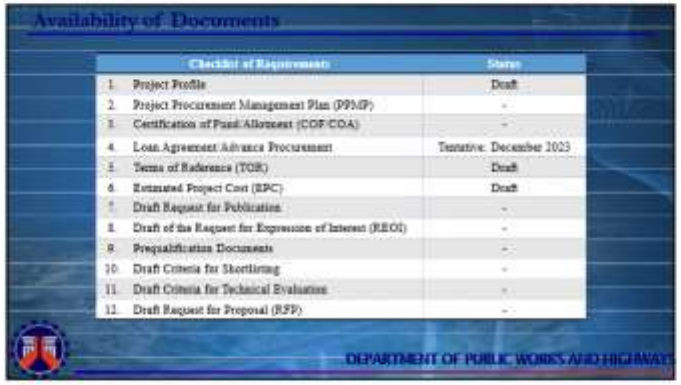

Checklist of Requirements	Status
1. Project Profile	Draft
2. Project Procurement Management Plan (PPMP)	-
3. Certification of Fund Allotment (COF/COA)	-
4. Loan Agreement Advance Procurement	Tentative: December 2023
5. Terms of Reference (TOR)	Draft
6. Estimated Project Cost (EPC)	Draft
7. Draft Request for Publication	-
8. Draft of the Request for Expression of Interest (REOI)	-
9. Prequalification Documents	-
10. Draft Criteria for Shortlisting	-
11. Draft Criteria for Technical Evaluation	-
12. Draft Request for Proposal (RFP)	-

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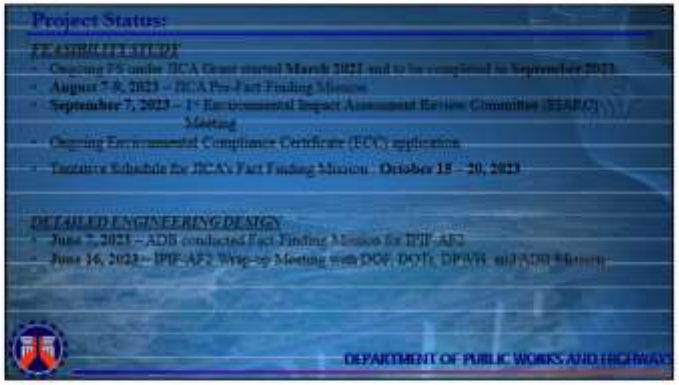

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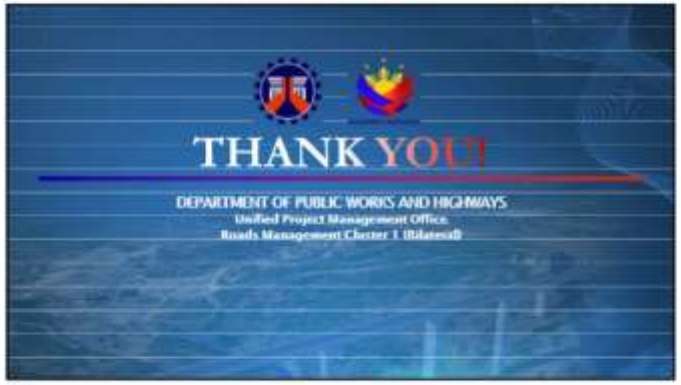

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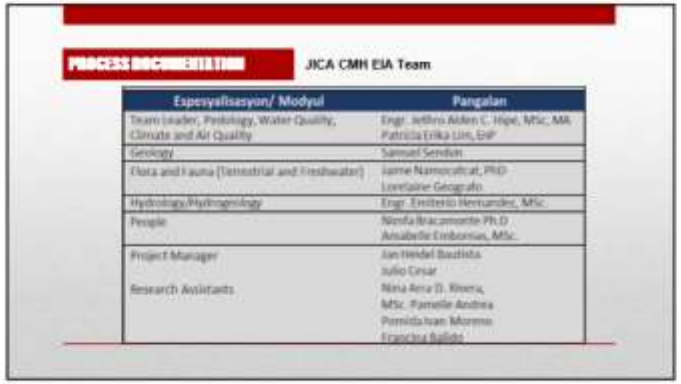

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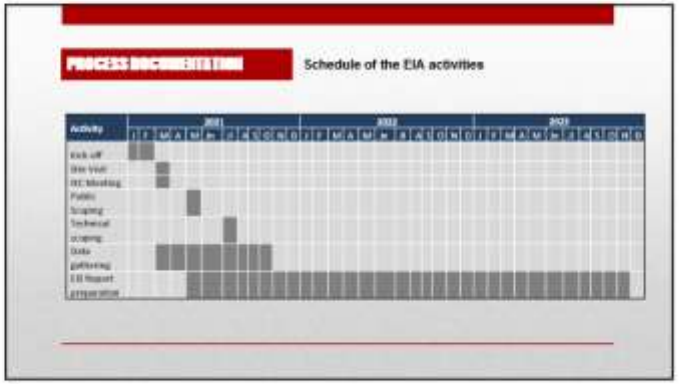

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PROCESS DOCUMENTATION

EIS study area

Province	City/Municipalities	No of Barangays
Misamis Oriental	Tagoloan	2
	Cagayan de Oro	3
Bukidnon	Manolo Fortich	8
	Sumilao	6
	Impasug-ong	5
	Malaybalay	3
Total		27

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PROCESS DOCUMENTATION

Public Participation - Summary of the IEC schedule and venue

Province	City/ Municipality	Date and Time	Venue
Misamis Oriental	Tagoloan	March 24, 2021, 2:00-3:00 pm	Tagoloan Central Elementary School, Tagoloan
	Cagayan De Oro	March 24, 2021, 10:00-11:00 am	Puerto Barangay Hall, Cagayan De Oro
Bukidnon	Manolo Fortich	March 22, 2021, 2:00-3:00 pm	BRCI Bldg., Dicklum, Manolo Fortich
	Sumilao	March 24, 2021, 10:00-11:00 am	Conference Hall, 2nd Floor, New Building, Sumilao
	Impasug-ong	March 25, 2021, 1:00-3:00 pm	Conference Hall, Municipal Hall, Impasug-ong
	Malaybalay	March 25, 2021, 10:00-11:00 am	Casisang Covered Court, Malaybalay City

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PROCESS DOCUMENTATION

Public Participation - Summary of the Public Scoping schedule and venue

Province	City/ Municipality	Date and Time	Venue
Misamis Oriental	Tagoloan	May 28, 2021 10:00-12:00 pm	Natumolan and Casinglot Covered Court, Tagoloan
	Cagayan De Oro	May 31, 2021 10:00-12:00 pm	Bugo Covered Court, Cagayan de Oro City
Bukidnon	Manolo Fortich	June 1, 2021 10:00-12:00 pm	BRCI Bldg., Dicklum, Manolo Fortich
	Sumilao	June 2, 2021 10:00-12:00 pm	Conference Hall, 2nd Floor, New Building, Sumilao
	Impasug-ong	June 3, 2021 10:00-12:00 pm	People's Hall, New City Hall, Malaybalay, Bukidnon
	Malaybalay	June 4, 2021 10:00-12:00 pm	Capitan Boyong Barangay Hall, Impasug-ong

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PROCESS DOCUMENTATION

Issues Raised During Meetings with Public Participation

Module	Issues raised
Land	Measures during construction to prevent debris to lower portions Measures for rain induced landslide Mitigation for affected flora and fauna in forested areas
Water	Road alignment traversing the water reservoir that the community uses as a water source Aggravation of flooding along the national highway in Barangay Casinglot and overflowing of the canal on the hillside part of Bugo

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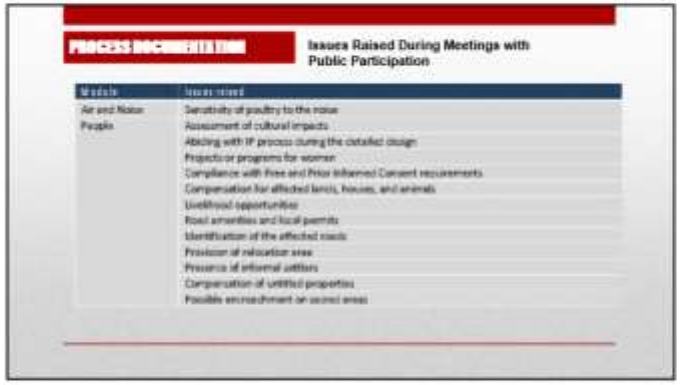

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Land Use

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Evaluation of the proposed CMH alignment according to ECAs

No.	ECA Category	Within ECA?	Comments
1	All areas declared by law as national parks, watershed reserves, wildlife preserves and sanctuaries	No	The proposed alignment is outside of any Protected Area
2	Areas set aside as aesthetic, potential tourist spots	Possible	The proposed alignment appeared to traverse barren areas in Sumilao
3	Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (Flora and Fauna)	No	The proposed alignment is outside of any Protected Area and traverses mostly agricultural lands
4	Areas of unique historic, archeological, geological, or scientific interests	No	The proposed alignment mostly traverses agricultural lands
5	Areas which are traditionally occupied by cultural communities or tribes	Yes	The proposed alignment will not traverse any approved CADT or CADC
6	Areas frequently visited and or hard hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity)	Yes	The proposed alignment traverse areas prone to natural hazards (subsidence hazard, landslide, creep, flood hazard, erosion/ slope failure, ground rupture

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Evaluation of the proposed CMH alignment according to ECAs

No.	ECA Category	Within ECA?	Comments
7	Areas with critical slope. All lands with slope of 50% or more classified as geohazard by Mines and Geosciences Bureau (MGB)	Yes	Some portions of the proposed alignment will traverse critical slopes
8	Areas classified as prime agricultural lands	Possible	Most of the alignment traverse agricultural lands
9	Recharge areas of aquifers	No	The proposed alignment mostly traverses agricultural lands in the low lands
10	Water bodies characterized by one or any combination of the following conditions: tapped for domestic purposes, within the controlled and/or protected areas declared by appropriate authorities, which support wildlife and fishery activities	No	The proposed alignment will traverse water bodies (rivers, creeks) that are not tapped as a source of domestic water or within Protected Areas

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Evaluation of the proposed CMH alignment according to ECAs

No.	ECA Category	Within ECA?	Comments
11	Mangrove areas characterized by one or any combination of the following conditions: with primary pristine and dense young growth, adjoining mouth or major river systems, near or adjacent to traditional productive fry or fishing grounds, areas which act as natural buffers against shore erosion, strong winds and storm floods, areas on which people are dependent for their livelihood	No	The proposed alignment is inland and far from the sea
12	Coral reefs characterized by one or any combination of the following conditions: with 50% and above live coralline cover, spawning and nursery grounds for fish, act as natural breakwater of coastlines	No	The proposed alignment is inland and far from the sea

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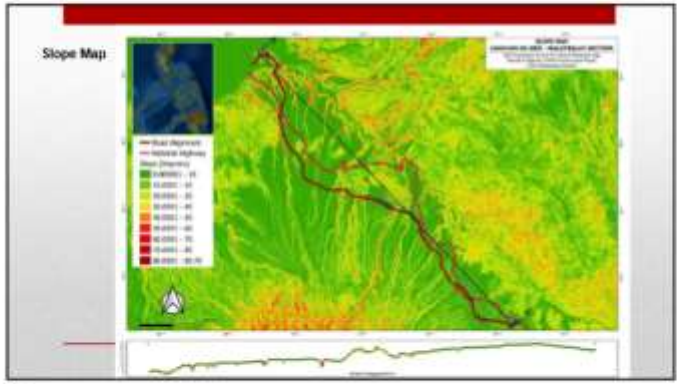

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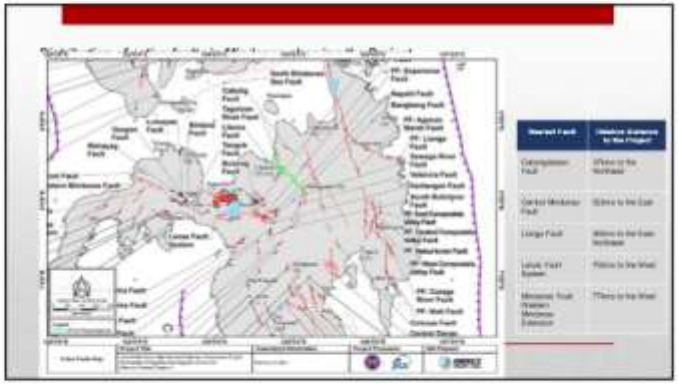

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Soil Sampling Results

Parameter	Lab results S1	Lab results S2	Lab results S3	Soil fertility guideline values* High	Soil fertility guideline values* Mod	Soil fertility guideline values* Low	Soil fertility evaluation S1	Soil fertility evaluation S2	Soil fertility evaluation S3
pH	8.3	8.2	8.11	5.5 - 7.5	5.0 - 5.5	<5.0 & > 8.0	Low	Low	Low
Organic Matter, %	1.189	9.468	3.675	> 3	1 - 3	< 1	Mod	High	High
Nitrogen, %	0.05	0.3	0.3	> 0.25	0.15 - 0.25	< 0.15	Low	High	High
Phosphorus, ppm	310	130	520	> 35	26 – 35	< 25	High	High	High
Potassium, mg/kg	450	320	790	> 250	150 – 250	< 150	High	High	High

NOTES: S1, S2, S3 – soil sampling stations; *BSWM Soil fertility Rating Guideline Values; Mod - moderate

Parameter	Unit	Lab results S1	Lab results S2	Lab results S3	Soil fertility guideline values Deficient	Soil fertility guideline values Marginal	Soil fertility guideline values Adequate	Soil fertility evaluation* S1	Soil fertility evaluation* S2	Soil fertility evaluation* S3
Molybdenum	mg/kg	<0.20	<0.20	<0.20						
Zinc	mg/kg	78.34	132.4	76.22	<0.5	0.5-1.5	>1.5	Adequate	Adequate	Adequate
Manganese	mg/kg	833.07	737.67	1438.57	<1.0	none	>1.0	Adequate	Adequate	Adequate
Iron	mg/kg	44900	72500	45300	<1.5	2.5-4.5	>4.5	Adequate	Adequate	Adequate
Nickel	mg/kg	150.71	37.71	481.17						
Boron	%	0.41	0.41	0.3						
Chlorine	ppm	13.051	1.684	0.842						

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Stream Sediment Sampling Results

Parameter	Lab results, mg/kg Sed1	Sed2	Sed3	Sed4	Sed5	Sed6	Sed7	Sed8	Sed9	Sed10	DSIV**
Arsenic (As)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	55
Cadmium (Cd)	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	12
Chromium (Cr)	64.48	59.10	19.97	22.04	8.57	<0.20	21.11	14.95	14.35	45.08	380
Mercury (Hg)	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	10
Lead (Pb)	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	530

NOTES: S1, S2, S3 – soil sampling stations; * Dutch soil intervention value

Parameter	Lab results, mg/kg* Sed1	Sed2	Sed3	Sed4	Sed5	Sed6	Sed7	Sed8	Sed9	Sed10	DSIV**
Arsenic (As)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	55
Cadmium (Cd)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	12
Chromium (Cr)	315.52	320.9	360.03	357.96	371.43	NI	356.89	365.05	365.65	334.97	380
Mercury (Hg)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	10
Lead (Pb)	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	530

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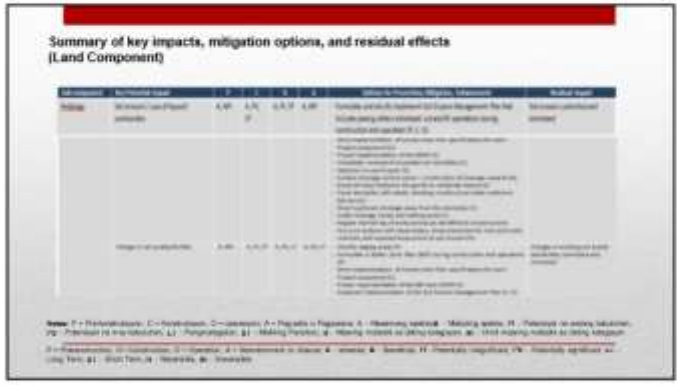

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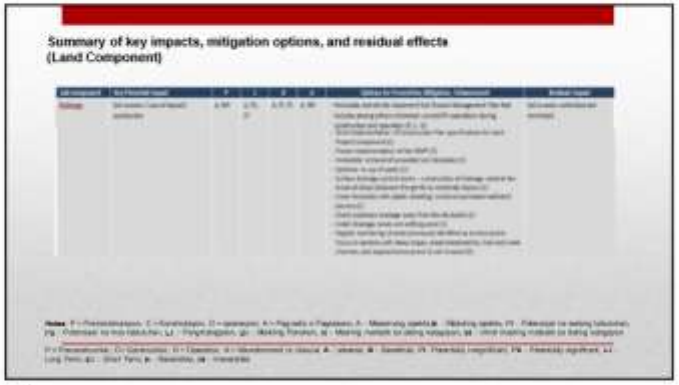

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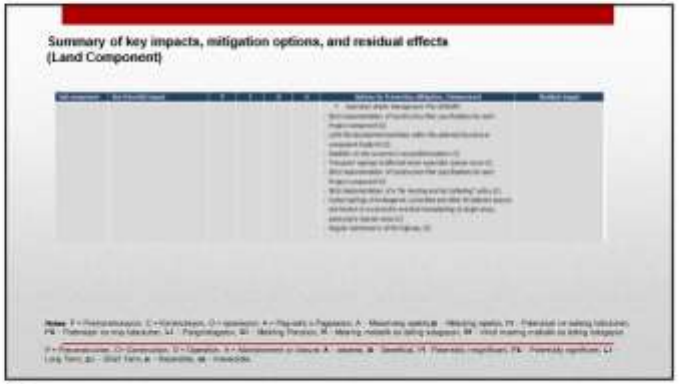

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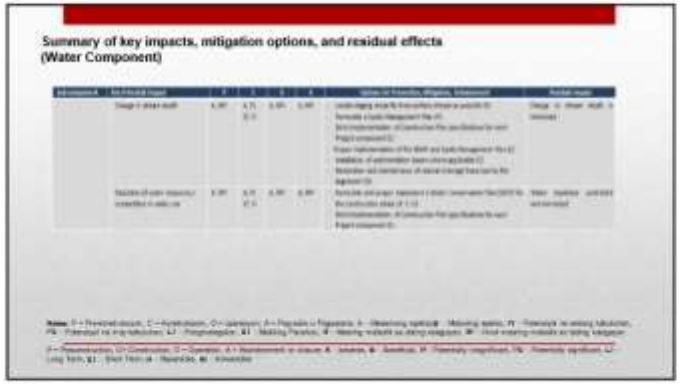

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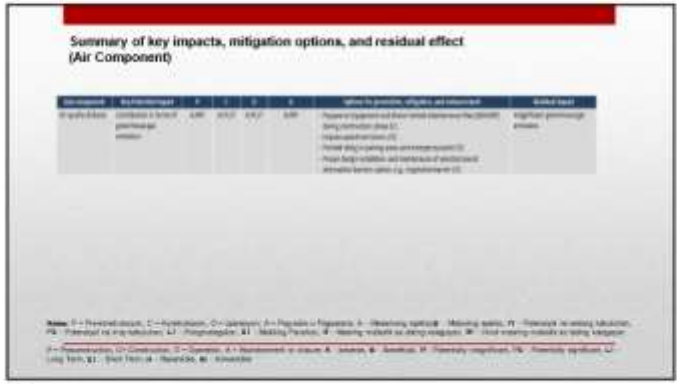

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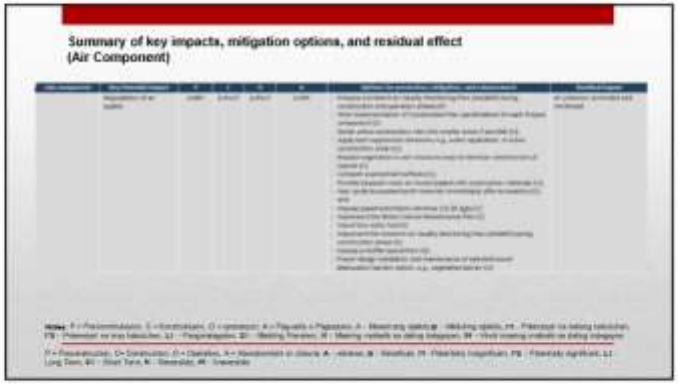

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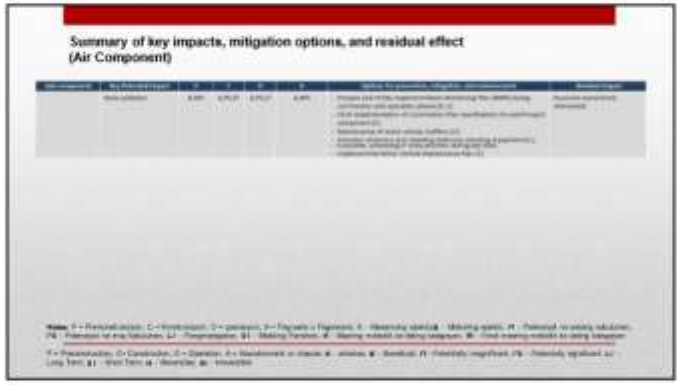

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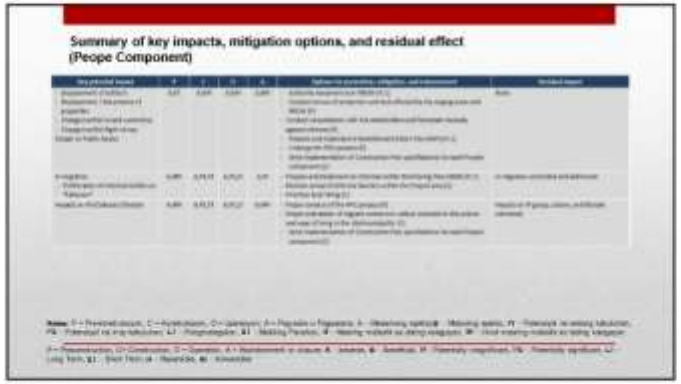

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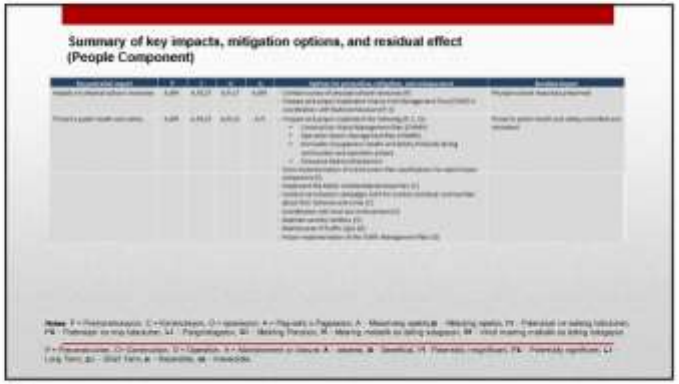

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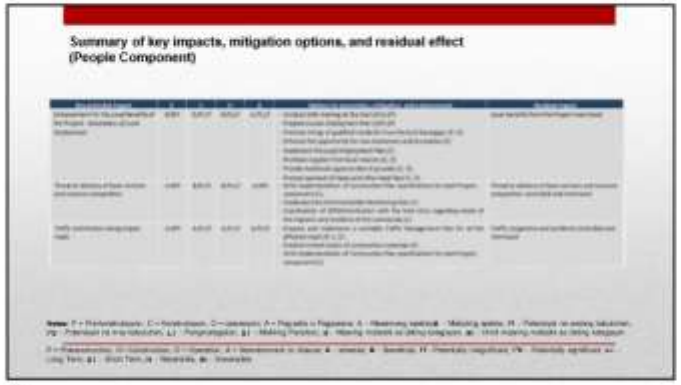

65

66

Attachment 19. Public Hearing Invitation Letters

Misamis Oriental Province LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

September 26, 2023

Mr. Peter M. Unabia
Governor
Office of the Governor
Provincial Capitol, Don Apolinar Velez Street
Cagayan de Oro City, Misamis Oriental
(0882) 274-5138

RECEIVED: Imp
DATE: 10-02-23
TIME: 11:01 AM

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Mr. Unabia :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
11 October 2023 (Wednesday)	9:00 AM *Registration starts at 8:30a.m.*	Congressional Office - Balay Ninoichin Tagoloan, Misamis Oriental

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polinton and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Cagayan De Oro City LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Hon. Oscar S Moreno
City Mayor
Office of the City Mayor
2nd Floor, Executive Building, City Hall
Cagayan de Oro City, Misamis Oriental
857-7587, 09656679604
osm.cdo@gmail.com

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Moreno** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

OFFICE OF THE MAYOR
RECEIVED
DATE: 10/2/2023 TIME: 8:07 am
CONTROL: _____ BY: Noelle
CAGAYAN DE ORO CITY

Protect the environment... Protect life...

DA Region 10

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1110
Tel.Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Ms. Carlene C Collado
OIC, Regional Executive Director
DA Region 10
Antonio Luna Street
Cagayan de Oro City, Misamis Oriental
088-8566871 / 088-8562753-55
agri10cdo@gmail.com

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Ms. Collado** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

DEPARTMENT OF AGRICULTURE
REGION 10
RECEIVED
DATE 10/3/23 TIME 1:21 pm
BY [illegible]
OFFICE OF THE REGIONAL DIRECTOR

Protect the environment... Protect life...

DPWH Region 10

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (022) 8539-4378
Website: www.emb.gov.ph, Email: [illegible]

September 26, 2023

Dir. Zenaida T Tan
Regional Director
DPWH Region 10
Bulua
Cagayan De Oro, Misamis Oriental
(088) 858-4323
tan.zenaida@dpwh.gov.ph

DPWH-X RECORDS SECTION
RECEIVED
DATE/TIME: OCT 03 2023

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Dir. Tan** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

NCIP Region 10

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: emmhelp@emb.gov.ph

Septe

RECEIVED
DATE: 10/02/23
BY:

Atty. Jene M. Ragsac
Provincial Officer
NCIP Misamis Oriental
Provincial Capitol Building, Corrales Ext
Cagayan de Oro City, Misamis Oriental
09536035564/(088822) 714513

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Mr. Binahon JR** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polinion and Engr. Jes Roland Cummayo or at this email: eiamgemb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Balubal, Cagayan De Oro City Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Hon. Bactong Pablo
Punong Barangay
Brgy. Balubal
Cagayan de Oro, Misamis Oriental

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Pablo :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 Inc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jos Roland Cammayo or at this email: cis@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and Concurrent
Assistant Secretary for Field Operation

BALUBAL CDO
RECEIVED
DATE: 10/4/2023
TIME: 9:24 p.m.
Mimmel B. [illegible]

Protect the environment... Protect life...

Brgy. Puerto, Cagayan De Oro City Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

JOSEPHINE E. DUA

September 26, 2023

Hon. Christian Rustico M Achas
Punong Barangay
Iligan-Cagayan de Oro-Butuan Rd Brgy. Puerto
Cagayan de Oro, Misamis Oriental

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Achas :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polinton and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

received: 10-2-23

Protect the environment... Protect life...

Brgy. Bugo, Cagayan De Oro City, Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Hon. Vic Talingting
Punong Barangay
Brgy. Bugo
Cagayan de Oro, Misamis Oriental

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Talingting** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

BUGO BARANGAY COUNCIL
RECEIVED
DATE: 10/2/23
TIME: 1:30 PM
BY: [illegible]
BUGO, CAGAYAN DE ORO CITY

Protect the environment... Protect life...

Tagoloan, Misamis Oriental LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]@emb.gov.ph

September 26, 2023

Hon. Nadya Emano-Elipe
Municipal Mayor
Office of the Municipal Mayor
Claro M Recto Avenue, Poblacion
Tagoloan, Misamis Oriental
(088) 890-4561
tagoloanmayoroffice@gmail.com

MUNICIPALITY OF TAGOLOAN
OFFICE OF THE MAYOR
RECEIVED
BY: RAMINGO, C. G.
DATE: 10/2/23 1:20pm

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Emano-Elipe** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Natumolan, Tagoloan, Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
GENR Compound, Visayas Avenue, Diliman, Quezon City 1110
Tel./Fax: (02) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Hon. Rafael P Vidal
Punong Barangay
Brgy. Natumolan
Tagoloan, Misamis Oriental

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Vidal** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

RECEIVED BY:
IVY L. ASINERO
BRGY. SECRETARY
Date: 10/2/23 Time: 2:21 PM

Protect the environment... Protect life...

Brgy. Casinglot, Tagoloan, Misamis Oriental

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
GENR Compound, Visayas Avenue, Diliman, Quezon City 1110
Tel.Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: mcomhuto@emb.gov.ph

September 26, 2023

Hon. Rafael P Vidal
Punong Barangay
Brgy. Natumolan
Tagoloan, Misamis Oriental

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Vidal** :

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

RECEIVED BY:
IVY L. ASINERO
BRGY. SECRETARY
Date: 10/2/23 Time: 2:21 PM

Protect the environment... Protect life...

Sumilao Bukidnon LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel/Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: recordsco@emb.gov.ph

September 26, 2023

Hon. Jose Antonio A Villo
Mayor
Office of the Municipal Mayor
Kisolon
Sumilao, Bukidnon
lgusumilao@gmail.com

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Villo** :

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Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: http://eia.emb.gov.ph/ (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

10/9/23

Protect the environment... Protect life...

Brgy. Kulasi Sumilao Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel. Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: recordsum@emb.gov.ph

September 26, 2023

Hon. Gilbert T Mamatan
Punong Barangay
Brgy. Kulasi
Sumilao, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Mamatan** ;

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jos Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operations

Protect the environment... Protect life...

Brgy. Poblacion Sumilao, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

Hon. Julius Cesar A Tan
Punong Barangay
Brgy. Poblacion
Sumilao, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Tan :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Poliman and Engr. Jim Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

10/9/23

Protect the environment... Protect life...

Brgy. Vista Villa Sumilao, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: [illegible]@emb.gov.ph

September 26, 2023

Hon. Noland Caramonte
Punong Barangay
Brgy. Vista Villa
Sumilao, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Caramonte** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jos Roland Cammayo or at this email: cia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. San Roque Sumilao, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]@emb.gov.ph

September 26, 2023

Hon. Jake T Curay
Punong Barangay
Brgy. San Roque
Sumilao, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Curay** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

10/4/23

Protect the environment... Protect life...

Brgy. Puntian Sumilao, Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: recentsco@emb.gov.ph

September 26, 2023

Hon. Tirso B Amistoso
Punong Barangay
Brgy. Puntian
Sumilao, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Amistoso** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jos Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

MAYOR'S OFFICE
RECEIVED
BUKIDNON, BUKIDNON

Protect the environment... Protect life.

Bukidnon Province LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

September 26, 2023

Hon. Rogelio Neil P. Roque
Governor
Office of the Governor
Bukidnon Provincial Capitol, Impalambong Old Cagayan Road,
Malaybalay City, Bukidnon
813-2457/0909 417 8156

bukidnonpgbofficial@gmail.com

RECEIVED
RECORDS SECTION
DATE: 10-9-2023
TIME: 9:36

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Roque** :

We are pleased to invite you or your representative to the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our Web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone number (02) 8559-4378 loc. 116 and look for the project case handlers Engr. Joel Pulintan and Engr. Jen Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Malaybalay Bukidnon LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1176
Tel/Fax: (632) 8539-4378
Website: www.emb.gov.ph E-MAIL: [illegible]

September 26, 2023

OFFICE OF THE CITY MAYOR
RECEIVED
BY: [illegible]
DATE: 10-03-23
TIME: 8:21
CITY OF MALAYBALAY

Mr. Jan Warren Pabillaran
City Mayor
Office of the City Mayor
2nd floor, New City Hall, Barangay Casisang
Malaybalay City, Bukidnon
(088)-813-5643
cmomalaybalay2019@gmail.com

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Mr. Pabillaran :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 Inc. 116 and look for the project case handlers Engr. Joel Pulintan and Engr. Jos Roland Cammayo or at this email: eis@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Patpat Malaybalay City Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel. Nos. (632) 8532-4378
Website: www.emb.gov.ph Email: eia@emb.gov.ph

September 26, 2023

OFFICE OF THE CITY MAYOR
RECEIVED
BY:
DATE: 10/03/23
TIME: 8:21
CITY OF MALAYBALAY

Hon. Renante M Okit
Punong Barangay
Brgy. Patpat
Malaybalay City, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Okit :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: https://www.emb.gov.ph/ (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES. CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Dalwangan Malaybalay City Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: recordcom@emb.gov.ph

September 26, 2023

OFFICE OF THE CITY MAYOR
RECEIVED
BY:
DATE: 10-03-23
TIME: 8:22
CITY OF MALAYBALAY

Hon. Raul B Pandong
Punong Barangay
Brgy. Dalwangan
Malaybalay City, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Pandong** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jee Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. 10 Malaybalay City Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

OFFICE OF THE CITY MAYOR
RECEIVED
BY: [illegible]
DATE: 10/03/23
TIME: 8:21
CITY OF MALAYBALAY

Hon. Nilo Q Salga
Punong Barangay
Brgy. 10
Malaybalay City, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Salga** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jos Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Kalasungay Malaybalay City Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph EIAdc.recordsao@emb.gov.ph

September 26, 2023

OFFICE OF THE CITY MAYOR
RECEIVED
BY:
DATE: 10/06/23
TIME: 8:21

Hon. Rodrigo O Niere
Punong Barangay
Brgy. Kalasungay
Malaybalay City, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Niere** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
12 October 2023 (Thursday)	9:00 AM *Registration starts at 8:30a.m.*	2nd Floor, New Building, Sumilao Municipal Hall

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: http://eia.emb.gov.ph (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Impasug-ong Bukidnon LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel/Fax: (02) 8539-4378
Website: www.emb.gov.ph Email: [illegible]@emb.gov.ph

September 26, 2023

RECEIVED
DATE: 10/3/23
TIME: 10:50
BY: [illegible]

Hon. Anthony Uy
Mayor
Office of the Municipal Mayor
Old Sayre Hwy, Poblacion
Impasug-ong, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Uy:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Poliman and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Kibenton Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Bhoyas Avenue, Dalmas, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: recordcoo@emb.gov.ph

September 2[illegible], 2023

Hon. Noel R Rojas
Punong Barangay
Brgy. Kibenton
Impasug-ong, Bukidnon

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
DATE: [illegible]

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Rojas**:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Pala Ara Theater Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Poliman and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. La Fortuna Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

Sept[illegible] 20, 2023

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
10/6/23

Hon. Nilo C Iba
Punong Barangay
Brgy. La Fortuna
Impasug-ong, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF THE DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Iba**:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Fully Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life

Brgy. Poblacion Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

September 2023

Hon. Von Omar P Lagayan
Panong Barangay
Brgy. Poblacion
Impasug-ong, Bukidnon

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
DATE: 10/3/23
TIME:
BY:
IMPASUG-ONG, BUKIDNON

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Lagayan**:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Pelintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life.

Brgy. Capitan Bayong Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel/Fax: (02) 8539-4378
Website: www.emb.gov.ph Email: accordcoa@emb.gov.ph

September 20, 2023

RECEIVED
DATE: 10/6/23
TIME: 10:00
BY:

Hon. Dawn M Roque
Punong Barangay
Brgy. Capitan Bayoneg
Impasug-ong, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Roque:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Pulintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Cawayan Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (02) 8539-4378
Website: www.emb.gov.ph Email: recordcoe@emb.gov.ph

Sept. 26, 2023

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
DATE:
TIME:
IMPASUG-ONG, BUKIDNON

Hon. Josefino B Manalo
Punong Barangay
Brgy. Cawayan
Impasug-ong, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Manalo:**

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kasamulan Folk Arts Theatre Kasamulan Grounds Malaybalay Bukidnon

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Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Impalutao Impasug-ong Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

OFFICE OF THE MUNICIPAL MAYOR
RECEIVED
DATE:
TIME:
BY:

September 11, 2023

Hon. Antonio O Dominao
Punong Barangay
Brgy. Impalutao
Impasug-ong, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Dominao:**

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-8378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Manolo Fortich Bukidnon LGU

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1110
Tel Nos. (02) 8539-4375
Website: www.emb.gov.ph Email: [illegible]

September 26, 2023

OFFICE OF THE MAYOR
RECEIVED
3:55PM
DATE: OCT 02 2023
MUNICIPALITY OF MANOLO FORTICH

Hon. Clive D Quiño
Municipal Mayor
Office of the Municipal Mayor
Casaawan
Manolo Fortich, Bukidnon
9177243823
lgumanolofortich@yahoo.com

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear **Hon. Quiño** :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kasandan Folk Arts Theatre Kasandan Oriental Malaybalay Bukidnon

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jes Roland Cammayo or at this email: cia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Alae Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel/Fax: (632) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

OFFICE OF THE MAYOR
RECEIVED
OCT 0 2 2023
DATE: 3:55pm
MUNICIPALITY OF MANOLO FORTICH

September 26, 2023

Hon. Erasmo Ceasar A Ramirez
Punong Barangay
Brgy. Alae
Manolo Fortich, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Ramirez :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

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For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Polintan and Engr. Jet Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy. Sankanan Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Orkhan, Quezon City 1116
Tel/Fax: (02) 8539-4578
Website: www.emb.gov.ph Email: [illegible]

OFFICE OF THE MAYOR
RECEIVED
OCT 02 2023
DATE:
MUNICIPALITY OF MANOLO FORTICH

September [illegible]

Hon. Dennis G Salvo
Punong Barangay
Brgy. Sankanan
Manolo Fortich, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Salvo :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4578 loc. 116 and look for the project case handlers Engr. Joel Poliman and Engr. Jes Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

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Brgy.Mambatangan Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

OFFICE OF THE MAYOR
RECEIVED
DATE: OCT 02 2023
MUNICIPALITY OF MANOLO FORTICH

September 1[illegible]

Hon. Angelie S Roa
Punong Barangay
Brgy. Mambatangan
Manolo Fortich, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Roa :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website http://[illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone numbers (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Palintan and Engr. Jet Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

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Brgy.Tankulan Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (02) 8539-4375
Website: www.emb.gov.ph Email: [illegible]

OFFICE OF THE MAYOR
RECEIVED
OCT 02 2023
DATE
MUNICIPALITY OF MANOLO FORTICH

September 26, 2023

Hon. Romeo P Dagunlay
Punong Barangay
Brgy. Tankulan
Manolo Fortich, Bukidnon

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Hon. Dagunlay :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy.San Miguel Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel/Fax: (02) 8539-4378
Website: www.emb.gov.ph Email: [illegible]

OFFICE OF THE MAYOR
RECEIVED
OCT 02 2023
3:55pm
MUNICIPALITY OF MANOLO FORTICH

September 26, 2023

Hon. Benjamin S Minoza
Punong Barangay
Brgy. San Miguel
Manolo Fortich, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Minoza :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kasamulan Folk Arts Theatre Kasamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

For more details, please contact the Environmental Impact Assessment and Management Division of this Office at telephone number (02) 8539-4378 loc. 116 and look for the project case handlers Engr. Joel Palintan and Engr. Jos Roland Cammayo or at this email: eia@emb.gov.ph.

Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy.Damilag Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel.Nos. (632) 8539-4375
Website: www.emb.gov.ph Email: [illegible]@emb.gov.ph

OFFICE OF THE MAYOR
RECEIVED
DATE: OCT 02 2023
MUNICIPALITY OF MANOLO FORTICH

September [illegible]

Hon. Allan G Torres
Punong Barangay
Brgy. Damilag
Manolo Fortich, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Torres:

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Fair Arts Theatre - Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

Protect the environment... Protect life...

Brgy.Diclum Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU
DENR Compound, Visayas Avenue, Diliman, Quezon City 1116
Tel Nos. (632) 8539-4378
Website: www.emb.gov.ph Email: recordsoe@emb.gov.ph

OFFICE OF THE MAYOR
RECEIVED
OCT 02 2023
DATE:
MUNICIPALITY OF MANOLO FORTICH

September 2[illegible]

Hon. Nelson S Binayao
Punong Barangay
Brgy. Diclum
Manolo Fortich, Bukidnon

SUBJECT : **PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)**

Dear Hon. Binayao :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section)** of **Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Fiala Arja Theatre Kaamulan Grounds Malaybalay Bukidnon

The project's Environmental Impact Statement (EIS) and Executive Summary for the Public (ESP) are downloadable at our website: [illegible] (kindly access the Notice of Public Hearing/Consultation through the link found in our web page).

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

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Brgy.Ticala Manolo Fortich , Bukidnon

Department of Environment and Natural Resources
ENVIRONMENTAL MANAGEMENT BUREAU

OFFICE OF THE MAYOR
RECEIVED
OCT 0 2 2023
DATE:
MUNICIPALITY OF MANOLO FORTICH

Mr. Kineth G Tanto
Panong Barangay
Brgy. Ticala
Manolo Fortich, Bukidnon

September 2[illegible]

SUBJECT : PUBLIC HEARING OF THE PROPOSED CENTRAL MINDANAO HIGH STANDARD HIGHWAY CONSTRUCTION PROJECT (CAGAYAN DE ORO – MALAYBALAY SECTION) OF DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS (DPWH)

Dear Mr. Tanto :

We are pleased to invite you or your representative in the **Public Hearing** of the **Proposed Central Mindanao High Standard Highway Construction Project (Cagayan de Oro – Malaybalay Section) of Department of Public Works and Highways (DPWH)** to be located in Cagayan de Oro City and Tagoloan Misamis Oriental, Manolo Fortich, Sumilao, Impasug-ong, Malaybalay Bukidnon. The said public hearing is scheduled on:

Date	Time	Venue
13 October 2023 (Friday)	9:00 AM *Registration starts at 8:30a.m.*	Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

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Thank you for your usual cooperation and support to the EIA system.

Very truly yours,

GILBERT C. GONZALES, CESO III
Director and concurrent
Assistant Secretary for Field Operation

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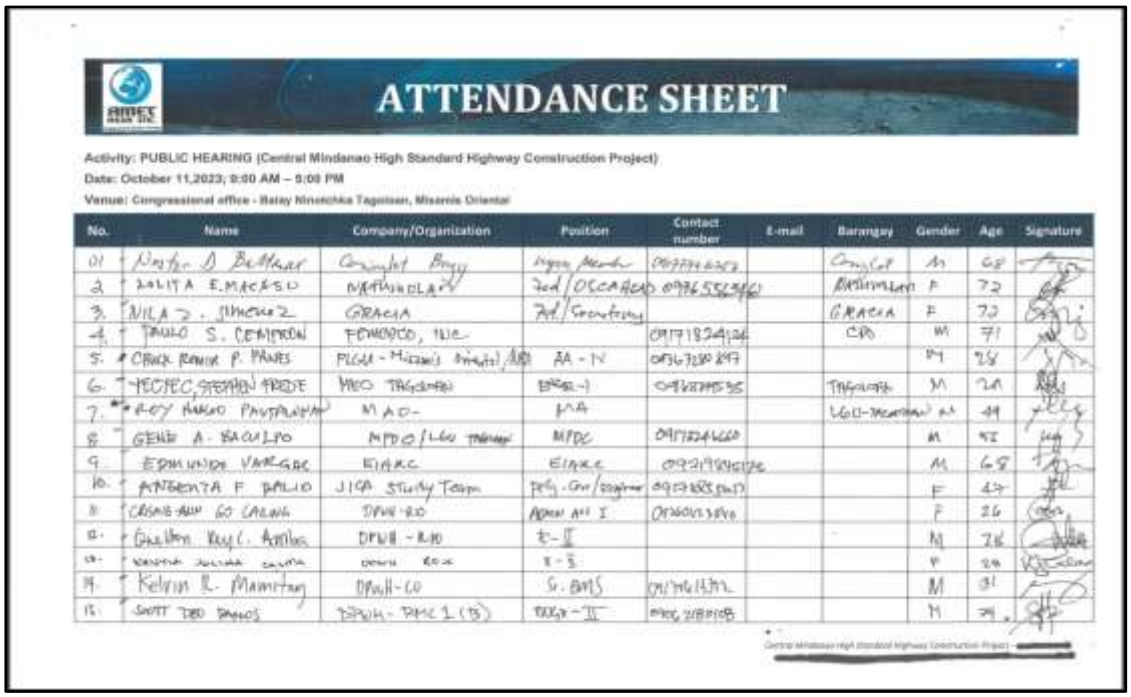
Attachment 20. Public Hearing Attendance

Public Hearing attendance sheets (onsite and virtual via Zoom)

Cagayan De Oro City and Tagoloan, Misamis Oriental

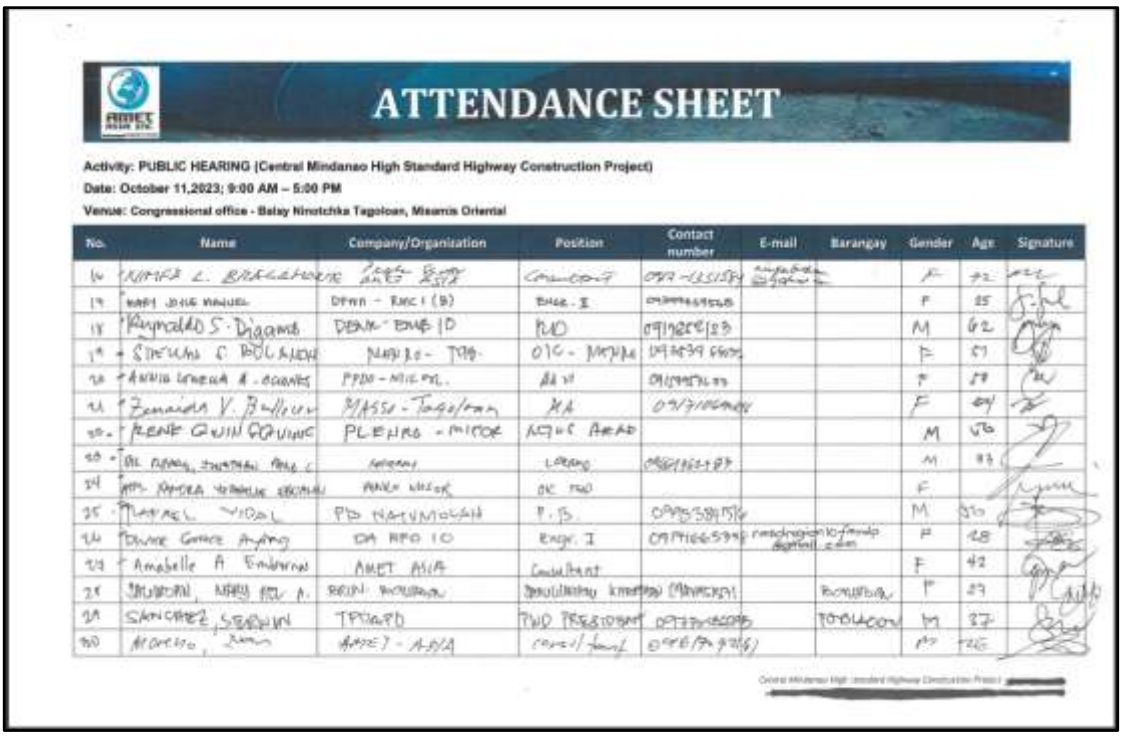
<u>On-site participants</u>



ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 11,2023; 9:00 AM – 5:00 PM
Venue: Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
01	Nestor D. Balthazar	Comalat Brgy	Brgy Member	[illegible]		Comalat	M	68	
2	[illegible]	[illegible]	2nd/OSCA Head	[illegible]		[illegible]	F	72	
3.	NILA [illegible]	GRACIA	2nd/Secretary			GRACIA	F	72	
4.	PAULO S. CEMBRON	PEMROCO, Inc.		09171824126		CPO	M	71	
5.	CHRICK [illegible] P. PANES	PLGU - Misamis Oriental	AA - IV	09367280897			M	26	
6.	[illegible], STEPHEN PRIDE	MEO Tagoloan	[illegible]	[illegible]		Tagoloan	M	28	
7.	ROY MARIO PANTALEON	MAO-	MA			LGU-Tagoloan	M	49	
8.	GENE A. BACULPO	MPDO/LGU Tagoloan	MPDC	09171824660			M	51	
9.	EDMUNDO VARGAS	EIARC	EIARC	09219846196			M	68	
10.	ANTONETTA F. BALIO	JICA Study Team	Proj. Coordinator	09178855840			F	47	
11.	CRISMAN GO CALANG	DPWH-RO	Admin Aid I	09260153840			F	26	
12.	[illegible]	DPWH - RO	E-II				M	26	
13.	[illegible]	DPWH - RO	E-5				F	29	
14.	Kelvin R. Manuntag	DPWH-CO	S. BMS	09176418712			M	31	
15.	SCOTT TED BRIONES	DPWH - DMC 1 (B)	EngR - II	[illegible]			M	29	



ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 11,2023; 9:00 AM – 5:00 PM
Venue: Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
16	[illegible]	[illegible]	Consultant	[illegible]	[illegible]		F	42	
17	MARY JOYCE MANUEL	DPWH - DMC I (B)	ENGR. I	[illegible]			F	25	
18	Raymondo S. Digamo	DPWH - DMC ID	RO	09192[illegible]/23			M	62	
19	SIMEONA C. PAULAUNG	MAYLAO - TPM	OIC - MAYOR	09[illegible]			F	57	
20	ANNIE LORENA A. ACOSTA	PPDO - MISOR	AA IV	09[illegible]			F	29	
21	Zenaida V. Bullecer	MASSO - Tagoloan	MA	09[illegible]			F	64	
22	RENE QUIN GONING	PLGU MISOR	MOVE AHEAD				M	56	
23	[illegible]	[illegible]	[illegible]	[illegible]			M	83	
24	[illegible]	[illegible]	[illegible]				F		
25	[illegible]	PDO MALAYBALAY	P.B.	09[illegible]			M	50	
26	[illegible] Grace Ayong	DA RFO 10	Engr. I	09[illegible]	[illegible]		F	28	
27	Amabelle A. Enderna	AMET ASIA	Consultant				F	42	
28	[illegible], MARY ROY A.	[illegible]	[illegible]	[illegible]		[illegible]	F	29	
29	SANCHEZ, SERWIN	TPDRRD	PDO President	09[illegible]		TOBLACON	M	37	
30	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 11,2023; 9:00 AM – 5:00 PM
Venue: Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
91	[illegible]	AMET ASIA INC	[illegible]	[illegible]			F	29	[illegible]
92	[illegible]								
93	[illegible]	EMB	EIAMC				F	60	[illegible]
94	[illegible]	[illegible]/EMB	[illegible]				M	63	[illegible]

Central Mindanao High Standard Highway Construction Project

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 11,2023; 9:00 AM – 5:00 PM
Venue: Congressional office - Balay Ninotchka Tagoloan, Misamis Oriental

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
45	Alcan T. Olila	Casisiyat Elem. School	Teacher	09941707897		Pro Casisiyat	Male	32	[illegible]
46	Gerlito R. Buman	BUGO	[illegible]	09074552280		BUGO	M	50	[illegible]
47	Nelson J. Jumela Sr.	Bugo Proper Serina	Vice Chairman	09161485805		BUGO	M	74	[illegible]
48	Jaud G. [illegible]	[illegible]	[illegible]	09078[illegible]		[illegible]	M	85	[illegible]
49	[illegible]								
50	Gilbert S. Buhisan	Z3 90B, Tag 90	TRISIMAD	09355817088		Pob.	M	75	[illegible]
51	Noel Moralde	LGU-CDO CAD	ITO-1	09358222422		CDO	M	55	[illegible]
52	Joel Polintan	EMB Co							[illegible]
53	Jes Roland Cinmayo	EMB Co							[illegible]
54	Junefer C. Marigmit	TPMMA	TRAFFIC	09262796582		Sta Cruz	M	45	[illegible]
55	Maniard Tomulac	CDNMMD	[illegible]						
56	Ariel Aranez	DEP-ED CDO	[illegible]	09773391049			M	30	[illegible]
57	Ely Mamaclay II	DEPED CDO	[illegible]	09171762833			M	54	[illegible]
58	Vic Talinuting	BUGO	P-B	09752297078		BUGO	M	58	[illegible]
59	Aida Mirabal Tolin	DA-RFO 10 CDO	Engineer I	09851095976	aida.p.mirabal@gmail.com		F	31	[illegible]
60	Jefferson R. Escarpe	CEPALCO	VSD-Supervisor	09566911364	jrescarpe2015@gmail.com	Tagoloan	M	42	[illegible]

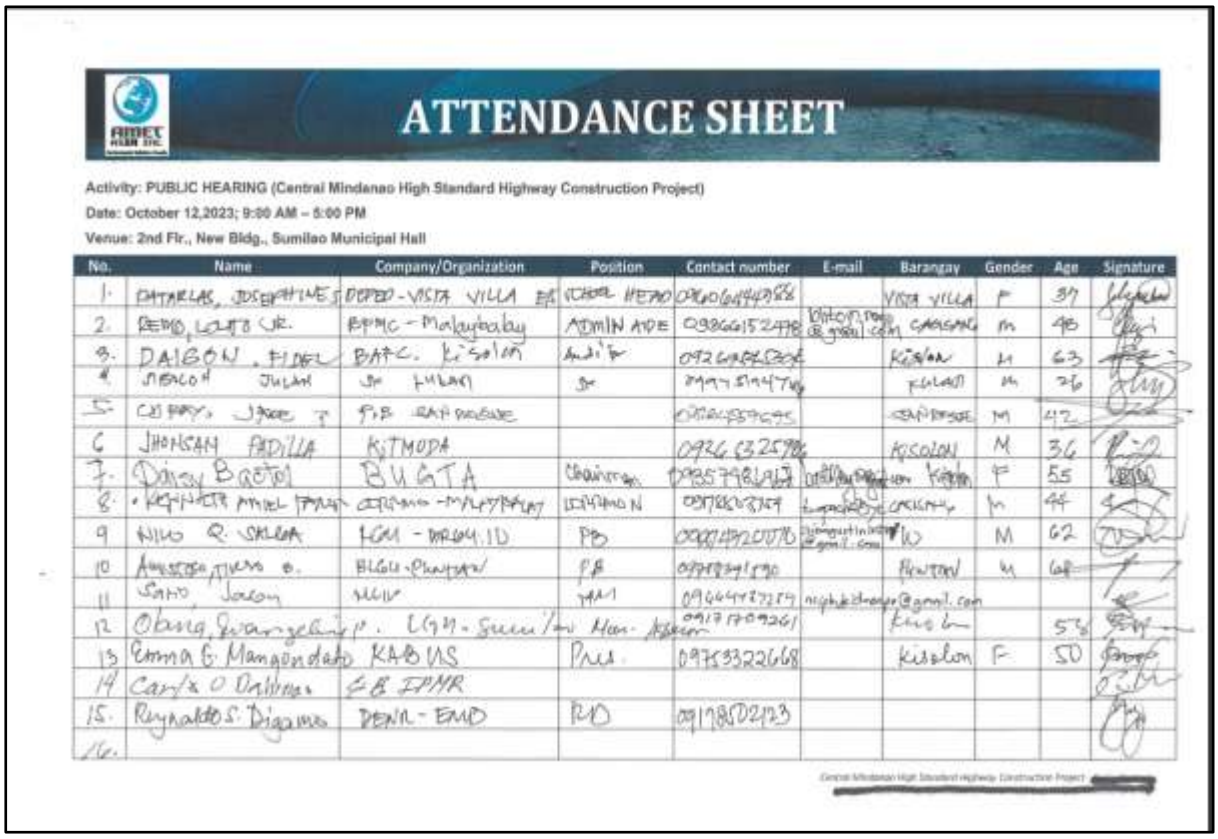
Central Mindanao High Standard Highway Construction Project

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Tomoaki Tanabe		JICA Study Team
2	Emmanuel Ramos	Consultant	Amet Asia

Sumilao and Malaybalay Bukidnon

<u>On-site participants</u>



ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 12,2023; 9:00 AM – 5:00 PM
Venue: 2nd Flr., New Bldg., Sumilao Municipal Hall

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1.	PATARLAS, JOSEPHINE S.	DEPED - VISTA VILLA ES	SCHOOL HEAD	09060644788		VISTA VILLA	F	37	
2.	REMO, LOUIS JR.	BPMC - Malaybalay	ADMIN AIDE	09866152478	[illegible]	CAMPUSANG	M	48	
3.	DALGON, FIDEL	BATC. Kisolon	Auditor	09260882804		Kisolon	M	63	
4.	SEALOA JULAN	SK KILAM	SK	09975194779		KILAM	M	26	
5.	CABRAL, JAGE T.	P.B. RAFI DRIVE		[illegible]		[illegible]	M	42	
6	JHONSAM FADILLA	KITMODA		09266325786		KISOLON	M	36	
7.	Daisy Bacto	BUGTA	Chairman	09357981917	[illegible]	Kisolon	F	55	
8.	[illegible]	[illegible] - MALAYBALAY	[illegible]	09786287369	[illegible]	[illegible]	M	44	
9	NILO Q. SALGA	LGU - MALAYBALAY	PB	09064920770	[illegible]	[illegible]	M	62	
10	[illegible]	BLGU - [illegible]	PB	09[illegible]1790		[illegible]	M	68	
11	Sano Jason	MLLU	YAM	09664[illegible]	[illegible]				
12	Obang Quangelin P.	LGU - Sumilao	Mun. Admin	09171709261		Kisolon		58	
13	Emma G. Mangondato	KABUS	Pres.	09753322668		Kisolon	F	50	
14	Carla O. Dalman	SB IPMR							
15.	Reynaldo S. Digamo	DENR - EMD	RO	09178502123					
16.									

Central Mindanao High Standard Highway Construction Project [redacted]

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 12,2023; 9:00 AM – 5:00 PM
Venue: 2nd Flr., New Bldg., Sumilao Municipal Hall

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	DALLIDIN, RITCHIE	DPWH - SAN ROQUE E/S	ES II-1	09553932215	[illegible]	San Roque	M	35	
2	LALAHAN, CARLITO	IP	IPMR	09935355910		KIYOLON	M	64	
3	FIDRENCIO, ETOURDE	IP	IPMR	09965356846		PUNTIAN	M	45	
4	Gilbert T. Manatad	IP	IPMR			Kiyolon	M	59	
5	ANDRON O. PAYAGOM	IP	IPMR			VISAULUA	M	65	
6	VIRGILIO B. DUMANA	San Roque, Sumilao, Bukidnon	Mun. Tribal Chairman			San Roque	M	70	
7	Vanessa Lynn Solon	SK Fed. / Brgy Kiyolon	SK-Fed.	09178018489	[illegible]	Kiyolon	F	29	
8	Jan Michael Binayao	MCIP			mcipbukidnon@[illegible]	Malaybalay	M	33	
9	ZAGADO, AUGUSTO S.	LGU SUMILAO	COMMO II	09166279986		KIYOLON	M	41	
10	Ann Marie C. Lato	LGU Sumilao	KPMC II	09178009016		KIYOLON	F	24	
11	Jesrer A. Mangubat	PPDO - Bukidnon	PPDO C	09172192637			M	58	
12	Mariana C. Kumoyas	LGU - Sumilao	MA	09155955239			F	57	
13	Jaelito Abang	LGU Malaybalay	DRRMO						
14	Jotolan Ks	LGU	COR						
15	EARL JOSEPH D. BULSA	Brgy. 10				Brgy. 10	M		
16	Tumamoroy Dennis Lee	CDREMO		09166918097			M	43	

Central Mindanao High Standard Highway Construction Project

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 12,2023; 9:00 AM – 5:00 PM
Venue: 2nd Flr., New Bldg., Sumilao Municipal Hall

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	[illegible]	[illegible]		[illegible]	[illegible]				
2	[illegible]								
3	[illegible]	[illegible]	[illegible]	[illegible]			F	24	
4	[illegible]	DPWH R10	E-II				M	28	
5	[illegible]	DPWH R10	E-I				F	29	
6	SCOTT [illegible]	DPWH-UPMO BMCI(A)	E-I				M	29	
7	JESON C. [illegible]	DPWH-R10	[illegible]				M	30	
8	[illegible]	DPWH-UPMO BMCI(A)	E-I				F	25	
9	Kelvin R. Manuitag	DPWH-PS	[illegible]				M	31	
10	Angelita F. Bulid	JICA Study Team	Proj Co / Engr	09178255051			F	49	
11	[illegible]	AMET ASIA	Documentator				F	30	
12	Annabelle A. Embarno	AMET ASIA	Consultant				F	42	
13	[illegible]	AMET ASIA	Consultant				M	26	
14	Jessan R. Lee	EMB	EIARC				F	64	
15	Edmundo Vargas	EMB	EIARC				M	68	
16	Jer Roland Cammayo	EMB CO	EIAS I				M	35	

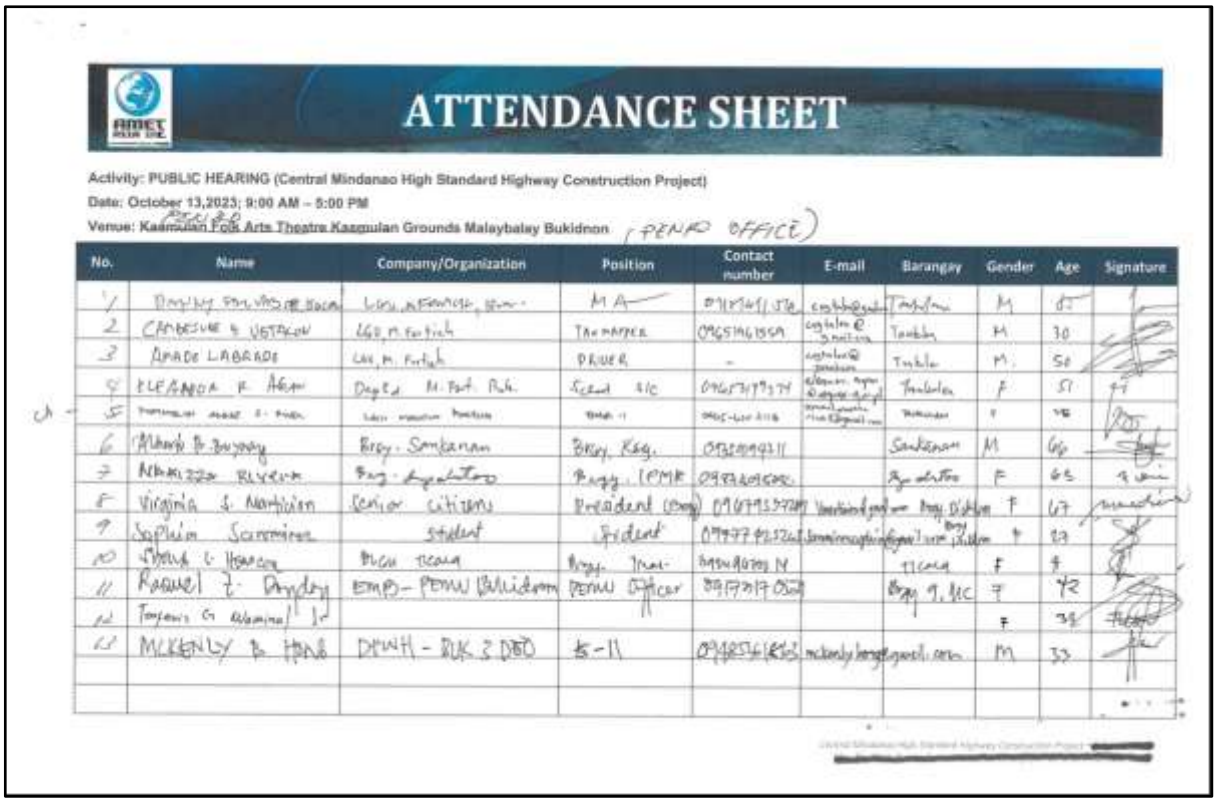
Central Mindanao High Standard Highway Construction Project

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Tomoaki Tanabe		JICA Study Team
2	Emmanuel Ramos	Consultant	Amet Asia
3	Samuel Sendon	Consultant	Amet Asia
4	Patricia Lim	Consultant	Amet Asia

Impasug-ong and Manolo Fortich Bukidnon

<u>On-site participants</u>



ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Fok Arts Theatre Kaamulan Grounds Malaybalay Bukidnon (PENRO OFFICE)

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
1	[illegible]	[illegible]	M A	[illegible]	[illegible]	[illegible]	M	55	
2	CAMBESUE A VETACON	LGU M. Fortich	TRIMPAPER	09651461859	[illegible]	Tankla	M	30	
3	AMADO LABRADO	LGU M. Fortich	DRIVER	-	[illegible]	Tankla	M	58	
4	ELEANOR R. AGAN	DepEd M. Fort. Pub.	Secret A/C	09673179374	[illegible]	Tankla	F	51	
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	F	48	
6	[illegible]	Brgy. Sankanan	Brgy. Kag.	09320094211		Sankanan	M	66	
7	[illegible]	Brgy. [illegible]	Brgy. IPMR	09[illegible]		[illegible]	F	65	
8	Virginia S. Nartivion	Senior citizen	President (Brgy)	09679937281	[illegible]	Brgy. Dishon	F	67	
9	Sophia Sarmiento	student	President	09977[illegible]	[illegible]	Brgy. Dishon	F	23	
10	[illegible]	BLGU Tcola	Brgy. [illegible]	09[illegible]		Tcola	F	4	
11	Raquel T. Dayday	EMB – PENRO Bukidnon	PENRO Officer	09173170[illegible]		Brgy. 9, MC	F	42	
12	Tomomi G. Albarina						F	38	
13	MCKENLY B. HONG	DENR – BLK 3 DBO	E-11	09[illegible]	[illegible]		M	33	

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon (PENRO OFFICE)

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
14	Bugada O. Cabaria	Women's	Member	[illegible]		Sta. Cruz	F	49	[illegible]
15	Galinyan, Lorey Mae	LGU Manolo Fortich	Secretary	[illegible]			F	45	[illegible]
16	Dasalla, Judith	Brgy. Chugsan - Mitangay Brgy. IPMR - Tankalan	IPMR	[illegible]		Tankalan	F	67	[illegible]
17	Stephen Jilm Batarinia	LGU - Manolo Fortich	DEAD	[illegible]		Tankalan	M	28	[illegible]
18	Martha B. [illegible]	Sinpakilab Brgy. Kauf	Brgy. Kag	[illegible]		Sinpakilab	F	68	[illegible]
19	Rosita E. Cayuhon	TICALA – PLGU	SLP	[illegible]		Ticala	M	40	[illegible]
20	Jan Richard Bingayo	MCIP		[illegible]	[illegible]		M	33	[illegible]

Central Mindanao High Standard Highway Construction Project

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon (PENRO)

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
21	SCOTT DEO RAMOS	DPWH UPMO BMCS (B)	E-II				M	29	[illegible]
22	[illegible]	DPWH UPMO BMCS (B)	E I				F	25	[illegible]
23	ANGELITA F. BALIO	JICA Study Team	Proj Coor / Engineer	09173825587			F	47	[illegible]
24	Jes Roland Camarajo	BTB CO	Engr I				M	25	[illegible]
25	Kelvin Ramon Namitag	DPWH B	SE. EMS	[illegible]			M	5	[illegible]
26	JOEL PALIMBAN	EMB Co	ENGR III						[illegible]
27	Paul M. Baity	Reviewer / PMS	Senior PMS						[illegible]
28	Annabelle A. Embornas	AMET ASIA	Consultant				F	42	[illegible]
29	[illegible]	AMET ASIA	Consultant - Social Expert	09127115154			F	72	[illegible]
30	Kevin Mendoza	AMET ASIA	[illegible]				F	30	[illegible]
31	Quelina Rey C. Aviles	DPWH R10	E-II				M	28	[illegible]
32	JESON C. [illegible]	DPWH R10	AS-I				M	30	[illegible]
33	CALMA, KRISTIA JULINA	DPWH RO-X	E-I				F	28	[illegible]
34	Reynaldo S. Dipanua	DENR - EMB	RD				M		[illegible]
35	Jason M. Morales	AMET - ASIA	Consultant				M	26	[illegible]

Central Mindanao High Standard Highway Construction Project

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon (PENRO OFFICE)

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
22	[illegible]	[illegible]	TREASURER	[illegible]		Dicklum		61	
23	EDWARD CESAR RAMOS	DB ALAE	DB	09675709910		ALAE		46	
24	Allan G Tomas Jr.	PPL Family. M.P. Bukl	Bgy. chairman	09500567374		Family		48	
25	Kristine Rochelle Espeleta	LGU - Impasugong	Admin Aide	09354897896			F	36	
26	Francisco Guimaga	LGU – Impasugong	MUN. TREAS	09171499472			M	61	

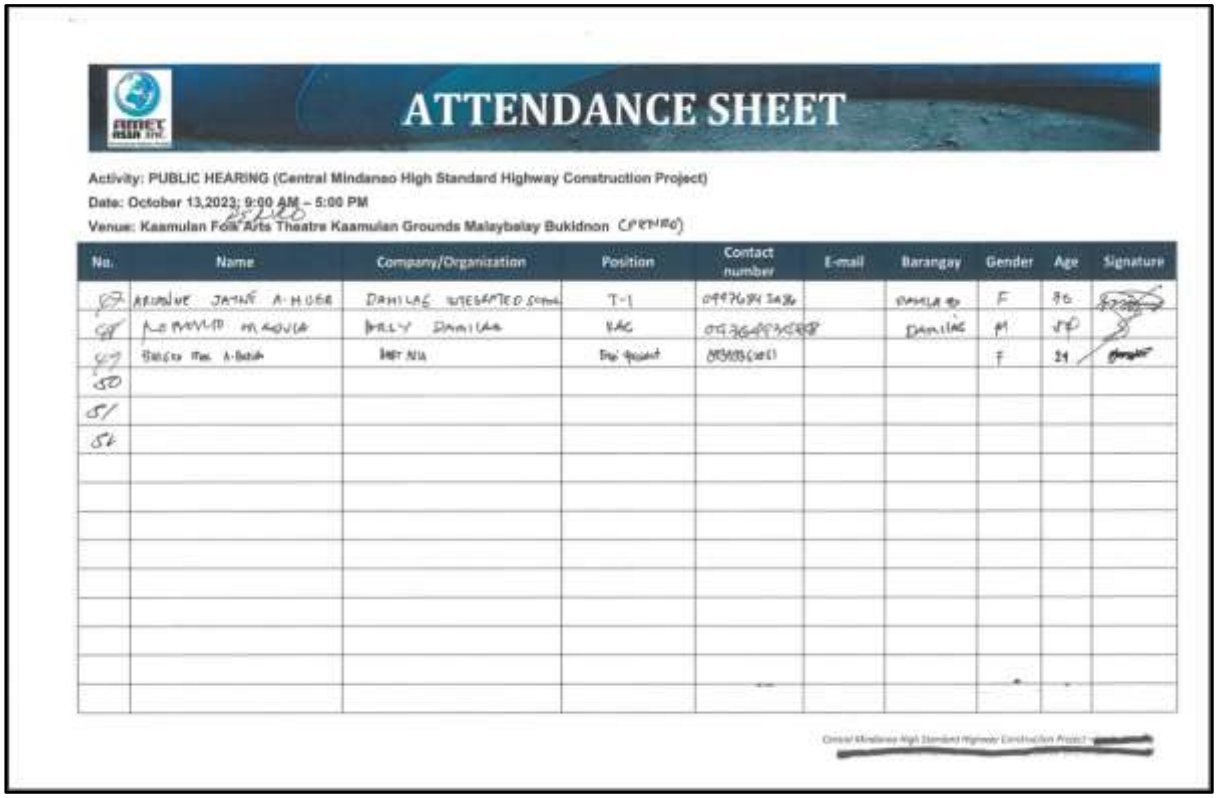
Central Mindanao High Standard Highway Construction Project

ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Folk Arts Theatre Kaamulan Grounds Malaybalay Bukidnon (PENRO OFFICE)

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
25	Sylvan Mach C. Velasco	LGU Manolo Fortich	Draftsman III	[illegible]	[illegible]	Tankulan	M	26	
26	RAMON P. MAGUDLAY	PB-TANKULAN	BRGY CHAIRMAN	09269436561		Tankulan	m	69	
27	[illegible] D. Pagayanan	LGU-Manolo Fortich	S.B	09658161[illegible]		Tankulan	M	61	
28	DENNIS C. SOLSO	PO [illegible]	BRGY CHAIRMAN	09[illegible]		[illegible]	M	61	
29	ABRAHAM PIN LOYA B	PNP Organization	PNP Guard	09[illegible]		Tankulan	+	46	
30	ALBERTO A. ECLIAGON	PENRO Bukl	DIC-Chief TSD	09561688807			M	60	
31	Timothy G Tomato	PB Ticala		09061[illegible]6		Ticala	M	39	

Central Mindanao High Standard Highway Construction Project



ATTENDANCE SHEET

Activity: PUBLIC HEARING (Central Mindanao High Standard Highway Construction Project)
Date: October 13,2023; 9:00 AM – 5:00 PM
Venue: Kaamulan Fore Arts Theatre Kaamulan Grounds Malaybalay Bukidnon

No.	Name	Company/Organization	Position	Contact number	E-mail	Barangay	Gender	Age	Signature
49	[illegible]	DAHILAG [illegible]	T-1	[illegible]		[illegible]	F	[illegible]	
48	[illegible]	[illegible] DAHILAG	[illegible]	[illegible]		DAHILAG	M	[illegible]	
47	[illegible]	[illegible]	[illegible]	[illegible]			F	24	
50									
51									
52									

Central Mindanao High Standard Highway Construction Project

Virtual (via Zoom) participants

	Name	Position	Company/Organization
1	Tomoaki Tanabe		JICA Study Team

Attachment 21. Public Hearing Photodocumentation

Cluster 1: Cagayan De Oro and Tagoloan Public Hearing

Onsite Attendees - Cagayan De Oro and Tagoloan Cluster in Congressional Office - Balay Ninotchka Tagoloan, Misamis Oriental

Engr. Joyce Manuel from DPWH RMC 1 (Bilateral) presenting the project description

Ms. Francina Balido presenting the EIA Study results and mitigation measures

Engr. Angelica Balid from JICA Study team showing the road alignment during the open forum

Cluster 2: Sumilao and Malaybalay Public Hearing

Onsite Attendees - Sumilao and Malaybalay Cluster in 2nd Flr., New Bldg., Sumilao Municipal Hall in Sumilao, Bukidnon

Signing the attendance sheet for Cluster 2 Public Hearing

Engr. Joyce Manuel from DPWH RMC 1 (Bilateral) presenting the project description

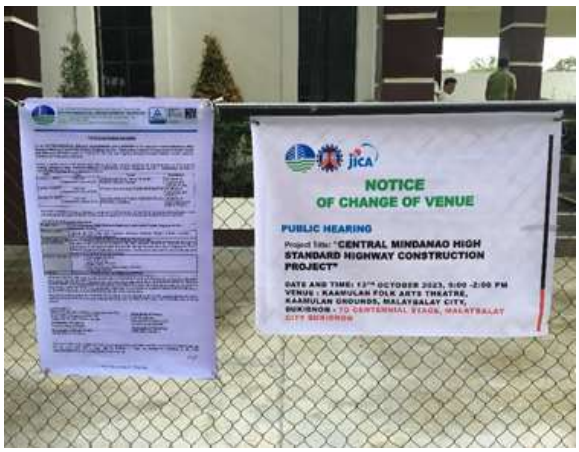
Mr. Fidel Daigon, FAFC Kisolon,
during the open forum

Mr. Bienvinido Narciso from ABAG,
during the open forum

Mr.Kenneth Taylor, DRRM,
during the open forum

Ms.Ann Lato, EMS,
during the open forum

Notice of Public Hearing and change of venue at
Centenniel Stage in Capitol Grounds, Malaybalay



Notice of Public Hearing and change of venue
at Kaamulan Folk Arts Theater

Cluster 3: Impasug-ong and Manalo Fortich Public Hearing

Onsite Attendees - Impasug-ong and Manolo Fortich Cluster in PENRO office in Capitol Drive, Malaybalay Bukidnon

Signing the attendance sheet for Cluster 3 Public Hearing

Mr.Danny Bocan, Municipal Assessor Manolo Fotich, during the open forum

Ms. Francina Balido from Amet Asia presenting the EIA study results and mitigation measures

Mr. Alex Payangga, S.B. Manolo Fortich, during the open forum

Ms.Bae Judith Dinsag, Municipal IPMR 'and Chieftain, asking a question during the open forum

Engr. Angelita Balid, JICA Study Team, answering a question during the open forum

Ms.Allan Torres, PB Damilag Manolo Fortich, during the open forum

Attachment 22. Public Hearing Proceedings

CLUSTER 1: Cagayan de Oro and Tagoloan
Public Hearing on the Central Mindanao High Standard Highway Project
Congressional Office, Balay Ninotchka, Tagoloan, Misamis Oriental
October 11, 2023
9:30-12:00 NN
Facilitator: Regional Director Reynaldo Digamo

Participants
1. Eli Mamaklay, Division Chief DepEd
2. Galaura, CLENRO Cagayan de Oro City
3. Gedion Buyan, Bugo
4. Jed Valerio, CPDO, Cagayan de Oro City
5. Jefferson Escarpe, CEPALCO
6. Kag. Dionedes Rosel, Balubal
7. Maynard Torres, DRRM Oro Rescue
8. Nelson Jumilla, Bugo Senior Citizen Vice President
9. Paolo, LGU MDRRM Tagoloan
10. Paulo Cempron, FEMODCO, Inc
11. Punong Barangay Rafael Vidal, Natumolan
12. Rene Guingguing, PENRO'
13. Roy Bataluna, Tagoloan

RD Digamo: Okay umpisahan nato ha. So, kinsa man dinhe nga naka-participate public consultation process? Diba gaingon sila ganiha sa presentation nga part sa process is the public hearing. But before the public hearing, meron pang public scoping, public consultation. So, who among you here was able to participate in the public consultation? Wala? Because during the public consultation process meron mga issues and concerns. And then you have the right to know.

House rules sa public hearing, ang katong gusto na dunay pangutana ug naay concern itaas ang kamot. Ang hearing officer i-acknowledge ka. Imo ipaila imong kaugalingon kung unsa na grupo ang imong gi-representahan and then imong ipasigot imong mga panguntana. Okay, who will shoot the first question?

Mr. Cempron: Good morning. I'm Paulo Cempron, federation chairman of Cagayan de Oro City Motorcade Federation. This is my first time, ingo pa ni Sir nga kami tanan bag-o pa gyud me ani, wala pa me kaapil sa consultation. So, kung i-weight lang nako particular sa kaangayan ba nga i-divert ang highway kay ibutang nato nga ang alignment ako na obserbahan sa akong mama nga in which part on Tagoloan diretso didto sa Sumilao possible Sumilao, Bukidnon. Meaning kato Puerto mawala nato, so may I know the reason why ingon ani?

RD Digamo: Thank you, Sir Paul. So, atong ipatubag sa DPWH. Why the road alignment is diverted from Puerto dire sa Sumilao. Pero dili mawala atong kalsada sa Puerto. Naa ra gihapon yan. It will still remain and unclog the traffic. Kasi nakita niyo na ang Puerto labi na diha sa bakana grabeh na dira ka traffic. So, we have somehow constructed another road to unclog the traffic labi na diha sa Puerto. But then we will let the DPWH reply to that query.

Engr. Ramos: Good morning po. So, sa part po namin sa DPWH as pinakita po kanina may tatlong alignment po na pinagaralan and ang nasabi po ng kasama ko na sa Engr. Joyce may limang aspect po siya para mapili po ang proposal alignment. So, itong alignment po ito. Ito po yung para mai-ano ang traffic tulad po ng nasabi ni direktor po. Para hindi po masyado ma-traffic sa area na sinasabi niyo po. Kung saan po yung mas economical kaya yan po ang napili naming alignment.

Mr. Cempron: Okay but dunay alignment didto another way nga less atong traffic but niabot gyapon ta sa Puerto sa highway. Magsugat ra gihapon. So, ang decongestion dadto sa imabaw pero pagabot na sa highway na, yang existing highway natin but didto gyapon ang highway kuno.

RD Digamo: Ang punto niya. Pagdating dito mag-abot parin sila.

Engr. Ramos: Sayre highway, Sir. That's an alternative alignment.

Mr. Cempron: Ang ako lang pangutana sa existing highway nato Tagoloan siya sa highway. So, niliko sa pikas murag nihawa, tungod sa alignment all which ang Puerto naa lang gihapon muagi. Ang purpose is to decongest. Pero nganong pagabot sa highway the same highway pa gyapon ang tinagpuan sa mga sakyanan nga buwag ni sa high standard highway ug sa Puerto nga highway sa Sayre mutagbo lang gyapon didto sa Tagoloan. Adto ka sa Puerto para Tagoloan, musangko ka sa Tagoloan. Unya ang isa pud sa alignment sa high standard highway nga propose, magtagbo lang gyapon na sa ubos. Sa ato pa, mutagbo ra gyapon siya.

RD Digamo: Sige si Sir Gideon.

Mr. Buyan: Gedion Buyan. Barangay legislator at the same time leader sa barangay Bugo. Sir ang concern nako related ra pud sa concern sa Lipunan. Based on some observation naa lang affected na mga families even siguro ilang mga properties na maapektuhan. Pero naa

bay anticipation na gihimo nga gitawag nga plano? Kay kung magsugod na pud ang project, mag-ongoing na ang gitawag nga construction sa dalan, I'm sure padulong sa Bugo. So, naa na bay anticipation mga gitawag nga affiliated agencies nga ingkaso mahitabo ni naa nay mga plano unsay buhaton? Ang Bugo nagbaha na gyud sa ubos. Pero kung naay gamay nga eroded nga lugar didto padulong gyud sa ato sa Bugo.

RD Digamo: The moment na magumpisa na ang construction, definitely there will be some sort of planning. Ang tanong, will you have identified measures to prevent this flooding, landslide or whatever consultation in the barangay Bugo?

Ms.Balido: Let me clarify. Ang question po natin ano po measures ang gagawin to prevent flooding? Tama ba? Ano ang gagawin? So, this one po. Dito po. Ito po yung options para ma-prevent or para ma-indicate po yung sinasabi ni sir na flooding. So una, kailangan po makapag-design po tayo na adequate na drainage system. So this will be on...Ito po kasi sinasabi ko halos mga plans pa po na kailangan po nilang ma-implement during the construction. Dapat din po yung road design is compatible din po doon sa slopes or structures. Meron din po tayong mga recommend po sa kanila na mga kailangan gawin katulad po noong...Barangay Bugo po kayo, Sir? So, bale mababa po yung lugar niyo? So, kunyari ang mangyayari yung matataas po nating mga lugar yung mga flood po galing sa kanila napupunta po sa inyo?
Pero may nabanggit po kayong project? Iba po yun. So, ayun po. May mga projects po na mga plans po na dapat po masunod during the operations po. And nakalagay po sa report po namin. So, kailangan din nila makapag provide ng mga backfilling and leveling of borrow pits to prevent water filling. But then again general po sabihin is may mga plans po na nakalagay po dito for prevention and mitigation po para maiwasan po yung mga ibang yun. Kasi during our study nakita po namin yung impact na binangit niyo po. So, these options para to prevent po yun. So, this must be masunod po para maiwasan po ito.

Mr. Buyan: Ang request po namin, Ma'am kung saan ang specific na entrada para diyan na this will be the plan ninyo if in case mangyari yun during sa constructions. Be specific talaga. Kasi yung nakalagay diyan pang general yan. Kadalasan kasi kung ano nangyayari sa taas ang mga tubig doon pumupunta sa amin. So, syempre yung mga tao concern nila kung halimbawa may road construction nanaman. Mas higit pa ang mangayayari.

RD Digamo: Yung concern ni Sir Gideon that will be addressed during the detailed

engineering design. Ngayon part of this study aaralin nila yung mga natural drainage system. Yung may mga tally? Kung saan dadaloy yung tubig. Possibly contaminated yung soil, sediment ana. So, aaralin nila yun based on the area and then based on that consider nila doon sa detailed engineering design. Ngayon, yung detailed engineering design na yan should be made known to the stakeholders dito sa baba. DPWH, you should make that known to the stakeholders and those areas that are more concerned about flooding. Don't worry kasi each project is there's an ECP and there will be MMT. Naalala niyo yun? That is still part of the public consultation. We will organize the MMT and there will be representatives coming from barangay Bugo. Definitely there will be representation from barangay Bugo, barangay Puerto. So that during the monitoring, yung concern po ninyo ma-input doon sa report. Okay.

Engr. Ramos: Actually, ito rin ang purpose ng public hearing, yung mga concern po ninyo kagaya kay sir kanina, kasama sa detailed engineering design kasi hindi naman namin alam particularly kung titingin lang kami sa google map. That is why pumunta po kami mismo dito para malaman natin yung mga concerns ninyo and magandang concern po yun para masama po natin siya. So, meron pa po kayong katanungan?

Mr. Jumilla: Maayong Buntag sa tanan. Ako Sir 50 years na ako sa Bugo, bahaonon na daan pa. Kay ang Bugo murag embudo. Pagbalhin nimo sa pikas kay moadto sa Bugo ang tubig sa taas. Nibalhin ko sa taas nga lugar pero nabahaan gihapon. Tama tong ingon ni Sir nga dapat naay public consultation kay ang taga Bugo ang maoy nasayod sa problema. Ang outlet sa Bugo connected sa Tagoloan gamay kaayo mao magbaha. Ang mga balay pud naa sa canal mao magbaha.

Mr. Cempron: So, related lang yung tatlo nilang concerns. It's about flooding. So you have to identify the sources of this flood waters during heavy rains. Kay baka mamaya kahit malayo doon sa project natin kayo parin yung ituturo na dahilan. Thank you at these guys are already telling us even without this project yet, there is already flooding. So, para hindi ma-attribute sa project natin you have to identify the sources of flood waters during heavy rains. Si sir po next.

Engr. Mamaklay: DepEd po.

RD Digamo: Pangalan, Sir?

Engr. Mamaklay: Engr. Eli Mamaklay. Division Chief head. Bali yung problema po namin

sa Bugo National High School meron kasi doon sa taas, may pipe doon. Ewan ko lang bakit andoon 4.9. Yung pipe na yun nakatutok doon sa school. Yun pala ang problema namin bumabagsak doon sa school. Ang ground floor namin na four-storey building hindi po namin magamit kasi kapag umuulan napupuno palagi ng lupa na galing sa taas.

RD Digamo: Sino po naglagay ng pipe na yan?

Engr. Mamaklay: Hindi ko po alam.

RD Digamo: You can bring your concern to the DPWH or to the city. Kasi pagusapan natin itong project na ito. You are talking of something that is existing. Okay. So, how will that affect itong project na ito. Ngayon, sa school niyo dinala niyo na ba yang concern na yan sa kinauukulan?

Engr. Mamaklay: Wala pa. Hindi namin alam kasi bali tinatanong ko kung siguro part ng Tagoloan yun sana maisama nila sa project na ito yung pag divert noong pipe. Kasi may isang bridge doon na dinugdon ang pipe papunta doon sa... anong tawag nito? Dapat doon sa bridge.

RD Digamo: Ganito nalang gawin natin. Maybe this guy doesn't know about it. Maybe you can bring the concern to the local DPWH. If not, the district office in the region. Okay, si Sir sa likod.

Kag. Rosel: Maayong buntag sa tanan. Ako si Kagawad Dionedes Rosel sa barangay Balubal. Kinis siya, maagian man amuang area sa private land. So akong question, na-negotiate na ba ang lot diha? Naa na bay negotiation about sa yuta, tanum. Adto pud na hapak sa barangay. Before sa construction at least plantsado na tanan. Ang mga tag-iya sa yuta wala nay reklamo didto sa barangay kay ato naman gi-negotiate. Mao na akong concern, Sir.

RD Digamo: Salamat sa concern, kagawad. Ang concern ni kagawad yung right-of-way natin. Meron na ba daw negotiation sa mga private properties na dadaanan ng project natin. So, sino sasagot?

Engr. Ramos: Sir, uulitin ko lang po. Ang tanong niyo po kung may negotiation na po sa mga tatamaan ng project?

RD Digamo: Yes.

Engr. Ramos: Sa ngayon po sir, Feasibility study palang tayo and may engineering detailed design pa. Sa detailed engineering design, so may mga separate na public consultation meetings regarding sa RAP yung Resettlement Action Plan. So, itong mga affected families po may separate na siya na public consultation meetings. And once na final and approved yung periciliary survey po natin. As of now po, yung alignment is para initially since FS palang po siya, magco-conduct pa po tayo ng more detailed na pagaaral po yung
detailed engineering design. And may separate na public consultation.

Kag. Rosel: May mga papers po ba na kailangan e-prepare

RD Digamo: Yes, definitely. Standard procedure yan ng DPWH. Bago sila pumasok diyan meron pa permit to enter na isyu ng mga private landowners. May mga negotiation.
The final negotiation magkaroon yan kapag natapo yan detailed engineering design. Kasi sigurado na tayo sa road alignment natin. So, magkaroon din ng separate na public consultation sabi ng taga DPWH. Okay, so si Rafael.

P.B. Vidal: From barangay Natumolan. Punong Barangay Rafael Vidal
Pumunta po ang DPWH sa Barangay Natumolan at pinagtatanong ang mga owners. Akala ko ay okay na itong project. May usapan na...the same project but anyway, kasi ang sa Barangay Natumolan dati hindi talaga problema ang floods. Ang nangyari pagdating ng Alae yung bagong daan, doon nagkaproblema na kami. Grabe ang baha talaga. May putik pa. So, kung pwede yung implementation kung magumpisa bigayan ng pansin. Kasi ganitong impact flooding, traffic, talagang worst na talaga sa lugar namin sa Tagoloan especially sa Kasinglot. Nagpasalamat kami sa Barangay Natumolan na meron ibang daan na mas shorten papuntang Bukidnon. So, we are blessed and happy barangay Natumolan but yun lang ang problema namin. Baka mangyari uli ang naranasan namin ngayon.

RD Digamo: Salamat Kap. Ang sabi ni kapitan, he was referring to the impact of the construction sa Alae Bridge. So, ang suggestion niya na tignan yun. Ibang project naman yun. Ano ibig sabihin noon? Doon sa study ninyo correlate niyo yung impact noong project by the local DPWH and this project. Yun ang ibig sabihin ni kapitan. Yung correlation at impact ng project dito. Para there is a way na ma-address yun dito sa mga mitigating measures natin para di na natin maranasan yung flooding

during the construction of the Alae Bridge. Okay. Dito muna.

Mr. Valerio: Maayong buntag sa tanan. Sa City government sa Cagayan de oro. Suggestion lang sana kasi meron mga concerns doon sa mga low lying barangays natin sa lalo na papuntang low land. Sana before magumpisa itong project na ito 2029 siguro, ma-address na sana ang problema sa baha dito sa baba. Sana meron ng project para ma-mitigate na yung flooding. So, hindi parallel yung project na kapag develop natin ng highway saka pa gagawin pa yung measure. Kung pwede sana unahin muna yung flood mitigating plans before ma-implement ang project na ito. Secondly, meron tayong partly na monitoring team na gagawin. Tanon ko lang sana, ako kasi ang head of team. Monthly ba sila nag rereport? Kung meron bang reklamo sa kanila ba isasanguni ang mga problema? Yun lang sir.

RD Digamo: Thank you, sir. From the City of Cagayan de Oro. Unahin niyo muna doon sa MMT. Yung mechanism sa MMT coming from the different stakeholders. Definitely from the government meron talagang representation. Usually, the monitoring is quarterly yan. Unless na meron talagang special na meeting ng team. As to saan mag-complain? The MMT can also accept complaints and MMT will take care of that. Okay.

Doon sa unang concern na dapat sana una address itong existing na flooding dito sa mga low lying barangays bago ito umpisahan. So, may I heard the response from the proponent?

Engr. Ramos: Regarding po doon sa problem niyo po sa flooding since po kasi kami is RFC 1 po kami. May minutes of meeting naman po tayo na mamaya namin address yung concern siguro. If ever po no mag-meeting po kami with our flood control. Meron po kasi kami FCFC specifically flood controls po yung mga handle po nila na project. So, for this specific project po yung address naman po namin yung magiging flooding upon implementation habang construct kasama po sa construction methodology kung paano namin mitigate yung flooding. Pero yung mga out na po sa project namin siguro relay nalang po namin sa department kung saan po nag-handle.

RD Digamo: Sige, si Sir sa likuran.

Mr. Paolo: Hello, good morning. Paolo from LGU Tagoloan. MDRRM. Do you consider na climate projection? Kasi, I noticed the drainage system. Actually, pwede na sa amount of rainfall. So, nakita ko kanina part sa design na naay drainage. Hopefully, the drainage will be capable of holding those certain amounts. Kasi may [Inaudible 39:51-40:01] and

siguro try to coordinate city and Tagoloan Planning Office sa MDRR kasi may mga datas kami yung mga history at tsaka yung twice na nangayri na. Yung nakita namin na pagbasak ng ulan. Hopefully the drainage size will be able to cope. And also, please consider the sea level rise. As we all know, dahil sa climate change. Pagdating sa nag level na yung water ng dagat useless na yung outlet.

RD Digamo: Very clear na siguro yung point ni Si Pao. So, the DRRM offices are good sources of data sa climate, about sa weather. So, coordinate with local DRRM office. So, sagot ng DPWH about sa suggestion ng drainage. Okay na ba yun, kaya ng drainage natin? Paano natin address yan.

Engr. Balid: Engr. Balid ng JICA study team. Bali since kami po gumagawa palang po kami ng FS. Meron naman po kaming hydrologist na inaral talaga kung ano yung impact ng mga tubig, kung ano yung mga inflows and outflows. So, since FS palang tayo ngayon considered naman siya doon sa detail engineering design na ginawa namin. Next step po nito magkakaroon tayo ng detailed design. Yung sa detailed design syempre engineering detailed design meron din po sila hydrologist. So, for sure makikipag-coordinate talaga sila sa inyo kasi kailangang kailangan nila yung mga secondary datas aside from the primary datas from other agencies.

RD Digamo: Okay malinawa po. Thank you very much for clarifying that and for assuring our stakeholder that these will be seriously considered in the final design. Anymore? Si Sir.

Roy Bataluna, Tagoloan: Maayong buntag sa tanan. Roy Bataluna sa Municipal Agriculture office sa Tagoloan. Ang akon lang question is kaning sure gyud ko nga big volume gyud ni sa balas nga gamiton sa construction. Then ang source ana is Tagoloan river. Ang problem ana karon sa among part sa agriculture dire sa Tagoloan, grabe na nga erosion ang naguba na gyud ang suba tungod sa paspas nga quarry. Dagahan man ang nisulod nga quarry. Mao na siya ang pangutana is wala bay laing source sa niyo gawas sa Tagoloan? Kay basin mahurot ang luna sa Tagoloan mahulog didto na sa upper part kay murag nahurot na sa daghan quarry dadto.

Ang akong concern is tagaan unta ug plano or unsa mga preventive measure nga dili pud maapektuhan ang agriculture area kay gamay ra kaayo ang agriculture area sa Tagoloan tungod sa quarry halos tanan suba sa Tagoloan gikan sa bukana paingon sa part na Bukidnon last

gyud. Niabot na ang buhangin karon. Mao na siya ang problema. Ang balas.

RD Digamo: Ang concern ni Sir Roy ang sources sa atong requirement sa aggregate sa balas.Sa ECC ana sigurado ako that sources of aggregates and construction materials shall be from legitimate suppliers. Pero balik tayo sa concern ni Sir Roy because too much quarrying will somehow erode the environment. Ang atong patubagon kay ang provincial ENRO nato na ang province ang mag-issue sa quarry permit. So, we will request engineer Guingguing to reply to that particular concern because the quarry permit is issued by the province.

Engr. Guingguing: Regards sa quarrying sa Tagoloan, Balinsag, even Cagayan de Oro. Ayaw lang mo kabalaka ang MGB and EMB ang provincial government sa construction ato na monitor nga walay construction sa Tagoloan. Then sa local source naa man ta Balingasag. Didto sila mukuha sa Cagayan de Oro. Didto sila sa Bukidnon. Daghan tag sources.

RD Digamo: Thank you. So, mabulagbulag ang sources nato sa aggregate base ng materials. But that will again reflect in the environmental impact assessment and in the FS. Okay. Meron pa ba?

Engr. Galaura: Good morning, I'm engineer Jannene Galaura from City LENRO, Cagayan de Oro City. Bali po ongoing po yung updating ng CLUP namin. And there are proposals to, highway designs to incorporate this planting strips. So, bale kapag ordinance na we will implement this in the whole constructions. For now, po, since wala pang ordinance we suggest na yung sa highway design po ninyo road wee tapos merong drainage canals. Then we highly recommend planting strips. To implement po green spaces. Sa gilid ng highway.

RD Digamo: Ma'am Jannene, thank you for bringing that up. Cagayan de Oro is a candidate for green cities. So, it is just correct that it could be captured sa design natin sa ating kalsada. Please capture that. I want to see that in the public hearing report. Thank you, Ma'am Jannene. Anymore?

Mr. Baltazar: Good morning sa tanan. Representing barangay Casinglot. So, pasalamat sa dakong project sa highway. Naa mga problema pero naa man solusyon. So, dili nalang ko muhatag ug problema. So, pasalamat lang mi sa mga taga Casinglot nga naa mi apil sa project sa highway. Kay kami man pud ang makagamit ana nga project.

RD Digamo: So, yung first section funded by hapon. Yung section funded by ADB.

Mr. Escarpe: Good morning. I'm Jefferson Escarpe from CEPALCO. Yung concern ko lang sa feasibility study if involved ba kung saan kami pwedeng maglagay kami ng poles for electricity? May concern dati sa construction na parang nagaaway kami sa right-of-way. Sa drainage, yungs a water system at tsaka kami. Minsa kapag mag ano kami sa lupa matamaan namin yung tubig, if not yung drainage. So, yung concern ko lang sana if ever sa study niyo, may nakalaan sana kaming note kung saan kami magalalagay ng poste.
Kapag highway kasi malalaking poste ang lalagay namin so malalaking hukay ang kailangan. Tapos isa sa complain na natanggap ko sa customer yung ibang may-ari ng lupa na nakapasok kami ay nagtatanong kung bakit bakapasok kami sa lupa nila. Problema namin saan namin ilipat yung poste yung lang po.

RD Digamo: Very valid concern yan. Ayan, sige. Sagutin mo, Ma'am.

Engr. Calma: Good morning, everyone. For the DPWH standard project yung sixty meters natin right-of-way na pinakita nila earlier. Yung last meter to the left and 4 meters to the right is actually dedicated for electric cooperatives or utilities PLDT, Globe, whatever. Hindi kasi kayo allowed mag encroach within na talaga sa right-of-way namin. Dili mo pwede muduol sa drainage or sidewalk para dili nato ma obstruct ang vehicles or ang pedestrian. Sometime man gud mauna mo before me makaabot. Diha gyud mugawas ang problema kapag naa nay post before kami magdalan. Pero if mauna ang dalan naa man gihatag nga space for electric cooperatives.

RD Digamo: Let us clarify these 4 meters left and right, this is allocated for utilities?

Engr. Calma: This is away sa drainage. Ang 4 meters is separate from the drainage and only for utilities.

Mr. Escarpe: Ang concern lang nako kay not part sa design pero paghuman sa dalan diba 4 meters. So, paghuman sa dalan kinsa ang unan muplastar drainage dayon ayha dayon me para dili namo mabungkal ang drainage, dili pud namo maigo ang tubig. Mao na among concern. At least part sa plan paghimo sa highway dadto me muplastar but include siya sa plano.

Engr. Calma: Ang drainage kay amua gyud na siya. Dili part of the 4 meters. Naa gyud siya sa sulod. Sometimes gani ang drainage is situated below the sidewalk or usahay naa siya sa tunga. Ang water lines lang ang kamo ang sa kilid.

RD Digamo: Good, thank you sir. Yes, ma'am.

Engr. Balid: Noong nag-conduct kami ng feasibility study. We take into

consideration the height ng electric lights, electric poles. For example, dito sa part ng Tagoloan meron kaming nire-align para hindi namin tamaan yung post na yun. Kaya huwag po kayo magalala. And kunyari dadaan sa highway kung gaano kalaki yung magiging poste ninyo. Nag-coordinate kami sa NGCP para sa lights.

RD Digamo: Don't worry kasi may coordination na ang mga agencies ngayon.

Mr. Torres: Good morning po. Maynard Torres, Disaster Risk Reduction Management Oro Rescue. For the information of everybody, not all incidents we receive involve wheels and persons, naa pud sakyanan. Ang rason sa driver, sakyanan and structures. Unsa ilang reklamo? Sa kalsada naay deretso liko. Example sa coastal road daghan nag reklamo kay moderetso ug liko ang dalan. Diha pud sa Puerto – sad but true nga ang dalan pa Bukidnon liko-liko jud maka cause ug disgrasya. Naa mi data sa mga areas nga daghan accidents.

RD Digamo: It's all about too many curves. Tama napansin ko nga yan. Sige address natin yan.

Engr. Balid: Ito nga po yung magandang balita dahil itong project kasi natin high standard highway. So, isa sa dahilan kung bakit siya tinawag na high standard kasi kailangan natin ma-evade yung mga accidents na nangyayari. So, mapapansin niyo isa sa mga rason kaya magkakaroon tayo ng ganito para maiwasan natin itong near death zigzags. Kasi base sa aming research ang laki laki ng mga aksidente dito nangyayari. Nakita niyo yung mga zigzag diyan ang steep ng gradient. 6% lang ang maximum steepness. Para smooth ang kanyang takbo at maiwasan natin yung aksidente.

RD Digamo: That is good news. Sa Claveria ang daming curves. Isa sa features natin na maiwasan ang curves. Only 6% compared sa matarik na road. But that will not eliminate traffic accidents – kay pag tul-id ang kalsada mas mabilis ang sasakyan. Very valid concern. Bakit ba high standard? Ano ang difference paki-explain po.

Engr. Balid: Bale po yung high standard highway isa po yan sa dahilan kung bakit ko kinuha yung project. So, yun ang mga expressway like NLEX, SCLEX kung sino ang nakapunta a Cebu yung bagong Mactan bridge high standard din po yun. Yung maka travel ka ng 80 km/hour na comfortable ka at safe ka. Yung ang gradient is 6% lang. Ang expressway sa Luzon halos patag lang, deretso, walang masyadong traffic. Yun, Sir.

RD Digamo: Tulad ng TPLEX, NLEX flat lang. Kasi nasa ibabaw ng lahat. Ang

features na hindi matarik at 6% gradient at may reflectorized lights. Sana naman mas matibay na reflectorized lights ang gamitin kasi after a month na daanan ng sasakyan nasira na. Sige si Sir muna.

Engr. Guingguing: The design is for 4 lanes, many years in the past nag widening ang DPWH at may matirang puno or poste sa gitna dahil dito, baka dapat ma incorporate ito sa design?

RD Digamo: Parang hindi na yata mangyayari yan kasi yung 60 meters nagiwan ng 4 meters bawat side. So, ibigsabihin yung kabuuan is 26-meter yun. So, kung mag six lanes ka na diyan hindi pa rin tatamaan kapag dito lang maglagay sa allocate na 4 meters both sides.

Engr. Balid: Yang design ay for 4 lanes ngayon pero siguro in 2050 ay maging 6 lanes.

Mr. Jamilla: Ang project about sa metro rail project for Mindanao. Pero yung alam namin meron line from Bukidnon to Cagayan. So, pwede niyo ma-check kung affected yung metro rail project from Davao ata to Cagayan to Iligan to Mindanao.

RD Digamo: May idea ba kayo diyan? But anyway, you should also consider if the government will pursue that project. Kasi that was conceptualized during the time of president Duterte. Wala na? Ah hindi natuloy daw.

Engr. Balid: We also asked for the tentative alignment of the metro rail project for now on hold pa.

RD Digamo: Meron pa ba? May tatamaan ba ng project ng DENR itong alignment na ito? Wala daw tatamaan. So, maraming salamat po sa pagdalo. And I would like to assure everybody that all were considered in the conduct of study, in the FS and the final design of this project.

ENGLISH LANGUAGE

RD Digamo: Okay, we will start. So, who was able to participate in the public consultation process? In the presentation earlier, they discussed that public hearings are also part of the process. But before the public hearing, there was public scoping and public consultation. So, who among you here was able to participate in the public consultation? None? Because during the public consultation process, they presented their issues and concerns. And then you have the right to know. House rules of the public hearing: to those who have questions and concerns, raise your hands. The hearing officer will acknowledge you.

Introduce yourself, the group represented, and then your questions. Okay, who will shoot the first question?

Mr. Cempron: Good morning. I'm Paulo Cempron, federation chairman of the Cagayan de Oro City Motorcade Federation. This is my first time, like most of us. We have not attended the consultation. So, if I will determine if it is applicable to divert the highway that my mom has observed since then, which part of Tagoloan to Sumilao, Bukidnon?

Does it mean Puerto Road will be gone? So, may I know the reason why it is like this?

RD Digamo: Thank you, Sir Paul. So, I will let the DPWH answer that. Why is the road alignment diverted from Puerto to Sumilao? But the Puerto Road will not be removed. There will be a new additional road to unclog the traffic. But then we will let the DPWH reply to that query.

Engr. Ramos: Good morning. So, we from the DPWH showed earlier that there were three alignments proposed, and according to my colleague Engr. Joyce said that there are five aspects to be considered before choosing that proposal alignment. We chose this alignment because it is the most economical and to relieve traffic.

Mr. Cempron: Okay but, there is another alignment there that is less traffic but it will still end in Puerto highway. But the traffic will still merge at the top. There will still be traffic.

RD Digamo: This means that the traffic will still merge here.

Engr. Ramos: Sayre highway, Sir. That's an alternative alignment.

Mr. Cempron: The alignment, although the Puerto Road exists and its purpose is to decongest, the traffic will still merge into Tagoloan, causing more congestion. But why will they still use the same highway? So, it means that the new road will still merge with the old road.

RD Digamo: Go on, Sir Gideon.

Mr. Buyan: Gedion Buyan. Barangay legislator and at the same time leader in barangay Bugo. My concern is also related to Lipunan. Based on some observation, there are affected families and their properties. Is there a plan from the affected agencies? In Bugo, there is flooding, if there is a landslide, it floods toward Bugo. Is there any plan to anticipate

this scenario?

RD Digamo: The moment construction starts, there will definitely be some sort of planning. The question is, will you identify measures to prevent this flooding, landslide, or whatever consultation in barangay Bugo?

Ms. Balido: Let me clarify. The question is: What are the measures to prevent flooding? These are the options to mitigate the flooding: design an adequate drainage system; these are plans to be implemented during the construction phase; and the road design slope structures should complement the elevation. You are from Bugo, sir; the flooding comes from the top, then it goes to your place? There are plans during operation that should be implemented for this; Lastly, provide backfilling to prevent flooding and landslides. These must be followed to avoid these impacts.

Mr. Buyan: Ma'am, our request is where specifically the entry point on your plan in case the construction pushes through. Be specific. Because what is in your report is general. The water from the top will come to our place. So, of course, people are concerned because there will be road construction again. Even worse will happen.

RD Digamo: Sir Gideon's concern will be addressed during the detailed engineering design. As part of this study, they will study the natural drainage systems. The one with the tally? Where the water will flow, the soil and sediment are possibly contaminated. So, they will study that based on the area, and then, based on that, they will consider that in the detailed engineering design. Now, that detailed engineering design should be made known to the stakeholders here. DPWH, you should make that known to the stakeholders and those areas that are more concerned about flooding. Don't worry because each project is required to get an ECP and there will be MMT. Do you remember that? That is still part of the public consultation. We will organize the MMT, and there will be representatives coming from barangay Bugo. Definitely, there will be representation from barangay Bugo and barangay Puerto. So that during the monitoring, your concern will be included in the report. Okay.

Engr. Ramos: Actually, this is also the purpose of the public hearing. Your concerns are included in the detailed engineering design because we don't know the exact details or concerns if we just look at the Google map. That is why we came here ourselves so that we would know your concerns, and that is a good concern. So, do you have any questions?

Mr. Jumilla: Good morning, everyone. I have been in Bugo for 50 years, but there

is still a long way to go for development. Because Bugo is like a funnel. When you move to the other side, the water at the top goes to Bugo. I moved to a higher place, but it was still flooded. You are right, sir. There should be a public consultation because the people from Bugo are the ones who know about the problem. The outlet in Bugo connected to Tagoloan causes flooding. The houses on the canal also cause flooding.

RD Digamo: So, the three concerns are related. It is all about flooding. So you have to identify the sources of these flood waters during heavy rains. Because maybe later, even if you are far away from our project, you will still be the one to blame. Thank you, and these guys are already telling us that even though the project has not started yet, there is already flooding. So, in order not to be attributed to our project, you have to identify the sources of flood waters during heavy rains. Sir, you're next.

Mr. Mamaklay: From DepEd.

RD Digamo: Your name, Sir?

Mr. Mamaklay: Engr. Eli Mamaklay. Division Chief head. The problem we have at Bugo National High School is that there is a pipe up there. I just don't know why there is a 4.9. That pipe is pointed at the school. That's the problem—the water goes into the school. We cannot use the ground floor of our four-story building because when it rains, it is always filled with mud.

RD Digamo: Who put that pipe there?

Mr. Mamaklay: I do not know.

RD Digamo: You can bring your concern to the DPWH or to the city. Let's talk about this project. You are talking about something that already exists. Okay. So, how will that affect this project? Now, at your school, have you brought that concern to the appropriate person?

Mr. Mamaklay: Not yet. We don't know because I'm asking if maybe that's part of Tagoloan. I hope they can include the diversion of the pipe in this project. Because there's a bridge there with the pipe going there to...What's it called? It should be there on the bridge.

RD Digamo: This is what we will do. Maybe this guy does not know about it. Maybe you can bring the concern to the local DPWH. If not, the district office in the region Okay, sir, in the back.

Kag. Rosel: Good morning, everyone. I am Kagawad Dionedes Rosel in Barangay Balubal. Our private land is included in the affected areas. So, my

question is, has the lot been negotiated? Negotiations about the land and crops. I hope that before construction, everything has been negotiated. So that the landowners have no complaints in the barangay. That is all my concern, sir.

RD Digamo: Thanks for the concern, Kagawad. Kagawad's concern is about right-of-way. Is there any negotiation on the private properties that our will be affected by the project? So, who will answer?

Engr. Ramos: Sir, let me just clarify. Your question is: is there a negotiation with those who will be affected by the project?

RD Digamo: Yes.

Engr. Ramos: Right now, sir, we are doing a feasibility study and have an engineering-detailed design. In the detailed engineering design, there are separate public consultation meetings regarding the RAP, the Resettlement Action Plan. So, these affected families have separate public consultation meetings. And once our periciliary survey is final and approved. The alignment is not final since we are still conducting our FS. We will conduct a more detailed study of the detailed engineering design. And there is a separate public consultation for this.

Kag. Rosel: We need to prepare our papers.

RD Digamo: Yes, definitely. That is the standard procedure of the DPWH. Before they enter, there is a permit to enter that is issued by private landowners. There will be negotiations. The final negotiation will occur when the detailed engineering design is done. Because the road alignment is final. So, there should also be a separate public consultation, as said by the DPWH. Okay, so Rafael.

B.C. Vidal: From barangay Natumolan. Barangay captain Rafael Vidal. The DPWH went to Barangay Natumolan and asked questions of the landowners.

I thought this project was okay. There are already negotiations for the same project, but anyway, because in Barangay Natumolan, floods were not really a problem before. What happened when the new road came to Alae? That's when we got into trouble. The flood was really bad. There is still mud. So, if the implementation is possible when it starts, pay attention. Because this causes flooding, traffic is really bad in our area in Tagoloan, especially in Kasinglot. We are grateful to Barangay Natumolan because there is another road that is

shorter to Bukidnon. So, we are blessed and happy in Barangay Natumolan, but that's our only problem. Maybe what we experienced today will happen again.

RD Digamo: Thank you, Cap. The captain said he was referring to the impact of the construction on the Alae Bridge. So, his suggestion is to look at that. That's another project. What does that mean? In your study, correlate the impact of the project by the local DPWH with this project. That's what the captain meant. The correlation and impact of the project are here. So that there is a way to address that in our mitigating measures so that we no longer experience flooding during the construction of the Alae Bridge. Okay. Next.

Mr. Valerio: Good morning, everyone. I'm from the city government of Cagayan de Oro. It's just a suggestion because there are concerns in our low-lying barangays, especially towards the lowlands. I hope that before this project starts in 2029, maybe the flood problem here will be addressed. I hope there is a project to mitigate the flooding. So, when we develop the highway, then there will be measures to be taken. If possible, the flood mitigating plans should be prioritized before this project is implemented. Secondly, we should have a monitoring team to work with this. I just wanted to ask because I'm the head of the team. Will they report monthly? If there is a complaint, will the problems be reported to them? That's it, sir.

RD Digamo: Thank you, sir. From the city of Cagayan de Oro. First, go to MMT. The mechanism in MMT comes from the different stakeholders. Definitely, from the government, there is real representation. Usually, the monitoring is quarterly. Unless there is a really special team meeting, as to where to complain? The MMT can also accept complaints, and the MMT will take care of them. Okay.

The first concern, this existing flooding here in the low-lying barangays should have been addressed first. So, may I hear the response from the proponent?

Engr. Ramos: Regarding your problem with flooding since we are RFC 1. We have minutes of the meeting, and we will address the concern later. If ever, we will have a meeting with our flood control. We have FCFC, specifically flood controls. So, for this specific project, we will address the flooding upon implementation during construction, including in the construction methodology how we mitigate the flooding. But the ones that are out of our project, maybe we just relay them to the department that handles those particular concerns.

RD Digamo: All right, sir, in the back.

Mr. Paolo: Hello and good morning. Paolo from LGU Tagoloan. MDRRM. Do you

consider that climate projection? I noticed the drainage system. Actually, it is possible with the amount of rainfall. So, I saw an earlier part of the design that had drainage. Hopefully, the drainage will be capable of holding certain amounts. Because there is [Inaudible 39:51-40:01] and maybe try to coordinate the city and Tagoloan Planning Office in MDRR because we have data, the history, and also it happened twice already. The one we saw was rain. Hopefully, the drainage size will be able to cope. And also, please consider the rise in sea level. As we all know, because of climate change. When the water levels the sea, the outlet is useless.

RD Digamo: Sir Pao's point is probably very clear. So, the DRRM offices are good sources of data on the climate and the weather. So, coordinate with the local DRRM office. So, DPWH's answer to the drainage suggestion Is that okay? Can our drainage handle it? How do we address that?

Engr. Balid: Engr. Balid from the JICA study team. Since we are still in the process of doing FS. We have a hydrologist who studied the impact of the waters, including the inflows and outflows. So, since we are doing the FS now, this will be considered in the detailed engineering design that we did. The next step is to have a detailed design. As for the detailed engineering design, they also have a hydrologist. So, for sure, they will really coordinate with you because they need the secondary data aside from the primary data from other agencies.

RD Digamo: Okay, it's clear. Thank you very much for clarifying that and for assuring our stakeholders that these will be seriously considered in the final design. Any more questions? Sir.

Mr. Bataluna: Good morning, everyone. Roy Bataluna at the Municipal Agriculture Office in Tagoloan. My only question is that I'm sure it's a big volume of sand that will be used in construction. Then the source is the Tagoloan River. The problem now in our part of agriculture in Tagoloan is that the river has been destroyed by severe erosion due to the rapid quarrying. There are many people who have entered the quarry. My question is: is there no other source for you besides Tagoloan? Because the water in Tagoloan might run out, it will fall in the upper part because it seems like many quarries there have run out.My concern is to give a plan or some kind of preventive measure so that the agriculture area will not be affected because we have few agriculture areas in Tagoloan because of the quarry, almost all the rivers in Tagoloan from the opening to Bukidnon. The sand has reached the area. This is the problem. The sand.

RD Digamo: Sir Roy's concern is the source of our requirement for aggregate in sand. In ECC, I am sure that sources of aggregates and construction

materials shall be from legitimate suppliers. But let's go back to Sir Roy's concern, because too much quarrying will somehow erode the environment. Our answer is to our provincial ENRO that the province will issue the quarry permit. So, we will request engineer Guingguing to reply to that particular concern because the quarry permit is issued by the province.

Engr. Guingguing: Regarding the quarrying in Tagoloan, Balinsag, and even Cagayan de Oro, do not worry because the MGB and EMB, the provincial government, will monitor and make sure that there will be no construction in Tagoloan. Then, from the local source, we have Balingasag. There, they will take Cagayan de Oro. They were in Bukidnon. There are many other sources.

RD Digamo: Thank you. So, we have different sources in the aggregate base of materials. But that will again reflect in the environmental impact assessment and in the FS. Okay. Do you still have questions?

Engr. Galaura: Good morning! I'm engineer Jannene Galaura from City LENRO, Cagayan de Oro City. We are currently updating our CLUP. And there are proposals for highway designs to incorporate these planting strips. So, when it becomes an ordinance, we will implement this in the whole construction. For now, since there is no ordinance yet, we suggest that your highway design be road strip and then have drainage canals. Then we highly recommend planting strips. To implement green spaces. On the side of the highway.

RD Digamo: Ma'am Jannene, thank you for bringing that up. Cagayan de Oro is a candidate for green cities. So, it is just correct that it could be captured in our design on our road. Please capture that. I want to see that in the public hearing report. Thank you, Ma'am Jannene. Any more questions?

Mr. Baltazar: Good morning, everyone. Representing barangay Casinglot. So, I just want to say thank you for the highway project. There are problems, but there are solutions. So, the people of Casinglot are thankful because we are involved in the highway project. We are also the ones who will benefit from this project.

RD Digamo: So, the first section was funded by the Japanese. The other section is funded by ADB.

Mr. Escarpe: Good morning. I'm Jefferson Escarpe from CEPALCO. My only concern is the feasibility study, if it involves where we can put poles for electricity. There was a concern before with the construction that we seemed to be fighting over the right-of-way. In the drainage, its water system, and sometimes when we do something on the ground, we hit the water pipes, if not the drainage. So, my only concern is that you

include in your study the location where we could put our post. On national roads, we put up big poles, so big pits are dug up. Then one of the complaints I received was that the land where we put the poles was private property. Now our problem is where to move the pole.

RD Digamo: That's a very valid concern. Please answer, ma'am.

Engr. Calma: Good morning, everyone. For the DPWH standard project, our sixty-meter right-of-way that they showed earlier—the 4 meters to the right and left—are actually dedicated to electric cooperatives or utilities (PLDT, Globe, whatever). Because you are not allowed to actually encroach within our right-of-way. You cannot approach the drainage or sidewalk so that we do not obstruct vehicles or pedestrians. Sometimes, poles were put first. That's when the problem comes in when there is a post before constructing roads. But if the road comes first, space is given to electric cooperatives.

RD Digamo: Let us clarify these 4 meters left and right, this is allocated for utilities?

Engr. Calma: This is from the drainage. The 4 meters are separate from the drainage and only for utilities.

Mr. Escarpe: My only concern is that it is not part of the design. So, after finishing the road, who is the one who will install the drainage so that we do not accidentally dig up the drainage and hit the water pipes? That is our concern. Include it in the plan.

Engr. Calma: We will install the drainage. Not part of the 4 meters. It's actually inside. Sometimes the drainage is located below the sidewalk, or sometimes it is in the middle. Only the water lines are on the side.

RD Digamo: Good, thank you sir. Yes, ma'am.

Engr. Balid: When we conducted the feasibility study, we took into consideration the height of electric lights and electric poles. For example, here in the Tagoloan part, we realign some roads so that we don't hit that post. So don't worry. How big will your post be? We coordinated with NGCP for the lights.

RD Digamo: Don’t worry because there will be coordination with the different agencies.

Mr. Torres: Good morning. Maynard Torres, Disaster Risk Reduction

Management, Oro Rescue For the information of everybody, not all incidents we receive involve vehicular and people but also structural. What are some complaints? Curve roads. For example, on the coastal road, many people complain that the road is straight and crooked. Also, in Puerto Rico—sad but true—the road to Bukidnon is winding and can cause accidents. We have data on areas where there are many accidents.

RD Digamo: It's all about too many curves. I noticed that also. Let's address that.

Engr. Balid: This is good news because this project is a high-standard highway. So, one of the reasons why it is called high standard is because we have to evade the accidents that will happen. So, you will notice one of the reasons why we have this is so that we can avoid these near-death zigzags. Based on our research, the size of the accidents that happen here. The gradient is steep. The maximum steepness is only 6%. So that the pace is smooth and we can avoid the accident.

RD Digamo: That is good news. In Claveria, there are many curves. One of our features is to avoid curves. Only 6% compared to the steep road. But that will not eliminate traffic accidents, because when the road is straight, the car goes faster. Very valid concern. Why high standard? What is the difference? Please explain.

Engr. Balid: The high standard highway is one of the reasons why I took this project. So, along with those expressways like NLEX, SCLEX, and Cebu, the new Mactan Bridge is also of high standard. When you can travel at 80 km/hour, you are comfortable and safe. The gradient is only 6%. The expressway in Luzon is almost flat and straight, without much traffic. That's it, sir.

RD Digamo: Like TPLEX, NLEX is just flat. Because it's on top of everything. The features are not steep, have a 6% gradient, and have reflectorized lights. I hope more durable reflectorized lights are used because, after a month, the driveway has been damaged.

Engr. Guingguing: The design is for 4 lanes. Many years ago, the DPWH widened, and there is a tree or pole left in the middle because of this. Maybe it should be incorporated into the design.

RD Digamo: It seems like that won't happen anymore because the 60 meters left 4 meters on each side. So, that means the total is 26 meters. So, if you make six lanes there, it will still not be hit if you only put in the allocated 4 meters on both sides.

Engr. Balid: The design is for 4 lanes now but maybe in 2050 it will be 6 lanes.

Mr. Jamilla: The project is about the metro rail project for Mindanao. But what we know is that there is a line from Bukidnon to Cagayan. So, you can check if the metro rail project from Davao to Cagayan to Iligan to Mindanao is affected.

RD Digamo: Do you have any ideas on that? But anyway, you should also consider that if the government will pursue that project. Because that was conceptualized during the time of president Duterte. None? Oh, it did not push through.

Engr. Balid: We also asked for the tentative alignment of the metro rail project, which is now still on hold.

RD Digamo: Are there more questions? Will this alignment hit a DENR project? He said no one would be hit. So, thank you very much for attending. And I would like to assure everybody that all were considered in the conduct of the study, in the FS, and in the final design of this project.

CLUSTER 2: SUMILAO AND MALAYBALAY
Public Hearing on the Central Mindanao High Standard Highway Project
Sumilao New Building, Sumilao, Bukidnon
October 12, 2023
9:10-12:00 NN
Facilitator: Regional Director Reynaldo Digamo

Participants
1. Ann Marie Lato, EMS Sumilao
2. Bienvinido Narciso, ABAG
3. Ar. Esmeraldo H. Herbito, CPDO, LGU Malaybalay
4. Datu Virgilio Dumana, Sumilao Municipal Tribal Chieftain
5. Evangeline Olaria, Sumilao Municipal Assessor's Office:
6. Fidel Daygon, FAFC Kisolon
7. Generero Taberneo, Malaybalay City ENRO
8. Kenneth Taylor, DRRM
9. Ma. Enore Sale, Puntian Elementary School:
10. Stephen Carnazo, OIC MPDO Sumilao

RD Digamo: Okay, let's welcome the open forum. Gamay lang kaayo ang rules nato, house rules. Kindly raise your hand, identify yourself, and then mention asa ka nasakop nga grupo - sa barangay ba ikaw, barangay official or whatever. Then kindly shoot your questions because I will be recognizing who will raise their hand. I will encourage everybody to please actively participate para ma ventilate ang inyuhang mga pangutana sa inyong mga kadauban. Ang unang mangutanan dunay premyo gikan kang Raffy. Who will shoot the first question?

Mr. Carnazo: Good morning po sa lahat. I am the OIC MPDO Sumilao. Yung ine-expect namin, sir na particular dito sa Sumilao is yung bigger picture kung saan ba talaga dadaan sana. Yung sinasabi na high standard highway sa bawat barangay. Kahit ako siguro yung mga barangay kapitan meron na mga idea kung saan talaga dadaan yung actual na alignment or kahit yung proposed na alignment. Pero ako ine-expect po namin na makita kung saan yung proposed or yung alignment sa bawat barangay. Ibig ko po sabihin is yung bigger picture po. Kasi alam ko maraming hindi klaro sa kanila. Maraming salamat po.

RD Digamo: Sige, daghang salamat. Ako ipakita dinhi kung unsa ang initial nga identification sa alignment. Kini ato ipatubag sa DPWH consultant kato imong pangutana. Asa gyud ang iyang agian sa kada barangay? Kailangan gyud ni bahin bahinon, section 1, section 2 kinsa may kaatiman sa grade 1 pa mo? Kinsay section 1? Okay, section 3 section 5, section 5. So, mao ni siya ang initial alignment. Pero subject pa ni siya detailed engineering design. Ang resulta sa detailed engineering design mao na to more or less ang final nga alignment. Okay, ato patubag sa atong mga consultant.

Engr. Balid: Maayong buntag sa tanan. Bali since nasa feasibility study, bale yung final alignment po talaga kung saan yung mga tatamaang barangay at kung sino sino yung mga taon maapektuhan nga ating proyekto ay doon pa mas malalaman na, esakto kasi mag pa periciliary yung mga tao, yung sa study ng detailed design mag- percialiary kami o kung sino man ang gagawa ng project na next sa amin duon na yung kung sino na talaga yung mga tao na matatamaan. Doon niyo na po malalaman. So, yung ngayon po kasi feasibility palang tayo hindi pa talaga siya yung kayo na mismo yung matatamaan. Pero since dahil dito nga po sa lugar niyo yung project dadaan, imbitado po para po sa mga posibleng environment impacts ang mangyayari sa inyo po. Salamat.

RD Digamo: Maraming salamat po ano sa ating sagot. Pero initially sa mga nakalagay dito sa Municipality of Sumilao, dito na kanina kung diyan, Vista Villa, Kulasi, Poblacion, Kisolon, San Roque. Yun sila ang mga initial na maapektuhan. Pero possible duna pay laing barangay or kaya hindi pa na-identify basin duna puy matanggal kay basin duna pay rerouting na mahitabo. So, what will tell us the final alignment is the conduct of the detailed engineering design. Kay duna pa man mga survey ana nga ilang himuon. Pero maapektuhan man ang atong barangay o dili kay constituents man ta sa Kisolon, kailangan gyapon ta nga muapil. Okay? Thank you. Kinsa man ang ikaduha? Next?

Wala bay mangutana kung pananglitan naa kay yuta karon nga girentahan sa DOLE. Unsa man ang plantation nato dire? Del Monte, okay. Kung ang imong lupa girentahan sa Del Monte, magkano ang Rentahan?

ALL: Twenty-five.

RD Digamo: Twenty-five thousand

.

Male: Kinse pa ang daaan. Ang bagong contract twenty-five. Ang wala pa na renew kay fifteen thousand. Okay. Natamaan ka ngayon sa alignment ng kalsada, ang limang ektarya mo ang natira nalang ay apat na ektarya because the road right-of-way is pila sa presentation? Sixty meters. Oo, yung right-of-way. So, tatamaan yung lupa mo nakarenta sa Del Monte, yung renta mo sa Del Monte taon taon yan. Ang gagawin ng gobyerno is one time ka lang babayaran sa right-of-way.

Tanong ko, what will be the effect financially and economically? Ang

gobyerno mubayad din yan.

Mr. Daygon: Fidel Daygon sa FAFC sa Famer's Sector. Sa barangay Kisolon ako ang representative sa Farmer's Sector. Usa sa akong gi-raise dadto, unsaon nalang pagbayad sa mga untitled na mga area nga maagian? Mga dili pa IMB. Daghan man agian na mga kalsada sa mga gamay na maguuma. Naay mga sekretarya nga maagian sa project.

RD Digamo: Okay, linawon ko sir. Dili buot ipasabot na ang estado sa lupa is Timberland?

Mr. Daygon: Oo, timberland.

RD Digamo: Ibig sabihin dili siya titulado apan deklarado? Kay naay tax declaration?

Mr. Daygon: Oo.

RD Digamo: I-capture natin yan kasi iba ang arrangement niyan kapag titled property, alienable and disposable or itong timberland. Kasi ang mahitabo diyan kapag timberland katong dunay mga claimants kinahanglan nila mag-apply sa DENR ng right-to-claim ito ang requirement noon.

Mr. Daygon: Sa una na mga meeting apil ko sa mga...tapos katong mga concerns. Ang nahitabo dayon sa kani nga quorum, dili pa man ni mao nga time

to...dili pa ni nga forum ang sakto nga venue pero ang amo lang bayran daan sa wala pa ang operation. Kay naa mi experience nga nagsugod na ang operation dire pero dugay pa nabayaran ang mga tao gikan sa paingon Tihabong padulong sa Bulawan. Naay duna kuna involvement parehas sa akong igsuon. Maayo unta nga ma address na ang bayad.

RD Digamo: So, for the record, the request is, if possible, the affected property shall be paid ahead of the construction or prior to the constructions. Okay. Di pa man nato tubagon karon basta we'll capture that in our proceedings. Kasi ang gobyerno mubayad gyud na pero dugay kaayo. Okay, that's a concern that we have to bring it out as part of the proceedings dire sa public hearing. Okay, anymore concern? Yes, Ma'am.

Ms. Sale: Ma. Enore Sale present dean sa Puntian Elementary. My concern is if ever ang area sa school is maagian sa high standard highway among concern is kanang pag-process bitaw sa pag-donate or recoveration sa kaning yuta because kami sa school are not allowed mag pirma. So, property.

RD Digamo: So, you talk to that project engineer. Kasi hanapan yan yung ECC diyan. Kasi ECC violation kapag hindi inasikaso yung mga right-of-way na yan kapag may nag-complain. Sige kayo.

Engr. Calma: Clarification lang if along Sayre highway siya, all right-of-way concerns are already settled since this is already a primary national highway. So, kung along Sayre highway na acquire na dapat namo ang 60 meters na right-of-way. Kay primary national highway man ni, dili man ni maka-convert into national highway kapag wala na acquire previously ang right of way.To clarify lang sa tanan, bahalag i-acquire namo ang 60 meters, dili man gud na namo ginagamit automatically. Usahay, two lanes or four lanes. Pero bahalag mu-widen na me ana padulong ten lanes pwede na me dili mu-consult kay that land is already acquired naman sa government. Bale amua na ng yuta.

RD Digamo: Unsay proof ana nga na-acquire na sa DPWH?

Engr. Calma: Right-of-way namo naay documents. Kay dili man gyud me maka-convert into national road basta dili namo ma-acquire whole stretch.

RD Digamo: So, I think it's a matter of explaining to them.

Mrs. Olaria: Possible sa imong lola pa, Ma'am. Kay kaning SAYRE this is very old na. If along Sayre highway ha.

RD Digamo: Because of lots of projects in the DPWH nagkakagulo because sometimes it affects sa different areas ako gyud ipa-research. Ang pinaka bagtas sa highway pa 1935. Parang ba naghatag ba ng authority sa DPWH to acquire lands for the road constructions. Makabantay pud mo sa NGCP.
Ang NGCP ang ilang mga linya, I think right-of-way naman yan is 15 meters from the center line. NGCP also by virtue of law was given the authority to acquire properties like this nga dili ta pwede mag-create ng structures within the 15 meters right-of-way under the main transmission lines. So, something like that. So, maybe in your reply you can cite particular laws vesting authority to the DPWH to acquire lands of the Philippines for the road constructions. Para maintindihan nila.

Mrs. Olaria: Pero ang gi-mean nimo nga sa una pa 1935 ang Sayre highway kanang sa Atugan. Kana siya new man gud na. Mga private properties ang nasa highway. Basin naa nay plano sa una kay Sayre highway Atugan kana sa Impasu-ong Poblacion paingon dinhi sa Atugan. Kanang amo bag-o na na ila lang kwaon kay daghan kay ng diha. Private properties daghan na dila.

Engr. Calma: Sakto si Ma'am. Ang original alignment nato for Sayre highway along Impasu-ong is traversing kanang nailhan nato nga lover's lane? Bale pag-abot ninyo anang monument mupa-left. Mao na siya ang original nga Sayre highway. After nabuhat aning Atugan bridge nga ni-direct si Sayre highway.
So, kaning atong linya karon na from monument straight to Atugan padulong anang straight na padulong Malaybalay that has been converted na into a national highway. So, bahalag muingon ta nga sa una nga dili na siya mostly Sayre highway nga original, pagbuhat nato aning diversion road sa Sayre na-convert na pud siya. Mao na atoang Sayre na. Actually, katong karaan nato nga Sayre is old Sayre highway. Dili na gyud siya mao si Sayre.

RD Digamo: So, mao. Sige lang. Basta settle lang to.

Engr. Balid: Yung project namin is sabi nga po namin high standard highway so JICA funded and ADB funded. Ibig sabihin internationally funded yung road. So, yung JICA and ADB masado silang stringent sa pagpapatupad

ng mga ROW acquisition. So, kaya kung mapapansin niyo, yung dito po sa ating project implementation schedule yung land acquisition po natin nandito pa siya bago pa mag-construction. Ibig sabihin, makakausap yung mga may-ari ng lupa, magkakaroon ng periciliary survey during the detailed design.
Makita niyo yung detailed design mauuna siya land acquisition kasi nagkakaroon niya ng periciliary survey. Diyan malalaman, kakausapin yung may-ari ng lupa at tsaka lang magkaka land acquisition. Hindi tayo mag-construct hanggat hindi pa natatapos, hindi pa na settle yung may-ari ng lupa, hindi pa nababayaran, hindi po mag-construct. Very strict po masyado ang JICA. Masyado silang concern sa mga tao ganyan. Kaya assured po kayo na mababayaran or kung ano man magkakaroon po ng usapan. Salamat po.

RD Digamo: Thank you po, Ma'am for hearing that assurance. Tama yun. Kasi kapag foreign funded projects very strict sa requirements. Lalo na sa social na aspect na maapektuhan ang tao. Pero kung GAA ang project nako for close lang yan. Sige. Sir.

Mr. Narciso: Bienvenido Narciso ABAG at the same time geographical from Bislig. So, naka meeting me last week padulong sa Cagayan de Oro. Mostly, ang office dili bitaw siya lump sum ang mismo. Dapat consider ninyo siya as live, naa tay laing polisiya nga kada area naa gyud consideration usab. Ang ritual man gud dili na siya concern lang sa, ang ritual mao na siya ang naigo para walay mahitabo nga towards incident.
At the same time, protection pud na sa mga ga-construct nga dili bitaw sila pasudlon. Mao na ilang concern nga mag-ritual lang gyud. Pero mao na siya sa lain laing government so lain lain ilang concern.

RD Digamo: So, capture natin concern na yun. Conduct of rituals. Different communities kahit it is possible to happen per barangay. As much as possible. Pero kung siguro itong IP community na ito nag-offer ng the same nga IP group na one time para it will not take the long process. And that will be captured on the request of the series of representatives as RDC. Serious Tribal Organization. Okay si Sir.

Datu Dumana: Municipal Tribal Chieftain. Virgilio Dumana. Support ni sa kabarangayan nga maagian sa atong dalan. Gikan sa Tingkala paingon sa Kabilya, San Roque to Sumilao tungod kay aduna among ancestral domain nga applyan dadtu. Usa me sa ancestral domain tuig mga duna pay adto.

RD Digamo: Kadti pa sa inyo?

Datu Dumana: Oo, ongoing na. Kini akong pagalantaw ani duna pay apektado nga kabarangayan. Hinaot ko nga ang mahitabo ang gitawag sa IPRA law Pre and Prior Consent sa pagsugod pa. Kay dadto sa amo nagkosulta bahin sa high standard highway. Ang karon kay high standard highway na ni.

RD Digamo: Mao gyapon ni siya.

Datu Dumana: Ah, mao gyapon ni siya. Ang sa amo kay natingala me kung okay na me adto. Apan tungod lain na pud siguro ni nga diversion. Nahinaot kami nga matapok balik ang mga tribu [Inaudible 46:50-46:57] kasagaran bank allowance agi adto. So, tungod kay kani nga dalan 2 lanes ra. Problema naa man gani nga tribu nga maapasan. Unsa ba kaha ning saysinta metros nga butang nato mao pa atong yutang kabilin. So, kini ang gusto namo nga mahitabo ang tangkob kay magpabilin gyapon ang lantaw nga dunay Pre and Prior Informed Consent kay apektado ang mga kabarangayan kaning among ancestral domain.
Upat ka barangay sa Manolo Tikala and Dalirig and Maluko pero ang maagian kay Tikala ra man, Vista Villa, San Roque, Sumilao, Kisolon. Anaa lang unta naay kana tanan. Dili man kay tungod ra sa tribo supportado gyud namo na among mga katawahan ug silingan nga dunay mga yuta nga walay mga papel. Ang ilang papel kay tax declaration. Hinaot me nga kay kasagaran baligya nila ilang tax declaration, karon kay title naman sa papirma ani. Karon kay ancestral domain wala man naapil ang declarant tapos tax declaration. Kana ra. Gusto nako maapil ug malingkuran kay walay papel ilang yuta. Dungan pa nga yangungo- kini bang Hapon basin naa silay laing tumong. Naa unta kasulatan, kay mahadlok mi sa nahitabo sauna sa atong mga katigulangan. Naga dili gyera ang tuyo ani nga dalan. That's all, sir.

RD Digamo: Daghang salamat kaayo. Higaunon Talaandig nga tribo. So, atong ipatubag dire sa kang ma'am. Kay nakahisgot ko ani sa una. Pero katong sa una kay mga hapon nga didto pa to sa una. Mao na ang peace offering sa ato, datu. Mga infrastructure. So, kinsa may mutubag ato?

Engr. Balid: Bali next week po, magkakaroon...Hindi ko lang sure kung nakatanggap na po kayo ng invite para po sa IPs. Pero magkakaroon po tayo ng third meeting po para sa IP. Yung binabanggit po kanina ni sir yun po yung same project po yun para lang po Malindong. Bali yung magiging third hearing po dito din pero baka para sa mga IP concerns po kasi yun. So, may mga imbitado lang na yung po sa IPs. Dito rin po sa Sumilao conference room next week. Ayun meron po pala si Ma'am. Salamat po.

RD Digamo: So, may naka-schedule na pala Dats na magtagbo mo usab. Naay invitation. So, didto nato ipagawas ang concern sa mga IP. Okay, naa pa bay nahabilin?

Mr. Taberneo: Akong concerns sa livestock industry kay gi-point ganina nga naay impact siya in terms of noise sa among poultry. Ang usa pud ka concern namo sa local government unit kay ang Malaybalay City is naa tay times sa national clearance nga ang piggery 500 meters away from the road, ang poultry 200 meters. Unsay mahitabo karon sa atuang existing mga poultry nga pananglitan ang dalan nipaduol dayon magpropose sila ug expansion. Unya mahimo man siyag land for government use.

RD Digamo: So, that's a big problem because Bukidnon most of the poultry and piggery projects. In fact, we have here the biggest piggery with more than 20,000 pigs capacity sa farm nato. Again, kana lang dire sa Sumilao. Based on the guidelines 500 meters and 200 meters ang piggery and poultry distance. Kay nauna naman sila. Lumapit kayo dito sana sa gilid ng pader ng piggery - anong gagawin natin diyan? Pwede natin hindi sagutin yan ngayon.

And that is a very serious concern again that will be captured by the proceedings of this public hearing. Siguro kung meron na tayong alignment, we can again initially identify ano yung exist kasi meron pa tayon issuance ng ECC, may geographical naman yun kung alin dito ang papasok sa 200 meters poultry, alin ba dito yung within 500 meters poultry para maisama na nila sa study.

Mr. Taberneo: Second concern, We have also experienced with project sa DPWH Malaybalay City nga naay ga-complain bitaw kay ang dalan murag nadaot na so. Ang usa namo nga tagaan ug pagtagad ani nga project nga ma- emphasize ang feedback mechanism. Nahitabo kay ipasa nalang diretso, sa office na magreklamo. So, dapat kung LGU ang ig-on naay pamaagi nga per LGU naay didto mapagawas ang complains.

RD Digamo: So, feedback mechanism and receive complains. Okay. If regional ang nag-implement sa project then punta ka sa region, if it is a district project, then punta ka sa district. Pero ibigsabihin, regardless what office implements the project feedback mechanism nga hindi na gagasto ang complainant papunta ka pa sa CDO para doon mo file ang complaint mo. Naku, madadale kayo diyan. So, there's should be a mechanism. Accepting and receiving complaints from the

constituents. Yes, Ma'am.

Engr. Bablid: Kaya nga ng nabanggit ko kanina dahil internationally funded, masyado po kaming strict diyan kung paano siya, yung mga feedback mechanism namin, masyadong nasusunod. Kagaya ngayon, yung ADB project namin meron talagang person-in-charge na para siya lang taga tanggap ng mga complains ng mga tao. Hindi siya pwede magreklamo na, "hindi ka pwede ka magreklamo" kung hindi siya pa mismo magtatanong ano problema niyo sa project, "may problema ba kayo?". So, magkakaroon po ng ganon yung project na ito either sa JICA man ang magimplement or ADB sa buong section meron po sila, parehas po sila na agency na may mga feedback mechanism talaga sila. Ibibigay din sa inyo yung mga cell number ng mga taong in charge. So, madali niyo po silang makontak.

RD Digamo: Again, we heard the assurance kasi nga fully funded. Talaga ito they will put a mechanism talaga in place para ma address natin ang mga ganyang concerns.

Ms. Lato: Good morning, everyone. I'm Ann Marie Lato, Team MENRO of LGU Sumilao. This is just a reminder to the DPWH because I understand that if it is an ADB project very stringent talaga yung mga measures para ma-protect yung environment. For the DPWH because we have experience it already dito sa Sumilao. We have an existing project in the circumferential road of Mt. Kitangalad, napabayaan talaga Ma'am. There's a huge damage to the environment. So, I just hope that the DPWH this time would really implement yung mag-conduct talaga ng monitoring sa mga contractor nila. If ano yung nasa program of work like if the number of dump truck na kailangan andoon sa project sana ganon talaga. Kasi ang nangyari dito sa Sumilao grabe yung erosion so the spike of the TSS of our major river here in Sumilao the Kulaman river - a tributary to a class A river the Tagoloan river. Sobrang taas ng Total Suspending Solids. So, I just hope na ma-address talaga itong project na ito. Thank you.

RD Digamo: Thank you kaayo MENRO. Any response?

Engr. Ramos: Yes, Ma'am. Good morning po. From DPWH po. Well noted naman po yung sinabi mo po. Bale sa AMET po kami but yung office po namin kasi nag-implement ng project. May mga environmental report po kami nire-review. May mga baseline po doon kung ano yung pasok sa standard kung kami ang mali na and then ginagawan naman actions.

Once nag-implement na yung project makakasama po yung self-monitoring report regarding sa environment concerns po.

RD Digamo: Thank you for the question and thank you for the response. Nabanggit ni MENRO na medyo napabayaan yung circumferential road. Tinanong ko from the office kung may ECC ba yan, meron. Ito nanaman. So, may ECC siya from Construction of Bypass Diversion Road Sayre Highway Parallel Road 1 Project located in Barangay Dahilayan, Kalugmanan, Manolo Fortich Bukidnon. Yung karugtong pala another ECC. Construction of Junction Sankanan, Kalugmanan Kaliraya road, Kalugmanan Dahilayan Section, Manolo Fortich, Bukidnon. So, ito yung gusto namin tanggalin na ugali ng DPWH. Kasi gusto nila ito katayin, maraming rason. Kasi yung section 1 is funded by JICA. Section 2 is funded by ADB. Mas maraming rason para katayin kasi iba iba yung funding na pinanggalingan. Ito kapag galing sa General Appropriations Act ang gagaling talaga ng DPWH. Kumbaga, PhD na sila dito. Meron pa ba?

Ar. Herbito: Good morning. On behalf sa CPDO Architect Esmeraldo Herbito as representative. So, naa lang koy i-clarify about sa Malaybalay. Permero naay project na circumferential dayon diversion, naa na pud niabot na bypass road. Malaybalay City is bypass road. Then human na pud nia na pud ning Central Mindanao High Standard Highway. So, karon clarify lang nako kay daghan man gud mga issues ang mga lot owner bitaw kay naa kunoy mga nabayran, naay wala. So, naa pud ko issue sa diversion road nga naay nabayran naa pud wala then naay nangadto sa office nga dako daw iyang nadawat sa DPWH. Dili siya pareha. So, karon kining sa kung asa ni dapita ang Malaybalay City Bypass Road? Daghan kaayo project sa DPWH nga dili namo ma kini katunga. Dayon kini napud sa Central Mindanao High Standard Highway so to clarify lang kung unsa man na barangay ang maagian.

RD Digamo: Sa Malaybalay side?

Ar. Herbito: Oo.

RD Digamo: Anyway, duna pa tay ugma kay series man ni atong public hearing. Kagahapon sa Misamis Oriental sa Cagayan de Oro side karon sa Sumilao, Impasug-ong. Ugma Malaybalay na pud ta.

Ar. Herbito: After ani, naa bay mahitabo nga toll fee ani?

RD Digamo: Wala ni siyay toll fee kay dili ni siya parehas sa expressway sa Luzon nga dunay private party nga PPP Private Party Partnership during agreement. Kani siya government man siya.

Ar. Herbito: Kaning sa Malaybalay City is bypass road. Actually nag-ask me ug

documents parehas CLUP City Ordinance pareha ra man sa ilang DGM management. Usa ba ni sila?

RD Digamo: Lahi ni sila. Kana imong gi-mention karon sa local lang na nato nga projects. I think this is already ongoing. Anyway, focus na muna tayo sa high standard. Anyway, you can still raise tomorrow. Punta tayo sa Malaybalay tomorrow. Doon tayo sa Kaamulan Grounds. So, shall we wrap up the open forum unless meron pa pahabol? Yes, Sir!

Mr. Taylor: From City Disaster Risk reduction management office, Sir. Ang concern namin is maraming talaga nadidisgrasya na mga sasakyan, trucks loaded with iba't ibang materyales, Sir. And then isang bahay doon sa amin talagang doon bumanga yung sasakyan. Tapos maraming namatay. And then yung concern namin is yung safety features ng High Speed Highway nati kasi yung speed natin is maximum 80 kilometers per hour. So, may emergency land off ba na pwedeng if mawalang ng brake yung na loaded na sasakyan pwedeng doon siya pumunta para walang mabanga. Marami kasi dito sa Damay yan ang concern talaga dito kasi sobrang busy yung road from Cagayan de Oro to Malaybalay. Thank you po.

RD Digamo: Thank you very much for bringing that up. Kasi kahapon din tinanong din yan ng taga disaster risk management. And then kahapon may natutunan ako. Ano yung tatlong elemento kapag nag cause ng traffic accidents? Tatlo daw e. Unang una Human factor. Pangalawa, vehicle. Baka naman karag karag na yung third gear mo hindi na kumakapi yung break. Pangatlo is infrastructure. Kapag sinasabing infrastructure usapan natin kalsada. Baka may mga portion na napakadilim o kay biglang liko. Yan po ang ipapaliwanag ni Ma'am ang kagandahan nito bakit sinasabing high standard highway. Doon sa Luzon yung mga expressway may mga levee. Pwede ka dito tumabi muna. Umihi ka doon, mag sigarilyo, ganyan. Sige po Ma'am pakisagot po.

Engr. Balid: Ayun nga po. Uulitin ko dahil nga po tayo ay high standard highway so ang features po nong kalsadang gagawin po natin unang una yung kanyang design speed na 80 kilometers per hour design siya para kayang kaya niya takbuhin yung speed na yun pag akyat man o pagbaba kasi yung gradient ng ating highway ang maximu ay six percent. Hindi siya yung usually na makikita niyo sa Sayre highway itong mga kulot kulot na ito ang hirap yan tumakbo dahil hindi ka niyan makakatakbo ng 80 KPH or yung mga dito or dito. Nakita niyo yung alignment halos smooth siya. Yung mga kurba kaya niyo parin. Ang maximum grade niya ay 6 percent lang. So, kung infrastructure ang pagbabasihan natin para sa safety, sigurado po kayo na

makakatakbo po ng maayos yung sasakyan.

RD Digamo: Okay at tsaka maliban po doon marami po tayo road signages na kapag may curve na ganyan. Ngayon kasi kung minsan napapansin natin meron kang signage pero isang piraso lang kasi nagtitipid. Ito maraming signages. So, we will expect that from Cagayan de Oro to Malaybalay the moment that will be constructed. Marami pong salamat sa inyong padalo and active participation that is the real essence of public participation process because in the EIA system sa umpisa palang meron na tayong public participation. Public scoping doon muna sa IEC meron mga group discussion, public scoping, public consultation, public hearing, andiyan po palagi. The moment this will be completed magkaroon po tayo ng Multipartite Monitoring Team. So, we will all participate in the monitoring of this project kung yung sinasabi nila traffic plan, soil erosion plan ay na-implement ba talaga on the ground. Ito sama ko lang ito yung kanyan impact doon sa supply ng mga raw materials kasi yan yung kahapon. That is also similar dito sa impact sa Bukidnon.

ENGLISH LANGUAGE

RD Digamo: Okay, let's welcome the open forum. Our house rules are simple. Kindly raise your hand, identify yourself, and then mention to what group you belong, barangay, barangay official, or whatever. Then kindly shoot your questions because I will be recognizing who will raise their hand. I will encourage everybody to please actively participate in order to ventilate your questions to your colleagues. The first one to answer will get a prize from Raffy. Who will shoot the first question?

Mr. Carnazo: Good morning, everyone. I am the OIC MPDO Sumilao. What we are expecting, sir, particularly here in Sumilao, is the bigger picture of where the alignment would actually be. The one that is said to be a high-standard highway in every barangay. Even I, or maybe the barangay captains, already have ideas where the actual alignment or even the proposed alignment will go. But we expect to see where the proposed alignment is in each barangay. I mean, it's the bigger picture. Because I know there are many things that are not clear to them. Thank you very much.

RD Digamo: Alright, thank you very much. I will show here the initial identification in the alignment. I will let the DPWH consultant answer your question. It is divided into sections. Section 1, Section 2. Who remembers their section in Grade 1? Section 1? Okay, section 3, section 5. So, this is the initial alignment. But this is still subject to detailed engineering

design. The result of the detailed engineering design is more or less the final alignment. Okay, let's hear the answer from our consultants.

Engr. Balid: Good morning, everyone. We are still in the feasibility study. The final alignment will determine which barangays will be affected by our project. We will still conduct periciliary, in which, in the detailed design, specialists will be chosen, or whoever will do the project next to us. That's when you'll find out. So, the one now is that because we are just feasibility, it's not really you who will be hit. But since the project will pass right here in your area, you are invited to consider the possible environmental impacts that will happen to you. Thank you

RD Digamo: Thank you very much for your answer. But initially, among those placed here in the Municipality of Sumilao are Vista Villa, Kulasi, Poblacion, Kisolon, and San Roque. They are the ones who will be affected initially. But it is possible that there are other barangays that have not yet been identified; maybe some villages will be removed, or maybe there will be rerouting. So, what will tell us the final alignment is the conduct of the detailed engineering design. Because there are still some surveys to be done. But whether our barangay is affected or not, whether we are constituents in Kisolon, we must participate. okay? Thank you. Who is next?
No one wants to ask? For example, your land is now rented by DOLE. What plantation do we have here? Del Monte, okay. If your land is rented in Del Monte, how much is the rent?

ALL: Twenty-five.

RD Digamo: Twenty-five thousand.

Male: The old one is fifteen.

RD Digamo: The new contract is twenty-five. For example, your land will be hit with the alignment of the road, your five hectares will now be four hectares because of the road right-of-way according in the presentation. Sixty meters. What the government will do is pay you only once for the right of way. Now I will ask you, what will be the effect financially and economically? The government will also pay for that.

Mr. Daygon: Fidel Daygon of the (FAFC) Famer's Sector In barangay Kisolon, I am the representative of the farmer's sector. How will they pay the untitled areas that will be affected? Non-IMBs. There are many small small farms that will be affected. There are sectors that will be hit by

the project.

RD Digamo: Okay, let me clarify sir. You mean your area is timberland?

Mr. Daygon: Yes, timberland.

RD Digamo: Does that mean your land is not titled but declared? Because you have a tax declaration?

Mr. Daygon: Yes.

RD Digamo: Let's capture that because the arrangement of that is different when it is titled property, alienable and disposable, or this timberland. Because what happens there is that when there are claimants in timberland, they have to apply to the DENR for a right-to-claim; this was the requirement before.

Mr. Daygon: In the first meetings, I participated in the... and then the concerns. What happened immediately with this quorum, it’s not even time to...this forum is not the right venue, but I hope they will pay us before the operation starts. We have experienced that the operation has started, but the people from Tihabong to Bulawan have not been paid. My brother has experienced that. It would be nice if this were addressed.

RD Digamo: So, for the record, the request is that, if possible, the affected property shall be paid ahead of the construction or prior to the construction. Okay. We can't answer right now, but we'll capture that in our proceedings. Because the government will pay, but it will take a long time. Okay, that's a concern, and we have to bring it out as part of the proceedings in the public hearing. Okay, any more concerns? Yes ma'am.

Ms. Sale: Ma. Enore Sale present dean at Puntian Elementary. My concern is that if ever the area at the school is affected by the high-standard highway, our concern is the right process for donating or recovering the land because we at the school are not allowed to sign. So, what I want is a clear agreement, maybe from government-to-government, because I can't decide because the secretary will decide. So, these school heads will soon leave the area. So, by the time this activity can be implemented in 2029, maybe I won't be the school head anymore. So, it must be if the school is ever affected by the super highway, sir.

RD Digamo: The question is if ever affected.

Ms. Sale: Because the school is government-owned and the only has a tax declaration. It doesn't have a title yet. Because there is also a provincial group that will take a portion of the school's land and then also the national

RD Digamo: How many hectares is the land?

Ms. Sale: Around 9. Then there is a plan to make an oval. If it's possible, maybe the school won't be a included in the project.

RD Digamo: So, if ever the road alignment will affect the property of the school there will be a formal arrangement of agreement by the national officials.

Ms. Sale: Because there were occurrences of problems, of course, sir, we will clarify with the school head and process them, but the instruction given to us by the division office is that we are not allowed. Then we have to submit it to the central office, so it needs addressed.

RD Digamo: Between DPWH after the detailed engineering design.

Engr. Balid: The director is right. But as much as possible on the design and planning side, we usually avoid schools like that, cemeteries, mosques, and that kind of thing. As long as possible, we are fixing the alignment so that you don't get hit.

RD Digamo: Okay. As much as possible avoid schools. Yes, Ma'am.

Mrs. Olaria: Good morning, everyone. Evangeline Olaria, Municipal Assessor's Office, Sumilao. My only concern, sir, is that every time there is a project, the DPWH requests us for tax declarations. The request that reached me already has a claimant. On what basis is he the claimant? Have they submitted a document?
I can't reply to the highway because what they put in the claimant's name on the tax declaration is incorrect. Then some lot numbers are not specific. No location. Lot number only, no PSD number, survey number location. People here have a lot of property. There is property in Puncha, and there is property in Nituan. So, I can't really identify which lot I should submit the tax declaration for. Can the claimant ask

them for the exact document for which they are the claimant? Another thing happened, sir. Some people have titles but are no longer in our office because they were not informed; they just received the title, so when they have the title, they go to the Municipal Assessor's Office to file a tax declaration. That's one problem. Has a title but no tax declaration.

RD Digamo: Does it mean they did not pay their property tax?

Mrs. Olaria: Others pay, but the basis for their payment is their old tax declaration. Because that is the basis for paying real property tax plus a tax declaration. Our requirements are PCA before tax declaration. Others don't care about real property taxes. The gray hair will only be charged. The process is very long. I seem to be struggling because there are many requests on the highway that I can present here and in the tax declaration to the claimant as well.

RD Digamo: Thank you very much, ma'am. That's very true. That's what the assessor said. Because if you will just ask for a certification without the details of specifics—where is the particular lot, who is the claimant, lot number, PSD—if there is a private subdivision survey, especially if it is not yet titled. So, it is really a problem to identify. But then every municipality has something called tax mapping. In the tax mapping, that box is labeled, and who are the owners? So, maybe for the DPWH in the right-of-way because this is a concern. When there is already a final alignment, that final alignment has geographical codes. Maybe submit it to the assessor for that to be done by the assessor based again on the overlay on our tax map. Once you have an overview of your road alignment on the tax map, you can more or less identify the lots and who the tax declarants are. But again, you have to be careful about it because it is common for two people to hold the same tax declaration over the same property.
That's common. Because this is an example, I am a tax declarant for lot number 1 and then Ma'am is a tax declarant for the same lot number 1. The obtained tax declaration copy has already been stamped, "Also declared in the name of". That's what ma'am said, "Also declared in the name of". So, who are the two now? Right? So, big mess. But we have to somehow eliminate some of the complications of the problem if the final alignment is superimposed on our tax mapping and if there is an initial identification of the lots that will be affected. Because it is really difficult for the assessor to reply to DPWH, especially if the right-of-way goes to the right side. There was a person there who would ask who the owner of this land was. Who owns it? Ah, Peter. But it wasn't really Pedro that they talked to.

So, what is recorded there at this particular point is that Pedro is the owner, but when it comes to the municipal tax map, Pedro is not the

one listed. Right? So, who will be installed as the owner now? Subject to negotiation. So, that is what we will probably do with our right-of-way because that is really a problem on the part of the municipal assessor. Okay. So, the issue is a lack of specific information or details about the particular lots affected by the road alignment that the correct party for the negotiation during the right-of-way acquisition.

Yes ma'am. Dungagi still.

Mrs. Olaria: To support the suggestion of Mr. Daygon. We experience it on our land. Should have paid first or consulted the owner because there is an area in Impasug-ong titled lot. So, from the first CPCP process until now, I have not been paid anything. Now there is also an expansion on the right site cut. What is it called that expanded more than 1 hectare? Maybe I got lot 9.2. Then the owner probably has more than 1 hectare now, and they cut the side even though no one consulted the owner. That's why, even if the land is asking for me, I won't even be able to tolerate it. They have proceeded without consulting the actual owner. Now the civil is still there.

RD Digamo: This is sometimes the DPWH notorious. I discovered one project today, the Mt. Kitanglad circumferential road. Is that familiar to you? Starting from Dahilayan, that penetrates here. You know ECC shot at the office just three kilometers away. I said, I will really kill this DPWH. I was surprised, "Huh? Three kilometers starting from Dahilayan, going here to Sumilao, going around Mt. Kitanglad". Ma'am is right. So, again, this is a serious concern.

Mrs. Olaria: They are here, sir. Maybe I can ask for help, as they have a side cut there. I just asked for help because they are already in the area.

RD Digamo: Is that part of the circumferential road that I mentioned earlier?

Mrs. Olaria: No, but I just included this because I tried to contact them; the engineer in charge of the highway can't contact them. They did not give us soil. Maybe they did not look for us. That portion of land is agriculture, and they cut the side. It's my land. I was not consulted by anyone. They told us that the owner was informed, but they told us that no one informed them. It is very difficult to ask about our area.

Engr. Calma: To address the concern about the consultation meetings. Maybe some of you recognize my face. As the representative from the regional office. We are always conducting public consultation meetings, both at the municipal and barangay levels. So, I don't know exactly what happened to your property, ma'am. Maybe the captain didn't notice that there was a meeting, but moving forward, we can't

settle for what already happened.
Moving forward, you can always prepare a letter addressed to our regional director with geotag photos stating your concern that this is what happened and that the contractor did not help you with your request. And as far as I know, our contractors are really humanitarian. If we have any requests, including some excavated soil, you can also pile it in the back near the farm, as long as it is not more than 10 kilometers from the site. They are really nice. Ma'am, it's just that maybe you want to dump it far away. But rest assured, you can send us a letter anytime with geotag photos so that we can identify the projects in the Impasug-ong area.

Mrs. Olaria: Another thing, Sir. Maybe we were not informed because my husband is a municipal councilor in impasug-ong and captain, all of them from the municipality they don't know.

Engr. Calma: Since this is a direct attack, please may I ask for the contract ID so that we can provide you with the documents to prove that we have done public consultation meetings at the municipal and barangay level. We have proper documentation for all the meetings we conduct.

RD Digamo: But wait, because the property owners are municipal officials, why were they not aware of that? Those are allegations that sidelined their property, but they were not informed. So, maybe you have to look at that particular concern because, on the part of the DPWH, there are too many owners and it is difficult to identify them all. But with this complaint, it is said to have surfaced, and it is very clear who complained. I think you have to look at this particular concern. Maybe you already, without even asking for DPWH identification of the project, are the ones who know what this project is, and why would you ask them for it?

Mrs. Olaria: Is this one project, sir. The highway, sir.

RD Digamo: Is this road widening?

Mrs. Olaria: We pass by every day, part of our title land and we're paying real property tax annually. They took more than one-hectare. Not for most of the project. Only one in Impasug-ong. That’s only my property

RD Digamo: So, you talk to the project engineer. Ask for the ECC. Because it is an ECC violation when those rights of way are not taken care of when someone complains. Go ahead.

Engr. Calma: Just a clarification: if it is along the Sayre Highway, all right-of-way concerns are already settled since this is already a primary national highway. So, if we acquire the 60-meter right-of-way along the Sayre highway, even though it is a primary national highway, it cannot be converted into a national highway if the right of way has not been acquired previously.
Just to clarify for everyone, we have to acquire the 60 meters; we don't even use it automatically. Sometimes, there are two lanes or four lanes. But if the lanes are widened, we do not need to consult because the land has already been acquired by the government.

RD Digamo: What proof do you have that this was acquired by the DPWH?

Engr. Calma: We have right-of-way documents. Because we can't really convert into national road as long as we don't acquire the whole stretch.

RD Digamo: So, I think it's a matter of explaining to them.

Mrs. Olaria: Possible even with your grandmother, ma'am. For Sayre, this is very old. If along Sayre Highway, ha?

RD Digamo: Because there are lots of projects in the DPWH, there is a mess because sometimes it affects different areas. I really have to do research. The most trafficked highway was in 1935. Does it seem like they gave authority to the DPWH to acquire land for road construction? You can also watch out for NGCP.
Some lines are NGCP, I think that right-of-way is 15 meters from the center line. NGCP was also, by virtue of law, given the authority to acquire properties like this, so we cannot create structures within the 15-meter right-of-way under the main transmission lines. So, something like that. So, maybe in your reply you can cite particular laws vesting authority in the DPWH to acquire lands in the Philippines for road construction. For them to understand.

Mrs. Olaria: But you mean the Sayre Highway right in Atugan before 1935? That’s new man. Private properties are on the highway. Maybe there is a plan for the first Sayre Highway from Atugan to Impasu-ong Poblacion to here in Atugan. There are many private properties.

Engr. Calma: She is right. Our original alignment for Sayre Highway along Impasu-ong is traversing what we know as the lover's lane. Mind you, when you reach that monument, turn left. That is the original Sayre Highway. After the Atugan bridge was lifted, the Sayre Highway was

directed.

So, our current line from the monument straight to Atugan goes straight to Malaybalay, which has been converted into a national highway. So, let's say at first that it is mostly Sayre Highway that is original. Let's take this diversion road to Sayre, and it has been converted. That's Sayre. Actually, our old Sayre is the old Sayre Highway. It’s not really Sayre anymore.

RD Digamo: So, that's it. Go for it. Just settle it.

Engr. Balid: Our project is a high-standard highway, so JICA and ADB funded it. That means the road is internationally funded. So, JICA and ADB are very strict in the implementation of ROW acquisitions. So, if you notice, the one here in our project implementation schedule is our land acquisition; it is still here before construction. That means the landowners will be consulted, and there will be a parcillary survey during the detailed design.

You can see the detailed design. The land acquisition will go first because we will conduct the periciliary survey. Then it will be known, the land owner will be consulted and land acquisition. We will not construct until it is finished; the land owner has not settled, payment has not been made, and we will not construct. JICA is very strict. They are too concerned with the people. So, you can be assured that you will be paid or whatever; there will be a discussion. Thank you.

RD Digamo: Thank you, Ma'am for hearing that assurance. That's right. Because when foreign funded projects are very strict in terms of requirements. Especially in the social aspect that affects people. But if my project is GAA, that's just for close. All right. Sir.

Mr. Narciso: Bienvenido Narciso ABAG, at the same time geographically from Bislig. So, I had a meeting last week on my way to Cagayan de Oro. Mostly, this is not a lump sum itself. You should consider it live; we have a different policy for each area that is also to be considered. Even though the ritual is not the only concern, the ritual is for the affected areas so that no accident will happen. At the same time, there is also protection for those who will do the construction. That's why there are so many concerns about doing theritual. But this is different in different government agencies.

RD Digamo: So, let's capture that concern. Conduct of rituals. Different communities, even though it is possible to happen per barangay. As much as possible. But maybe this IP community offered the same IP

group one time, so it won't take the long process. And that will be captured at the request of the series of representatives as RDC. Serious tribal organization. Sir is okay.

Datu Dumana: Municipal Tribal Chieftain Virgilio Dumana. Support the barangay that passes our way. From Tingkala to Kabilya, San Roque to Sumilao, because we our applying for ancestral domain there. We are one of the ancestral domains that still exist.

RD Digamo: Is it Kadti (titled land)?

Datu Dumana: Yes, it's ongoing. This makes me think that there are still affected villages. I really hope that what is called in the IPRA law, Pre and Prior Consent, will be strictly followed from the very beginning. Now, this is a high-standard highway.

RD Digamo: it's still the same.

Datu Dumana: Ah, that's what he said. I was surprised if it was okay for me to go there. But maybe this diversion is for another reason. We hope that the tribes will gather, mostly bank
allowances. So, because this road is only two lanes, there is even a problem that the tribe can overcome. What if these sixty meters of our land are still our heritage land? So, this is what we want in Tangkob because we want that there is still pre- and prior-informed consent because the villages in our ancestral domain are affected. There are four barangays in Manolo Tikala, Dalirig, and Maluko, but the only ones passing through Tikala are Vista Villa, San Roque, Sumilao, and Kisolon. It's all there. It's not just because of the tribe that we really support our people and neighbors who have land but don't have papers. Some tax declaration papers. I really wish because they usually sell a few tax declarations; now it's time to sign them. Now, with ancestral domain, the declarant is not even included after the tax declaration. That's it. I want to be involved and serve because there is no paper on some land.

Additional concern: The Japanese may have another agenda. There should be a written agreement because we are afraid of what happened to our ancestors in the sauna. The dry road is not a war. That's all, sir.

RD Digamo: Thank you very much. Higaunon Taalaandig tribe So, I will let you answer, ma'am. Because I mentioned this in the first place. But the first one was in the afternoon. That's the peace offering for us, Datu.

Infrastructures. So, who will answer this?

Engr. Balid: Yes, next week, there will be...I'm just not sure if you have already received an invite for the IPs. But we will have a third meeting for IP. What sir was talking about earlier is the same project, that's just for Malindong. We will have the third hearing here as well, but maybe it's for IP concerns. So, there are only invitees in the IPs. Also, here at the Sumilao conference room next week. Ma'am has one. Thank you.

RD Digamo: So, Datu, there is already a schedule for you to meet as well. There is an invitation. So, that's where we bring out the concern about IPs. Okay, is there anything left?

Mr. Taberneo: My concern is about the livestock industry because it has been pointed out that it has an impact in terms of noise on our poultry. The only thing that concerns us in the local government unit is that in Malaybalay City, there are incidences in the national clearance that the piggery is 500 meters away from the road and the poultry is 200 meters away. What will happen now to the existing poultry? For example, if the road approaches, they will propose an expansion. Then it can be land for government use.

RD Digamo: So, that's a big problem because Bukidnon handles most of the poultry and piggery projects. In fact, we have the biggest piggery on our farm, with more than 20,000 pigs. Again, that's all in Sumilao. Based on the guidelines, the piggery and poultry distances are 500 meters and 200 meters, respectively. Because they came first. Come here to the side of the piggery wall. What are we going to do there? We cannot answer that now.
And that is another very serious concern that will be captured by the proceedings of this public hearing. Maybe if we have an alignment, we can again initially identify what exists because we still have the issuance of the ECC, which has a geographical area that will enter the 200-meter poultry, and which of these will be within 500-meter poultry so they can include them in the study.

Mr. Taberneo: Second concern, we have also experienced with the project in DPWH Malaybalay City that there are people who will complain because the road seems to be damaged. The one thing we will pay attention to in this project is to emphasize the feedback mechanism. It happened to pass directly to the office to complain. So, there should be a procedure per LGU where the complaints will be addressed.

RD Digamo: So, use the feedback mechanism and receive complaints. Okay. If the project is implemented regionally, then go to the region; if it is a district project, then go to the district. But that is to say, regardless of what office implements the project feedback mechanism, the

complainant will not spend any more money; you still go to the CDO to file your complaint there. Oh, you will be taken there. So, there should be a mechanism. Accepting and receiving complaints from the constituents Yes ma'am.

Engr. Balid: That's why I mentioned earlier because it's internationally funded, we're very strict about how our feedback mechanisms are compliant. As it is now, our ADB project actually has a person-in-charge who is the only person who receives people's complaints. They cannot say to them, "You can't complain" if he doesn't ask himself what's wrong with the project, "Do you have a problem?". So, this project will have something like that; whether it is implemented by JICA or ADB in the entire section, they have it; they are the same agency that really has feedback mechanisms. You will also be given the cell numbers of the people in charge. So, you can easily contact them.

RD Digamo: Again, we heard the assurance because it is fully funded. This is really how they will put a mechanism in place so that we can address such concerns.

Ms. Lato: Good morning, everyone. I'm Ann Marie Lato, Team MENRO of LGU Sumilao. This is just a reminder to the DPWH because I understand that if it is an ADB project very stringent measures are to be followed to protect the environment. For the DPWH because we have experience it already here in Sumilao.
We have an existing project on the circumferential road of Mt. Kitangalad that has been really neglected, ma'am. There's huge damage to the environment. So, I just hope that the DPWH this time will really implement monitoring of their contractors. If what is in the program of work, like the number of dump trucks that are needed, is in the project, I hope it really is. Because what happened here in Sumilao is severe erosion, the TSS of our major river here in Sumilao, the Kulaman River, is a tributary to a class A river, the Tagoloan River. Total suspended solids are too high. So, I just hope that this project can really be addressed. Thank you.

RD Digamo: Thank you so much MENRO. Any response?

Engr. Ramos: Yes ma'am. Good morning. From DPWH. Well, what you said is noted. we are from AMET, but our office implemented the project. We are reviewing environmental reports. There are baselines as to what is included in the standard if we are at fault and then actions are taken. Once the project is implemented, a self-monitoring report regarding environmental concerns will be included.

RD Digamo: Thank you for the question and for the response. MENRO mentioned that the circumferential road has been somewhat neglected. I asked the office if it has ECC, and it does. ECC from the Construction of Bypass Diversion Road Sayre Highway Parallel Road 1 Project located in Barangay Dahilayan, Kalugmanan, Manolo Fortich, Bukidnon. The continuation of another ECC Construction of Junction Sankanan, Kalugmanan Kaliraya Road, Kalugmanan Dahilayan Section, Manolo Fortich, Bukidnon So, this is the behavior of the DPWH that we want to remove. There are many reasons why they want to divided the project. Section 1 is funded by JICA. Section 2 is funded by ADB. There are more reasons to divide because the funding source is different. When this comes from the General Appropriations Act the DPWH is good at this. Apparently, PhD in this practice. Is there more?

Ar. Herbito: Good morning. On behalf of CPDO Architect Esmeraldo Herbito as representative, I just have to clarify about Malaybalay. First there is a project called circumferential diversion, and now there is a bypass road. Malaybalay City is a bypass road. Then the Central Mindanao High Standard Highway So, today I just want to clarify that even though the lot owners have many issues, it's because some are said to have been paid and some are not.
So, I also have an issue on the diversion road; some paid, some didn't, and then some went to the office where they said they received it from the DPWH. This is not the same. So, now where is the Malaybalay City Bypass Road? There are so many projects in DPWH that we can't even do half of them. It is then on the Central Mindanao High Standard Highway, just to clarify which barangay to pass through.

RD Digamo: In Malaybalay side?

Ar. Herbito: Yes.

RD Digamo: Anyway, we still have tomorrow because this public hearing is a series. Yesterday in Misamis Oriental in Cagayan de Oro, today in Sumilao, Impasug-ong. Tomorrow, we will be in Malaybalay again.

Ar. Herbito: After this, will they collect the toll fee?

RD Digamo: This does not have a toll fee because it is not the same as the expressway in Luzon because there is a private party called PPP Private Party Partnership during the agreement. This is a government project.

Ar. Herbito: The one in Malaybalay City is a bypass road. Actually, they asked me for documents similar to the CLUP City Ordinance, just like some DGM management. Are they the same?

RD Digamo: This is different. What you mentioned now about our local projects I think this is already ongoing. Anyway, let's focus on the high standard first. Anyway, you can still raise it tomorrow. Attend in Malaybalay tomorrow. We will be there at Kaamulan Grounds. So, shall we wrap up the open forum unless there is more to say? Yes, Sir!

Mr. Taylor: From the City Disaster Risk Reduction Management Office, sir. Our concern is that many vehicles and trucks loaded with various materials are really having accidents, sir. And then there was a house near us where the car exploded. Then many died. And then our concern is the safety features of our high-speed highway because our speed is a maximum of 80 kilometers per hour. So, is there an emergency land-off that can be done if the loaded vehicle loses its brake? He can go there, so there is no danger. Because there are many people here in Damay, that is the real concern here because the road from Cagayan de Oro to Malaybalay is very busy. Thank you.

RD Digamo: Thank you very much for bringing that up. Because the disaster risk management person also asked that yesterday. And then yesterday I learned something. What are the three elements that cause traffic accidents? First, human factor. Second, vehicles. Maybe when you're in third gear, the break doesn't stick anymore. Third is infrastructure. When we say infrastructure, we are talking about roads. Maybe there are portions that are very dark, or because of sudden turns. That's why Ma'am will explain its beauty and why it is called a high-standard highway. In Luzon, the expressways have levees. You can stand here first. Pee there, smoke a cigarette, and that's it. All right, ma'am, please answer.

Engr. Balid: That's it. I will repeat because this is a high-standard highway, so the features of the road that we will make first are the design speed of 80 kilometers per hour. This is designed so that you can drive at that speed whether going up or down because the gradient of our highway maximum is six percent. Not the one you usually see on the Sayre Highway—these curve ones that are hard because you can't drive at 80 KPH with that, or the ones here or here. The alignment is almost smooth. The maximum grade is only 6 percent. So, if we base it on infrastructure for safety, you are assured that the car will be able to run smoothly.

RD Digamo: Okay, besides that, we have many road signs when there is a curve

like that. Now sometimes we notice that you have signage, but it's only one piece because it saves money.
This project has many signages. So, we will expect that from Cagayan de Oro to Malaybalay, this will be constructed. Thank you very much for your attendance and your active participation.
That is the real essence of the public participation process, because in the EIA system, at the very beginning, we had public participation. At IEC, there are group discussions, public scoping, public consultation, and public hearings; it's always there.
The moment this is completed, let's have a multipartite monitoring team. So, we will all participate in the monitoring of this project if, as they say, the traffic plan and soil erosion plan have really been implemented on the ground. This is the only impact I have on the supply of raw materials, because that was yesterday. That is also similar to the impact in Bukidnon.

CLUSTER 3: IMPASUG-ONG AND MANOLO FORTICH
Public Hearing on the Central Mindanao High Standard Highway Project
PENRO Conference Room, Malaybalay City
October 13, 2023
9:45-12:00 NN
Facilitator: Regional Director Reynaldo Digamo

Participants
1. Alex Payangga, IPMR Manolo Fortich
2. Allan Flores Jr, Barangay Captain, Damilag
3. Bae Judith Dinsag, IPMR Tangkulan
4. Danny Bocan, Municipal Assessor Manolo Fotich
5. Kag. Alberto Buynay, Sankanan
6. Kenneth Tanito, Barangay Captain Ticala
7. Mckinley Honi, DPWH Bukidnon
8. Sybreen Marsh Velasco, LGU Manolo Fortich

RD Digamo: Maayong Buntag sa atong tana! Buhay pa ba ta? Buhay pa?

All: Buhay pa!

RD Digamo: Buhay na buhay. Yan ang kagandahan ng mga Bisaya. Buhay na buhay yan kahit hindi pinakinggan, okay lang yan. Kahit palipat lipat tayo ng venue ay ayos lang, diba?
Okay. The very meat of the public hearing is the open forum. Kay mao man ni ang katuyuan sa public hearing is pasintapay na nahabilin nga mga concerns bahin ani ataong project nga Central Mindanao High Standard Highway. High standard. Dili ni siya basta standard. So dili kasinginlon nga ang mga bisaya kasi sa Mindanao dili man kasi ta mga second class citizen. Mao ng tagaan gyud tag kalsada nga high

standard.
Thank you very much PENRO for a very short notice nga naka-occupy ta dire sa ilahang conference room. Kay mahirapan man ta sa hayag kaayo. Dili man ni mabasa. So dire comfortable. Thank you very much through sir Albert among gitawagan si nga maong nahabilin.
Kaila mo kinsay PENRO tua sa DENR? Wala mo kaila?

Male: Wala

RD Digamo: Paano kung naa moy concern? Or gusto mo mag apply ug tree cutting permit or sa inyo planted trees? Ang atong PENRO si PENRO TP Alima. Maong mga tambok iyang mga dapig kay ginaalimahan gyud na ni PENRO TP.
So, atong grupo dire para makahibalo kita kung kinsa man naa karon dinhe nga maga bisita sa Malaybalay gikan sa DPWH nga si Mary Joyce Manuel, katong nagpresent kanina. Asan si Joyce? Andito. Small but terrible from DPWH UPMO. Ano yan UPMO?

Engr. Manuel: Unified Project Management Office.

RD Digamo: Unified Project Management Office. What about RMC?

Engr. Manuel: Road Management Cluster.

RD Digamo: Road Management Cluster. So, duna pud sa bridge ano. Hiwalay naman. Kasama ni Joyce si Scott Ramos. Kita mo sa salida ni Scott na siya maoy actor? Kasama ito si Scott who also from DPWH UPMO. Then si Kelvin Mamitay sa likoran. Yan yung mga sniper. Yang mga sniper nasa likoran yan. Kitang kita kayo.

Sa part naman natin ng consultant andito si Ms. Angi. Manager man yun sa JICA study team. So, medyo malusog si Ms. Angi. Malusog talaga yan. Taga JICA yan eh.
Ang atin naman mga consultant that was commissioned by the proponent to conduct the environmental impact assessment or sa pagtuon sa lugar na maapektuhan sa atong proyekto ang AMET Asia. Ang nia karon dinhe nga very small but terrible si Francin, nasaan? Andoon sa likuran. Yung nag-present kanina. Tapos si Ivan Moreno, andoon sa likuran din. Si Nimfa Bracamonte, Ma'am Nimfa yaan retire nato sa MSU-IIT sa Iligan. Tapos si Ms. Amabelle Embornas and Kolin Manalastas.

Sa Team nato sa central office si Engr. Joel, nasaan si Joel at tsaka si Engr. Jess andito po. Sa ato sa Malaybalay sa Pradis Bukidnon kanina nandiyan si Raquel Lindoy ang atong ang Provincial Environment and

Management Unit Officer. Siya ang head sa EMB sa province of Bukidnon. Bumalik na siguro sa office niya. And yours truly ang inyong sulugoon sa rehiyon EMB, Ray Digamo. Mao atoang public hearing officer.

Simple lang tayo atoang house rules. You raise your hand, sir we acknowledge you pagtayo nimo you state your name and group na representahan and then I will ask your question. I will encourage everybody to please actively participate. Do not hesitate to ask. Mangutana gyud ta kay pagmasugdan na unya ni nga proyekto although sugdan siya in 2029 pa siya. Pila pa ka tuig? 2023 pa ta karon! Unom pa diay ni ka-tuig. Tapos matapos siya sa 2034. Mommy, pila na imong edad sa 2034?

Female: 67.

RD Digamo: Plus 11? Ah, buhay pa! Kain tayo ng maraming malungay para malakas. May iron yan. Okay. Anyway, it is better nga naa tay gipaabot. Andito na atong PMO sa Bukidnon si PMO Raquel. Kung naa moy tuyo sa Environmental Management Bureau, kung gusto mo muapply ng ECC sa inyohang resort. Kinsa man naay resort dinhe? Taas ang kamot. Siguro walay heater inyong resort maong dili mo mutaas? Kay tugnaw kaayo.

Let's start the ball rolling. Teka muna, guto ko mahibalo kaning venue kasi nato sa Malaybalay, kasi nakatulo ta ug venue. Tapos na kami didto sa Tagoloan last wednesday intended for Cagayan de Oro. Gahapon didto me sa Sumilao. Supposedly katong sa Sumilao kahapon intended unta to sa Manolo Fortich and Sumilao. Ang kaning sa Malaybalay is for Impasug-ong and Malaybalay. Kaya lang nagkamali sa clustering. Ang nahatag sa ato kay Malaybalay and Sumilao.

Gusto ko mangutana kung naay representative sa Impasug-ong? Isa, dalawa, tatlo sa impasug-ong. Sa Malaybalay naa bay nibalik? Isa nalang kabuok. Sa Manolo Fortich? Daghan sa Manolo. Ang katong uban nga wala nagpataas asa man to sila gikan?
Basta ang participants nato karon gikan sa LGU, gikan sa IP, naay gikan sa atoang Civil Society Organization, Government national agency, naa pud DepEd. Sige. Ato na umpisahan. Kinsa may gusto mangutana paguna? May premyo nga house and lot! Si Sir. Kinsa man manghatag ani nga microphone. Lisod pud nga ako gihapon.

Allan Flores Jr.: Salamat, Sir. Pwede ba magbisaya?

RD Digamo: Pwede ra bisaya. Naa mu-translate para ma-record.

B.C. Flores Jr.: Ako po ay si Allan Flores Jr. Barangay Captain po ng Barangay Damilag under the Municipality of Manolo Fortich. Kanina po ang pinakita na ang isa sa objective ng public hearing natin ngayon sa assessment EIA is para ma-discuss din po yung mga affected parties. Pero since alam ko na malayo pa project na ito. 2029 pa pero ang concern ko lang po as Barangay Captain yung mga residente na apektado. Meron ba kayong data kung kagaya sa amin sa Manolo Fortich mga residente na apektado sa the way ng highway? Households' para ma-include Namin?

RD Digamo: Sino po ang sasagot?

Engr. Balid: Magandang umaga po, Kapitan. Bale yung study po nag-conduct kami ng resettlement action plan study. So, meron po mga partial or mga posibleng matamaan pag-construct na talaga yung highway natin. Sa ngayon po kasi yung feasibility study palang naman tayo so yung mga naimbitahan doon sa from survey, posibleng sila na yung matatamaan or posibleng hindi rin sila matatamaan kasi depend na sa DTM design kung saan yun na mismo yung talagang detalyadong na kung saan ba talaga dadaan yung kalsada natin. Pero inaral yan, sir. So, may mga tao na po na kung sino po yung possibleng matamaan po. Salamat.

RD Digamo: Yun lang? So, yung intensive na dagdag na survey or census of the parties that will be affected kapag meron na tayong detailed engineering design kasi sigurado na ta sa atong linya sa atong kalsada. Okay. Kinsa man musunod?

Bae Dinsag: Maayong udto sa tanan. Bae Judith Dinsag, Municipal IPMR and Municipal Chieftain sa Bukidnon at the same time IPMR sa barangay Tangkulan. Sa first presentation nila nakaapil me kay sa barangay Tangkulan man to gi-held. Then ang among hangyo is parehas sa giingon ni Ma'am sa amin usa ra ang naay changes sa ruta nila but sa pila karon gibalik katong gi-present nga mao gyud ni ang ruta from Tagoloan unsa ra changes? Basta kay nag-worry man gud dadto sa Manolo kay daghan man gud ang kalsada.
Pag-survey nila dire muagi pero sa final naa nay changes kay usahay maka-save daw sila unya wala didto ang tag-iya. Ang akong hangyo kung 2029 man tuod na pero before ang construction, mubalik sila didto sa IP community. Kay ang nakahitabo man gud pareha ana sa Minyihun, nagsabot sila nga before matrabaho ang ML kinahangalan ipahibalo kadtong tag-iya sa yuta kay aron dili matabunan ang lubong sa mga kinauhan. Unya ang nahitabo kay nag-bulldoz na. Wala pahibalo. So kato nga problema kay ako na gipabantay wala nakahibalo karon asa tundungan kining kinatawahan. So, ambot gani ug na sala man to nila ug two hundred thousand kay affected man emotionally. So, mao ra na among hangyo nga sa start sa

constructions ibalik gyud kung asa gyud ang bahin kay basin naay sacred places, burial grounds na maagihan. Importante sad ang magritual before mag-start.

RD Digamo: Salamat po. Ang ating proyekto is funded po siya internationally. JICA and ADB, very concerned po sila sa social na aspeto lalo na po sa conjugal. So, if there are changes in the road alignment i-define ang computation, provide ang alignment, the team will go back to the IP community and then present and then conduct rituals whatever possibly identify burial grounds, sacred grounds so that as much as possible maiwasan ito sa road alignment. Duly note po ito Bae kasi that was concern yesterday daoon po sa Sumilao. So, magkakaroon pa po ng pagpupulipuli na yung lahat po ng mga IP sa hiwalay na pagpupulong. Okay. Thank you very much po.

Mr. Payangga: Good morning sa tanan. Alex Payangga, IPMR sa Manolo Fortich. Ang concern namo kay ang nangahitabo sa mga project roads sa IP ang problema nga nangaabot sa amo is kaning pambayad sa right of way, mga tanum. Unya kasagara gyud pag-implement nila sa project malimtan na dayon to mga tagiya. Unya, halo gyud dili mabayran. Hantod karon man gali naa pay pending sa among opisina nga wala pa gyud nahuman nalang ang project wala pa gyud bayari. Daghang salamat.

RD Digamo: Daghang salamat, Sir. So, Same situation sa Sumilao but for the benefit of this group we will let our representative from the DPWH dito sa central. Kasi yung experience ni sir ayun di ang experience nila, sad experience. Hindi favorable. Sad experience po hindi implemented locally by the head office or district office. So sana naman hindi mabaon sa limot yung pagbabayad. Pero may mga proseso din po. So, papa-explain po natin sa ating DPWH Central.

Engr. Ramos: Good morning po, I'm Engineer Scott from DPWH National po. Regarding po sa budget po ng right of way, may allocated po department namin for the appreciation for the right of way. So, ang sa amin lang po, strict po kami yun po kompleto ang requirements. May requirements po tayo na di-discuss po kapag ka may separate public consultation po ang resettlement action plan. So, sa ngayon po domain by concerns pala po and then may iba pa po schedule ng public consultation regarding po sa Right-of-Way Action Plan natin. So, initially po para mabayaran po dapat kompleto tayo ng requirements. So, kapag nag-public consultation na po tayo ng RAP may kasama po kaming legal team. Doon di-discuss or explain kung paano po ma-compensate yung affected na property. So, sa mga susunod po na consultation regarding RAP doon po explain kung paano po. Sa concern mo po if mababayaran, as long as completo po ng requirements, may pangbayad po, may budget po ang DPWH para sa

pag-acquire.

RD Digamo: Okay, maraming salamat po. So, yung grupo na po ng Right-of-Way Appreciation ng DPWH sila naman doon. So, may binangit po si Sir Scott na kung kumpleto ng appreciator ang department para mabayaran, unang una po sa listahan yung proof of ownership po ninyo, the property land naapektuhan sinasabi. Meron kayong titolo, basahin niyo na yung titulo na yan kasi hahanapin po yan ng Right-of-Way team doon po sa final negotiation. Tandaan po ninyo na ginamit po kanina yung laki, lawak is 60 meters. That is 30 meters from the center right of sight. Ganyan kalaki ang right of way. Okay so, meron pa po ba?

Mr. Bocan: Maayong buntag sa tanan. Salamat sa snacks. Ako diay si Danny Bocan Municipal Assessor sa Manolo Fotich. Ang akong kani bitaw relocation kay naa man gud mga tao nga maapektuhan sa Right-of-Way nga wala gyud mabutangan [inaudile 20:35-20:37] unya ang matulod kay LGU. Si LGU kulang man ug kanang site. Sa national, naa ay para sa ila na intended in case na wala gyud maplastaran nila?

RD Digamo: Thank you so much sir sa atoang Municipal Assessor sa Manolo Fotich, Bukidnon. Ang tanong, meron po bang nakalaan na resettlement site ang DPWH para po doon sa mga maapektuhan lalo na kung matatamaan po yung kanilang bahay sa inyong gagawing kalsada. Kasi yung experience po nila ay inabadona sa LGU yung relocation. So, meron po ba? Ano po ang masagot po natin diyan sa tanong ng ating Municipal Assessor?

Engr. Ramos: Regarding po sa resettlement, bale hindi po kasi mandate ni DPWH. Coordinate po yun sa national council or NCP.

RD Digamo: Okay. Sige ganito, hindi naman talaga mapagusapan yung mandato. Tama ka naman pero yung proyekto ang dahilan kung bakit meron naapektuhan na bahay o mga tao diyan. But there will be arrangement kasi meron tinatawag natin na convergence kumbaga ng project. The DPWH will coordinate with the National - Department of Human Settlement and Urban Development. Yan.
But then kung ibabato sa LGU, okay lang siguro si LGU will but magbabayad si DPWH. Ang DPWH should be the one to provide the funding for the acquisition and the development of the resettlement site. Okay na ba tayo doon assessor? Kasi yung sinsasabi nila there can be the DPWH will provide for the funding so LGU will be the one to find a property that we need to acquire [Inaudible 23:00 23:04]

Mr. Bocan: Noted, Sir.

RD Digamo: O sige, noted. Sige po mara po salamat. Sino po ang sunod na magtanong?

Mr. Honi: Good morning. Si Mckinley Honi from DPWH Bukidnon. Sir, katong giingon ni Ma'am nga katong involvement ng district dito sa project.

RD Digamo: District Office ng DPWH?

Mr. Honi: Yes, Sir. Ano po ang magiging involvement ng district sa project.

RD Digamo: Ano daw ang involvement ng DPWH District Office dito sa proyektong ito?

Engr. Ramos: Bale ang magiging pinaka involvement niyo po, Sir kasi di naman po kami mga locals dito so yung coordination po ninyo sa district tsaka assistant if ever ano man po yung kailangan ng DPWH na from the district. So, magkakaroon po tayo ng interdepartmental na communications regarding sa main activity po doon sa district. Sa area mismo.

RD Digamo: So, okay na po yun sir. So, magkakaroon po ng directives yan from central office ng DPWH. Okay, meron pa ba?

Mr. Velasco: Good morning, everyone, I'm Sybreen Marsh Velasco, from LGU Manolo Fortich. Okay lang sir na even though nasa FS stage palang siya maybe we can ask for a shape file of the proposed road alignment for planning purposes?

RD Digamo: May kahilingan dito kung pwede ba sila humingi ng shapefile and proposed road alignment kahit na tentative road alignment palang ito? Or do you need clearance muna from your bossing? Yan mga bagay na yan alam niyo, hindi rin natin maiwasan na meron di magaling na mga Pinoy. Kasi yang mnga ganyan alam niyo kapag magkaroon na ng acquisition this is an actual experience in a project, kapag nalaman nila na ito dadaan yung kalsada. Ngayon kung tignan mo yan, talagang malinis na yan.
Pero kapag nalaman nila na doon dadaan ang kalsada, naku kinabukasana napuno na yan ng saging, napuno na yan sa niyog, oo! Tatayuan na yan ng bahay kasi marami yan din na speedway. Yan din ang masama sa atin minsan we take advantage of. So, ganun na mga bagay na medyo di pa naman sigurado, so maingat talaga. So, sa amin sa EMB kung meron mag-apply ng ECC mag-susubmit yan ng TIS. Yang

TIS na yan kung meron humihingi hindi namin ibibigay until na-issue yung ECC.
Because that document is not considered as a public domain. Kasi hindi pa na-issue. It is still something to review and evaluate. It is a list you don't give to the public. Pero kapag na-isyu na yung ECC, magiging public document anybody can have access of that document. And this way, na ito ay temporary pa naman itong alignment natin initial certification palang it could beat the mature to keep the proposed alignment. So, sorry po ha. Marami po salamat. Yes, Sir.

Kag. Buynay: Maayong buntag. Ako si Kagawad Alberto Buynay sa barangay Sankanan, Manolo Fortich. Ang ako lang pangutana, standard ba ang bayad sa yuta nga maagian sa kalsada? Or base ba sa zonal price or pwede ba ang tagtukod sa yuta maoy magbuot sa presyo sa yuta?

RD Digamo: Yan po ang katanungan. Marami din interesadong malaman yan sagot kung standard ba daw yung presyo ng pagbabayad sa yuta. Valuation of your property that will be affected o baka naman pwede yung may-ari ng lupa ang magtatalaga kung magkano yung benta niya? O sige, sino ang sasagot diyan?

Engr. Calma: Good morning, everyone. I'm representing DPWH regional office 10. When it comes to right-of-way acquisition sir, we are guided by Republic Act 10752 also known as Right-of-Way Acquisition Act. So, based ato nga balaod nato, sir ang atoang initial gyud ana nga magbuhat ka ug third party land assesor which is accredited by the BSP. So, para na siya malikay sa pag-put ug interest. So, dili kami ang magbuot, dili pud mo ang magbuot. Katong gi-acredit ni BSP nga Land Appraiser. At the same time property appraiser pud siya so pwede sa structures. Kato pud siya ang mag-assess sa value. Thank you.

RD Digamo: So, dunay in commissioned of the third-party appraiser na authorized sa Bangko Sentral ng Pilipinas. Para neutral gyud. So, there will be a fair and just assessment and evaluation of the property that will be affected.
Darling, ano yung Republic Act?

Engr. Calma: Republic Act 10752.

RD Digamo: Aralin niyo yan. Republic Act 10752. Yan yung Right-of-Way Acquisition Act. okay. Meron pa ba po na katanungan?

Kag. Buynay: Ang iyang yuta maagian sa project pero hantod karon wala gyud nasugdi kung dili ang iyang presyo gyud ang matuman.

RD Digamo: Ang project wala gyud masugdi?

Kag. Buynay: Oo.

RD Digamo: So, unsa to nga project?

Kag. Buynay: Murag nilaktawan lang.

RD Digamo: Anong project yun?

Kag. Buynay: Tulay siya, Sir.
RD Digamo: So, hindi natapos yung tulay?

Kag. Buynay: Yung kang Louie Alongo [?]. Dili siya musugot nga i-open kung dili mukuan sa iyang price. Murag pila na ka years nga dili masudlan. Karon iyang gihimo nga toll fee. Kuhaan habal-habal bayad.

RD Digamo: Bawal na yan.

Female: Sir, musabat nalang ko. Kung tanawon nimo ang kadtong, ang approach man gud sa tulay kay naa naman ang tulay nga bag-o. Pag-approach gyud sa tulay murag kung imong tan-awan straight lang siya. Pero kung sa tabok dinhin kung tan-awon nimo is part pa siya sa straight. Nganong wala pa nakita ang pagtagbo ana.

Engr. Calma: Actually, we are on appropriation pa ani nga property and at the same time we are planning to realign our local road gamay para lang gyud nga mapadayon lang sa ang road while ga-exploring pa sa may… Dayon murag naa na may instructions nga murag dili siya allowed nga mag toll fee. Gapa- toll fee pa ba gyapon siya karon? Wala na? I hope wala na kay naa naman gyud kanang changes nga nahitabo. Looking forward dili na magpa toll fee ta. Magpatabang gyud sa DPWH ana. Residents nga dili magpa toll fee while ongoing pa ang constructions.

RD Digamo: Yan yung hihingin namin yung tulong at kooperasyon for the things na nangyari diyan. Kasi yan yung magpapatagal ng proseso. So, baka yan tulay na yan, baka siguro nadaanan namin yan because of that concern. So, di talaga pwede yan na may toll fee. The government

always has the mechanism to acquire the property kung yan ang sinasabing, "kapag hindi nakuha sa santong dasalan, idadaan natin sa expropriation" because the government has the authority to expropriate property for government projects. Okay, didto banda murag mingaw man. Unsa man ni dinhi? Ayun.

B.C. Tanito: Magandang umaga. Ako pala si Kenneth Tanito Punong Barangay ng Ticala. Paano po yung tax declaration? Dami po namin natamaan?

RD Digamo: Paano yan kapag tax declaration lang ang hawak ng imad ng lupa? Tax declaration.

Engr. Ramos: Sa ngayon po hindi ko po masagot. So, kapag may RAP na public consultation nalang po. Masmaganda po kasi manggaling sa legal na. Sa legal nalang po. May public consultation po for RAP.

RD Digamo: Ano po yung RAP?

Engr. Ramos: Resettlement Action Plan.

RD Digamo: Resettlement Action Plan. And then this team from DPWH will go down.

Engr. Ramos: Gagawa po ng series of public consultation po from Municipa to Barangay level.

RD Digamo: But then again, that question will be captured in our proceedings ha. Because that could be the basis now of the RAP putting a consideration on these concerns. Salamat Kap sa imong concerns. Daghan kaayo interesado kay sigurado gyud na kanang ilang gigunitan kay tax declaration lang. Dili titulo. Kung duna gani kadti ani we do not know kung naa bay tax ana. So, we have to undergo the process. Meron parin ba? Pahabol? O atong DPWH naay pahabol.

Engr. Calma: Additional lang sa question ni Sir. Ang among process man gud sa among regional office kay bahalag tax declaration lang naa as long as twenty years minimum pwede siya mag-serve as proof of ownership. Pero again mas maayo kung naa gyud titulo.

RD Digamo: Twenty years of possession of property. Unsa gani tawag ana? Open continuous adverse possession of property. Murag base ta ana sa proof of ownership. Pero naa gyapon na siya sa Republic Act?

Engr. Calma: Actually, sa Article pero dili siya specific na sa type sa, ang gibutang man gud na requirement proof of ownership. Dili siya specific nga gitagaan ug tittle.

RD Digamo: Ah, okay yun. So, twenty years of possession of property. So, yung ang i-prove ninyo. Kung halimbawa ang nag-claim ay thirty years na possession of property kay ang edad niya bente singko palang? So, ano ang magiging proof nya na thirty years na ako nag-occupy diyan, twenty-five years old palang siya. So, yung ang mga kanyang ninuno.

Okay. Meron pa? Wala na talaga.

So, on behalf of DENR EMB, assistant secretary to the environmental sector and director Gilbert Gonzales. I would like to thank PENRO of Bukidnon for this facility and of course kayo po na mga actor at actresses sa public hearing because without your presence kanina medyo na-badtrip ako kanina. Declare ko na sana failure yung public hearing. Oo, mabuti nalang may bumulong sa akin, "maghunos dili ka". From this, we successfully conducted this public hearing. Thank you, very much and good morning.

ENGLISH LANGUAGE

RD Digamo: Good morning to all of us! Are we still alive? Still alive?

All: We are still alive!

RD Digamo: Very alive. That is the good thing about the Bisaya. We are very much alive, even if they don't listen to us. That's okay. Even if we move from different venues, it's fine, right?

Okay. The very meat of the public hearing is the open forum. Because the purpose of the public hearing is to confirm that there are still concerns about our project, the Central Mindanao High Standard Highway, High standards. He is not just standard. So, in Mindanao, we are not second-class citizens. That's why they will give us a high standard road.

Thank you very much PENRO for a very short notice that you allow us to occupy here in your conference room. Because it is difficult for us because it is so bright. Can't even read. So, it's comfortable here.

Thank you very much through sir Albert. Do you know who is the head of PENRO in DENR? You don't know him?

Male: No.

RD Digamo: What if you have concerns? Or do you want to apply for a tree-cutting permit for your planted trees? Our PENRO is PENRO TP Alima. His sides are fat because PENRO TP is really taking care of them. So, our group, so I will introduce so that you will know who is here today, the visitors here in Malaybalay from the DPWH, is Mary Joyce Manuel, who presented earlier. Where is Joyce? Here. Small but terrible from DPWH UPMO. What is UPMO?

Engr. Manuel: Unified Project Management Office.

RD Digamo: Unified Project Management Office. What about RMC?

Engr. Manuel: Road Management Cluster
.

RD Digamo: Road Management Cluster, so there is also a consultant for bridges. It's separate. Joyce is with Scott Ramos. Have you seen Scott's movie where he is the actor? This is Scott, who is from DPWH UPMO. Then Kelvin Mamitay is in the back. Those are the snipers. Those snipers in the back. Our consultant, Ms. Angi, is the manager of the JICA study team. So, Ms. Angi is relatively healthy. She is really healthy. She is from JICA.

We have consultants that were commissioned by the proponent to conduct the environmental impact assessment or to focus on the area that will be affected by the project, AMET Asia. Francine is very small but terrible, where is she? She is also at the back. The one who presented earlier. Then Ivan Moreno, there in the back too. Nimfa Bracamonte, Ma'am Nimfa is a retired MSU-IIT in Iligan. Then Ms. Amabelle Embornas and Kolin Manalastas
Our team at the central office is Engineer Joel, and Engineer Jess is also here. In Malaybalay, in Pradis Bukidnon, Raquel Lindoy is our Provincial Environment and Management Unit Officer. She is the head of the EMB in the province of Bukidnon. And yours truly is your servant in the EMB region, Ray Digamo. I will be your public hearing officer today.

Our house rules are simple. You raise your hand, we acknowledge you, introduce yourself by stating your name and group, and then ask your question. I encourage everyone to actively participate. Don't

hesitate to ask. Let's ask questions, even though it will start in 2029. How old are you? It's still 2023! This project will be finished in 2034. Mommy, how old will you be in 2034?

Female: 67.

RD Digamo: Plus 11? Ah, still alive! Let's eat a lot of food strong It has iron. Okay. Anyway, it is better that we have something to look forward to. PMO Raquel is here as our PMO in Bukidnon. If you have permission from the Environmental Management Bureau, if you want to apply for an ECC at your resort. Does anyone have a resort here? Hands up. Maybe your resort doesn't have a heater so you can't get up? Because it's so cold.

Let's start the ball rolling. Wait, I want to know this venue because we are in Malaybalay, because we have three venues. We finished in Tagoloan last wednesday intended for Cagayan de Oro. Yesterday I was in Sumilao. Supposedly the one in Sumilao yesterday was meant to be Manolo Fortich and Sumilao. This one in Malaybalay is for Impasug-ong and Malaybalay. That's why the clustering went wrong. What was given to us was Malaybalay and Sumilao.
I want to ask if there is a representative in Impasug-ong? One, two, three in impasug-ong. Has anyone returned to Malaybalay? Just one in total. In Manolo Fortich? Many in Manolo. Those who did not raise their hands, where are they from?
As long as our participants today are from the LGU, from the IP, there are from our Civil Society Organization, Government national agency, there is also DepEd. All right. Let's start. Who wants to ask first? There is a house and lot prize! Sir.

Allan Flores Jr.: Thank you, Sir. Is it okay to speak in Bisaya?

RD Digamo: It’s okay to speak in Bisaya. Someone will translate.

B.C. Flores Jr.: I am Allan Flores Jr. Barangay Captain of Barangay Damilag under the Municipality of Manolo Fortich. Earlier, it was shown that one of the objectives of our public hearing today in the assessment EIA is to discuss with the affected parties. But since I know that this project is still a long way from being started, it’s still 2029, but my only concern as the barangay captain is the residents who are affected. Do you have any data on residents like us in Manolo Fortich who are affected by the highway project? Households so that we can include?

RD Digamo: Who will answer his question?

Engr. Balid: Good morning, Captain. In our study, we conducted a resettlement action plan study. So, there are partial or possible ones that will be hit when our highway is actually constructed. Right now, we are just doing the feasibility study.
So, for those who have been invited to the survey, it is possible that they will be hit or they may not be hit because it depends on the DTM design, which is the very detailed design of the road. Thank you.

RD Digamo: That's all? So, the intensive additional survey or census of the parties that will be affected when we have a detailed engineering design because we are sure of our line on our road. Okay. Who's next?

Bae Dinsag: Good afternoon, everyone. Bae Judith Dinsag, Municipal IPMR and Municipal Chieftain in Bukidnon, and, at the same time, IPMR in barangay Tangkulan. In their first presentation, I was able to participate because it was held in Barangay Tangkulan. Then our request is the same as what Ma'am told us only there are changes in their route, but in the presentation today, we are being presented with the same route from Tagoloan. What are the changes? It's just that they were worried in Manolo because there are too many roads. They did a survey early on, but in the end, there were changes because it was more economical but the owner was not informed. My request before the construction, I hope they will return to the IP community. Because what happened was the same in Minyihun, they agreed that before the ML, it was necessary to inform the owner of the land so that the burial site would not be affected.
Then what happened was that it was bulldozed. They did not inform us. So that's the problem, because we are the watchers, and we were not informed. So, I don't know. It's their fault, the two hundred thousand are affected emotionally. So, before the construction starts, inform us. We know the location of sacred places and burial grounds that are affected. It is also very important to perform a ritual before starting.

RD Digamo: Thank you. Our project is funded internationally. JICA and ADB are very concerned with the social aspect, especially the conjugal one. So, if there are changes in the road alignment, define the computation, provide the alignment, and then the team will go back to the IP community and then present and then conduct rituals, identify burial grounds or sacred grounds so that, as much as possible, avoid them in the road alignment. This is a duly noted, Bae, because that was a concern yesterday in Sumilao. So, all the IPs will have a turn in a

separate meeting. Okay. Thank you very much.

Mr. Payangga: Good morning, everyone. Alex Payangga, IPMR from Manolo Fortich. Our concern is what is happening with the project roads in IP. The problem that has reached us is the payment for the right-of-way, our crops. Then, usually, when they implement the project, the owners forget about it. Then it's almost impossible to receive payment from them. Even now, it is still pending in our office that the project has been completed, but there is still no payment received. Thanks a lot.

RD Digamo: Thank you very much, sir. So, same situation in Sumilao, but for the benefit of this group, we will let our representative from the DPWH answer the query. Because their experience different, sad experience. Not favorable. The sad experience was not implemented locally by the head office or district office. So, I hope the payment will not be forgotten. But there are also processes. So, we will explain to our DPWH Central

Engr. Ramos: Good morning! I'm Engineer Scott from DPWH National. Regarding the budget for the right of way, our department has allocated something for the appreciation of the right of way. So, we are strict about the complete requirements. There are requirements, and we will discuss them in a separate public consultation in the resettlement action plan. So, right now, it is a domain of concerns, and then there is another public consultation schedule regarding our Right-of-Way Action Plan. So, initially, in order to be paid, we must complete the requirements. So, when we do a public consultation with RAP, we have a legal team with us. We will discuss or explain how to compensate the affected property. So, in the next consultations regarding RAP, we will explain how. Regarding your concern about whether you will be paid, as long as the requirements are complete, you will be paid. The DPWH has a budget for acquisition.

RD Digamo: Okay, thank you very much. So, they are the group in charge for DPWH's Right-of-Way Appreciation. So, Sir Scott mentioned something that if the appraiser's documents are complete - to be paid, the first thing on the list is your proof of ownership of the affected property. You have titles, read your titles because the Right-of-Way team will look for them during the final negotiation. Please remember that the size was used earlier, the width is 60 meters. That is 30 meters from the center. That's how wide the right-of-way is.

Okay, so is there anything else?

Mr. Bocan: Good morning, everyone. Thanks for the snacks. I am Danny Bocan Municipal Assessor in Manolo Fotich. About the relocation, because there are people who will be affected by the right-of-way, there will

be nothing [inaudile 20:35–20:37], then it will be submitted to the LGU. LGU lacks the capacity for this. What are the plans of the national government?

RD Digamo: Thank you so much, sir, to our municipal assessor in Manolo Fotich, Bukidnon. The question is, does the DPWH have a designated resettlement site for those who will be affected, especially if their house will be hit by the road you will build? Their experience was the task of relocation was given to the LGU. So, are there any? How can we answer the question from our municipal assessor?

Engr. Ramos: Regarding resettlement, it doesn't matter because it is not a DPWH mandate. Coordinate with the national council or NCP.

RD Digamo: Okay. All right, the mandate was not negotiated. You are right, but the project is the reason why there are affected houses or people there. But there will be arrangements because there is what we call the convergence of the project. The DPWH will coordinate with the National Department of Human Settlement and Urban Development. That. But then, if it is thrown at the LGU, maybe the LGU will be okay, but DPWH will pay. The DPWH should be the one to provide the funding for the acquisition and development of the resettlement site. Are we okay there, assessor? Because of what they are saying, the DPWH will provide the funding, so LGU will be the one to find a property that we need to acquire [Inaudible 23:00 23:04].

Mr. Bocan: Noted, Sir.

RD Digamo: Oh okay, noted. Thank you. Who will ask next?

Mr. Honi: Good morning. Mckinley Honi from DPWH Bukidnon. Sir, what Ma'am said was the district's involvement in the project.

RD Digamo: District Office of DPWH?

Mr. Honi: Yes, Sir. What will be the involvement of the district office in the Project?

RD Digamo: What is the involvement of the DPWH District Office in this project?

Engr. Ramos: We will coordinate with the district office if we ever need assistance. So, we will have interdepartmental communications regarding the main activity in the district. In the area itself.

RD Digamo: So, it's okay, sir. So, there will be directives from the DPWH central office. Okay, is there anything else?

Mr. Velasco: Good morning, everyone. I'm Sybreen Marsh Velasco, from LGU Manolo Fortich. Sir, even though it's still in the FS stage, maybe we can ask for a shape file of the proposed road alignment for planning purposes?

RD Digamo: There is a request here if they can ask for a shapefile and proposed road alignment, even if it is just a tentative road alignment. Or do you need clearance from your boss first? You know those things; we can't avoid the fact that there are also clever Filipinos. Because things like that, you know that when there is an acquisition, this is an actual experience in a project, when they know that the location of the road. But when they found out that the road would go through there, oh, the next day it was full of bananas; it was full of coconuts, yes! A house will be built there because there are also many speedways.

That's also a bad thing about us that sometimes we take advantage of. So, things like that are still a bit uncertain, so be really careful. So, for us at EMB, if someone applies for ECC, they will submit TIS. If someone asks for that TIS, we will not give it until the ECC is issued. Because that document is not considered as a public domain. Because it hasn't been issued yet. It is still something to review and evaluate. It is a list you don't give to the public. But once the ECC is issued, it will become a public document anyone can have access to that document. And this way, this is still a temporary alignment of our initial certification because it could beat the mature to keep the proposed alignment. So, I'm sorry. Thank you very much. Yes, Sir.

Kag. Buynay: Good morning. I am Kagawad Alberto Buynay in barangay Sankanan, Manolo Fortich. My only question is, do we have a standard fee for the land that will be affected by the project? Or is it based on the zonal price or can the owner of the land decide the price?

RD Digamo: That's the question. Many people are also interested in knowing whether the payment price for land is standard. The valuation of your property will be affected, or maybe the land owner can assign how much he sells? Oh well, who's going to answer that?

Engr. Calma: Good morning, everyone. I'm representing DPWH regional office 10. When it comes to right-of-way acquisition, sir, we are guided by Republic Act 10752, also known as the Right-of-Way Acquisition Act. So, based on our law, sir, our initial requirement is that you hire a third-party land assessor that is accredited by the BSP. So, he can avoid showing interest. So, we don't decide, and you don't either. The land appraiser is accredited by BSP. At the same time a property appraiser for structures. He is also the one to assess the value. Thank you.

RD Digamo: So, there is a commissioned third-party appraiser authorized by the Bangko Sentral ng Pilipinas. To be neutral. So, there will be a fair and just assessment and evaluation of the property that will be affected. Darling, what is the Republic Act?

Engr. Calma: Republic Act 10752.

RD Digamo: Learn that. Republic Act 10752. That is the Right-of-Way Acquisition Act. okay Do you have any more questions?

Kag. Buynay: His land is affected by the project but so far nothing has been agreed upon unless his price is met.

RD Digamo: The project hasn't started yet?

Kag. Buynay: Yes.

RD Digamo: So, what project?

Kag. Buynay: They just skipped the area.

RD Digamo: What project is that?

Kag. Buynay: Bridge, Sir.

RD Digamo: So, the bridge was not completed?

Kag. Buynay: The one of Louie Alongo [?]. He won't agree to open if they will not pay his price. It's like you haven't been able to get in for years. Now he is collecting the toll fee.

RD Digamo: That is not allowed.

Female: Sir, I will interrupt. The approach to the bridge is good because the bridge is new. Approaching the bridge, it seems that if you look at it, it's straight. But if you look across it, it's still part of the straight.

Engr. Calma: Actually, we are still appropriating this property, and at the same time, we are planning to realign our local road a little so that we can continue on the road while still exploring the area. It seems that there are already instructions. It seems like he is not allowed to collect the toll fee. Is he still collecting toll fees now? I hope there are no more changes. Looking forward, he should not collect toll fees. Ask for help from the DPWH. Residents should not pay toll fees while the construction is still ongoing.

RD Digamo: That's why we're asking for help and cooperation for the things that happened there. Because that will prolong the process. So, they are not allowed to collect toll fees. The government always has the mechanism to acquire the property, such as through expropriation, because the government has the authority to expropriate property for government projects.

B.C. Tanito: Good morning. I am Kenneth Tanito Punong Barangay of Ticala. How about the tax declaration? Many of us will be affected?

RD Digamo: What if the land owner only has a tax declaration?

Engr. Ramos: Right now, I can't answer your question. So, only during RAP public consultation. It's even better because the legal team will attend the consultation. There is a public consultation for RAP.

RD Digamo: What is RAP?

Engr. Ramos: Resettlement Action Plan.

RD Digamo: Resettlement Action Plan. And then this team from DPWH will go down.

Engr. Ramos: A series of public consultations will be held from the municipal to the barangay level.

RD Digamo: But then again, that question will be captured in our proceedings. Because that could be the basis for the RAP putting these concerns into consideration. Thank you, Kap, for your concerns. A lot of people are interested because I'm sure that some of them are just holding on to the tax declaration. Not a title. If there is any product, we do not know if there is a tax. So, we have to undergo the process. Do you still have it? postscript? Or our DPWH has an afterthought.

Engr. Calma: Additional, Sir. Our process in our regional office is that only tax declarations that are at least twenty years old can serve as proof of ownership. But again, it is better if there is a title.

RD Digamo: Twenty years of possession of property. What is it called? Open continuous adverse possession of property. It seems to be based on proof of ownership. But is it already under the Republic Act?

Engr. Calma: Actually, in the Article, but not specific to the type, the proof of ownership requirement is also stated. It is not specifically given a title.

RD Digamo: Ah, that's okay. So, twenty years of possession of property. So, that's what you will prove. For example, if the claimant has thirty years of possession of property, why is he only twenty-five? So, what will be his proof that I have been occupying there for thirty years, he is twenty-five years old. So, those are his ancestors. Okay. Is there anything else? So, on behalf of DENR EMB, assistant secretary to the environmental sector and director Gilbert Gonzales. I would like to thank PENRO of Bukidnon for this facility and of course you actors and actresses at the public hearing because without your presence earlier I had a bit of a bad trip. I would have declared the public hearing a failure. Yes, it's a good thing someone whispered to me, "don't get carried away". From this, we successfully conducted this public hearing. Thank you, very much and good morning.

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