



ENVIRONMENTAL IMPACT ASSESSMENT (FINAL REPORT)

CTI ENGINEERING INTERNATIONAL CO., LTD.

For the Improvement of Water Supply Project in
COTABATO CITY



[JANUARY 2026]



GEOINNOVATIVE SPECIALISTS INC.

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EXECUTIVE SUMMARY

PROJECT FACT SHEET

MCWD and the JICA Team agreed to set the target year of the Project in 2032, which is 3 years after the expected completion of the Project. The Team explained that the water supply ratio in the proposed water supply area, currently 32.4%, will increase to 62.4% with the implementation of the project (Phase I-I). The ratio will further increase to 74.1% with the implementation of Phase 1-2.

As part of the Government's regulatory requirements, the Proponent is required to acquire an Environmental Compliance Certificate for the Project, and in order to obtain such requirement, an Environmental Impact Assessment (EIA) (herein referred to as the "Study") has to be carried out.

The data and information used in the preparation of this EIA was based on the documents, plans, actual field survey and environmental test of the Proponent. Secondary data was based on various national government agencies and local government units.

BASIC PROJECT INFORMATION

1	PROJECT NAME	<i>PREPARATORY SURVEY FOR THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SYSTEMS IN COTABATO CITY</i>
2	PROJECT LOCATION	<i>Barangay Tamontaka 1, Tamontaka 2, Mother Tamontaka, Kalanganan 2, City of Cotabato, Province of Maguindanao Del Norte</i>
3	PROJECT TYPE	<i>Water supply project</i>
4	PROJECT AREA	<i>4 hectares</i>
5	PROJECT MAJOR COMPONENTS	<i>The components of the project are:</i>
		<i>Water intake facility, water transmission facility, water purification facility (purification capacity of 7,200 m³/day, rapid filtration system)</i>
		<i>Water distribution reservoir (3,600 m³)</i>
		<i>New water distribution pipes (7.7 km)</i>
		<i>Other incidental facilities, etc.</i>
6	PROJECT COST	<i>PHP 1.0 billion (rough estimate)</i>
7	PROJECT DURATION	<i>Feb. 2026 – Oct. 2029</i>



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PROPONENT PROFILE

Proponent Name	<i>Metro Cotabato Water District</i>
Name of Representative	<i>MARIA MELINDA ELAINE V. BARCIMO General Manager</i>
Address	<i>Governor Gutierrez Avenue Rosary Heights 7. Cotabato City, Philippines 9600</i>
Contact Details	<i>Landline: (064) 421 1070; Email: metrocotabatowaterdistrict@gmail.com Website: https://metrocotabatowd.gov.ph/</i>

PROJECT PREPARER

Name of Preparer	<i>Geoinnovative Specialists Inc.</i>
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DESCRIPTION OF THE PROJECT EIA PROCESS

TERMS OF REFERENCE OF THE EIA STUDY

The EIA Report was prepared by the Consultant, a 100% Filipino-owned company built from an innovative group of specialists whose expertise is in the field of Geology, and Engineering and its practical applications such as Geotechnics, Geophysics, Environment, and Design. The Proponent approved the preparation of this EIA for their application of an ECC and relevant environmental permits from various regulatory agencies of the Government.

EIA TEAM

Based on initial scoping, the document necessary is an Environmental Impact Statement (EIS) for the Proponent to be issued an ECC. Most of the technical documents were provided by the Proponent.

The baseline environmental information was prepared and assessed by a group of technical experts. **Table 1** enumerates the composition of the EIA Team for this EIA study.

TABLE 1 LIST OF EIA MEMBER AND EXPERTISE

Name	Field of Expertise	Modules Assigned
Eric Del Rosario	EIA/Flora and Fauna/Geographic Information Systems	Report Preparation/Overall Team Leader
Michael Anthony Cruz/ Datu Arniel Ali	Socio-economy	The People
Jefferson Cruz	Aquatics/ Flora and Fauna/ Land Use	The Water, The Land
Keith Bitao	Flora and Fauna	The Land
Erwin Del Rosario	Geographic Information Systems/ Mapping	The Land
Christopher Cabading	Air and Noise Quality	The Air
Sittie Sipiya Masabpi/ Asiha Ambag	Technical Assistants	The People

EIA STUDY SCHEDULE & AREA

The schedule for the duration of study is shown in **Table 2**. The study was conducted at the Project site on different occasions and schedules.

TABLE 2 SCHEDULE OF THE EIA PREPARATION

Activities	Dates Covered
1. Kick-off Meeting	July 26, 2024
2. Collection/Gathering of necessary documents/ references for review	July 26 – October 29, 2024
3. Air Quality, and Noise and Vibration level Survey	July 27 – 28, 2024



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Activities	Dates Covered
4. Flora and Fauna	July 26 – 27, 2024
5. Preparation of Report	August – October 2024
6. Public Consultation Meeting	June 24, 2025
7. Draft EIA Study Submission	July 2025
8. Submission of Final Report	October 9, 2025



EIA METHODOLOGY

The methodology adopted in this study specifies the basic data collection, survey and investigation methods applied.

BASELINE DATA COLLECTION

- A. Primary and secondary baseline data were gathered for the following sectors: land, water, biological, socio-cultural, and air. A listing of these data, including the category of data and sources, is presented in **Table 3**. A summary of the key baseline characteristics and monitoring plans are shown in **Table 4**.
- B. Available data were collated and assessed as to relevance and quality of information. Previous studies and plans deemed applicable to the present condition were considered in the study. The methodology discussed herein is consistent with various applicable guidelines and cognizant of available studies, data, related references and reports. The detailed methodologies are discussed further:

1. Available data and records

Collection of all available data and records for multiple years and seasonal (monthly) variation concerning the following:

- Depth and duration of precipitation in the area as well as rainfall intensity and frequency. Rainfall data obtained from Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) that include daily rainfall and short duration rainfall. Daily rainfall was used in the analysis of rainfall distribution and patterns in the Project Area;
- Stream-flow data that include peak discharge, daily streamflow or gage height if available for major waterways traversing study area and discharging into major water bodies;
- Collection of all available topographic and mapping data (preferably at 1:250000, 1:50000 and 1:10000 scales), including residential and informal settlement along the affected regions of the Project.

2. Multi-agency Sourcing of Data

Data from other sources were also exhausted to determine basic information on the biophysical component of the project area. These include the following:

- LGU's City Planning and Development Office (CPDO);
- Bureau of Research Standards (BRS);
- Department of Public Works and Highways (DPWH);
- Department Environment and Natural Resources (DENR);
- Ministry of Environment, Natural Resources, and Energy (MENRE);
- Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA);
- National Mapping and Resource Information Agency (NAMRIA);
- Philippine Statistics Authority (PSA);
- National Water Regulatory Board (NWRB); and



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- Philippine Institute of Volcanology and Seismology (PHIVOLCS)

3. Data from Project Proponent

Available data from the Project proponent were requested and utilized in the preparation of EIA.

- Certified True Copies of OCT/TCT/TD, Contract of Lease, Joint Venture Agreement, and Authority to Use
- Location/Vicinity Map
- SEC Registration/Certificate of Incorporation
- Site Development Map
- Bathymetric Map
- Location Map

C. Briefly, site visits and ocular inspections of the study area were carried out simultaneously with data and information gathering.

D. The succeeding sections present detailed descriptions of the various survey procedures adopted in investigating the existing environmental settings/modules of the project area.

E. GIS Development

All collected and updated information such as hydro meteorological data, topographical data, demographics and others, both in spatial and tabular data, were formatted and linked together in a GIS environment using appropriate software.

Spatial data such as maps were converted into shape files, while the tabular data were in MS Access database system. Open-source GIS software was developed to serve as the platform of the GIS environment of the project.

TABLE 3 SUMMARY OF THE ENVIRONMENTAL AND SOCIO-ECONOMIC STUDIES AND SURVEYS CONDUCTED

MODULE	ENVIRONMENTAL STUDIES & SURVEYS	CLASSIFICATION OF DATA OBTAINED		SOURCES OF SECONDARY DATA
		Primary Data	Secondary Data	
Physico- Chemical Environment	Meteorological Characterization of the Project Areas			Nearest PAGASA Synoptic Stations
	• Climate		✓	
	• Rainfall		✓	
	• Temperature		✓	
	• Tropical cyclone		✓	
	• Relative humidity		✓	
	• Prevailing surface winds (wind rose)		✓	
	• Cloudiness		✓	
• Thunderstorm and cloudiness		✓		



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MODULE	ENVIRONMENTAL STUDIES & SURVEYS	CLASSIFICATION OF DATA OBTAINED		SOURCES OF SECONDARY DATA
		Primary Data	Secondary Data	
Physico- Chemical Environment	<ul style="list-style-type: none"> Topography 		✓	NAMRIA & Actual Topographic Survey
	<ul style="list-style-type: none"> Regional and River Hydrology 	✓	✓	NIA, NWRB, Local Water Utilities Office, BSWM & Local DA Office
	<ul style="list-style-type: none"> Lithology and Stratigraphy 	✓	✓	PHILVOCS, MGB & Actual Geotechnical Survey
	<ul style="list-style-type: none"> Regional Tectonic Setting 		✓	
	<ul style="list-style-type: none"> Landslides and Soil Erosion 		✓	
	<ul style="list-style-type: none"> Aquifer Characteristics 		✓	NWRB, Local Water Utilities Office, BSWM & Local DA & NIA Office
	<ul style="list-style-type: none"> Rivers, lakes, etc. 	✓	✓	
	<ul style="list-style-type: none"> Creeks 	✓	✓	
	<ul style="list-style-type: none"> Flood Occurrence 	✓	✓	
	<ul style="list-style-type: none"> Water Quality Survey 	✓	✓	Actual Survey and Previous Works Undertaken Near the Project Area
	<ul style="list-style-type: none"> Air Quality Survey 	✓	✓	
<ul style="list-style-type: none"> Noise 	✓	✓		
Biological Environment	Terrestrial survey	✓	✓	DENR-PAWB, CENRO/ PENRO, Universities & Actual Surveys
	Aquatic surveys (River)	✓	✓	
	Endangered/Threatened Species	✓	✓	
Socio - Economic Environment	Land and Resource Use (Land-use conflict, land drainage issues, etc.)	✓	✓	Planning and Development Offices of Affected Municipalities & actual survey
	Socio-Economic Aspects (Labor Data, Health and Sanitation Issues, etc.)	✓	✓	
	Perception Survey	✓	✓	



SUMMARY OF BASELINE CHARACTERIZATION

TABLE 4 SUMMARY OF KEY ENVIRONMENTAL IMPACTS AND MANAGEMENT AND MONITORING PLAN

Key Environmental Aspects	Summary of Findings	Possible Environmental/ Social Impacts	Baseline Environment	Preventive/ Mitigating Measures	Monitoring Parameters/ Implementation	Cost of Mitigation/ Monitoring
LAND						
	<p><i>Land Use and Classification</i></p> <ul style="list-style-type: none"> Land use / land cover of the site is predominantly and residential /Built-Up. Land Classification maps from NAMRIA revealed that the project area is considered alienable and disposable. <p><i>Geology and Soils</i></p> <ul style="list-style-type: none"> Geologic data show that the project site stood along Recent rocks. Key Geohazards affecting the project areas are Flooding. Soil cover is represented by the Faraon Clay. <p><i>Terrestrial Flora and Fauna</i></p> <ul style="list-style-type: none"> A total of 30 floral species belonging from 19 different families were tabulated at the site represented by 5 	- Consistency with land use	<p>Current land use w/in 1km radius (as per zoning ordinance):</p> <ul style="list-style-type: none"> Industrial <p>Actual land uses w/in 1km radius:</p> <ul style="list-style-type: none"> Built-up/Residential 	- Ensure compatibility with land use		



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
	<p>species of herbs and fern, 1 palm, 13 grasses, 3 shrubs, 2 vines and 6 species of trees. Generally, all species encountered in the area were not listed and not evaluated in the IUCN Red list of endangered species as well as the DENR DAO2007-01 listing of threatened Philippine plants. One species of tree, Narra, is considered Vulnerable.</p>					
			<p>Existing vegetation in the area:</p> <ul style="list-style-type: none"> - Crop land - Marshland 	<ul style="list-style-type: none"> - Compliance with conditions of DENR/LGU - Promote restoration of damaged or destroyed vegetation where possible (e.g., tree planting); 	<ul style="list-style-type: none"> - Annual inspection of area replanted/re vegetated 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
		<ul style="list-style-type: none"> - Change in surface landform/topography/terrain/slope - Soil Erosion 	<p>Slope:</p> <ul style="list-style-type: none"> - Level to Undulating (0-8%) - The project site is not located in an area identified by MGB/PAG-ASA/PHIVOLCS as hazard prone 	<ul style="list-style-type: none"> - Provide erosion control and slope protection measures 	<ul style="list-style-type: none"> - Regular inspection of slope protection measures in erosion-prone areas - Regular inspection for new eroded areas near the site 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost
		<ul style="list-style-type: none"> - Soil/Land contamination due to improper solid waste disposal 	<ul style="list-style-type: none"> - Existing soil type in the area: <ul style="list-style-type: none"> - Clay 	<ul style="list-style-type: none"> - Implementation of the Ecological Solid Waste Management Plan (ESWMP) - Implement waste minimization, re-use and recycling of solid waste materials - Implement proper segregation, 	<ul style="list-style-type: none"> - Daily inspection of waste/recycling bins for segregated solid waste collection - Daily inspection for presence of un-segregated garbage in the facility - Weekly inspection of 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/ Social Impacts	Baseline Environment	Preventive/ Mitigating Measures	Monitoring Parameters/ Implementation	Cost of Mitigation/ Monitoring
				collection and disposal of domestic wastes; assign designated areas as collection points - Provide receptacle/ bins for solid wastes - Coordinate with the municipal solid waste unit for garbage collection (if possible) or acquire the services of a private solid waste hauling contractor	solid waste accumulated	
		- Soil Contamination during construction of water intake facility or water treatment plants due to cement-based solidifiers that	- Existing soil type in the area: Clay	- Conduct of leaching test and/ or soil contamination analysis before and during construction	- In the Philippines, there are no laws or standards regarding soil contamination. Japan's Soil	- Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
		may cause leaching of hexavalent chromium			Contamination Countermeasures Act sets the standard for leaching levels of hexavalent chromium at 0.05 mg/ L or less	
		- Enhance visual aesthetics	- There is presence of visually significant landforms/landscape/ structures	- Implement landscaping and other beautification measures - Provide adequate buffer	- Regular inspection of landscaping and other beautification activities - Regular monitoring of buffer zones	- Cost integrated in the construction/operation cost
WATER						
		- Increased in siltation due to project activities	- Distance to nearest/ receiving water body is less than 1 km	- Set up proper and adequate sanitary facilities - Strictly require the contractor and its workers	- Regular (ocular) inspection of: - Drainage/canal systems	- Cost integrated in the construction/operation cost



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			<ul style="list-style-type: none"> - Fresh water classification is Class C - Distance of project area to the nearest well used is within project site - The nearest well is used for drinking/domestic and production use 	<ul style="list-style-type: none"> - to observe proper waste disposal and proper sanitation - Strictly observe proper waste handling and disposal - Provision of wastewater treatment facility (e.g. septic tank, chemical treatment, etc.) - Provision of three-chambered septic tank for domestic sewage - Provide bund walls on all chemical storage tanks and processing tanks which is connected directly to WTP 	<ul style="list-style-type: none"> - Water treatment facility (i.e., grease trap, septic tank, etc.) - Quarterly monitoring of the following: pH, TSS concentration, BOD, total coliform, Color, Oil and grease 	



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		<ul style="list-style-type: none"> - Competition in water use 	<ul style="list-style-type: none"> - The population using the receiving surface water is greater than 1,000 and less than or equal to 5,000 persons - The available/nearest water sources are deep wells and Level III water supply system 	<ul style="list-style-type: none"> - Observe water conservation measures - Careful selection of the project site to avoid disruption of traditional water uses 	<ul style="list-style-type: none"> - Regular coordination with concerned agencies 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost
		<ul style="list-style-type: none"> - increased occurrence of flooding 	<ul style="list-style-type: none"> - The project site is located in an area identified by MGB/PAG-ASA as flood-prone 	<ul style="list-style-type: none"> - Use appropriate design for project facilities - Implement an appropriate drainage system - Regularly remove debris and other materials that may obstruct water flow - Use appropriate technology (e.g. raised hand- 	<ul style="list-style-type: none"> - Regular coordination with concerned agencies 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				pumps) to protect drinking water from flood contamination		
AIR/NOISE						
		<ul style="list-style-type: none"> - Air quality degradation 	<ul style="list-style-type: none"> - Distance to the nearest community is 0.5 to 1 km - High concentration of Total Suspended Solid with 247 ug/n3. 	<ul style="list-style-type: none"> - Properly operate and maintain all emission sources (e.g. vehicles, pumps, generators, etc.) - Install when applicable, the appropriate air pollution control device/s - Strictly enforce good housekeeping practices - Control vehicle speed to lessen suspension of road dust - Conduct water spraying to 	<ul style="list-style-type: none"> - Regularly monitor presence/absence of complaints - Regular (ocular) inspection of: <ul style="list-style-type: none"> - Absence of white or black smoke from vehicles, heavy equipment and generator - Regularly monitor 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				<ul style="list-style-type: none"> suppress dust sources and minimize discomfort to nearby residents - Use covered vehicles to deliver materials that may generate dust 	<ul style="list-style-type: none"> ng of buffer zones 	
		<ul style="list-style-type: none"> - Nuisance due to noise generation 	<ul style="list-style-type: none"> - Distance to nearest community is 0.5 to 1 km - Location 2 has above noise level results in the morning and daytime. 	<ul style="list-style-type: none"> - Properly operate and maintain all noise sources (e.g. vehicles, pumps, generators, etc.) - Install when applicable, the appropriate noise control device/s (e.g., mufflers, silencer, sound barriers, etc.) - Provide adequate buffer 	<ul style="list-style-type: none"> - Regularly monitor presence/absence of complaints - Regularly monitoring of buffer zones 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/ Social Impacts	Baseline Environment	Preventive/ Mitigating Measures	Monitoring Parameters/ Implementation	Cost of Mitigation/ Monitoring
				and/or planting of trees		
PEOPLE						
		<ul style="list-style-type: none"> - Enhanced employment and/or livelihood opportunities - Increased revenues for LGU - Enhanced delivery of public services (e.g., education, health care peace and order, etc.) 	<ul style="list-style-type: none"> - Size of population of host Barangay (NSO, 2015): Barangay Balut – more than 1000; - Classification of host barangay is rural - Available social services within/near the host barangay are schools (e.g., elementary, high school), Health facilities (e.g., clinics, hospitals, etc.), peace and order (e.g., police outpost, barangay 	<ul style="list-style-type: none"> - Prioritize local residents for employment - Promptly pay local taxes and other financial obligations - Regular coordination with LGU. Prior consultation & coordination to minimize disruption of daily domestic activities & respect for cultural practices - Ensure participation of the community in consultations and dialogues 	<ul style="list-style-type: none"> - Regularly monitor presence/absence of complaints - Regular coordination with LGU 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
			tanods, etc.), Recreation and sports facilities	- Provide appropriate traffic/warning signs, lighting, etc.		
		- Impacts on community health and safety	- Increase provision of healthy and safer drinking water	- Regular coordination with LGU - Provide appropriate warning signs, lighting and barricades, whenever practicable - Observe proper housekeeping - Provide on-site medical services for any emergency - Participate in public awareness programs on health and safety - Implement appropriate safety programs for	- Presence/Absence of complaints from the community - Regular coordination with LGU - Regular submission of reports to concerned agency	- Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/ Social Impacts	Baseline Environment	Preventive/ Mitigating Measures	Monitoring Parameters/ Implementation	Cost of Mitigation/ Monitoring
				both community and workers - Strictly comply with fire, safety and similar regulatory requirements - Strictly comply with requirements of RA 6969 specifically on the storage, transport, and disposal of hazardous wastes generated on site, if any		



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Environmental Monitoring Fund (EMF) and Environmental Guarantee Fund (EGF) Commitments

When it is possible, depending on the evaluation of the MENRE, an EMF and EGF will be established to assure the public that the Proponent is committed in rehabilitating or restoring whatever risk or hazard that the Project may impose to the Environment and more important to the stakeholders/ communities. This will be done through a memorandum of agreement between the Proponent, MENRE, and representatives of concerned stakeholders. The amount for the funds shall be determined and managed by both parties to ensure that it will be appropriate in cases an environmental damage occurs.



CHAPTER 1 PROJECT DESCRIPTION

1.1 PROJECT LOCATION AND AREA

A. Geographical Location

The proposed water treatment facility is geographically located in Barangay Tamontaka 2, Cotabato City, Province of Maguindanao. It lies 160 kilometres southeast of General Santos City with Latitude 7°10' 25.35" N and longitude 124°14'53.06"E. The Road system is considered first class which divides the land mass into various patterns to provide the best suitable path between destination in and around the province. It is bounded on the North by the Barangay Tamontaka III and Rosary Heights XII; on the West by Barangay Tamontaka I, on the South by the Tamontaka River; and on the East by Barangay Tamontaka III. The Map of the project area showing its location and the covered Barangay is shown in **Figure 1.1-1**. **Figure 1.1-2** shows the road system map connecting the proposed infrastructure project.

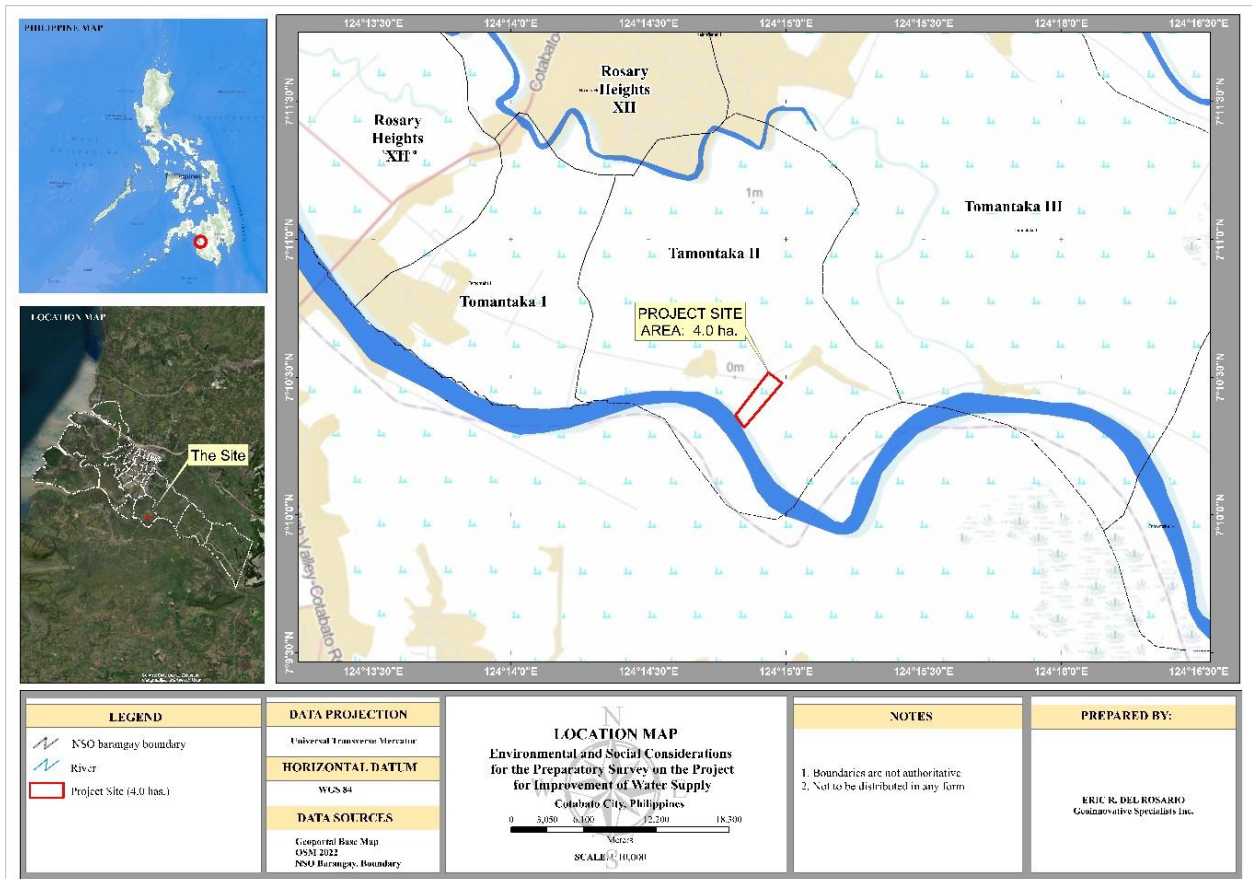


FIGURE 1.1-1 LOCATION MAP SHOWING BOUNDARY OF THE PROJECT AREA



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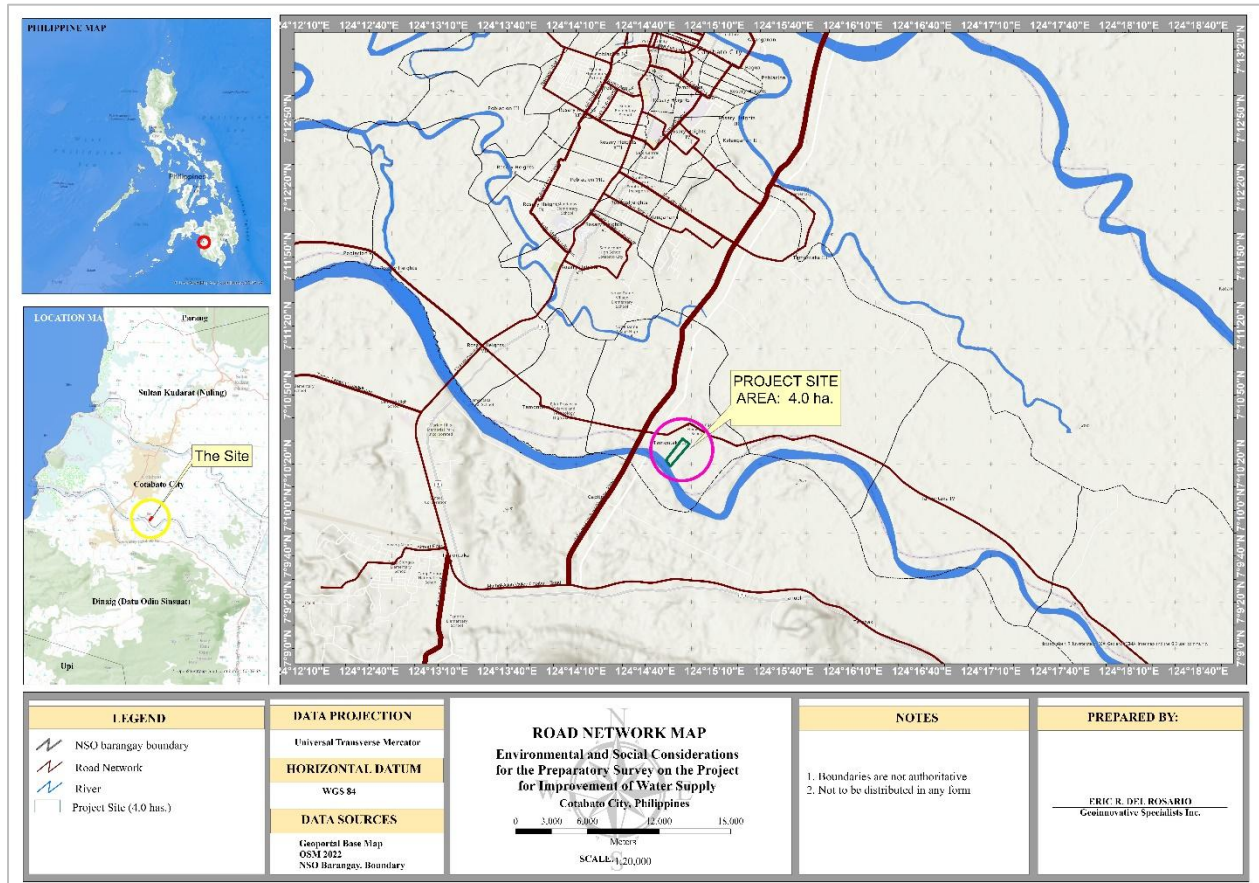


FIGURE 1.1-2 ROAD SYSTEM MAP SHOWING THE ROAD NETWORK WITHIN PROJECT AREA

B. Impact Areas

The potential direct and indirect impact areas of the project **Table 1.1-1** were delineated based on the definition specified in Annex 2-2 of the Revised Procedural Manual of DAO 2003-30.

The direct impact areas (DIA) are the areas where all project facilities are proposed to be constructed and where all operations are proposed to be undertaken. Indirect impact areas (IAA) are areas immediately outside the coverage of the project facilities and project operations/activities. **Figure 1.1-3** presents the potential impact area relative to the project.

TABLE 1.1-1 POTENTIAL DIRECT AND INDIRECT IMPACT AREAS

Area Classification	Area Coverage
Direct Impact Areas	In terms of biophysical impact: <ul style="list-style-type: none"> The area within the project site boundary comprising 4 Hectares
	In terms of socio-cultural impact: <ul style="list-style-type: none"> Barangays Tamontaka 2, Tamontaka 1, Mother Tamontaka, Kalanganan 2
Indirect Impact Areas	In terms of biophysical impact: <ul style="list-style-type: none"> Barangays Tamontaka 3, RH VIII, RH IX, Capiton
	In terms of socio-cultural impact: <ul style="list-style-type: none"> Adjacent Barangay and Municipalities which will be benefited from the project. Neighbouring Municipalities may indirectly benefit from the project in terms of employment and business opportunities.



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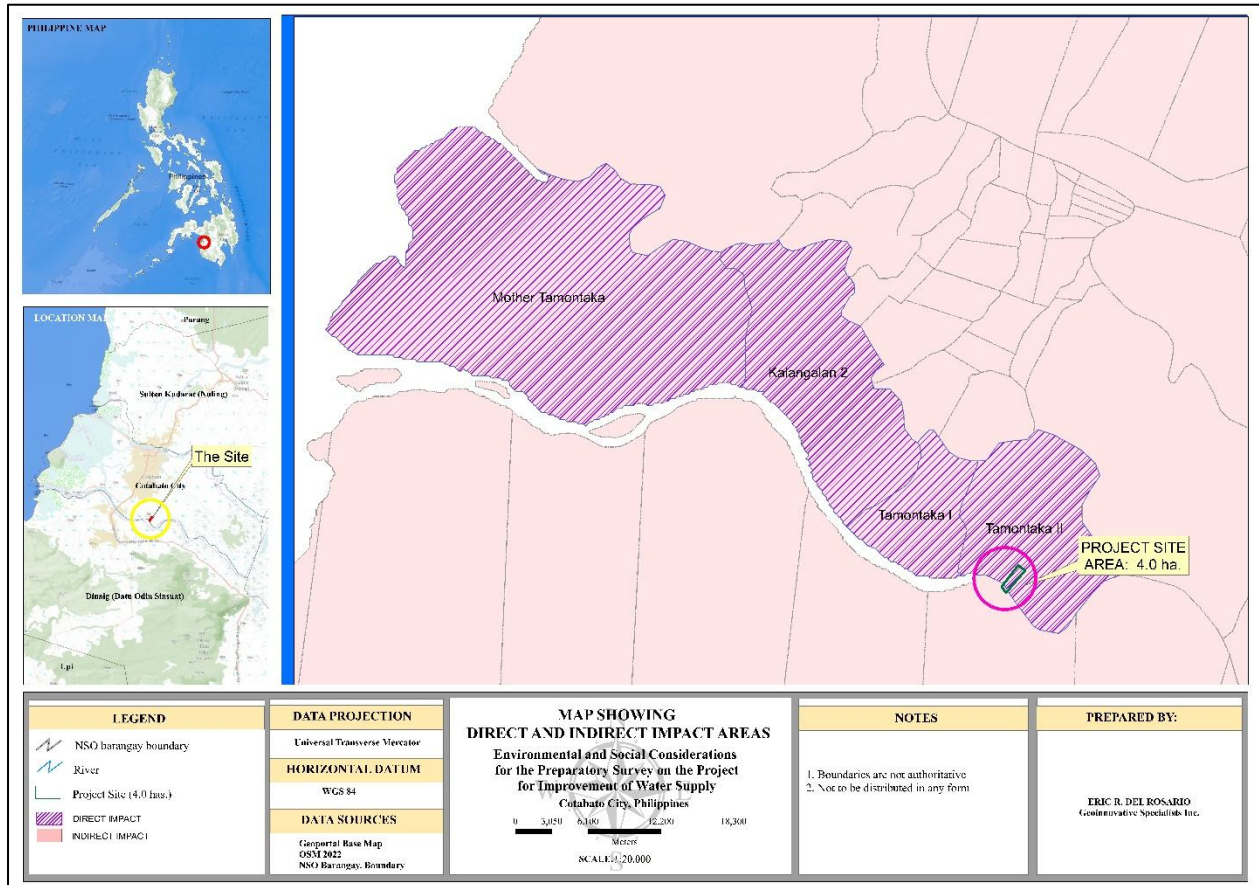


FIGURE 1.1-3 MAP SHOWING IMPACT AREAS OF THE PROJECT AREA



CHAPTER 2 PROJECT RATIONALE

The Metro Cotabato Water District (MCWD) derived its legal mandate to serve the populace from Presidential Decree No. 198, as amended, otherwise known as the Provincial Water Resources Act of 1973. The district was formed on October 12, 1976. On November 5, 1976, the Local Water Utilities Administrations issued the Certificate of Conformance No. 30 to the MCWD.

The district is committed to providing an adequate and affordable supply of potable water to all its concessionaires, attaining corporate viability, maintaining organizational efficiency, pursue technological dynamism and consciousness in environment protection to sustain a highly reliable system for the benefit of all stakeholders within its service area.

It serves 36 out of 37 barangays in the City of Cotabato, 10 barangays in Sultan Kudarat Municipality, and 7 barangays in Datu Odin Sinsuat Municipality, in the province of Maguindanao. It has a total of 41,686 active service connections, as of December 31, 2023¹.

The Project Proponent proposes to apply an ECC for the improvement of water supply project in Cotabato City, Philippines.

The project will expand safe and stable water supply services in Cotabato City through the construction of water supply facilities, thereby contributing to the development of the entire region to promote peace in Mindanao. The existing water purification plants are vulnerable to disasters, such as water cutoffs due to the inability to take water from branch rivers during floods, etc. Therefore, a water purification plant that takes water from the Tamontaka River, the trunk river, is highly necessary from the perspective of maintaining lifelines during disasters.

Directly, the project will support the economy of the host barangays and even that of the neighbouring barangays through the employment of local labour especially during the project construction and operation stage. Furthermore, due to the increase of workforce in the project sites, there will be an increase in demand for goods and services that results in the creation of indirect employment and livelihood. This can provide a wider range of employment opportunities not only for the locals but also potentially for workers from adjacent municipalities and the province.

Aside from the potential capacity of the Project to employ additional workforce, it can also benefit local government units in terms of revenues during operation. It can directly attract local and foreign investors who could provide additional earnings for the local government units.

¹ MCWD, Official Website



CHAPTER 3

PROJECT SIZE AND COMPONENTS

Shown on the tables below are the project components:

TABLE 3.1-1 MAJOR COMPONENTS OF THE PROJECT

Item	Specifications	Note
Intake Capacity	12,000 m ³ /day	Phase 1-1: 8,000 m ³ /day Phase 1-2: 4 000 m ³ /day
No. of Pumps	4 000 m ³ /day Submersible Pump 3 sets	Total head: 20m and 18.5 kW 2-duty and 1-standby (Standby pump will be used as a common for Phase 1-1 and Phase 1-2)
Space of Pump	For 4 sets	Space for four pumps will be reserved for future expansion. Phase 1-1: 3sets Phase 1-2: 1set
LWL	EL -1.1m	-0.5m from bottom of creek (EL-0.6m)
HWL	EL +2.2m	Clearance 1m from Embankment Height: L.3.2m
Additional Equipment	Crane & Roof etc.	
Conveyance Pipe Diameter	Phase 1-1: 350mm Phase 1-2: 250mm	

Footprint of Proposed Layout of Project Facilities

The proposed layout of the project is shown in **Figure 3.1-1** and **Figure 3.1-2**.



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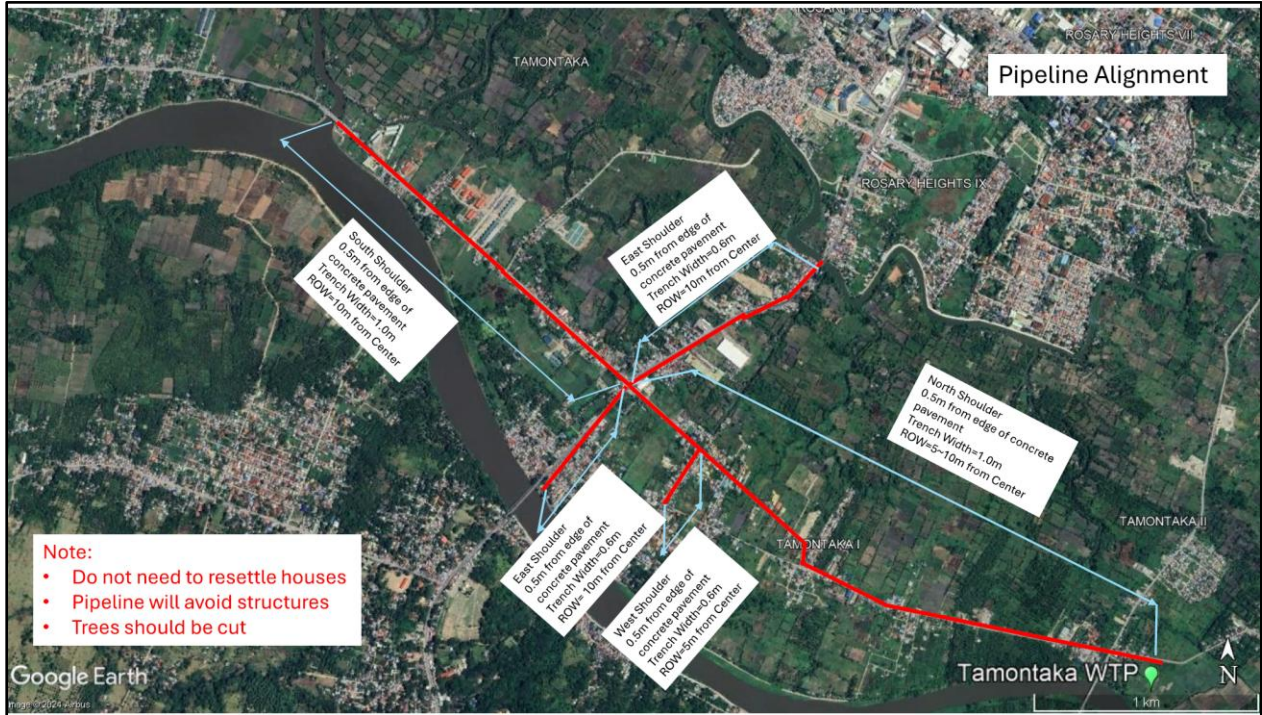


FIGURE 3.1-1 PROPOSED LAYOUT OF PROJECT TRANSMISSION AND DISTRIBUTION FACILITIES



FIGURE 3.1-2 PROPOSED LAYOUT OF PROJECT WATER TREATMENT FACILITIES



CHAPTER 4

DEVELOPMENT PLAN, DESCRIPTION OF PROJECT PHASES AND CORRESPONDING

Pre-construction

The pre-construction stage of the project involves preparation of preparatory plans and designs to determine the needed additional materials and equipment. This will include due diligence activity such as acquisition of local and national government permits and compliances and finding suitable project site.

Construction

During the construction stage all plans will be based on project detailed work plan as scheduled to consider all engineering plans and budgetary requirements.

Operation

The day-to-day operation will be the properly handled by competent managers and engineers and sub-contractors.

Decommissioning/Abandonment/Rehabilitation

The abandonment activities will involve dismantling of all equipment, disposal of chemicals and other structures. During this phase, all usable parts and materials will be utilized according to its appropriate use. Waste segregation will be employed in all aspects as part of the company's waste management program. All materials and equipment that can be utilized for other beneficial uses will be reused while the waste materials that have economic value will be sold as scraps. Residual wastes that cannot be reused will be recycled or will be properly disposed through a certified and accredited sanitary land fill. If appropriate, the land will be restored close to its original use or will be utilized for other uses that are consistent to the existing land use of the area during abandonment.



CHAPTER 5 MANPOWER

Construction Phase

TABLE 5.1-1 MANPOWER REQUIREMENT DURING CONSTRUCTION PHASE

Manpower Requirement	Expertise/Skills	Gender (F:M)	Total
20	Management and Supervisor	5:15	20
100	Skilled/non-skilled	20:80	100
15	Admin, Driver and Support Staff	10:5	15
50	Security	10:40	50
185	Total	45:140	185

Operation Phase

TABLE 5.1-2 MANPOWER REQUIREMENT DURING OPERATION PHASE

Manpower Requirement	Expertise/Skills	Gender (F:M)	Total
Administrative	Various	1:2	30
Customer Service	Various	2:1	10
Engineering/ Technical	Various	1:4	50
Security	Various	1:4	20
	Total		110



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CHAPTER 6 INDICATIVE PROJECT INVESTMENT COST

The indicative cost for this phase of the project is included in the original project cost which was utilized during the first phase of the project estimated at about **PHP 1.0 billion**.



CHAPTER 7

ANALYSIS OF KEY ENVIRONMENTAL IMPACT

The analysis of key environmental impacts on the different components (i.e. Land, Water, Air and People) was based on baseline characterization in the preparation of this EIA.

7.1 THE LAND

A. Methodology

Baseline assessment was undertaken through desktop review of existing information and gap analysis according to the EIA technical requirements. This is supplemented by field assessment and sampling for environmental parameters where gaps exist to establish current baseline conditions.

Existing maps for the parameters of topography, geology, soils and geohazards, were reviewed and utilized for spatial analysis. Related previous studies and other existing documentation were reviewed in relation to the proposed project area. Site visits were also done to document current/existing baseline conditions.

B. Land Use and Classification

B.1. Impact in Terms of Compatibility with Existing Land Use/ Land Cover

The impact of land use change resulting from the development of the Project is considered to be minimal, as the project area has been previously declared as compatible with the existing Land Use Plan of the City and can be subject to future redevelopment.

- **Existing Land Use**

Using the NAMRIA maps and data, the land use/ land cover of the project area is determined. Maps of NAMRIA are based on Satellite Images (Spot 5) taken in 2020 and validated in 2021. Based on the data gathered, the land use of the site is predominantly Residential with few patches dedicated for institutional purposes (**Figure 7.1-1**).

- **Existing Land Cover**

Based on land cover map from NAMRIA, the existing land cover of the Project site are primarily annual crops, built-up area, and perennial crops (**Figure 7.1-2**).

- **Mitigation**

The project area will be subjected to a land use change since the project site is agricultural, and built-up, which does not correspond to its intended purpose. As a mitigating measure, the proponent will maintain as much as possible the existing vegetation cover of the project area and conduct landscaping / rehabilitation of areas disturbed. Proper engineering designs will be implemented to ensure that the environmental impacts are manage and mitigated.



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B.2. Impact on compatibility with classification as an Environmentally Critical Area (ECA)

The project area is located within an Environmentally Critical Area (ECAs) according to the ECA Categories prescribed under the revised Guidelines for Coverage Screening and Standardized Requirement EMB Memorandum Circular 005 (July 2014). Among the categories, only one (1) potential hazard was confirmed based on NAMRIA hazard maps with classification as highly susceptible to flooding (**Please see Item 6 in Table 7.1-1**).

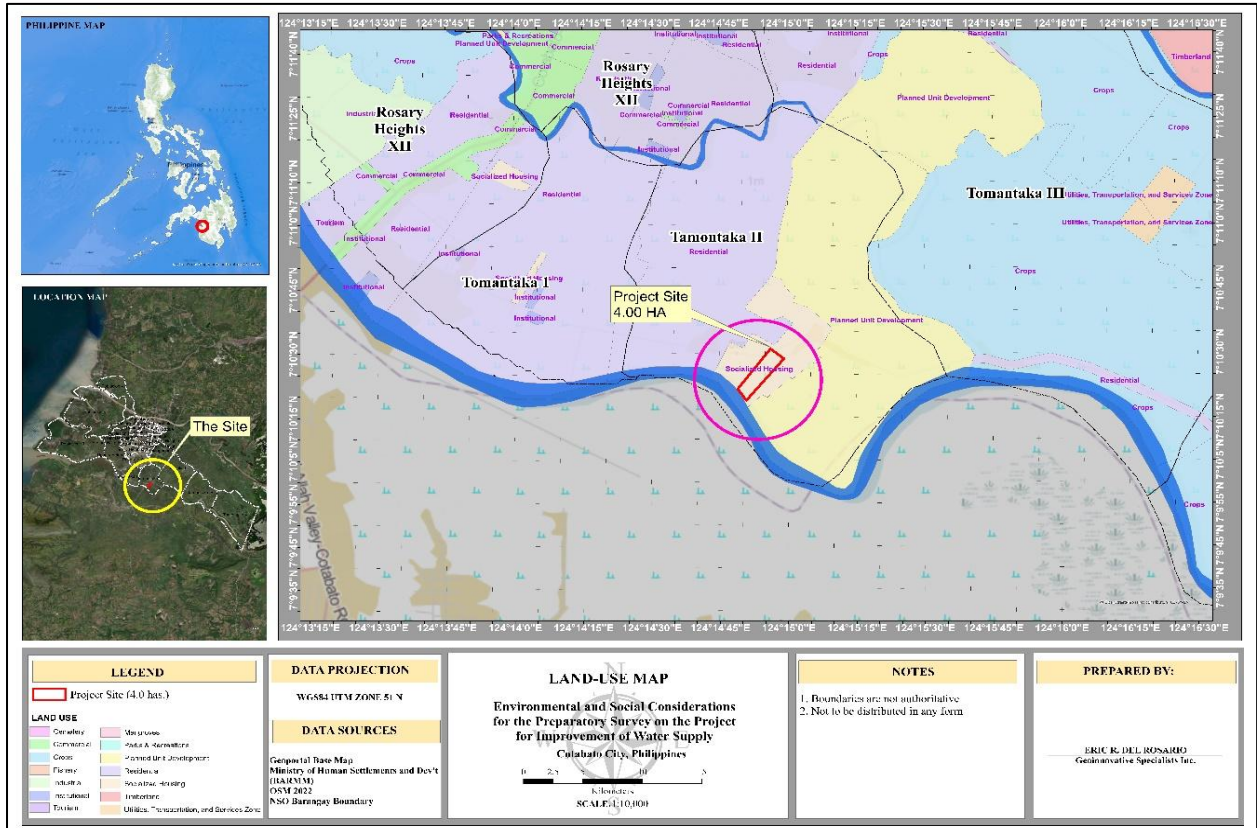


FIGURE 7.1- 1 LAND USE MAP OF THE PROJECT AREA



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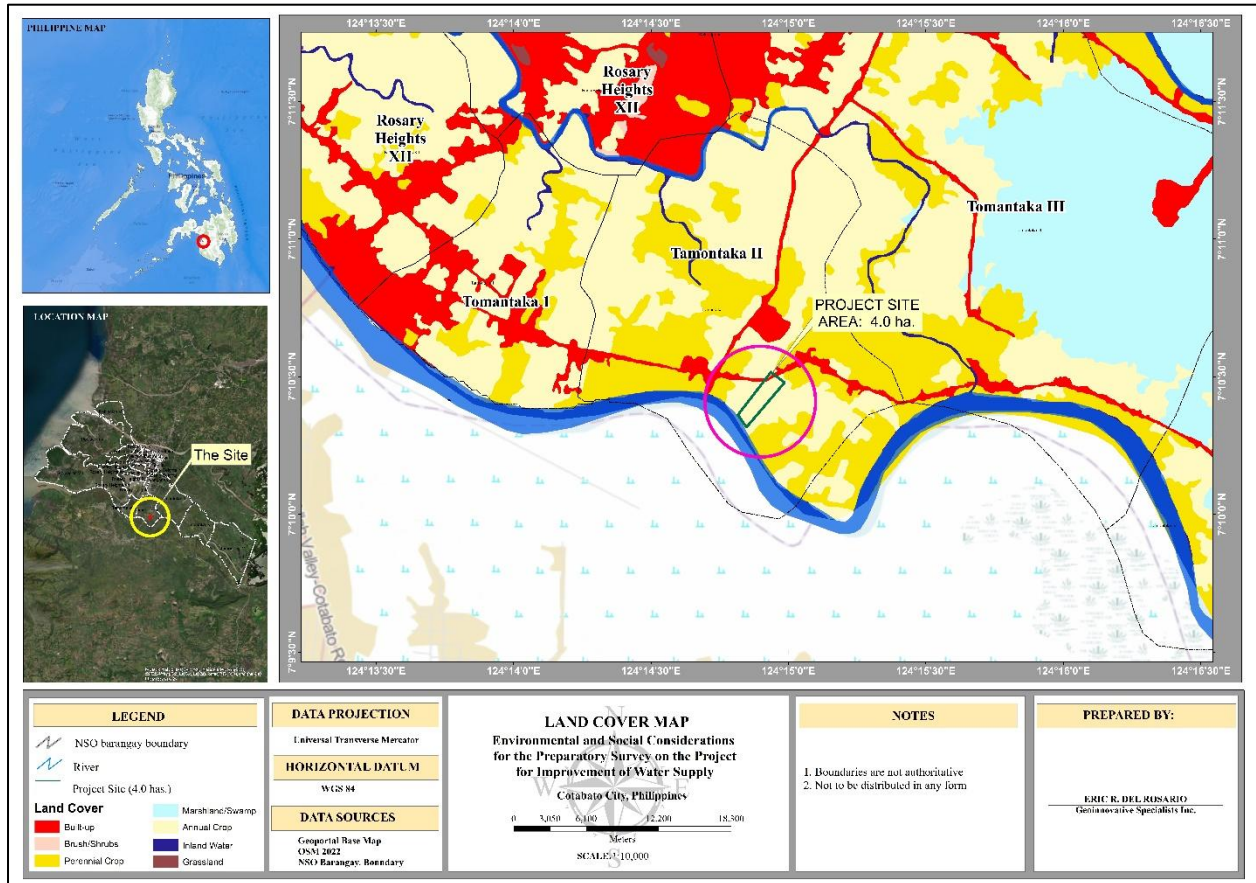


FIGURE 7.1-2 LAND COVER MAP OF THE PROJECT AREA

TABLE 7.1-1 ENVIRONMENTALLY CRITICAL AREAS

	ECA Category	Technical Description of ECA Category based on the Revised Guidelines for Coverage Screening and Standardized Requirement (EMB Memorandum Circular 005, July 2014)	Presence within the Project Area	Description
1	Areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries	<ul style="list-style-type: none"> Areas declared as such under Republic Act No. 7586 or the National Integrated Protected Areas System (NIPAS) Act. Areas declared as such through other issuances from pertinent national and local government agencies such as presidential proclamations and executive orders, local ordinances, and international commitments and declarations. 	None	Not applicable
2	Areas set aside as aesthetic, potential tourist spots	<ul style="list-style-type: none"> Aesthetic potential tourist spots declared and reserved by the Local Government Units (LGU), Department of Tourism (DOT) or other appropriate authorities for tourism development. 	None	Not applicable



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	ECA Category	Technical Description of ECA Category based on the Revised Guidelines for Coverage Screening and Standardized Requirement (EMB Memorandum Circular 005, July 2014)	Presence within the Project Area	Description
2	Areas set aside as aesthetic, potential tourist spots	<ul style="list-style-type: none"> Class 1 and 2 caves as cited in EMB MC 2014-004 and defined under DENR MC 2012-03 and significant caves as maybe determined by BMB and EMB. 	None	Not applicable
3	Areas that constitute the habitat of any endangered or threatened species of Philippine wildlife (flora and fauna)	<ul style="list-style-type: none"> Areas identified as key biodiversity areas (KBAs) by BMB, Areas declared as Local Conservation Areas (LCA) through issuances from pertinent national and local government agencies such as presidential proclamations and executive orders, local ordinances and international commitments and declarations. 	None	Not applicable
4	Areas of unique historic, archaeological, geological or scientific interest.	<ul style="list-style-type: none"> All areas declared as historic site under RA 10066 by the NHCP The whole barangay or municipality, as maybe applicable, where archaeological, paleontological and anthropological sites/reservations are located as proclaimed by the National Museum. The whole barangay or municipality, as maybe applicable, of cultural and scientific significance to the nation as recognized through national or local laws or ordinances (e.g., declared geological monuments and scientific research areas and areas with cultural heritage significance as declared by the LGUs or NCCA). 	None	Not applicable
5	Areas that are traditionally occupied by cultural communities or tribes	<ul style="list-style-type: none"> Areas issued Certificate of Ancestral Domain Title (CADT) or Certificate of Ancestral Land Title (CALT) by the National Commission on Indigenous Peoples (NCIP). Areas issued Certificate of Ancestral Domain Claim (CADC) or Certificate of 	None	Not applicable



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	ECA Category	Technical Description of ECA Category based on the Revised Guidelines for Coverage Screening and Standardized Requirement (EMB Memorandum Circular 005, July 2014)	Presence within the Project Area	Description
		Ancestral Land Claim (CALC) by the DENR. <ul style="list-style-type: none"> • Areas that are historically/traditionally occupied as ancestral lands or ancestral domains by indigenous communities as documented in reputable publications or certified by the NCIP 	None	Not applicable
6	Areas frequently visited and/or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.)	<ul style="list-style-type: none"> • The area shall be so characterized if any of the following conditions exist: <ul style="list-style-type: none"> - Geologic hazard areas: <ul style="list-style-type: none"> • Areas classified by the MGB as susceptible to landslide; • Areas identified as prone to land subsidence and ground settling; areas with sinkholes and sags as determined by the MGB or as certified by other competent authorities. - Flood-prone areas: <ul style="list-style-type: none"> • Areas with identified or classified by MGB or PAGASA as susceptible or prone to flood. - Areas frequently visited or hard-hit by typhoons: <ul style="list-style-type: none"> • For purposes of coverage depressions, storms and typhoons will be covered in the category. 	Yes	The province of Maguindanao has been classified as very low risk in terms of typhoon vulnerability by the joint DENR-Manila Observatory Study. The project site is classified as not susceptible to landslide. NAMRIA flood hazard maps indicate very high susceptibility to flooding



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	ECA Category	Technical Description of ECA Category based on the Revised Guidelines for Coverage Screening and Standardized Requirement (EMB Memorandum Circular 005, July 2014)	Presence within the Project Area	Description
6		<ul style="list-style-type: none"> • This shall refer to all provinces affected by a tropical cyclone in the past. - Areas prone to volcanic activities/earthquakes: <ul style="list-style-type: none"> • This refers to all areas identified by the Philippine Institute of Volcanology and Seismology (PHIVOLCS) as Permanent Danger Zone as well as areas delineated to be prone to pyroclastic flow hazard, lava flow hazard, lahar hazard and other volcanic hazard as found applicable per active volcano. • This refers to all areas identified by the PHIVOLCS to be transected by active faults and their corresponding recommended buffer zones, as well as areas delineated to be prone to ground shaking hazard, liquefaction hazard, earthquake-triggered landslide hazard and tsunami hazard. 		
7	Areas with critical slopes	<ul style="list-style-type: none"> • This shall refer to all lands with slopes of 50% or more as determined from the last official topographic map from NAMRIA. 	None	Not applicable
8	Areas classified as prime agricultural lands	<ul style="list-style-type: none"> • Prime agricultural lands shall refer to lands that can be used for various or specific agricultural activities and can provide optimum sustainable yield with a minimum of inputs and development costs as determined by the Department of Agriculture, National Irrigation Administration or concerned LGU through their zoning ordinance. 	None	Not Applicable
9	Recharge areas of aquifers	<ul style="list-style-type: none"> • Recharge areas of aquifers shall refer to sources of water replenishment where rainwater or seepage actually enters the aquifers. • Areas under this classification shall be limited to all local or non-national watersheds and geothermal reservations. 	None	Not applicable



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	ECA Category	Technical Description of ECA Category based on the Revised Guidelines for Coverage Screening and Standardized Requirement (EMB Memorandum Circular 005, July 2014)	Presence within the Project Area	Description
10	Water bodies	<ul style="list-style-type: none"> All natural water bodies (e.g. rivers, lakes, bays) that have been classified or not. 	None	Not applicable
11	Mangrove areas	<ul style="list-style-type: none"> Mangrove areas as mapped or identified by the DENR. 	None	Not applicable
12	Coral reefs	<ul style="list-style-type: none"> Coral Reefs as mapped or identified by DENR and/or DA-BFAR. 	None	Not applicable

Under Category 6, the location of the project area is not frequently visited and/or hard-hit by natural calamities (geologic hazards, typhoons, volcanic activity, etc.). The project area does not fall within the landslide susceptible areas defined by the MGB (Figure 7.1-3). Although, the project site has been classified as very high risk in terms of flood vulnerability. (Figure 7.1-4).

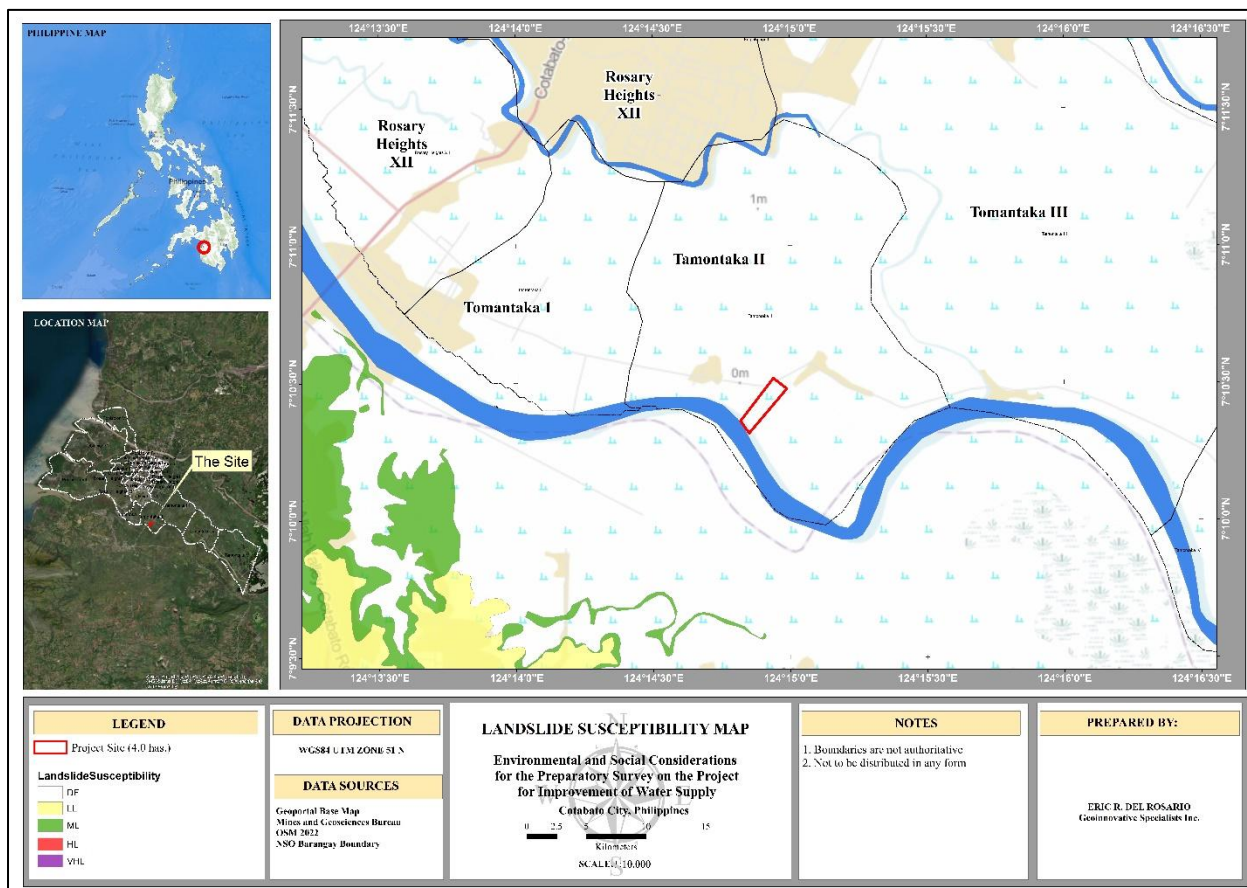


FIGURE 7.1-3 LANDSLIDE SUSCEPTIBLE MAP OF THE PROJECT AREA



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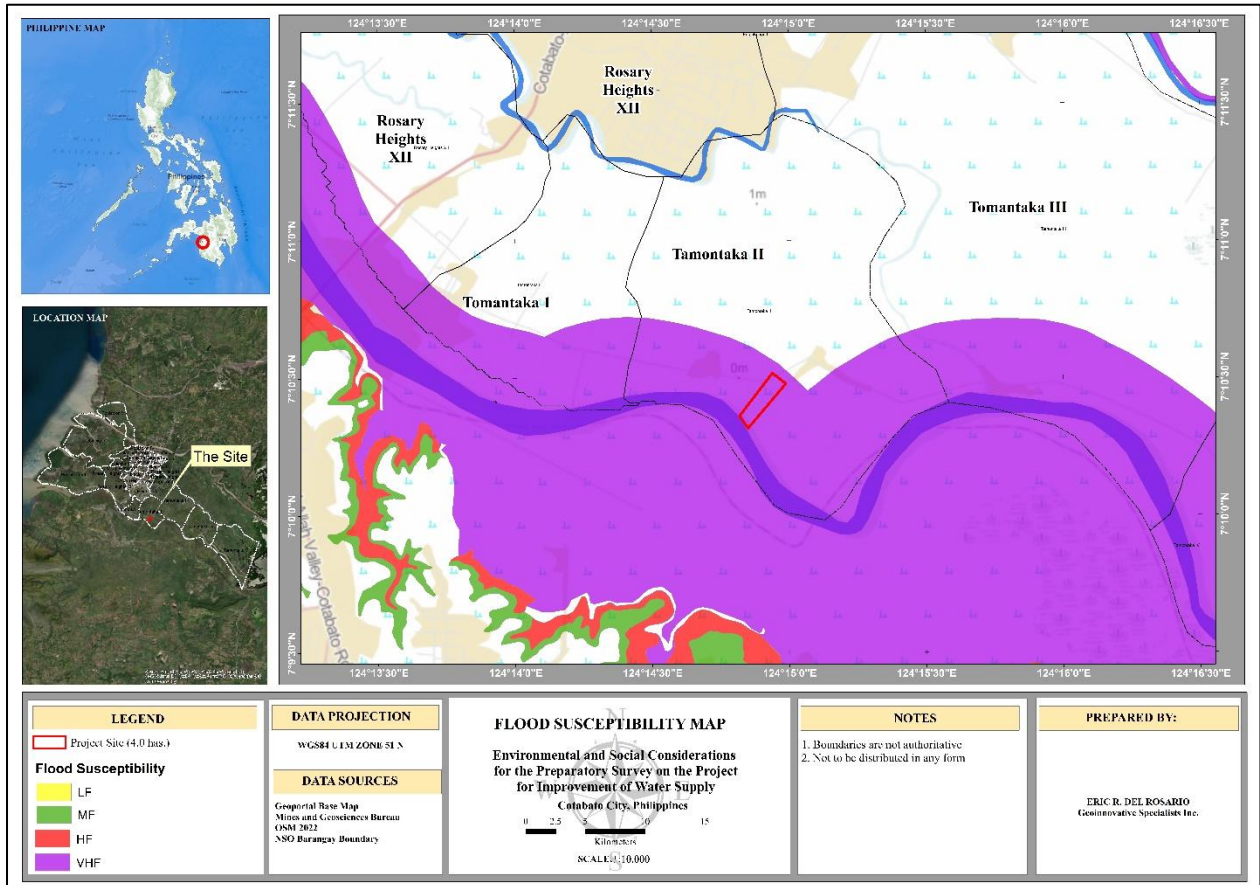


FIGURE 7.1-4 FLOOD SUSCEPTIBLE MAP OF THE PROJECT AREA

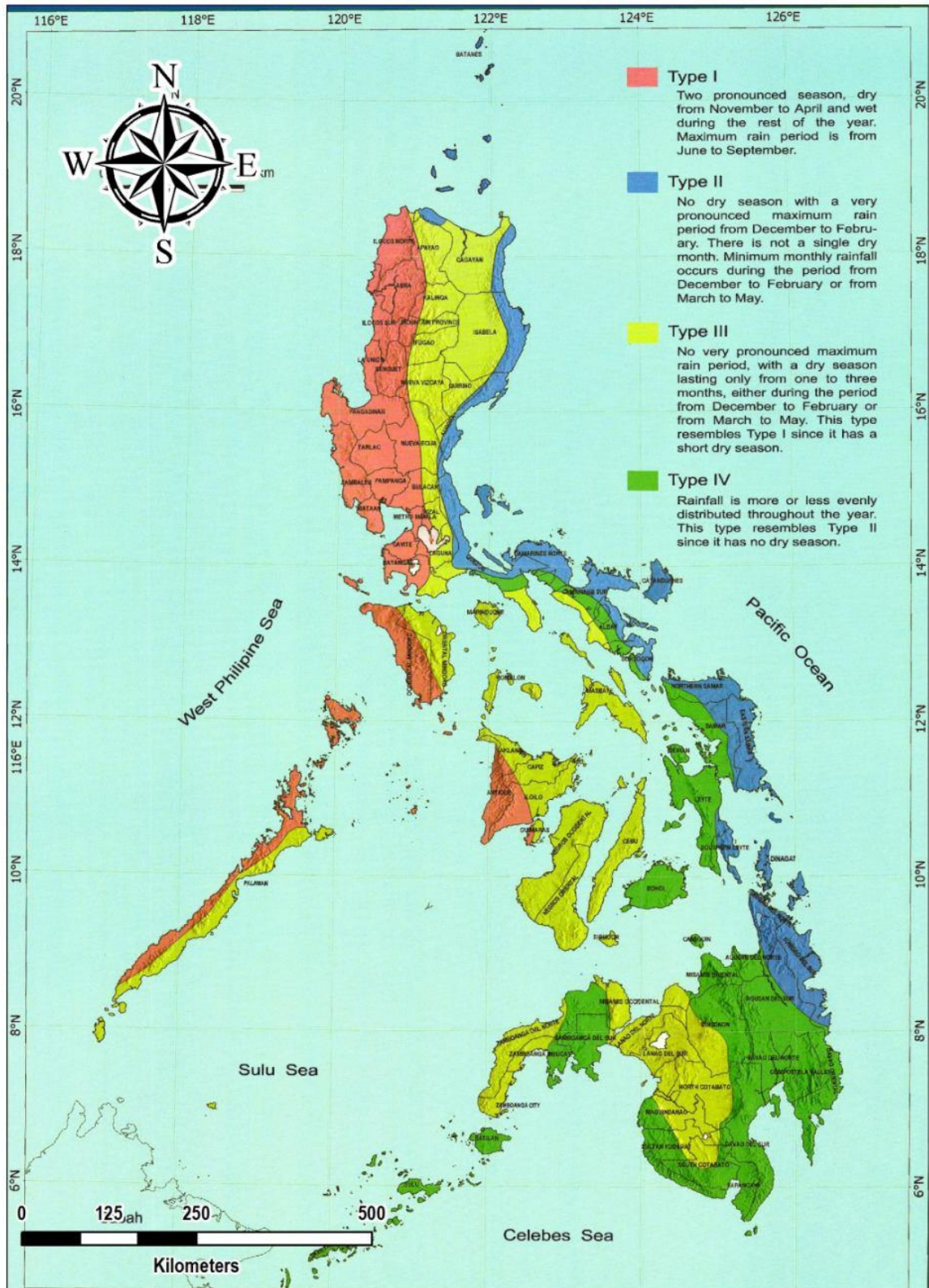
Likewise, Central Mindanao, where Maguindanao are part of, is classified by the PAGASA (2025) as rare to with no very pronounced maximum rain period (Type III) with dry season lasting only for a month (**Figure 7.1-5**). This explains that the area is less frequently traversed by passing typhoons, with a very low chance of being affected in a year (**Figure 7.1-5**). A study on Philippine Vulnerability to Environmental Disasters by the Joint Team of the Department of Environment and Natural Resources and Manila Observatory (2015) similarly classifies the Maguindanao Province as very low risk to passing typhoons (**Figure 7.1-6**).



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Horizontal Datum: GCS WGS 1984
Vertical Datum: Mean Sea Level
Units: Meters

FIGURE 7.1-5 PAGASA MODIFIED CORONAS CLIMATE CLASSIFICATION TYPE



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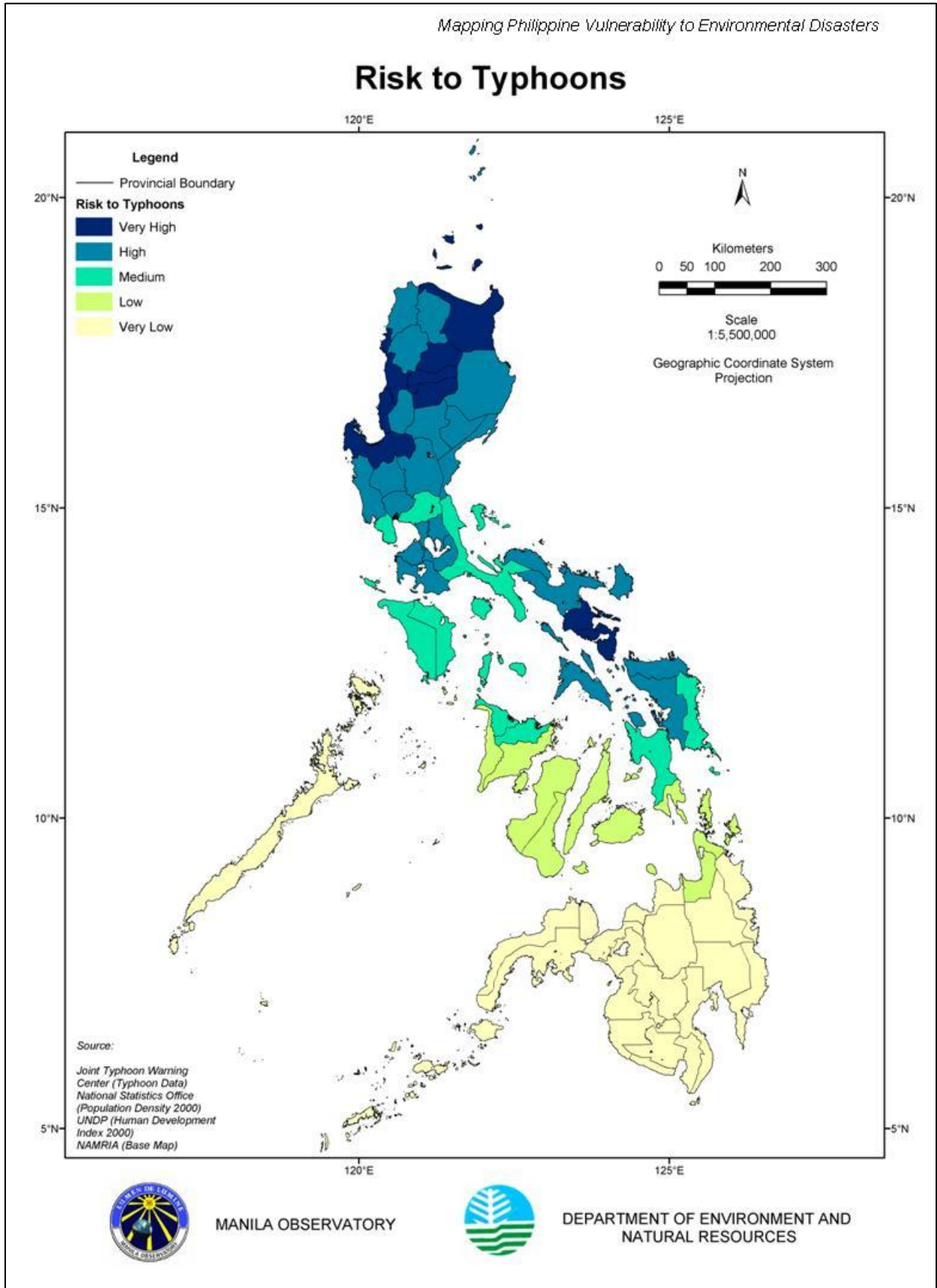


FIGURE 7.1-6 DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES (DENR) – MANILA OBSERVATION



B.3. Impact in Existing Land Tenure Issue/s

The Project area is not covered by Comprehensive Agrarian Reform Program (CARP), Mineral Production Sharing Agreement (MPSA), Certificate of Ancestral Domain Claim (CADC), Certificate of Ancestral Land Claim (CALC), Certificate of Land Title (CALT) or Certificate of Ancestral Domain Title (CADT) and other tenurial instruments that may restrict the proposed use of the project area. The proposed property has been identified to be under documented ownership and does not have any tenure issues. The 4-hectare proposed water treatment facility has been purchased by the MCWD for the sole purpose of establishing a water supply project facility.

C. Geology/Geomorphology

C.1. Change in Surface Landform/ Geomorphology Topography/ Terrain/ Slope

In case there will be any improvement, this may will result in the temporary change in topography and elevation of the project area. These changes in landform can be temporary and minimal if there are post-construction plans to transfer the excavated material to a different location, or permanent if these are to be indefinitely retained.

▪ **Existing Geomorphological Conditions**

In the Philippines, slopes are classified into different categories based on their steepness, which often impacts land use and classification. Areas with slopes of 18% or more are generally classified as forestlands, while those below 18% are considered alienable and disposable (A&D) lands. NAMRIA topographic and BSWM slope maps (**Figures 7.1-7**) define the topography as generally level to nearly level, with slope ranging from 0 to 3 percent. Slope conditions within the project site are mainly from flat to undulating. Slope classifications are breakdown as follows:

- **Level to nearly level:** 0-3% slope.
- **Gently sloping to undulating:** 3-8% slope.
- **Undulating to rolling:** 8-18% slope.
- **Rolling to moderately steep:** 18-30% slope.
- **Steep:** 30-50% slope.
- **Very steep:** Over 50% slope.

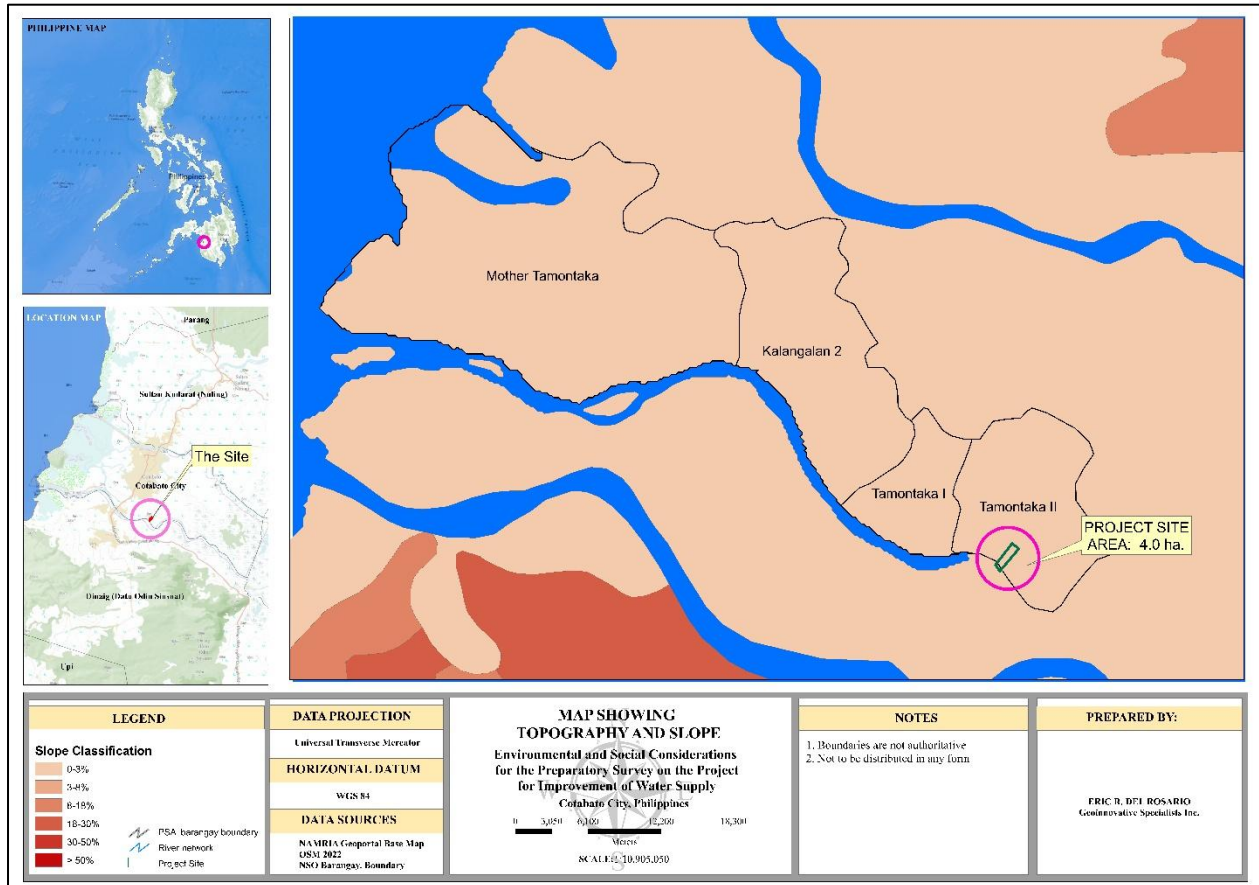


FIGURE 7.1-7 SLOPE MAP OF THE PROJECT AREA

- **Mitigation**

The surface disturbance from excavation, if any, for the site preparation is considered temporary and can only be mitigated by backfilling to original strata at the end of project life and rehabilitation/closure. Domes or hills developed from the stockpiling of excavation spoils will be maintained at safe slope grade to avoid siltation of sediments.

C.2. Change in Sub-Surface Geology

Any excavation for the site preparation and removal of the overburden will expose the upper subsurface of the soil and increased surface weathering and erosion in these particular areas.

- **Geologic Conditions**

The Project area is underlain by one (1) major rock unit which is considered Recent (**Figure 7.1-8**). The extensive formation is located practically in all surface of the Project site. The nearest active fault structure to the project locations in terms of aerial distance is the Cotabato Fault segment, located about 20 kilometres north-east of the project locations. Other active fault structures of significant distance are the Daguma Range (approx. 90 kilometres) (**Figure 7.1-9**).



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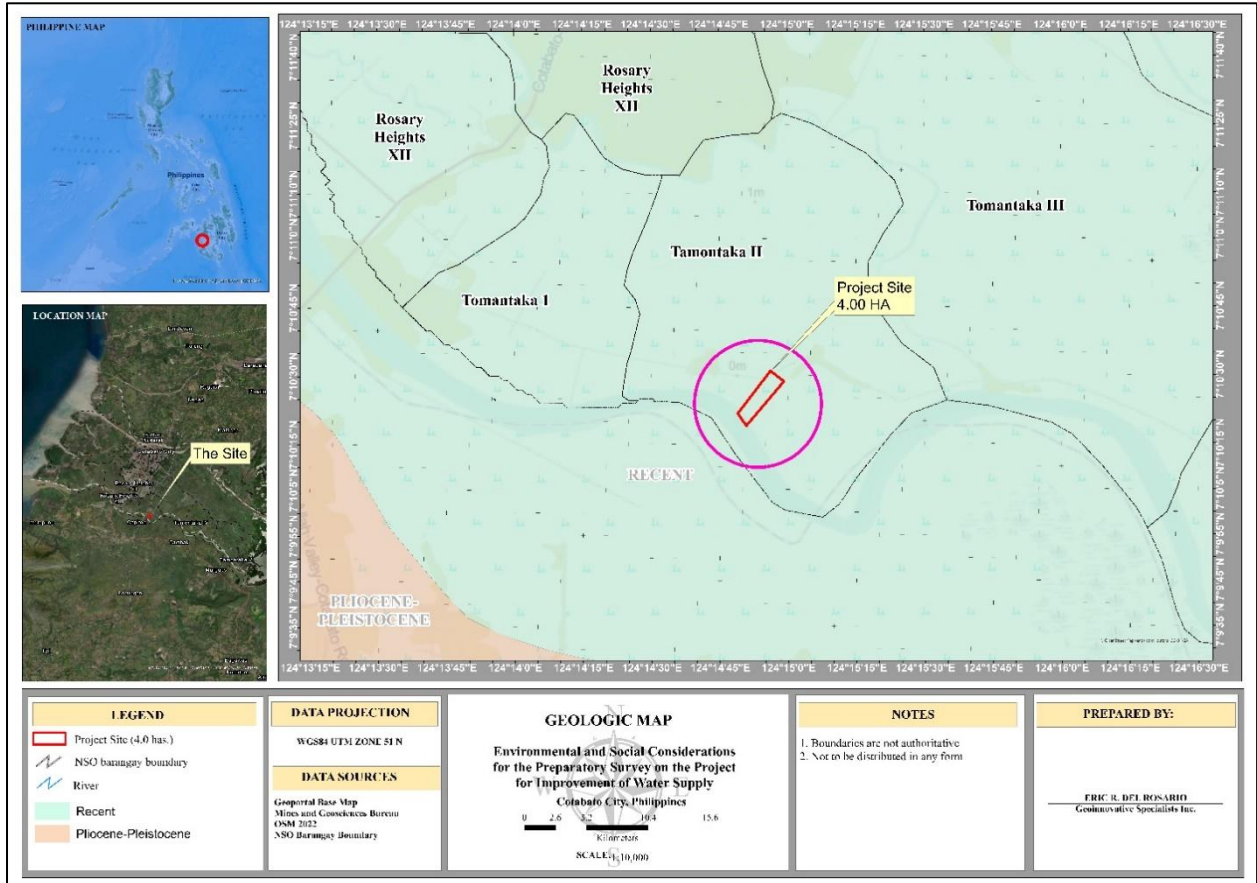


FIGURE 7.1-8 GEOLOGICAL MAP OF THE PHILIPPINES

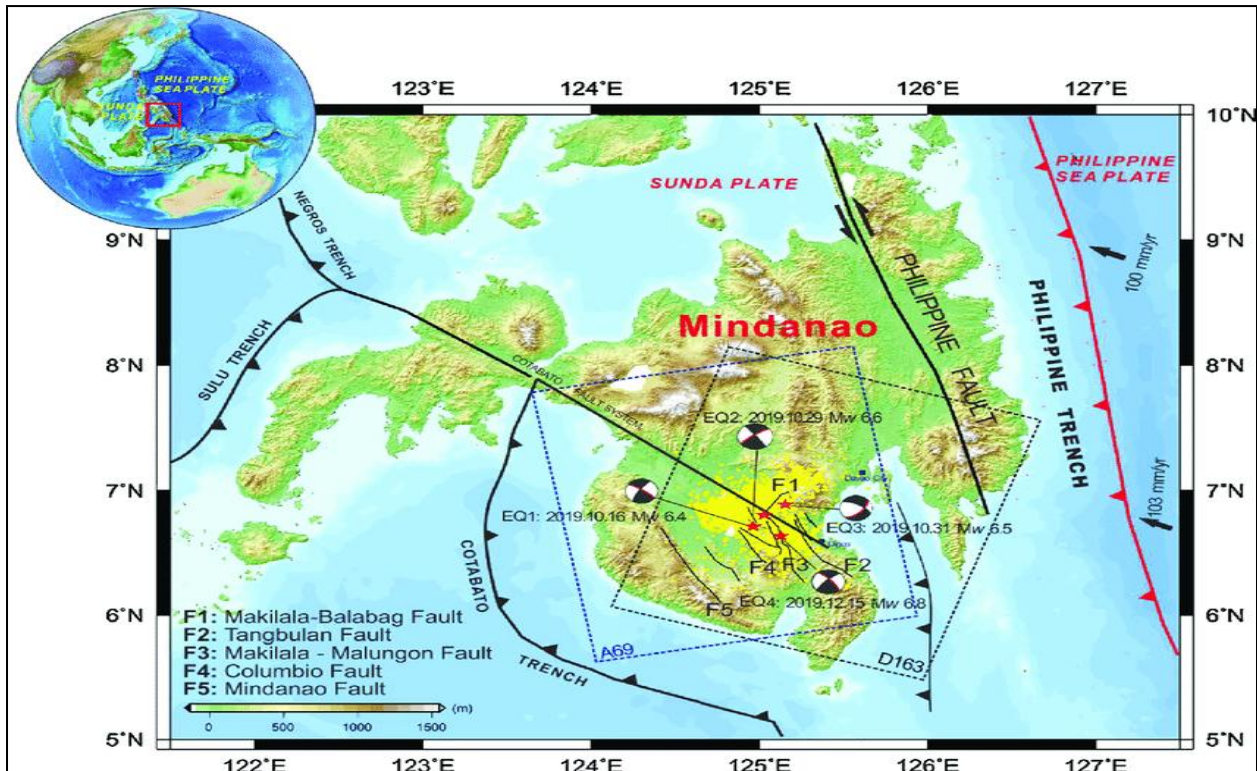


FIGURE 7.1-9 MAP SHOWING FAULT LINE NEAR THE PROJECT AREA
 (Source: Binguan Li et al., 2020)



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- **Mitigation**

Since the area is naturally built-up and agricultural, erosion is no longer an issue. The nearby stream is prone to such situation, still the bedrock is hard enough to withstand soil erosion. Also, the river channel is well vegetated. This can still be further enhanced with the placement of liners or concrete lining if necessary. Vegetation covers such as grass and small, crawling plants can also be planted on open and exposed ground to reduce the exposure to the weathering and erosion process.

D. Pedology

The soil classes within the Project derived from maps prepared by the Bureau of Soils and Water Management (BSWM) is presented in **Figure 7.1-10**. The Faraon Clay is the most prominent soil class to most of the project site and other vicinity.

D.1. Soil Erosion/Loss of Topsoil/Overburden

In summary, the excavation activities during the construction phase, if any, will result in the temporary loss of topsoil within the project footprint. The removed topsoil, if treated as excavation spoil temporary or permanently stored in spoil collection areas, will remain subject to wind and water erosion and further contribute to soil loss. Work areas surrounding the project footprint will also be subject to soil loss and erosion due to movement of heavy equipment and excavation activities.

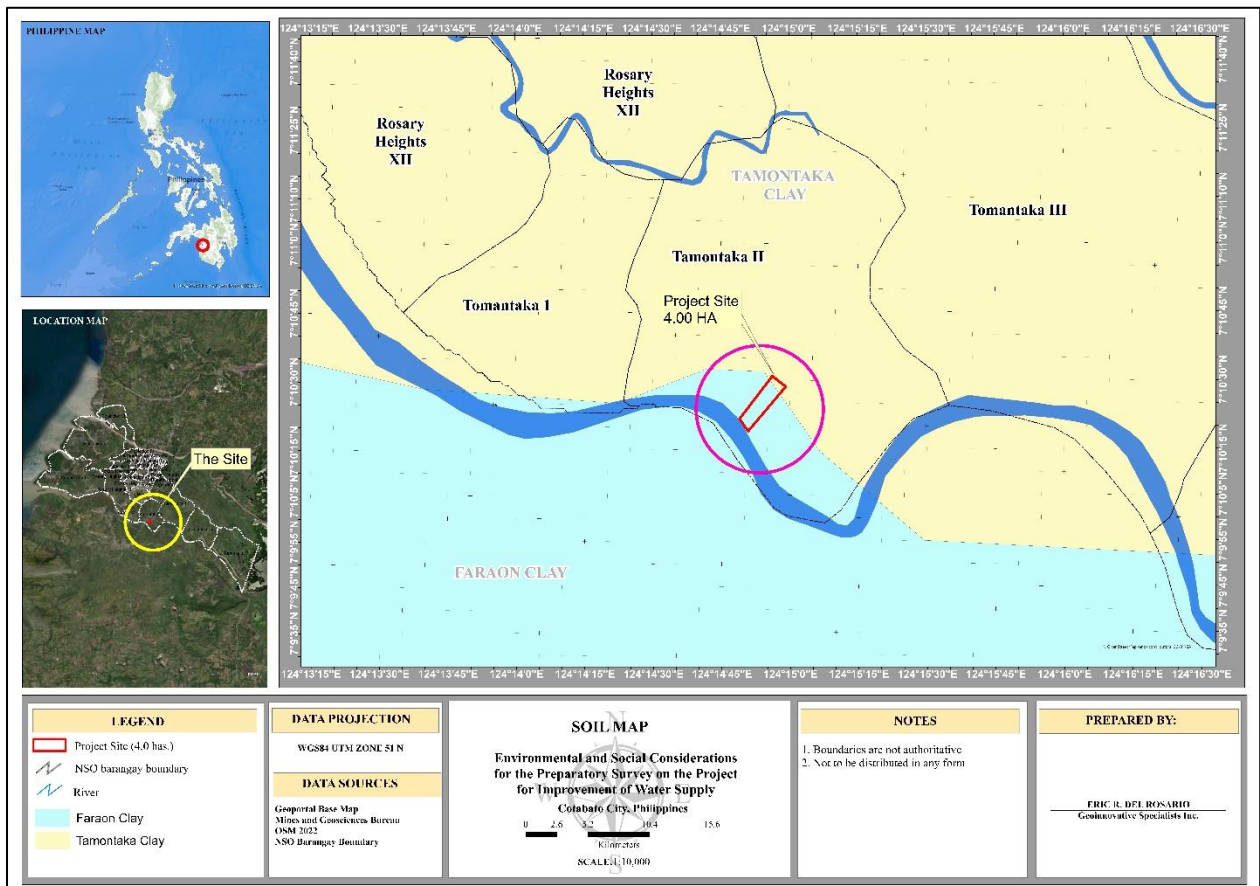


FIGURE 7.1-10 SOIL MAP OF THE PROJECT AREA



E. Terrestrial Biology

The study was conducted using the rapid terrestrial ecology assessment. Visual assessment was employed. Though the area is built up, there is an identified riparian ecosystem adjacent to the project site (**Figure 7.1-11**). The goals of this assessment:

The specific objectives of the study are:

- a) Perform flora and fauna field surveys as indicators of the current ecological condition in the project site;
- b) Describe existing ecological values in the project site that may potentially be affected by development;
 - Vegetation – vegetation types or communities, species inventory, local distribution, endemism and conservation status.
 - Wildlife – species inventory, general population status, habitat association, endemism and conservation status.
- c) Determine potential impacts of the Project to the ecological values of project site; and
- d) Recommend site specific measures to mitigate potential impacts to ecological values.

Before the actual field surveys were conducted, the terrestrial biology assessment reviewed the location of the project sites on map and conducted a reconnaissance survey on July 2024 to determine exact project locations on the ground and have a general picture of the wildlife and vegetation characterizing the project sites. Moreover, the following information were also considered and noted:

- NAMRIA Topographic maps;
- Land Use Map of the City of Cotabato; and
- Other published or unpublished related information pertaining to vegetation and wildlife in the project site.

The study site is predominantly Agricultural and built-up. Adjacent are the riparian environment where most of the assessment was conducted. Based on current vegetation cover and location, habitat conditions for vegetation and wildlife in the project sites could be described as fragmented.

E.1. Flora

The vegetation assessment was conducted to establish baseline vegetation conditions in the project site relating to species composition and structure, vegetation types or communities, endemism and conservation status. Obtained baseline vegetation condition was used to determine potential impacts of the project and enumerate appropriate mitigation measures. Specifically, the assessment analyzed the potential impacts of the project to floristic composition, existence of endemic and threatened species, and local abundance and distribution of native species.



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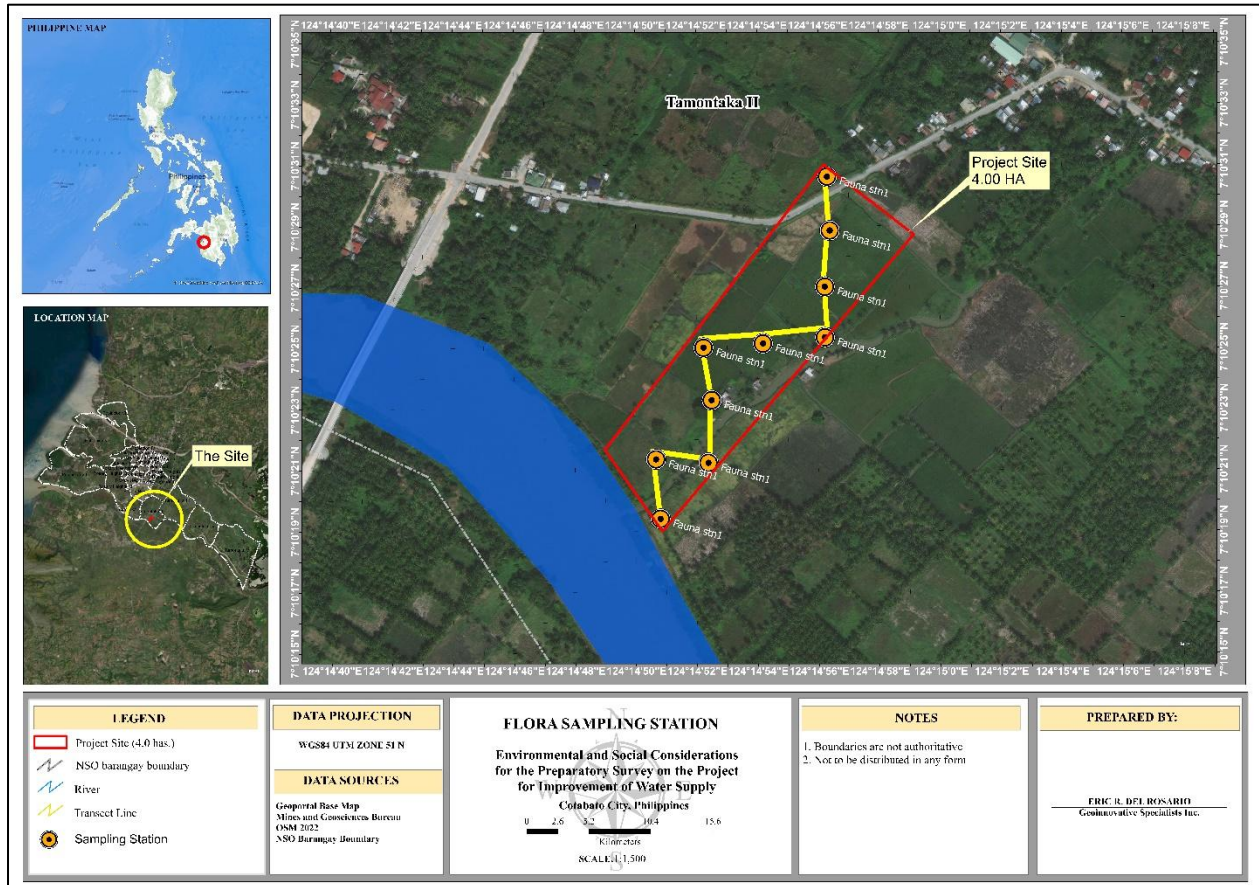


FIGURE 7.1-11 LOCATION OF FLORA SAMPLING STATIONS

The study utilized both primary and secondary data to characterize the vegetation at the project site. A transect survey and the establishment of ten (10) quadrats at 10 x 10 meters within the project site was conducted in July 2024. Identification and listing of vegetation were carried-out. The parameters assessed included cover, dominance, abundance, relative frequency, uses and economic relevance, endemicy and conservation status.

The study site is an existing crop land which is submerging to water due to the overflowing of the Tamontaka River. Based on current vegetation cover and location, habitat conditions for vegetation in the project sites could be described as fragmented with frequent anthropogenic activities.

i. Location of Flora Sampling Points

Ten quadrats were established in strategic areas of the project sites to represent various vegetation cover. A transect survey was conducted to include noticeable clumps of vegetation in the fishpond. **Table 7.1-2** presents the geographical locations of the vegetation quadrats and transect lines.

Figure 7.1-12 and **Figure 7.1-13** show the existing vegetation and/or land use during the time of the sampling on the survey area.



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TABLE 7.1-2 LOCATION AND GENERAL HABITAT OF VEGETATION

Sampling Station	Coordinates	Locality	General Habitat Description
Station 1	120° 33' 55.53 E 14° 41' 20.710 N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 2	120° 33' 55.47 E 14° 41' 13.390	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 3	120° 33' 55.63 E 14° 41' 6.280" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 4	120° 33' 59.45 E 14° 40' 44.670 N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 5	120° 34' 2.210" E 14° 40' 35.750" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 6	14° 40' 22.550" E 120° 34' 7.170" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 7	123°34'45.71" E 10°15'34.54" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 8	120°33'30.84 E 14°40'37.240" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango.



Sampling Station	Coordinates	Locality	General Habitat Description
			Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 9	120°33'35.70" E 14°40'35.230" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 10	120°33'41.58" E, 14°40'33.940" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.



FIGURE 7.1-12 VEGETATION IN THE PROJECT SITE

ii. **Flora Methods and Sampling Techniques**

Quadrat sampling

The standard sampling technique utilized for the assessment of the flora was the quadrat sampling method. Ten quadrats, each measuring 10 m x 10 m, were established representing the various vegetation cover. All samples/stems encountered within the quadrats including annual and perennial shrubs, grasses and legumes were identified to its corresponding taxon (i.e., species, genus, family). The abundance, or the number of individuals per species was also recorded.



FIGURE 7.1-13 QUADRAT SAMPLING ASSESSMENT

Transect survey

To include the other vegetation along the project site area, a supplemental transect line survey was conducted. Plant forms and species not encountered in the quadrats were included in this method. Similarly, all samples/stems encountered focusing on small trees and woody shrubs were identified to its corresponding taxon (i.e., species, genus, family).



FIGURE 7.1-14 TRANSECT SURVEY



Data analysis

• General Statistics and Biodiversity Indices

The different plant forms including trees, shrubs, grasses, herbs and legumes in the project site were assessed based on taxonomy (i.e., species, genus and family) and ecology (i.e., biodiversity indices). The quantitative measures of diversity and evenness of each species within the quadrats were calculated using Shannon's Diversity Index and Equitability Index formulas, Dominance were measured using the Berker Parker equation.

A total of 30 floral species were tabulated at the site represented by 1 species of herbs and fern, 7 species of grass, 2 species of vine, 1 palm, and 18 species of shrubs and trees. Listed in **Table 7.1-3** are their scientific, as well as, common names, the conservation status and the economic relevance and use. Generally, shrubs, weed, and fern, and some species encountered in the area were either under the category of least concern, not listed and not evaluated in the IUCN and not listed at all in DENR DAO2007-01 listing.

TABLE 7.1-3 SPECIES LISTING OF VEGETATION SURVEYED IN THE PROJECT SITE

	Common name	Scientific name	Family name	Life Form	IUCN Status	DENR DAO 2007-01
1	Himbabao	<i>Alleaenthus luzonica</i>	Moraceae	Tree	Not Listed	Not Listed
2	Tibig	<i>Ficus nota</i>	Moraceae	Tree	Not Listed	Not Listed
3	Tan-ag	<i>Kleinhovia hospita</i>	Sterculiaceae	Tree	Not Listed	Not Listed
4	Alim	<i>Melanolepis multiglandulosa</i>	Euphorbiaceae	Tree	Not Listed	Not Listed
5	Coconut	<i>Cocus nucifera</i>	Arecaceae	Palm	Not Listed	Not Listed
6	Lantana	<i>Lantana camara</i>	Verbenaceae	Herb	Not Listed	Not Listed
9	Kawayan tinik	<i>Bambus spinusa</i>	Poaceae	Grass	Not Listed	Not Listed
7	Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae	Tree	Not Listed	Not Listed
8	Mango	<i>Mangifera indica</i>	Moringaceae	Tree	Not Listed	Not Listed
9	Banana	<i>Musa sapientum</i>	Musaceae	Herb	Not Listed	Not Listed
10	Raintree	<i>Albizia saman</i>	Fabaceae	Tree	Not Listed	Not Listed
11	Hauli	<i>Ficus septica</i>	Moraceae	Tree	Not Listed	Not Listed
12	Pako	<i>Diplazium esculentum</i>	Athyriaceae	Fern	Not Listed	Not Listed
13	Takip kuhol	<i>Nephelium lappacium</i>	Sapindaceae	Tree	Not Listed	Not Listed



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	Common name	Scientific name	Family name	Life Form	IUCN Status	DENR DAO 2007-01
14	Kalios	<i>Streblus asper</i>	Moraceae	Tree	Not Listed	Not Listed
15	Cogon	<i>Imperata Cylindrica</i>	Poaceae	Grass	Not Listed	Not Listed
16	Indian lanutan	<i>Polyalthia longifolia</i>	Anonaceae	Tree	Not Listed	Not Listed
17	Talahib	<i>Saccharum spontaneum</i>	Poacea	Grass	Not Listed	Not Listed
18	Tambo	<i>Phragmites vulgaris</i>	Poaceae	Grass	Not Listed	Not Listed
19	Quiapo	<i>Pistia stratiotes</i>	Poaceae	Grass	Not Listed	Not Listed
20	Datiles	<i>Muntingia calabura</i>	Muntingiaceae	Tree	Not Listed	Not Listed
21	Malubago	<i>Hibiscus tiliaceus</i>	Malvaceae	Tree	Not Listed	Not Listed
22	Maize	<i>Zea maize</i>	Poaceae	Grass	Not Listed	Not Listed
24	Rice	<i>Oryza sativa</i>	Poaceae	Grass	Not Listed	Not Listed
25	Atsuete	<i>Bixa orellana</i>	Bixaceae	Tree	Not Listed	Not Listed
26	Lagolo	<i>Acrostichum aureum</i>	Pteridaceae	Fern	Not Listed	Not Listed
27	Cassava	<i>Manihot esculenta</i>	Euphorbiaceae	Shrub	Not Listed	Not Listed
28	Sweet Potato	<i>Ipomoeae batatas</i>	Convolvulaceae	Vine	Not Listed	Not Listed
29	Kangkong	<i>Ipomoeae aquatica</i>	Convolvulaceae	Vine	Not Listed	Not Listed
30	Narra	<i>Pterocarpus indicus ssp. indicus</i>	Fabaceae	Tree	Vulnerable	Vulnerable

Note: Based on International Union for Conservation of Nature (IUCN Red list), Near Threatened (NT)- A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future; Least Concern (LC) - A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category; Not Evaluated (NE) - A taxon is Not Evaluated when it has not yet been evaluated against the criteria but is in the Catalogue of Life

- Species Richness and Composition**

Table 7.1-4 shows a total of 2243 individuals surveyed along the established 10 quadrats belonging to 10 different families recorded.

TABLE 7.1-4 NUMBER OF SPECIES/INDIVIDUALS RECORDED

Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
Takip kuhol	3	8	9	10	0	0	0	0	0	0	30



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Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
Quiapo	1	0	0	2	17	7	0	3	0	0	32
Sweet potato	1	0	0	0	2	1	0	0	0	0	4
Tambo	0	5	1	0	5	1	0	0	0	0	12
Kangkong	7	13	7	0	0	0	0	2	0	0	29
Talahib	14	6	10	2	18	15	0	4	0	0	69
Narra	0	0	1	0	0	0	0	0	0	0	1
Malubago	0	0	0	0	0	0	1	0	1	1	3
Maize	0	0	0	0	0	0	1	0	1	0	2
Cogon	0	0	0	0	0	0	0	0	10 x 100	10 x 100	2000
Kawayan	0	0	0	0	0	0	2	0	1	3	6
Mango	0	0	0	0	0	0	0	0	1	0	1
Datiles	0	0	0	0	0	0	0	0	1	5	6
Lagolo	5	0	0	0	0	0	0	0	0	0	5
Ipil-ipil	0	0	0	0	0	0	0	0	2	10	12
Banana	0	0	0	0	0	0	3	0	2	5	10
Kalios	3	0	0	1	2	1	0	0	0	5	12
Pako	3	0	1	1	1	1	1	0	0	1	9
Total	32	32	29	16	45	26	8	9	1014	1030	2243

The dominant species came from the Family Poaceae (*Imperata Cylindrica*) which is a type of grass plant that covers the ground with considerable number. Shrubs and Ferns came second comprising to 11 different species, followed by Trees. families. Only 2 species of Fern was observed (*Lagolo and Pako*).

Table 7.1-5 shows the result of the computed diversity indices used for the analysis of the flora identified during the survey.

TABLE 7.1-5 DIVERSITY INDICES OF SURVEYED FLORA

Diversity Index	Quadrats/ Transect Line									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Number of Individuals	32	32	29	16	45	26	8	9	1014	1030
S - Number of Species	7	4	6	5	6	6	6	9	9	8
H	-0.3671	-0.2331	-0.233	-0.115	-0.1445	-0.0889	-0.0889	-0.2733	-0.2733	-0.2723
H' - Shannon	0.36713	0.23309	0.23303	0.11501	0.14447	0.08885	0.08885	0.27332	0.27332	0.26232
Hmax	1.60944	1.38629	1.60944	1.09861	1.38629	1.38629	1.38629	2.19722	2.19722	2.29523
E - equitability	0.22811	0.16814	0.14479	0.10469	0.10421	0.06409	0.06409	0.1244	0.1244	0.1046
D - Berger parker	0.0619	0.04332	0.05748	0.07847	0.03301	0.05776	0.05776	0.00217	0.00217	0.00226



E.2. Fauna

The fauna assessment was conducted to establish baseline data on wildlife assemblage and to describe existing ecological values they represent in the area. Moreover, the assessment was undertaken to determine potential impacts of the project to wildlife and provide site specific mitigation measures to the said impacts.

i. Location and General Description of the Project Site and Transect Lines/ Sampling Points

The study area is primarily a rice field and riparian community and is characterized as frequently submerged area in the brought by the overflowing of Tamontaka River. The study site is composed of vast vegetation of grasses and other riparian species at the time of assessment (**Figure 7.1-15**).



FIGURE 7.1-15 FAUNAL SURVEY

Line transects, point observations, bioacoustics, and interviews with the local residents conducted in the late afternoon of July 26, 2024 and early morning of July 27, 2024 revealed that bird species found in the area belong to grasslands and waterbirds categories. Site observation to assess the faunal resources within and vicinity of the project site was done through quadrat sampling, Cage traps, and opportunistic Transect survey. The transect line used in the Floral assessment was the same survey line established to conduct the faunal assessment. It started at the left side of the Barangay Road near the JICA (PS) location benchmark in Barangay Tamontaka II (**Figure 7.1-16**) following a south-west direction that bisects through the vast grass vegetation and adjacent to rice field areas.



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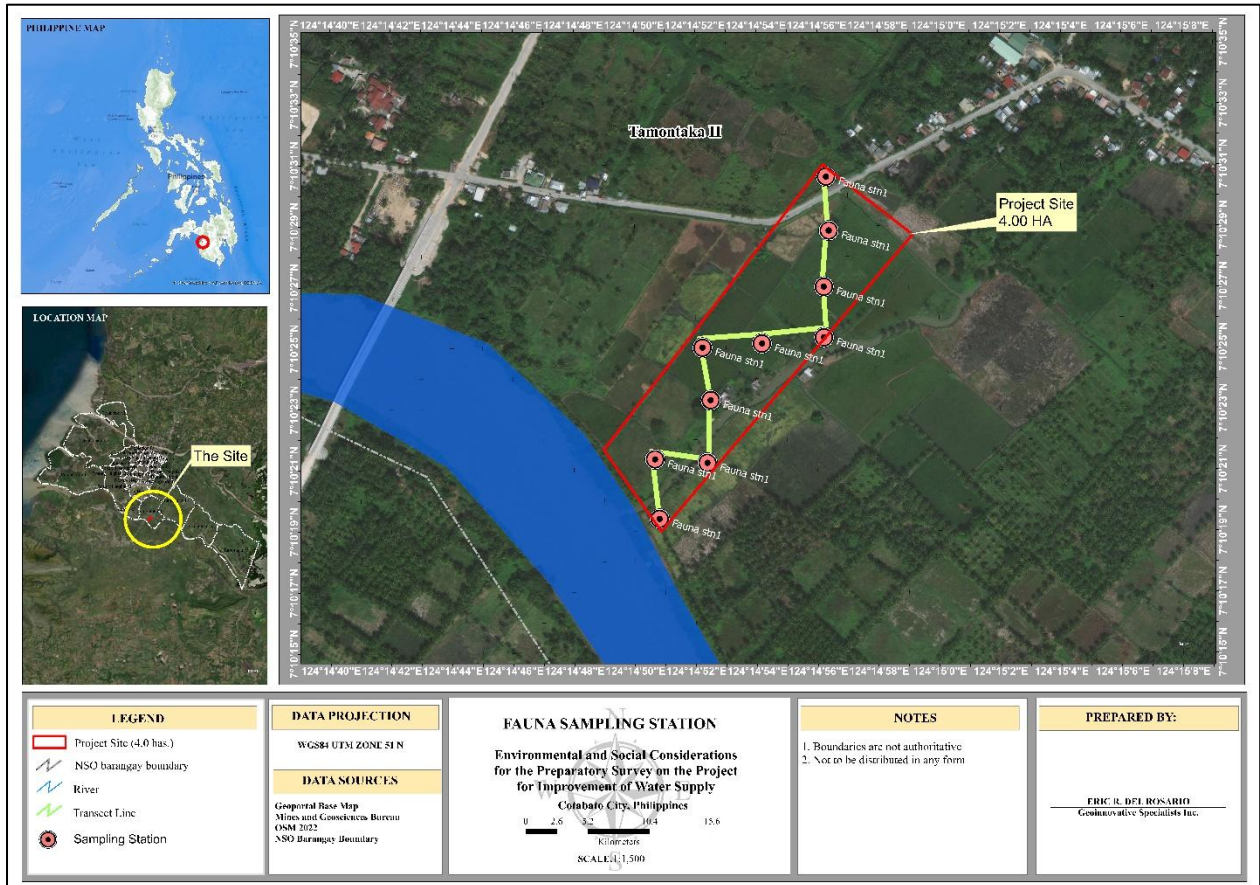


FIGURE 7.1-16 TRANSECT AND QUADRAT SAMPLING FOR FAUNAL ASSESSMENT

Table 7.1-6 below shows that one (1) bird species is categorized as Vulnerable based on the 2024 IUCN Red List of Threatened Species. The Philippine Duck is also listed as Vulnerable Species in the DENR Administrative Order No. 2019-09, *Establishing the List of Terrestrial Threatened Species and their Categories and the List of other Wildlife Species pursuant to Republic Act 9147 otherwise known as the Wildlife Resources Conservation and Protection Act of 2001*.

TABLE 7.1-6 ENDEMIC BIRD SPECIES AND IUCN 2016 CATEGORY

Species	Conservation Category
Philippine Coucal (<i>Centropus viridis</i>)	Least Concern
Collared Kingfisher (<i>Todiramphus chloris</i>)	Least Concern
Rufous Night-heron (<i>Nycticorax caledonicus</i>)	Least Concern
Philippine Duck (<i>Anas luzonica</i>)	Vulnerable
Cattle Egret (<i>Bubulcus ibis</i>)	Least Concern
Eurasian Tree Sparrow (<i>Passer montanus</i>)	Least Concern
Yellow-vented Bulbul (<i>Pycnonotus goiavier</i>)	Least Concern
Barred Rail (<i>Hypotaenidia torquata</i>)	Least Concern
Philippine Bush-warbler (<i>Horornis seebohmii</i>)	Least Concern



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FIGURE 7.1-17 COLLARED KINGFISHER FOUND IN THE PROJECT SITE



FIGURE 7.1-18 PHILIPPINE BUSH WARBLER FOUND IN THE PROJECT SITE

The project area, being marshy in nature, attracts birds as the area offers an abundant supply of food. It was found out that there are at least nine (9) species of birds in the area namely: (1) Philippine Coucal (*Centropus viridis*); (2) Collared Kingfisher (*Todiramphus chloris*); (3) Rufous Night-heron (*Nycticorax caledonicus*); (4) Philippine Duck (*Anas luzonica*); (5) Cattle Egret (*Bubulcus ibis*); (6) Eurasian Tree Sparrow (*Passer montanus*); (7) Yellow-vented Bulbul (*Pycnonotus goiavier*); (8) Barred Rail (*Hypotaenidia torquate*); and (9) Philippine Bush-warbler (*Horornis seebohmi*). The preceding table shows the actual bird count during the assessment.

TABLE 7.1-7 BIRD SPECIES SURVEYED IN THE PROJECT SITE WITH THEIR ECOLOGICAL IMPORTANCE VALUE

Species	Number			Freq.	RA	RF	IV
	Late Afternoon	Early Morning	Total				
(1) Cattle Egret (<i>Bubulcus ibis</i>)	45	60	105	2	0.27062	0.15385	0.42446
(2) Philippine Bush-warbler (<i>Horornis seebohmi</i>)	0	1	1	1	0.00258	0.07692	0.07950
(3) Philippine Coucal (<i>Centropus viridis</i>)	0	1	1	1	0.00258	0.07692	0.07950
(4) Eurasian Tree Sparrow (<i>Passer montanus</i>)	80	125	205	2	0.52835	0.15385	0.68220
(5) Yellow-vented Bulbul (<i>Pycnonotus goiavier</i>)	3	5	8	2	0.02062	0.15385	0.17446
(6) Collared Kingfisher (<i>Todiramphus chloris</i>)	1	0	1	1	0.00258	0.07692	0.07950
(7) Philippine Duck (<i>Anas luzonica</i>)	12	20	32	2	0.08247	0.15385	0.23632
(8) Barred Rail (<i>Hypotaenidia torquate</i>)	15	20	35	2	0.09021	0.15385	0.24405
(9) Rufous Night-heron (<i>Nycticorax caledonicus</i>)	0	2	2	1	0.00258	0.07692	0.07950
Total	156	234	390	13	1	1	2

Note: Freq. (Frequency), RA (Relative Abundance), RF (Relative Frequency), IV (Importance Value)

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Per individual counts, the most abundant species were the Eurasian Tree Sparrow and the Cattle Egrets. These types of species common in marshy areas and rice fields nationwide found gleaning or any other potential food found thereof.

ii. **Other Fauna**

• **Bats**

Mist nets installed in the early dusk of July 26, 2024 and removed in the dawn of July 27, 2024 captured 14 individuals of Hill Long-tongued Fruit Bat (*Macroglossus sobrinus*), a Least Concern species with a Stable population trend based on 2016 IUCN List. It is found in secondary habitats and old fruit orchards, villages, and banana plantations. It is commonly associated with human settlements under the roof of houses (Bates and Harrison 1997). **Figure 7.1-19** shows the Bat species captured and released during the study.



FIGURE 7.1-19 HILL LONG-TONGUED FRUIT BATS FOUND IN THE PROJECT SITE



FIGURE 7.1-20 MIST NETS TRAPS INSTALLED DURING ASSESSMENT

• **Murids**

Cage traps were installed in the site using burnt coconut as baits. Unfortunately, the trapped murids were able to escape the cage traps primarily because these murids have grown enough in size. It is



suspected that they belong to the species of Ricefield Rat (*Rattus argentiventer*) considering the ecosystem of the area. This species is categorized as a Least Concern species based on the IUCN List.

- **Reptiles and Amphibians**

Interviews with the local people in the area revealed that there are sightings of the critically endangered Philippine crocodile (*Crocodylus mindorensis*) not inside the project site but in general within the whole Liguasan Marsh, at a distance of more than 50 kilometers from the site. This is due to the proximity of the project site to Liguasan Marsh, a known habitat and geographic range of the species based on IUCN May 2012 assessment. Although mentioned by our local guide, this does not mean that a crocodile of such species is present in the actual project site. It is only assumed that crocodiles may be present because the Tamontaka River is one of the tributaries of the Liguasan Marsh. This also proves that the project has no direct impact to these vulnerable species.

Local folklore in the area is that, mentioning its name attracts them, which validates the presence of the species in the area.

Another species of reptiles reported by the local people is the Common Water Monitor (*Varanus salvator*), a Least Concern species that thrives in a wide range of ecosystems, from forests to mangroves, agricultural areas, shrubland and wetlands. Other probable wildlife mentioned by locals are listed in **Table 7.1-8**.

TABLE 7.1-8 LIST OF OTHER PROBABLE WILDLIFE SPECIES IN THE PROJECT SITE

Species	English Name	Distribution	IUCN Status	DAO 2019-09
Herpeto-Fauna				
<i>Phyton reticulates*</i>	Reticulated phyton	Widespread	Least Concerned	Other Threatened Species
<i>Varanus spp.*</i>	Monitor lizard	Widespread	Least Concerned	Not Included
<i>Gecko gecko*</i>	Common Tockay Gecko	Widespread	Not Evaluated	Other Threatened Species
<i>Lamprolepis spp*</i>	Tree Skink	Widespread	Not Evaluated	Not Included
<i>Rhinella marina*</i>	Marine Toad	Global	Least Concerned	Not Included
Non-Flying Mammals				
<i>Rattus tanezumi**</i>	Oriental House Rat	Widespread	Least Concerned	Not Included
<i>Suncus murinus**</i>	Asian house shrew	Widespread	Least Concerned	Not Included
<i>Musmu sculus**</i>	House Mouse	Widespread	Not Evaluated	Not Included

Notes: *Secondary data and Ethno-biological interview; **probability of occurrence"

- **Insects**

Transect walks, observations, acoustics and light traps were used to record the insect species in the area. **Table 7.1-9** below shows that there are at least nine (9) Orders of Insects found in the area. **Figure 7.1-21** shows the collected insects during field assessment.



TABLE 7.1-9 INSECTS FOUND IN PROJECT SITE

Order	Species	IUCN Status	DAO 2019-09
Hemiptera	Cicads	Not Evaluated	Not Included
Lepidoptera	Moths and butterflies	Not Evaluated	Not Included
Coleoptera	Beetles	Not Evaluated	Not Included
Hymenoptera	Bees and wasps	Not Evaluated	Not Included
Diptera	Flies	Not Evaluated	Not Included
Araneae	Spiders	Not Evaluated	Not Included
Blattodea	Cockroaches and termites	Not Evaluated	Not Included
Orthoptera	Grasshoppers, locusts, and crickets	Not Evaluated	Not Included
Odonata	Dragonflies	Not Evaluated	Not Included

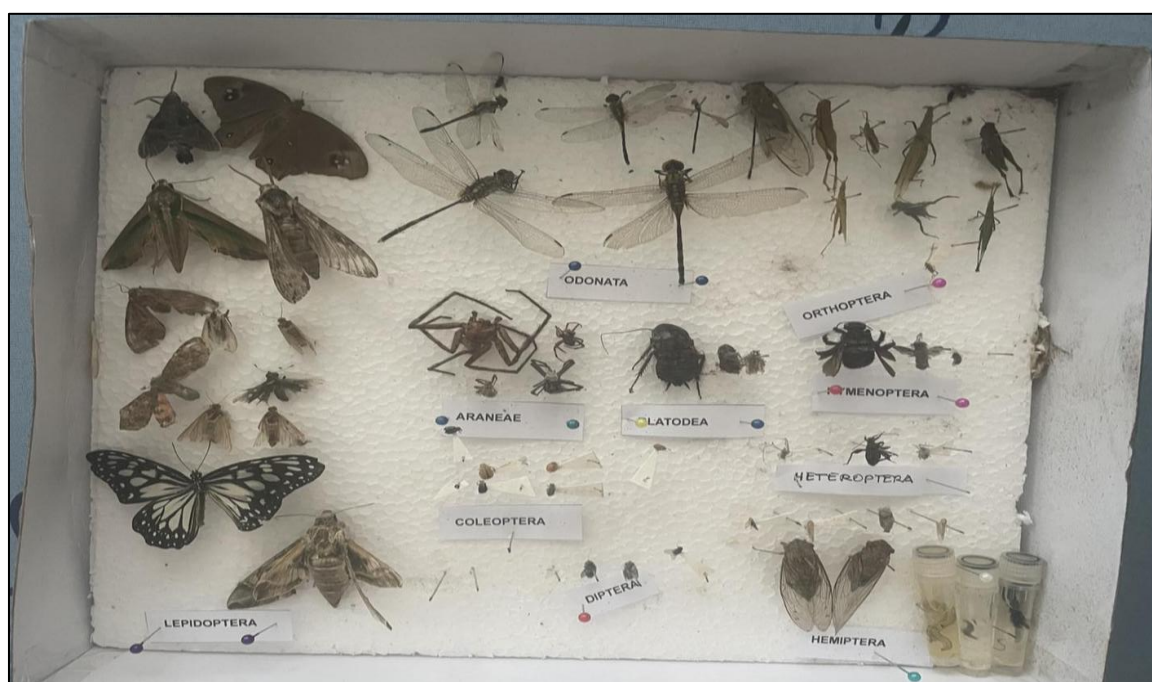


FIGURE 7.1-21 COLLECTED SPECIMENS OF THE CLASS INSECTA DURING THE FIELD ASSESSMENT

- **Impacts**

The project site has a total area of approximately 4 ha. To allow for project developments, the same area may potentially be subjected to vegetation removal. Vegetation assessment results showed that the project site (given its location and past disturbances) is already fragmented in terms of habitat condition due to previous current land use and tenurial purposes.

- **Mitigation**

To limit and contain vegetation removal, delineation of the development area would be performed on both plans and on the ground. Prior to development, collection of seeds and/or wildlings of endemic and/or threatened plant species would be conducted to transfer and/or out-plant them outside the project sites. This will ensure that the species will continue to thrive in the surrounding areas of the project sites. Projected impacts of vegetation removal to land cover and wildlife in terms of habitat loss and/or reduction are very minimal and short-term (limited during the construction



phase and regeneration period). Vegetation types or communities that may be affected are readily and commonly available in the surrounding areas. MCWD will secure the necessary tree cutting permits from DENR and follow conditions set forth therein.

iii. Threat to existence and/or loss of important local species

• **Protected Vegetation Communities in the Project Site**

As mentioned above, Narra trees (*Pterocarpus indicus forma indicus*) are considered to be included among the vulnerable plant species because of the ecological and economic uses it can provide. The laws with provisions for the general protection and conservation of riparian ecosystems include the Fisheries Code, the Forestry Reform Code, the National Integrated Protected Area System Act and the Wildlife Conservation and Protection Act. A provision in the National Internal Revenue Code (Republic Act 7161), which amends certain provisions of the Forestry Reform Code, actually provides for the express prohibition on the cutting of all species of Narra, without distinction or qualification.

• **Endemic Species**

The project site as described previously is already fragmented in terms of habitat condition since there is evidence of frequent intrusion activities. They are continually exposed to various anthropogenic disturbances which restrict endemic species to flourish. There are no endemic species observed during the survey of both flora and fauna. Philippine endemics are species in which their distribution range is confined or limited only in the country.

• **Threatened Species**

There One vulnerable species (Philippine Duck (*Anas luzonica*)) based on IUCN Red List of Threatened Species (2016) was recorded in the project site. The species is known to flock in groups with around 32 individuals observed during the survey. This type of species is highly migratory and a native of Southeast and East Asia Countries. There were no threatened species based on DAO 2007-01 List of Threatened Wildlife and Plant Species.

• **Mitigation**

Potential impacts to wildlife in terms of habitat loss and/or reduction are very minimal and temporary. Vegetation types recorded are readily and commonly available in the surrounding areas. This condition would allow species to transfer or migrate to nearby similar habitats.

Progressive vegetation removal should be undertaken at the project site. This is to allow collection of seeds and/or wildlings of endemic and/or threatened plant species for transfer and/or out-planting outside the project sites. Tree cutting permits should be requested to determine the appropriate action on tree vegetation. In case cutting is prohibited; a perimeter fence should be constructed to delimit the area from destruction or further degrading human activities. Lastly, potential impacts to wildlife in terms of habitat loss and/or reduction are very minimal and temporary.

iv. Threat to abundance, frequency and distribution of important species

Removal of vegetation could affect not only endemic and/or threatened species but also other native plants and wildlife in terms of their local abundance, frequency and distribution. Some native plants and wildlife may not be currently categorized as Threatened but may locally be limited in abundance, frequency and distribution. Project development may potentially contribute to the further decline of these plants and wildlife



in the local setting. In addition, removal of the vegetation could affect the people who are economically dependent on the certain important species.

- **Mitigation**

The proposed project development activities are confined and very limited in the area. Moreover, all species recorded are already accustomed or adapted to the current condition of their habitats found within and the immediate vicinity of the project site. This means that individual species that compose a vegetation type could easily be propagated and out planted or similar areas with the same assemblage are readily available to serve as replacement/s for affected portion. All recorded vegetation types or communities are also available in the surrounding areas which mean that wildlife could easily transfer/migrate to said areas. Thus, vegetation removal as a threat to local abundance, frequency and distribution of native species is very unlikely.

v. Hindrance to wildlife access

The interior area which will be designated as the stockpile area is already open and with less vegetative cover. Although bird species are gleaning on such site, it is only temporary and occasional depending on the presence of humans. No impact can be attributed whatsoever since they can transfer from nearby areas with similar habitat.

E.3. Threat to Existence and/or Loss of Important Local Species

- **Protected Vegetation Communities in the Project Site**

There are no protected vegetation communities within the project site based on PD 705, RA 7586 and the CLUP of the host City government. Nearest protected areas (**Figure 7.1-22**) such as the Mt. Piaganungan National Park are far from the project site to have significant effects.



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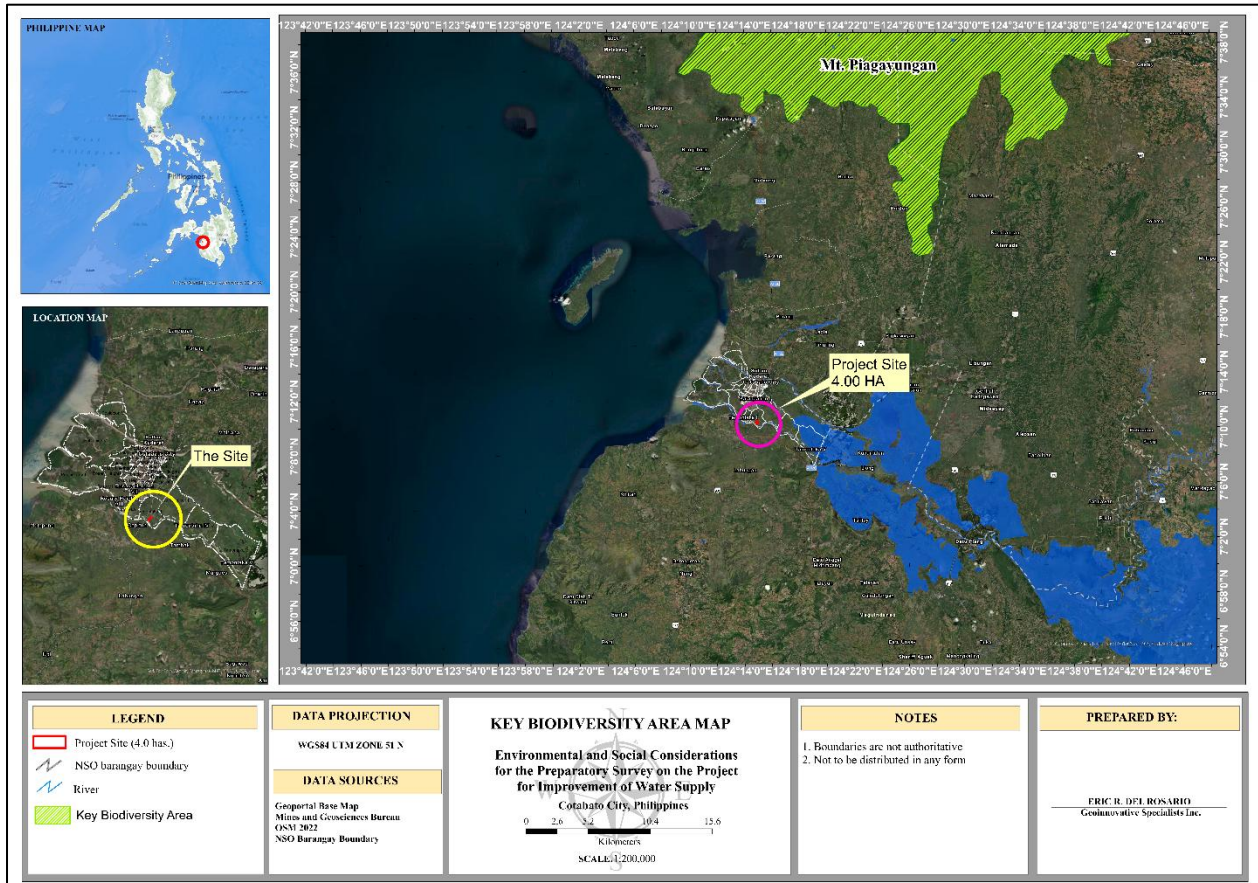


FIGURE 7.1-22 PROTECTED AREA MAP OF THE PROJECT AREA

7.2 THE WATER

A. Oceanography

The project will not have any impact on the coastal ecosystem.

B. Water Quality

- **Water Sampling Analysis**

The water quality tests were conducted by an independent third-party environmental laboratory accredited by MENRE-BARMM.

- **Method of Sampling**

Water sampling was conducted on April 25, 2024. Sampling was done by employing grab sampling. This was conducted by directly collecting samples of effluents produced by the equipment. Collected samples were ice-chilled (approximately 4°C) and were immediately transported to the laboratory.

- **Sampling Sites**

A total of 3 sampling stations were established within and around the vicinity of the project area. These sampling stations are described in **Figure 7.2-1**.



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TABLE 7.2-1 WATER QUALITY STATIONS

Station ID	Location of Sampling Station	Coordinates
1	Near Grand Mosque	7°11'55.86"N 124° 9'57.44"E
2	Near Tamontaka Bridge 2	7°10'48.66"N 124°13'20.34"E
3	Near WTP intake site	7°10'18.01"N 124°14'49.04"E

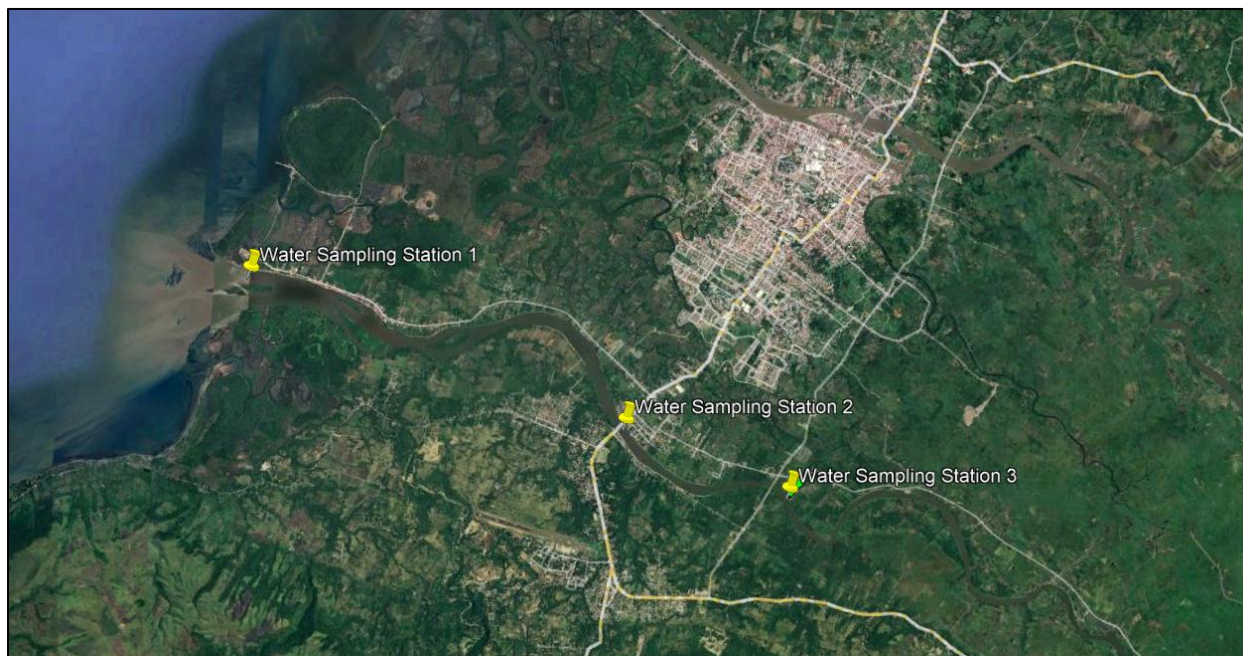


FIGURE 7.2-1 WATER SAMPLING STATIONS

- **Parameters, Preservation, and Analytical Methods**

The parameters analyzed which pertain to conventional and other pollutants contributing to aesthetics and oxygen demand for freshwater waters, toxic and other deleterious substances, and other parameters with no prescribed value are summarized in **Table 7.2-2**.

TABLE 7.2-2 PARAMETERS ANALYZED FOR SURFACE WATER QUALITY

Marine and Stream Water Quality Parameters			
Conventional and Other Pollutants Affecting Aesthetics and Exerting Oxygen Demand for Coastal and Marine Waters	<ul style="list-style-type: none"> • pH • Temperature • Dissolved oxygen • Biological oxygen demand 	<ul style="list-style-type: none"> • Total suspended solids • Oil and grease (as hydrocarbons) 	<ul style="list-style-type: none"> • Total coliform • Fecal coliform
Toxic and Other Deleterious Substances for Coastal and Marine Waters	<ul style="list-style-type: none"> • Arsenic 	<ul style="list-style-type: none"> • Cyanide 	<ul style="list-style-type: none"> • Lead • Mercury
Parameters with No Prescribed Values in the DAO 1990-34 Water Quality Criteria	<ul style="list-style-type: none"> • Electrical conductivity • Total dissolved solids • Nitrate • Total phosphorus 	<ul style="list-style-type: none"> • Calcium • Chloride 	<ul style="list-style-type: none"> • Magnesium • <i>E. coli</i>



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Table 7.2-3 lists the different water quality parameters that were analyzed for this sampling activity, along with the corresponding container, sample volume, holding time and preservation method used. The analytical procedures used by OMLI are consistent with the *Standard Methods for the Examination of Water and Wastewater by the American Public Health Association (2000)*. These procedures are the approved methods described in the *DENR Administrative Order No. 34, series of 1990: Revised Water Usage and Classification/Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations (DAO 1990-34) for water quality criteria and 2007 PNSDW*. The laboratory methods used, and method detection limits are shown in **Table 7.2-4**.

TABLE 7.2-3 CONTAINER REQUIREMENTS AND PRESERVATION METHODS

Parameters	Sample Volume	Container	Handling and Preservation	Maximum Holding Time
BOD COD	1 L	Polyethylene	Cool-stored to 4°C	48 hrs
TSS, TDS, Cl, SO ₄ , NO ₃ , Total P, Filterable and Reactive P	1 L	Polyethylene	Cool-stored to 4°C	48 hrs
Dissolved copper	1 L	Polyethylene	Filtered on-site; Added HNO ₃ to pH<2; Cool-stored to 4°C	6 months
Oil and Grease	1 L	Wide-mouthed glass, with aluminium foil	Added H ₂ SO ₄ to pH<2; Cool-stored to 4°C	28 days
Phenol	1 L	Polyethylene	Added H ₂ SO ₄ to pH<2; Cool-stored to 4°C	28 days
Total coliform, Fecal coliform, <i>E. coli</i>	250 mL	Glass, sterilized	Cool-stored to 4°C	24 hrs
As, Cd, Pb, Hg	500 mL	Polyethylene rinsed with HNO ₃	Added HNO ₃ to pH<2; Cool-stored to 4°C	28 days
Hexavalent chromium	250 mL	Polyethylene rinsed with HNO ₃	Cool-stored to 4°C	24 hrs
Cyanide	250 mL	Polyethylene	Added NaOH to pH>12; Cool-stored to 4°C	14 days
Calcium, Metals	1 L	Polyethylene rinsed with HNO ₃	Added HNO ₃ to pH<2; Cool-stored to 4°C	6 months
Total alkalinity, total acidity, total hardness	1 L	Polyethylene	Cool-stored to 4°C	14 days
TPH/BTEX	40 mL	Volatile Organic Analysis bottle	Cool-stored to 4°C	14 days

TABLE 7.2-4 LABORATORY ANALYTICAL METHODS AND DETECTION LIMIT

Parameters	Laboratory Method	Method Detection Limit
Turbidity	Nephelometric (Turbidimeter)	0.05 NTU
BOD	Azide Modification (Dilution Technique)	1 mg/L
COD	Dichromate –Open Reflux	5 mg/L
TSS	Gravimetric (dried at 103-105°C)	1 mg/L
TDS	Gravimetric (dried at 108°C)	1 mg/L
Phenol	Chloroform extraction	0.001 mg/L
Oil and grease	Petroleum Ether Extraction	1.0 mg/L



Parameters	Laboratory Method	Method Detection Limit
NO ₃ -N	Brucine sulfate	0.01 mg/L
Sulfate	Gravimetric	1 mg/L
Chloride	Argentometric	0.2 mg/L
Total Hardness (as CaCO ₃)	Flame AAS	0.02 mg/L
Total Alkalinity (as CaCO ₃)	Titrimetric	0 mg/L
Acidity (as CaCO ₃)	Titrimetric	0 mg/L
Filterable reactive P	Stannous chloride	0.01 mg/L
Total P	Stannous chloride	0.01 mg/L
CN ⁻	Specific ion electrode	0.05 mg/L
As	Hydride Generation AAS	0.001 mg/L
B	Mannitol	0.1 mg/L
Cr	Flame AAS	0.02 mg/L
Hg	Cold Vapor AAS	0.0001 mg/L
Pb	Flame AAS	0.01 mg/L
Sb	Flame AAS	0.005 mg/L
Total coliform	Multiple Tube Fermentation	
Fecal coliform	Multiple Tube Fermentation	
<i>E. coli</i>	Streak Plate	

- Water Quality Assessment**

The water quality of the surface waters was assessed based on local guidelines (DAO 1990-34 and PNSDW 2007). Groundwater sources near the project site are mainly for drinking and domestic consumption, hence, the laboratory test results were compared with the PNSDW 2007 values pertaining to microbiological quality, inorganic chemical constituents with health significance, and physical and chemical quality for acceptability aspects.

The DAO 1990-34 describes the classification and the beneficial use of fresh water and coastal/marine water bodies. **Table 7.2-5** and **Table 7.2-6** in the Philippines. This guideline prescribes water quality criteria for a water body corresponding to the water’s designated best use. The quality of effluent being discharged into a water body is regulated to ensure that the water quality of the receiving waters will continue to support the designated use of the water source.

The DENR amended the classification of coastal and marine waters in 1997 through the Administrative Order No. 23, entitled Updating Departments Administrative Order No. 34, Series of 1990 Otherwise Known as the Revised Water Usage Classification/Water Quality Criteria Amending Section Nos. 68 and 69, Chapter III of the 1978 NPCC Rules and Regulations (DAO 1997-23) (**Table 7.2-16**).

TABLE 7.2-5 DAO 1990-34 WATER USAGE AND CLASSIFICATION GUIDELINES FOR FRESH SURFACE WATERS

Classification	Beneficial Use*
Class AA	Public Water Supply Class I This class is intended primarily for waters having catchments that are uninhabited and otherwise protected and that require only approved disinfection in order to meet the PNSDW.



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Classification	Beneficial Use*
Class A	Public Water Supply Class II For sources of water supply that will require complete treatment (coagulation, sedimentation, filtration, and disinfection) in order to meet the PNSDW.
Class B	Recreational Water Class I for primary contact recreation such as bathing, swimming, skin diving, etc. (particularly those designated for tourism purposes).
Class C	Fishery Water For the propagation and growth of fish and other aquatic resources Recreational Water Class II (e.g., boating, etc.). Industrial Water Supply Class I for manufacturing processes after treatment.
Class D	For agriculture, irrigation, livestock, watering, etc. Industrial Water Supply Class II (e.g., cooling, etc.). Other inland waters, by their quality, belong to this classification.

In general, beneficial use refers to the current best beneficial use that is expected to last, at least, for the next 10 to 20 years. In special cases when dictated by political, economic, social, public health, environmental, and other considerations, certain waters may be classified according to the intended or future beneficial use.

TABLE 7.2-6 DAO 1997-23 AMENDING THE DAO 1990-34 WATER USAGE AND CLASSIFICATION GUIDELINES FOR COASTAL / MARINE WATERS

Classification	Beneficial Use
Class SA	Waters suitable for the propagation, survival and harvesting of shellfish for commercial purposes; National marine parks and marine reserves established under existing laws and/or declared as such by the appropriate government agency; and Coral reef parks and reserves designated by law and concerned authorities.
Class SB	Tourist zones and marine reserves primary used for recreational activities such as bathing, swimming, skin diving, etc. established under existing laws and/or declared as such by the appropriate government agency; Recreational Water Class I (Areas regularly used by the public for bathing, swimming, skin diving, etc.); and Fishery Water Class I (Spawning areas for <i>Chanos chanos</i> or “Bangus” and similar species).
Class SC	Recreational Water Class II (e.g., boating, etc.); Fishery Water Class II (Commercial and sustenance fishing); and Marshy and /or mangrove areas declared as fish and wildlife sanctuaries
Class SD	Industrial and Water Supply Class II (e.g., cooling, etc.); and Other coastal and marine waters, by their quality, belong to this classification.

Based on 2018 DENR EMB Regional Office 12 Water Quality Report, Tamontaka River was classified under Class C in 2019. Consequently, the water quality assessment of these water bodies was in accordance with their declared DENR classification.

The projected potential impacts and mitigating measures per project activity are shown in **Table 7.2-7**.



TABLE 7.2-7 PROJECTED PROJECT IMPACT ON WATER

Project Activity	Potential Impact	Mitigation Measures	Monitoring Plan
<i>Operation Phase</i>			
Land clearing and removal of vegetation and trees	Increase in the siltation or erosion and downstream sedimentation	Proper handling and disposal of excavated materials to be undertaken in order to minimize siltation. Silt traps to be installed to minimize the impact of siltation on the downstream area	A water quality monitoring shall be done following the Water Quality Monitoring Manual for Ambient Water Quality Monitoring issued by DENR-EMB in 2008; Laboratory analyses shall be DENR-approved methods
Operation management	Degradation of water quality and increase of microbial count due to run-off from sanitary sewage and improper waste disposal	Provision of portable toilets shall be provided for the laborers A solid waste management plan shall be prepared and implemented accordingly. All wastes and hazardous materials should be collected and transported by a DENR-accredited haulers	Parameters to be included are pH, BOD5, DO, oil and grease, TSS, if possible, some heavy metals Solid wastes shall be checked daily. Adherence/compliance to RA 9003 shall be strictly observed

- **Water Quality Assessment**

The water quality assessment aims to determine the baseline condition of water resources potentially affected by the project. Sampling was conducted in three (3) locations representing different sources and conditions: spring water (Tanuel), surface water (Dimapatoy), and raw river water during high and low tide near the water treatment plant (WTP) intake.

- **Sampling Sites and Methodology**

- ✓ **Tap_Tanuel (Spring Water):** Near Grand Mosque (sampled at 09:35AM, 25 April 2024)
- ✓ **Tap_Dimapatoy (Surface Water):** Near Tamontaka Bridge2 (sampled at 10:09AM, 25 April 2024)
- ✓ **High Tide and Low Tide:** Near WTP intake site (sampled at 07:41AM and 02:16PM, respectively, 25 April 2024)

In this project, raw water quality testing was conducted at the Tamontaka River intake point during both low tide and high tide on April 25, 2024. Compared to the Philippine National Standards for Drinking Water (PNSDW), the measured values exceeded the standards during both low and high tide for the following parameters: total coliform, thermotolerant coliform, Escherichia coli (E. coli), color, odor, turbidity, aluminum, and



iron. In addition, during high tide, the level of heterotrophic bacteria also exceeded the standard. For all other water quality parameters, the values were below the PNSDW limits.

On the same day, water quality testing was also conducted for piped water upstream and downstream of the intake point. The upstream sample was taken near Tamontaka Bridge II and originated from the Dimapatoy Water Treatment Plant (WTP), while the downstream sample was taken near the Grand Mosque and originated from the Taniel Pumping Station (PS), which uses spring water with sterilization. The piped water from the Dimapatoy WTP (surface water with rapid filtration) met all PNSDW parameters, whereas the piped water from the Taniel PS exceeded the standard for total hardness.

During construction, the potential for water pollution is mainly associated with the intake structure works carried out within the river. However, since the construction will be conducted with the installation of a temporary cofferdam, the impact on river water quality is expected to be minimal.

During operation, the water treatment plant will include a drainage system consisting of a wastewater basin, sludge basin, and drying beds. With the following treatment processes, the entire volume of supernatant water from the wastewater basin will be returned to the intake well, and no effluent will be discharged:

- **Wastewater Basin:** Receives upper-layer discharge from the sedimentation basin during periods of low turbidity, backwash water from the filtration basin, and all other wastewater from the facilities. The entire volume will be returned to the intake well at a regulated flow rate that minimizes the impact on the raw water quality entering the treatment plant, allowing sufficient time for return.
- **Sludge Basin:** Receives settled sludge from the sedimentation basin. The supernatant is separated, and the concentrated sludge is sent to the drying beds. The separated supernatant is sent to the wastewater basin.
- **Drying Beds:** Dehydrate the concentrated sludge using solar drying to produce manageable dry sludge cakes. The dewatered filtrate is discharged from the bottom of the drying beds into a nearby creek.

✓ Additionally, domestic wastewater generated by the water supply facility operators will be minimal in volume and will be treated using septic tanks, so it is not considered problematic.

• **Summary of Results**

The results of the assessment are shown in **Tables 7.2-8 to Table 7.2-11**. While the **Table 7.2-12** shows the list of parameters with results above PNWSD standards.

TABLE 7.2-8 RESULT OF WATER QUALITY ASSESSMENT IN TAP-TANUEL STATION

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	<1.0	CFU/ml	<500	Pour Plate
pH (on-site)	7.2	-	6.5-8.5	Electrometric



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Parameters	Results	Unit	PNSDW Standard	Methods
Temperature (on-site)	31	°C	-	Laboratory and Field
Color	<5	ACU	10	Visual Comparison
Odor	Non-Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Taste	Non-Objectionable	-	No Objectionable Taste	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	410	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	325	mg/L	300	EDTA Titrimetric
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Nitrate as NO ₃ ⁻ -N	1.90	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	17.1	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	322	mg/L	-	Titration
Electrical Conductivity	731	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.60	mg/L	1.50	Ion-Selective Electrode
Boron (B)	<1.00	mg/L	2.00	Carminic
Sulfate (SO ₄ ²⁻)	9	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	3.00	Diazotization
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/ distillation)
Turbidity	0.16	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	<0.10	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.031	mg/L	0.70	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	<0.002	mg/L	1.0	ICP-OES
Iron (Fe)	<0.007	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	<0.007	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	<0.004	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS



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Parameters	Results	Unit	PNSDW Standard	Methods
Sodium (Na)	24.05	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.016	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	0.046	mg/L	-	Combustion
Bromoform	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS

TABLE 7.2-9 RESULT OF WATER QUALITY ASSESSMENT IN TAP-DIMAPATYOY STATION

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	<1.0	CFU/ml	<500	Pour Plate
pH (on-site)	7.5	-	6.5-8.5	Electrometric
Temperature (on-site)	30	"C	-	Laboratory and Field
Color	<5	ACU	10	Visual Comparison
Odor	Non-Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Taste	Non-Objectionable	-	No Objectionable Taste	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	287	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	240	mg/L	300	EDTA Titrimetric
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Nitrate as NO ₃ ⁻ -N	0.91	mg/L	50.00	Nitrate Electrode
Chloride {Cl ⁻ }	4.7	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	229	mg/L	-	Titration
Electrical Conductivity	485	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.28	mg/L	1.50	Ion-Selective Electrode
Boron (B)	<1.00	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	5	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	3.00	Diazotization
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/distillation)
Turbidity	1.28	NTU	5	Nephelometric



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Parameters	Results	Unit	PNSDW Standard	Methods
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	<0.10	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium(Ba)	0.021	mg/L	0.70	JCP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	<0.002	mg/L	1.0	ICP-OES
Iron (Fe)	<0.007	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	<0.007	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	<0.004	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	9.61	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.012	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	0.415	mg/L	-	Combustion
Bromoform	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS
Chloroform	0.011	mg/L	0.3	Purge and Trap Capillary-Column Gas Chromatographic-MS
Bromodichloromethane	0.005	mg/L	0.06	Purge and Trap Capillary-Column Gas Chromatographic-MS
Dibromochloromethane	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS

TABLE 7.2-10 RESULT OF WATER QUALITY ASSESSMENT IN RAW-HIGH TIDE STATION

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	est. 680	CFU/ml	<500	Pour Plate
pH (on-site)	7.1	-	6.5-8.5	Electrometric



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Parameters	Results	Unit	PNSDW Standard	Methods
Temperature (on-site)	32	°C	-	Laboratory and Field
Color	25	ACU	10	Visual Comparison
*Odor	Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	227	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	124	mg/L	300	EDTA Titrimetric
Total Suspended Solids (TSS)	46	mg/L	-	Gravimetric (dried at 103-105 °C)
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Ammonia as NH ₃ -N	0.16	mg/L	-	Ammonia-Selective Electrode
Nitrate as NO ₃ ⁻ -N	0.17	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	13.3	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	131	mg/L	-	Titration
Electrical Conductivity	324	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.11	mg/L	1.50	Ion-Selective Electrode
Boron (B)	0.170	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	11	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	3.00	Diazotization
Total Nitrogen	1.2	mg/L	-	Kjeldahl/By-Calculation
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/ distillation)
Turbidity	9.55	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	2.45	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.020	mg/L	0.7	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	0.005	mg/L	1.0	ICP-OES
Iron (Fe)	2.273	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	0.080	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	0.008	mg/L	0.07	ICP-OES



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Parameters	Results	Unit	PNSDW Standard	Methods
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	16.99	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.013	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	1.127	mg/L	-	Combustion

TABLE 7.2-11 RESULT OF WATER QUALITY ASSESSMENT IN RAW-LOW TIDE STATION

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	est. 460	CFU/ml	<500	Pour Plate
pH (on-site)	8.1	-	6.5-8.5	Electrometric
Temperature (on-site)	33	°C	-	Laboratory and Field
Color	20	CU	10	Visual Comparison
*Odor	Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	232	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	132	mg/L	300	EDTA Titrimetric
Total Suspended Solids (TSS)	70	mg/L	-	Gravimetric (dried at 103-105 °C)
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Oil and Grease	<1	mg/L	-	Liquid-Liquid, Partition-Gravimetric
Ammonia as NH ₃ -N	0.06	mg/L	-	Ammonia-Selective Electrode
Nitrate as NO ₃ ⁻ -N	0.28	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	8.6	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	133	mg/L	-	Titration
Electrical Conductivity	330	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.10	mg/L	1.50	Ion-Selective Electrode
Boron (B)	0.487	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	13	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	3.00	Diazotization
Total Nitrogen	1.1	mg/L	-	Kjeldahl By-Calculation



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Parameters	Results	Unit	PNSDW Standard	Methods
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/ distillation)
Turbidity	17.5	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.01	mg/L	0.01	ICP-OES
Aluminum (Al)	4.26	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.026	mg/L	0.70	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	0.007	mg/L	1.0	ICP-OES
Iron (Fe)	4.043	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	0.131	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	0.013	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	15.81	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.012	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	1.409	mg/L	-	Combustion
Benzo(a)pyrene	<0.0003	mg/L	0.0007	Gas Chromatographic-MS
Organophosphate Pesticides (OPP)				
Malathion	<0.04	µg/L	-	Gas Chromatographic-MS
Dichlorvos	<0.06	µg/L	-	Gas Chromatographic-MS
Demeton-S-methyl	<0.02	µg/L	-	Gas Chromatographic-MS
Dimethoate	<0.02	µg/L	-	Gas Chromatographic-MS
Tolclofos-methyl	<0.01	µg/L	-	Gas Chromatographic-MS
Pirimphos-methyl	<0.01	µg/L	-	Gas Chromatographic-MS
Chlorpyrifos	<0.02	µg/L	-	Gas Chromatographic-MS
Methidathion	<0.04	µg/L	-	Gas Chromatographic-MS
Prothiofos	<0.02	µg/L	-	Gas Chromatographic-MS
Profenofos	<0.04	µg/L	-	Gas Chromatographic-MS
Ethion	<0.01	µg/L	-	Gas Chromatographic-MS
Pyrazophos	<0.13	µg/L	-	Gas Chromatographic-MS
Phenol	<0.001	mg/L	-	Chloroform Extraction



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Parameters	Results	Unit	PNSDW Standard	Methods
Benzene	<0.0003	mg/L	0.01	Purge & Trap Capillary-Column Gas Chromatographic-MS
Toluene	<0.0003	mg/L	0.7	Purge & Trap Capillary-Column Gas Chromatographic-MS
Ethylbenzene	<0.0002	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
Total Xylene	<0.0002	mg/L	0.5	Purge & Trap Capillary-Column Gas Chromatographic-MS
Styrene	<0.002	mg/L	0.02	Purge & Trap Capillary-Column Gas Chromatographic-MS
Tetrachloroethene	<0.005	mg/L	0.04	Purge & Trap Capillary-Column Gas Chromatographic-MS
Carbon tetrachloride	<0.005	mg/L	0.004	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichlorobenzene	<0.005	mg/L	1	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,4-Dichlorobenzene	<0.005	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichloroethane	<0.005	mg/L	0,03	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichloroethene	<0.003	mg/L	0.05	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dibromo-3-Chloropropane	<0.00005	mg/L	0.001	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dibromoethane /Ethylene Dibromide (EDB)	<0.0003	mg/L	0.0004	Purge & Trap Capillary-Column Gas Chromatographic-MS
Bromoform	<0.005	mg/L	0.1	Purge & Trap Capillary-Column Gas Chromatographic-MS
Chloroform	<0.005	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
Bromodichloromethane	<0.005	mg/L	0.06	Purge & Trap Capillary-Column Gas Chromatographic-MS



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Parameters	Results	Unit	PNSDW Standard	Methods
Dibromochloromethane	<0.005	mg/L	0.1	Purge & Trap Capillary-Column Gas Chromatographic-MS
Aldrin	<0.00002	mg/L	0.00003	Gas Chromatography- ECD
Dieldrin	<0.00001	mg/L	0.00003	Gas Chromatography- ECD
Chlordane	<0.00002	mg/L	0.0002	Gas Chromatography- ECD
Endrin	<0.00002	mg/L	0.0006	Gas Chromatography- ECD
Lindane	<0.00002	mg/L	0.002	Gas Chromatography- ECD
Dichlorodiphenyltrichloroethane (DDT)	<0.00003	mg/L	0.001	Gas Chromatography- ECD
Dichloromethane	0.010	mg/L	0.02	Gas Chromatography
Vinyl Chloride	<0.0002	mg/L	0.0003	Gas Chromatography
Di(2-ethylhexyl)phthalate	<0.005	mg/L	0.008	Gas Chromatography
Carbamates				
Oxamyl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Methomyl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
3-Hydroxy Carbofuran	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Aldicarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Bendiocarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Thiodicarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Carbaryl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Methiocarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Carbofuran	<0.0002	mg/L	0.007	Liquid Chromatographic-MS/MS
Atrazine and its Chloro-s-Triazine Metabolites				
Atrazine	<0.01	ug/L	-	Gas Chromatography
Atrazine-desethyl	<0.1	ug/L	-	Gas Chromatography
Atrazine-desisopropyl	<0.1	ug/L	-	Gas Chromatography
Carbofuran	<0.0002	mg/L	0.007	Liquid Chromatographic-MS/MS
Glyphosatec	<0.01	mg/L	1	Gas Chromatography
Pendimethalin	<0.00005	mg/L	0.02	Gas Chromatography



TABLE 7.2-12 PROJECTED PROJECT IMPACT ON WATER

Parameter	PNSDW Limit	Tap_Tanuel	Tap_Dimapatoy	Raw_High Tide	Raw_Low Tide
Total Coliform (MPN/100ml)	<1.1	<1.1	<1.1	>8.0	>8.0
Thermotolerant Coliform	<1.1	<1.1	<1.1	>8.0	>8.0
Escherichia coli (E. coli)	<1.1	<1.1	<1.1	>8.0	>8.0
Heterotrophic Plate Count	<500 CFU/ml	<1.0	<1.0	est. 680	est. 460
pH	6.5–8.5	7.2	7.5	7.1	8.1
Total Hardness	300	325	240	124	132
Color	10	<5	<5	25	20
Turbidity	5	0.16	1.28	9.55	17.5
Aluminum	0.2	<0.10	<0.10	2.45	4.26
Iron	1.0	<0.007	<0.007	2.273	4.03

- **Interpretation and Discussion**

- ✓ **Tap_Tanuel and Tap_Dimapatoy** sources are within the allowable limits of PNSDW for all microbiological parameters, indicating suitability for domestic use after minimal treatment.
- ✓ **Raw Water (High and Low Tide)** from the river shows significantly **exceeded levels of coliform and E. coli**, suggesting **high microbial contamination** during both tidal conditions.
- ✓ **Heterotrophic Plate Count** exceeded the 500 CFU/ml threshold during **high tide** (estimated 680 CFU/ml), indicating elevated microbial activity, likely due to upstream pollution or stagnation during tidal inflow.
- ✓ **pH levels** remained within the acceptable range (6.5–8.5) across all sites, suggesting no acidity or alkalinity issues.

- **Potential Impacts**

- ✓ The **contaminated raw water intake site** poses a significant **risk to public health** if used without proper treatment. This emphasizes the need for robust filtration and disinfection processes in the WTP design.
- ✓ Upstream pollution sources (e.g., domestic wastewater discharge, livestock runoff) may contribute to microbial load and require mitigation through community-based sanitation programs or enforcement of water quality laws.

C. Aquatic Ecology

A survey for the presence of aquatic species was conducted around the vicinity of the project site along the river estuary using the same transect line with that of the flora and fauna survey. The survey was conducted on July 27-28 from 0700h to 1700h to evaluate important components of the aquatic ecosystems in the primary impact area of the Project. The method used to catch aquatic specimens is the common fish traps used by local fishers (See **Figure**



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7.2-2) while the location of the fish traps along the study area is shown in **Figure 7.2-3**. The location of the transect line for the aquatic biota survey is shown in **Figure 7.2-4**.



FIGURE 7.2-2 COMMON FISH TRAPS USED BY LOCAL FISHERS



FIGURE 7.2-3 LOCATION OF FISH TRAPS

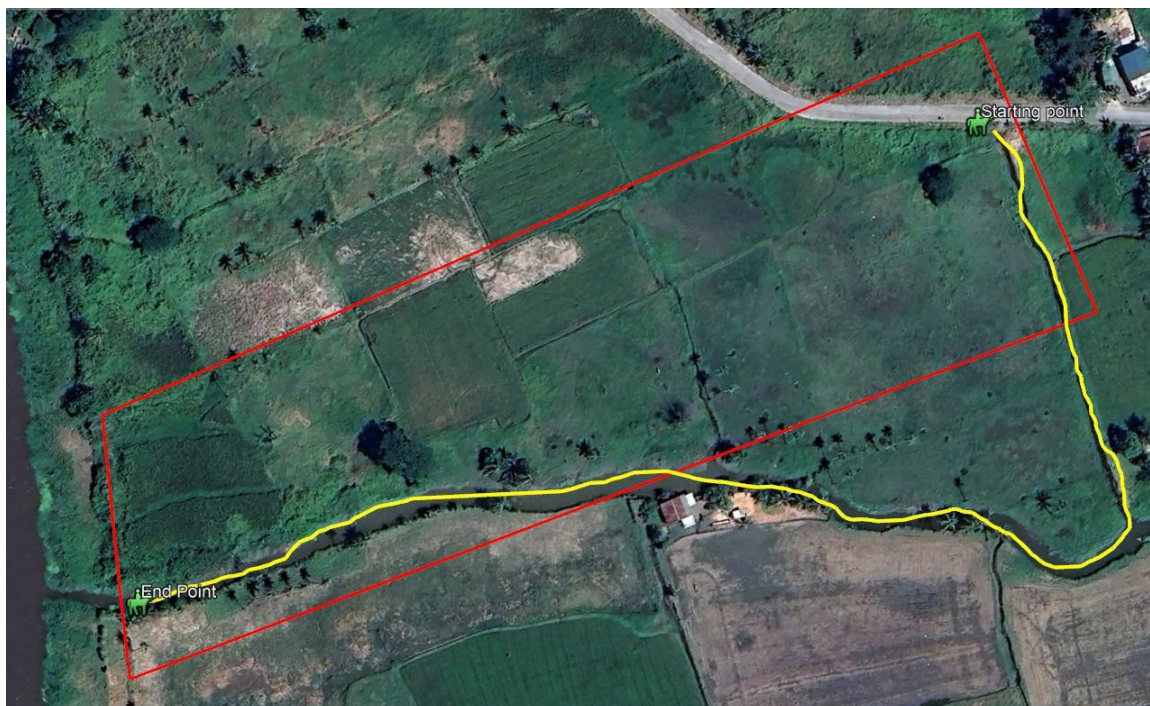


FIGURE 7.2-4 AQUATIC BIOTA TRANSECTS LINE OBSERVATION ROUTE

- **Aquatic Fauna Species Composition and Endemicity**

Table 7.2-13 shows that there are at least 10 species of fish found in the project site. These species belong to 8 families and 9 genera. The project site is equally composed of native and introduced species with five (5) representatives each.

TABLE 7.2-13 FISH SPECIES FOUND IN THE PROJECTS AREA

Scientific Name	Family	Common Name	Local Name	Status	IUCN Status	DAO 2019-09
1. <i>Anabas testudineus</i>	Anabantidae	Climbing Perch	<i>Puyo</i>	Native	Least concerned	Not Included
2. <i>Anguilla marmorata</i>	Anguillidae	Giant mottled eel	<i>Kasili</i>	Native	Least concerned	Not Included
3. <i>Channa striata</i>	Channidae	Snakehead murrel	<i>Haluan/ Dalag</i>	Introduced	Least concerned	Not Included
4. <i>Clarias batrachus</i>	Clariidae	Philippine Catfish	<i>Hito/Katipa</i>	Native	Least concerned	Not Included
5. <i>Clarias macrocephalus</i>	Clariidae	Broadhead catfish	<i>Hito</i>	Native	Decreasing	Not Included
6. <i>Cyprinus carpio</i>	Cyprinidae	Common Carp	<i>Karpa</i>	Introduced	Least concerned	Not Included
7. <i>Labeo rohita</i>	Cyprinidae	Rohu	<i>Rohu</i>	Introduced	Least concerned	Not Included
8. <i>Macrobrachium rosenbergii</i>	Palaemonidae	Giant river prawn	<i>Udang</i>	Native	Least concerned	Not Included
9. <i>Oreochromis niloticus</i>	Cichlidae	Nile Tilapia	<i>Tilapia</i>	Introduced	Least concerned	Not Included
10. <i>Osphronemus pectoralis</i>	Osphronemidae	Gourami	<i>Gurami</i>	Introduced	Not Evaluated	Not Included

- **Species Diversity**

Table 7.2-14 shows that both fish catches at the 2 sites yielded almost the same results indicating an even distribution of species. It also shows that the Nile Tilapia (*Oreochromis niloticus*) and the Gourami (*Osphronemus pectoralis*) are the dominant species of fish in the project site with 15 and 13 individuals, respectively. On the other hand, least dominant fish species is the Broadhead catfish, a native species with only 2 individuals. These results



infer that the ecosystem of the project site is already invaded by introduced species such as Tilapia and Gourami as a result of the current aquaculture practices in the region.

TABLE 7.2-14 FISH SPECIES AND NUMBER OF INDIVIDUALS DURING THE STUDY

Common Name	Local Name	Site 1	Site 2	Total
Climbing Perch	Puyo	5	4	9
Giant mottled eel	Kasili	2	1	3
Snakehead murrel	Haluan/ Dalag	2	3	5
Philippine Catfish	Hito/Katipa	1	2	3
Broadhead catfish	Hito	1	1	2
Common Carp	Karpa	3	4	7
Rohu	Rohu	2	3	5
Giant river prawn	Udang	5	6	11
Nile Tilapia	Tilapia	8	7	15
Gourami	Gurami	7	6	13
	Total	36	37	73

Analysis of the results using Shannon-Wiener Diversity Index revealed that site 2 has slightly higher diversity index than site 1 with 2.15 and 2.09, respectively. These figures may be considered high since the value is higher than 1. It also showed that the Effective Number of Species (ENS) is around 8 and can be inferred that there are 8 species of fishes that contribute to the biodiversity of the ecosystem.

TABLE 7.2-15 ANALYSIS OF THE RESULTS OF THE NUMBER OF FISH CATCH IN THE 2 SAMPLING SITES

Common Name	Local Name	Site 1	pi	ln		Site 2	pi	ln	
Climbing Perch	Puyo	5	0.14	-1.97	-0.27	4.00	0.11	-2.22	-0.24
Giant mottled eel	Kasili	2	0.06	-2.89	-0.16	1.00	0.03	-3.61	-0.10
Snakehead murrel	Haluan/ Dalag	2	0.06	-2.89	-0.16	3.00	0.08	-2.51	-0.20
Philippine Catfish	Hito/Katipa	1	0.03	-3.58	-0.10	2.00	0.05	-2.92	-0.16
Broadhead catfish	Hito	1	0.03	-3.58	-0.10	1.00	0.03	-3.61	-0.10
Common Carp	Karpa	3	0.08	-2.48	-0.21	4.00	0.11	-2.22	-0.24
Rohu	Rohu	2	0.06	-2.89	-0.16	3.00	0.08	-2.51	-0.20
Giant river prawn	Udang	5	0.14	-1.97	-0.27	6.00	0.16	-1.82	-0.29
Nile Tilapia	Tilapia	8	0.22	-1.50	-0.33	7.00	0.19	-1.67	-0.32
Gourami	Gurami	7	0.19	-1.64	-0.32	6.00	0.16	-1.82	-0.29
		36	1.00		-2.09	37.00	1.00		-2.15
				H'	2.09			H'	2.15
				ENS	8.08			ENS	8.55

- Aquatic Flora Species composition, endemicy and diversity**

The assessment of the aquatic flora along the transect line used in the flora and fauna survey revealed that there are at least 11 species in the study area. As shown in **Table 7.2-16**, the Introduced species dominated the aquatic vegetation with seven (7) representative species. A notable native species in the area is the Lagolo (*Acrostichum speciosum*), which



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is one (1) of the two (2) floating fern species of the Philippines. With respect to dominance, the Common Reed and Water Hyacinth, both introduced species covered most of the project site as their count were found to be numerous. This situation is not unique to the project site as majority of the swampy areas of the country are already invaded by these species.

TABLE 7.2-16 AQUATIC FLORA FOUND IN THE PROPOSED SITE

Scientific Name	Common Name	Endemicity	Count	IUCN Status	DAO 2017-11
1. <i>Phragmites australis</i>	Common Reed	Introduced	Numerous	Least concerned	Not Included
2. <i>Acrostichum speciosum</i>	Lagolo	Native	moderate	Least concerned	Not Included
3. <i>Cyperus alternifolius</i>	Umbrella papyrus	Introduced	moderate	Least concerned	Not Included
4. <i>Eleocharis acicularis</i>	Spikerush	Introduced	few	Least concerned	Not Included
5. <i>Lemna minor</i>	Duckweed	Native	few	Not evaluated	Not Included
6. <i>Azolla pinnata</i>	Azolla	Native	moderate	Least concerned	Not Included
7. <i>Microsorium pteropus</i>	Java fern	Native	few	Not evaluated	Not Included
8. <i>Nymphaeaceae</i>	Water lily	Introduced	moderate	Not evaluated	Not Included
9. <i>Equisetum hyemale</i>	Horsetail	Introduced	few	Least concerned	Not Included
10. <i>Pistia stratiotes</i>	Cuyapo	Introduced	moderate	Least concerned	Not Included
11. <i>Eichhornia crassipes</i>	Water hyacinth	Introduced	Numerous	Not evaluated	Not Included

Few – 1-500; moderate – 501-1000; numerous – 1000 & more



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Photos of the aquatic species assessed during the survey are shown below in **Figure 7.2-5** to **Figure 7.2-6**.



FIGURE 7.2-5 FISH COLLECTED DURING THE AQUATIC SURVEY



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FIGURE 7.2-6 FISH COLLECTED DURING THE AQUATIC SURVEY



FIGURE 7.2-7 AQUATIC FLORA OBSERVED DURING THE ASSESSMENT



FIGURE 7.2-8 AQUATIC FLORA OBSERVED DURING THE ASSESSMENT



FIGURE 7.2-9 AQUATIC FLORA OBSERVED DURING THE ASSESSMENT

7.3 THE AIR

A. Climate

The project area falls in Type III of the modified Corona's climate classification. Type III climate covers central Mindanao, where Cotabato City is situated. It describes that the dry season usually starts in November and ends in April, while the wet season begins in May, peaks in July or August, and ends in October.

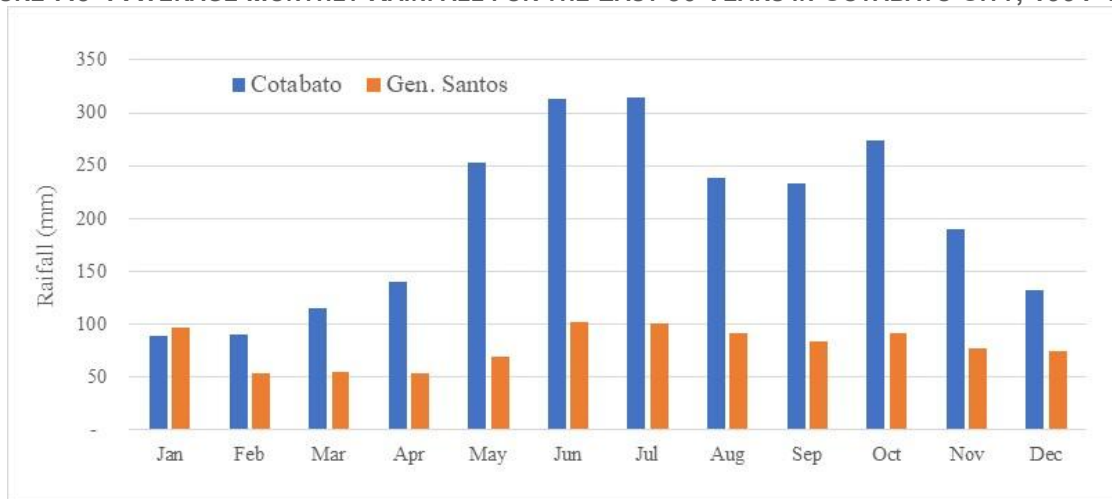


- **Rainfall**

The average rainfall from the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) daily data indicates that the total monthly rainfall is constantly low during the year's first quarter. It then escalates from May, reaching its highest value in August, then declines until December. The highest average monthly rainfall was reached 315 mm at Cotabato City in July, while the lowest recorded was 89 mm in January (Figure 7.3-1).

The average rainfall based on 1991–2020 records is 2,384 mm at Cotabato City station. The highest annual rainfall is recorded in 2009, with 3,893 mm. The daily maximum total is 460 mm on 25 July 2009.

FIGURE 7.3-1 AVERAGE MONTHLY RAINFALL FOR THE LAST 30 YEARS IN COTABATO CITY, 1991–2020

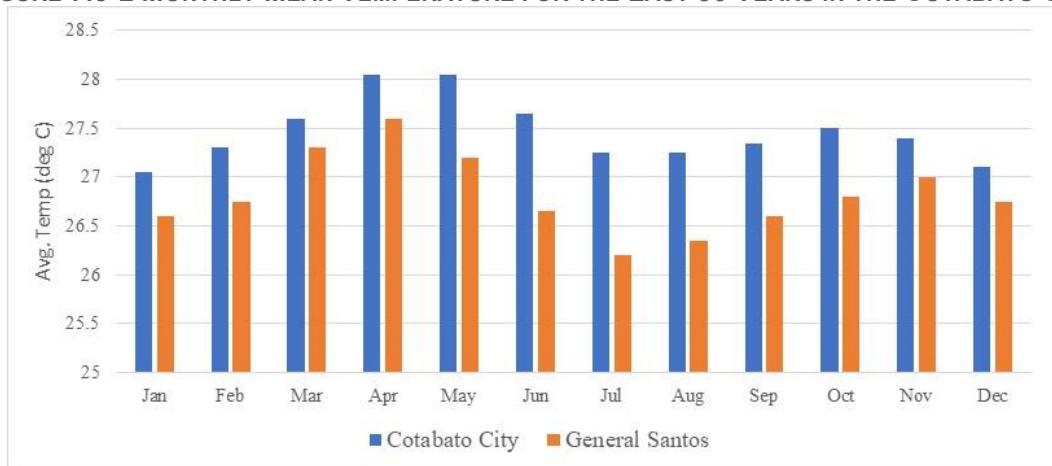


Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024

- **Temperature**

The temperature recorded from Cotabato City has the lowest value in January, then increases from February to May (Figure 7.3-2). The recorded annual average temperature ranges from 27.0 °C to 28.0 °C. The difference between the highest and lowest temperatures over the last 30 years is 1.4 °C (Maguindanao) and 1.0 °C (South Cotabato).

FIGURE 7.3-2 MONTHLY MEAN TEMPERATURE FOR THE LAST 30 YEARS IN THE COTABATO CITY



Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024



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- **Wind Regime**

Seasonally, the Mount Busa mountain ranges create a funnel that constricts the wind from the Celebes Sea towards Central Mindanao. Cotabato City sections have mean wind speeds from 4.05 to 4.29 m/s.

Magnitude of Extreme Events

The climatological extreme values of the monthly and annual summaries of temperature, rainfall, and wind speed influencing the Cotabato City is presented in Table 7.3-1. The recorded annual extreme high and low temperatures (1986–2021) were 38.6 °C on 28 April 2019 and 29 May 2019 and 18.9 °C on 26 January 2014, respectively. The most significant daily rainfall recorded was 201 mm on 31 October 1996. The strongest winds blew westerly on 5 August 1993, 7 November 1988, and 17 December 1996 at 28 m/s.

TABLE 7.3-1 CLIMATOLOGICAL EXTREMES RECORDED AT COTABATO CITY STATION, MAGUINDANAO, 1986–2021

Month	Temperature (°C)				Greatest daily rainfall (mm)		Strongest winds (m/s)		
	High	Date	Low	Date	Amount	Date	Speed	Dir	Date
Jan	36.8	31 Jan 2020	18.9	26 Jan 2014	62.4	31 Jan 2004	19	N	24 Jan 1998
Feb	37.3	23 Feb 2020	20.8	18 Feb 2017	80.7	23 Feb 2010	18	W	25 Feb 2008
Mar	37.9	20 Mar 2020	21.0	27 Mar 2006	67.2	25 Mar 2006	22	NNW	21 Mar 1999
	37.9	31 Mar 2020							
Apr	38.6	28 Apr 2019	21.0	18 Apr 1989	142.2	13 Apr 1989	18	NNW	26 Apr 1995
May	38.6	29 May 2019	21.0	8 May 2006	109.0	10 May 2008	24	WNW	17 May 1991
Jun	36.7	7 Jun 2019	20.5	6 Jun 2008	104.4	12 Jun 1990	22	W	12 Jun 1990
Jul	36.8	26 Jul 2021	20.6	27 Jul 2012	174.0	31 Jul 2009	26	W	28 Jul 1991
Aug	36.3	12 Aug 2021	20.5	10 Aug 2006	83.1	3 Aug 2004	28	NNW	5 Aug 1993
Sep	36.3	5 Sep 2020	20.8	28 Sep 2007	116.0	21 Sep 2009	23	E	18 Sep 1989
Oct	36.4	20 Oct 2017	20.8	7 Oct 2006	201.7	31 Oct 1996	23	N	2 Oct 2010
	36.4	18 Oct 2021							
Nov	36.6	3 Nov 2017	20.7	12 Nov 2008	142.2	12 Nov 1990	28	W	7 Nov 1988
	36.6	28 Nov 2018							
Dec	36.2	3 Dec 2017	20.0	31 Dec 1986	97.6	7 Dec 2003	28	WSW	17 Dec 1996
	36.2	13 Dec 2018							
Annual	38.6	28 Apr 2019	18.9	26 Jan 2014	201.7	31 Oct 1996	28	NNW	5 Aug 1993
	38.6	29 May 2019					28	W	7 Nov 1988
							28	WSW	17 Dec 1996
Period of Record	1986–2021				1986–2021		1986–2021		

°C = degree centigrade, Dir = E = east, m/s = meter per second, mm = millimeter, N = north, NNW = north-northwest, W = west, WNW = west-northwest, WSW = west-southwest.

Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024

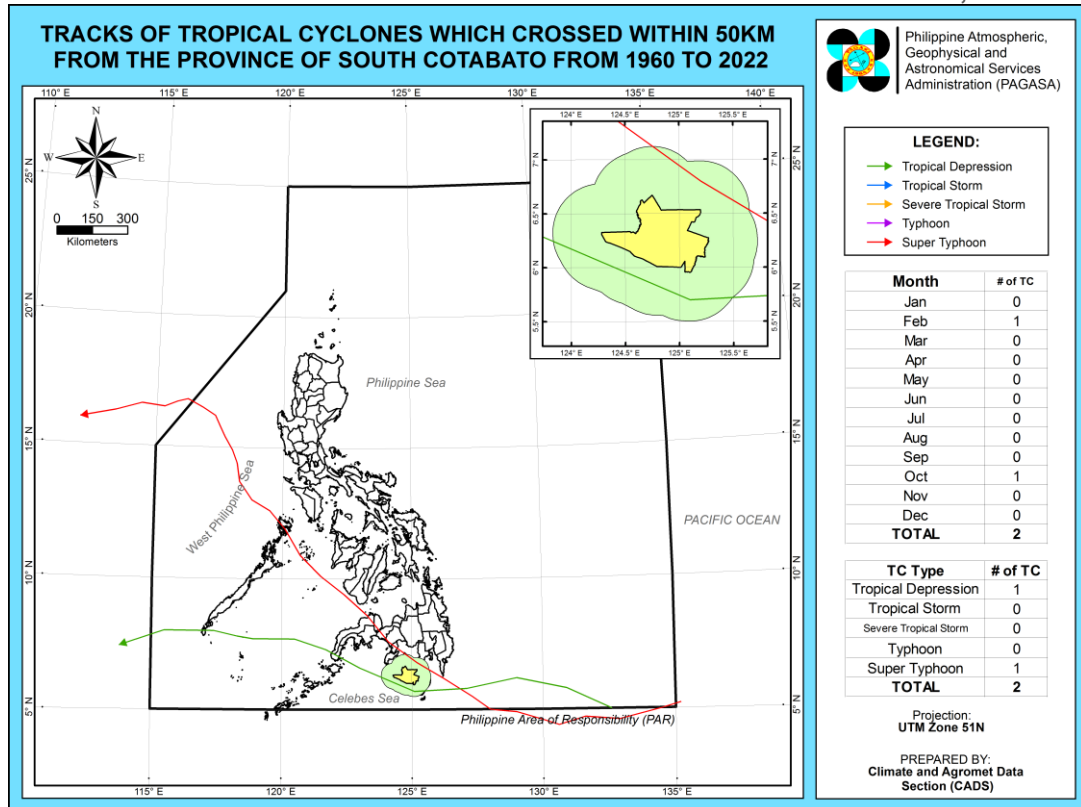


- **Cyclone Frequency and Magnitude**

The greatest number of cyclones in the Central Mindanao areas occurs in February and October. These tropical cyclones are associated with the occurrence of low-pressure regions typically originating over the North-Western Pacific Ocean side of the Philippine Area of Responsibility (PAR) and generally moving northwestward. Tropical cyclones also develop in the West Philippine Sea. These cyclones have unusual motions and are rare, with just two occurrences in more than 60 years. PAGASA categorizes cyclones based on their sustained winds as (i) tropical depressions (TD) with wind speeds of up to 61 kph or less; (ii) tropical storm (TS) with wind speeds of 62–88 kph, (iii) severe tropical storm (STS) with a wind speed of 89–117 kph, (iv) tropical typhoon (TY) with wind speeds of over 118–220 kph, and v) super typhoon with a wind speed of more than 220 kph.

With a very low typhoon risk, the area tracked only two (2) tropical cyclones that crossed within its 50 km (Figure 7.3-3). From 1960 to 2022, PAGASA recorded an annual average of 20 tropical cyclones in the PAR, with nine passing through Philippine landmasses. Of the Nine weather disturbance, only two passes through Central Mindanao during the months of February and October (Figure 7.3-4). Figure 7.3-5 shows the category of cyclones which crossed central Mindanao and its percentage.

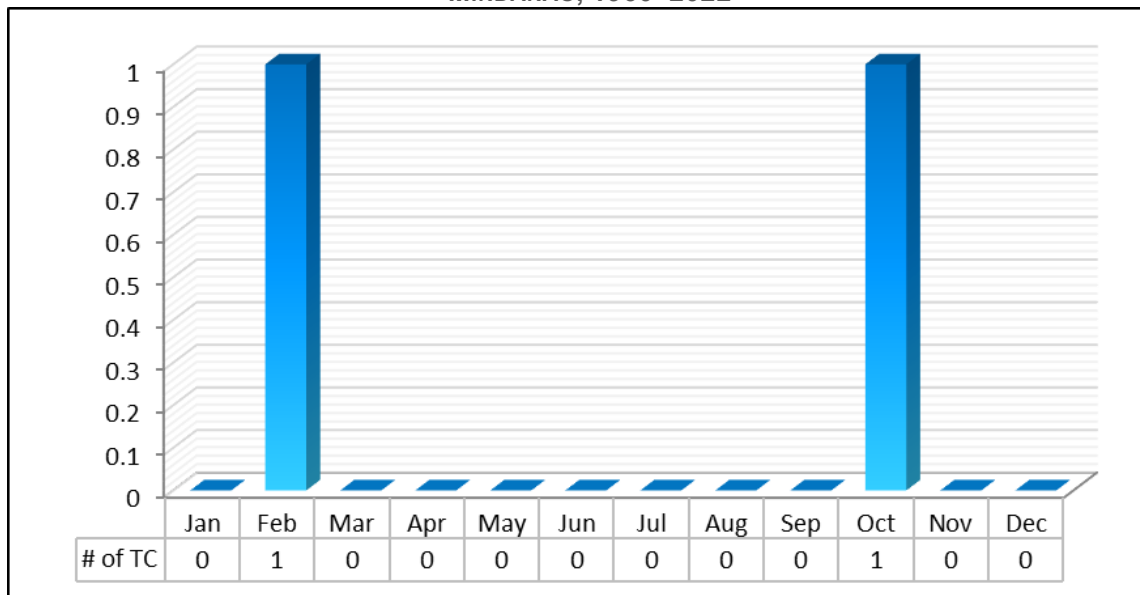
FIGURE 7.3-3 TRACKS OF TROPICAL CYCLONES WHICH CROSSED CENTRAL MINDANAO, 1960–2022



Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024

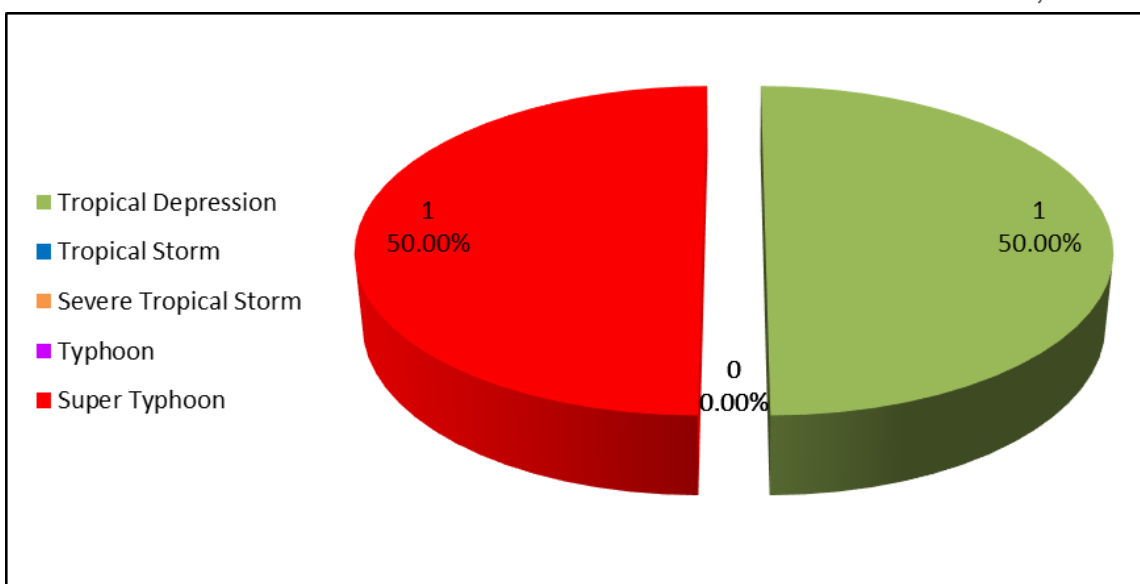


FIGURE 7.3-4 MONTHLY DISTRIBUTION OF TROPICAL CYCLONES WHICH CROSSED WITHIN CENTRAL MINDANAO, 1960–2022



Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024

FIGURE 7.3-5 CATEGORY OF TROPICAL CYCLONES WHICH CROSSED CENTRAL MINDANAO, 1960–2022



Source: PAGASA, DPWH Flood Control Project in Central Mindanao 2024

- **PAGASA Climate Extreme Projection**

Temperature Extremes

Climate projections are necessary for climate change impact assessment and national planning. In particular, the impacts of climate change on road projects for the coming years are critical. The project utilizes the recent Philippine Climate Extremes Report 2020 published by the DOST-PAGASA, in partnership with Manila Observatory and the Ateneo de Manila University.

The PAGASA 2021 report used the downscaled historical and projected daily extremes data to calculate the projected changes in 24 climate extremes indices for two (2) Representative Concentration Pathways (RCP): RCP4.5 and RCP8.5. The annual extremes are averaged over the 20-year time periods to come up with the climatological



extreme. The observed data is based on the South America Land Surface Observation Weather Stations (SA-OBS) gridded data for 1986–2005 while the projected changes are based on the ensemble median of the 12 models. The projections from two scenarios, RCP4.5 and RCP8.5, are provided for three time periods: early future (2020–2039), mid-future (2046–2065), and late future (2080–2099).

Based on DOST-PAGASA, climate extreme indices provide additional information that can describe the magnitude, frequency, and duration of extremes, which could help in the assessment of possible adaptation options. Extreme indices are grouped by variable (rainfall and temperature) and by attribute (magnitude, frequency, and duration).

Based on PAGASA (2020) projection, the temperature extreme indices show spatial variability in the baseline; but projected changes indicate almost spatially uniform warming trends, with the magnitude and duration of warming increasing in the future. The change in the daily temperature range is particularly interesting as it indicates a slight cooling and greater spatial variability in the future. However, the magnitude of change is relatively small over Maguindanao (BARMM).

The summary of the temperature extremes in Maguindanao (BARMM) is presented in **Table 7.3-2**.

TABLE 7.3-2 TEMPERATURE EXTREME INDICES OF THE PROJECT AREA

Scenario	Period	Maguindanao		
		TXm (°C)	TXx (°C)	TX90p (%)
Baseline Value	1986–2005	31.0	34.2	11.3
Moderate Emission RCP 4.5	Early (2020–2039)	31.5 (0.5)	34.7 (0.5)	31.4 (20.1)
	Mid (2046–2065)	32.1 (1.1)	35.4 (1.2)	57.0 (45.7)
	Late (2080–2099)	32.6 (1.6)	36.0 (1.8)	70.0 (58.7)
High Emission RCP 8.5	Early (2020–2039)	31.7 (0.7)	34.9 (0.7)	37.6 (26.3)
	Mid (2046–2065)	32.6 (1.6)	36.1 (1.9)	76.3 (65.0)
	Late (2080–2099)	34.4 (3.4)	37.9 (3.7)	99.3 (88.0)

TXx = maximum daily maximum temperature, TXm = mean daily maximum temperature, TX90p = percentage of days when daily maximum temperature > 90th percentile, and RCP = representative concentration pathways.

Note: Values in parentheses are change anomalies

Source: DOST-PAGASA, Manila Observatory and Ateneo de Manila University (2021). *Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support Informed Decisions on Climate Change Adaptation and Risk Management*. Philippine Atmospheric, Geophysical and Astronomical Services Administration, Quezon City, Philippines. p.104 & p.107.

Average Daytime Temperature (TXm)

TXm refers to the average of daytime temperatures.

Historical data shows that the average daytime temperature within the Maguindanao area ranges from 29.5 °C to 31.0 °C. This is projected to increase in both RCP scenarios. In the RCP4.5 scenario, TXm is expected to increase by as much as 0.6°C in the early future and 1.6°C in the late future; in the RCP8.5 scenario, it is expected to increase by as much as 3.4°C in the late future.



Warmest Daytime Temperature (TXx)

TXx refers to the temperature on the hottest day of the year.

Baseline observations show that the hottest daytime temperature in the project area ranges from 32.7 °C to 34.2 °C. It is also projected to increase in the future, by as much as 1.8 °C in the late future for the RCP4.5 scenario and by as much as 3.8 °C in the RCP8.5 scenario.

Fraction of Hot Days (TX90p)

TX90p tracks the number of hot days when the maximum temperature exceeds the 90th percentile threshold.

Historically, the number of hot days occurs at 11.7% (42 days) of the year. This is projected to increase significantly in the future, with projections indicating an increase of at least 10.7% (39 days) in the early future, and as much as 88.0% (321 days) in the late future, essentially making every day of the year a hot day.

Rainfall Extremes

Based on PAGASA (2020) projection, the precipitation extreme indices show distinct patterns of spatial variability in the baseline data, especially for the magnitude and frequency indices. The projected changes indicate a general drying trend but also the occurrence of extreme rainfall events in the area. Prolonged wet events tend to decrease, but prolonged dry events also show localized decreases, indicating possibilities of increased frequency of wet events in the future which would interrupt the long-duration dry events.

The summary of rainfall extremes of Maguindanao (observed and projected annual climate extremes) is presented in **Table 7.3-3**.

TABLE 7.3-3 RAINFALL EXTREMES OF THE PROJECT AREAS(MM)

Scenario	Period	Maguindanao		
		Rx1day	P99	R99p
Baseline Value		31.6	26.8	63.5
Moderate Emission RCP 4.5	Early (2020-2039)	30.1 (-1.5)	25.6 (-1.2)	53.0 (-10.5)
	Mid (2046-2065)	31.1 (-0.5)	25.9 (-0.9)	59.8 (-3.7)
	Late (2080-2099)	33.8 (2.2)	26.6 (-0.2)	66.4 (2.9)
High Emission RCP 8.5	Early (2020-2039)	31.8 (0.2)	25.4 (-1.4)	54.7 (-8.8)
	Mid (2046-2065)	31.9 (0.3)	25.9 (-0.9)	57.3 (-6.2)
	Late (2080-2099)	32.2 (0.6)	25.5 (-1.3)	62.8 (-0.7)

Rx1day = maximum 1-day rainfall total, mm = millimeter, P99 = rainfall on extremely wet days, and R99p = total rainfall extremely wet days.

Source: DOST-PAGASA, Manila Observatory and Ateneo de Manila University (2021). Philippine Climate Extremes Report 2020: Observed and Projected Climate Extremes in the Philippines to Support



Informed Decisions on Climate Change Adaptation and Risk Management. Philippine Atmospheric, Geophysical and Astronomical Services Administration. Quezon City. Philippines. p.104, 107.

Maximum 1-day Rainfall Total (Rx1day)

Rx1day describes the maximum amount of rain that can fall in one day. Such extreme rainfall is typically associated with local thunderstorms or large-scale systems such as monsoons or tropical cyclones and may induce flash floods or landslides. It is useful as an engineering design criterion in sizing hydraulic structures.

Baseline observations show that Maguindanao experiences a maximum 1-day rainfall total of up to 31.6 mm. For RCP4.5, the area can get as much as 2.2 mm of additional rainfall in the late future. In the RCP8.5 scenario, the area is projected to have an increasing Rx1day as time progresses, from approximately 0.2 mm in the early future to around 3.4 mm in the late-future.

Rainfall on Extremely Wet Days (P99)

P99 indicates the amount of rainfall on “extremely wet” days, defined as those exceeding the 99th percentile threshold.

Historically, rainfall distribution on extremely wet days is similar to P95 with maxima reaching up to 33 mm/day and minima at around 26.8 mm/day. In both scenarios, the P99 is projected to decrease by as much as 1.4 mm/day in the early to late future in Maguindanao province. The changes are projected to become slight in the early future and mid-future.

Total Rainfall Extremely Wet Days (R99p)

R99p describes the total amount of rain that falls on “extremely wet” days when rainfall exceeds the 99th percentile. Similar to R95p, it is related to the rainfall events that occur during the wet season and during tropical cyclone events.

Historically, R99p can reach up to 63.5 mm and be concentrated over the Maguindanao area. Dry trends of up to 10 mm are projected over the Maguindanao area in the early future in both scenarios.

• Implications for the Project

- The absence of a distinct dry season may affect construction scheduling and material storage, requiring year-round erosion control and sedimentation management.
- Rainfall and humidity levels should be considered in the design of drainage systems, wastewater discharge, and potential flooding.
- Climate resilience measures must be integrated, especially to manage extreme rainfall events that may increase due to climate change.
- While typhoon incidence is low, occasional intense rainfall can still pose risks to slope stability, excavation safety, and transport logistics during construction.



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B. Air Quality Assessment

The ambient air and noise sampling activity was conducted by an independent consultant on July 27-28, 2024. The samples were submitted and analyzed by Ostrea Incorporated a registered and accredited environment laboratory by the DENR EMB 3. The result and laboratory analysis are shown in **Appendix 3**.

The equipment's used for the collection of NO₂ and SO₂ was a Tri-Gas Sampler and High-Volume Sampler with 10-micron particle-size inlet for PM 10. The methods used in analyses of PM 10 concentrations were determined by gravimetric method, Tetra-chloromercurate (TCM) absorber - Pararosaniline Colorimetric for sulfur dioxide and Impinger Griess-Saltzman method for nitrogen dioxide. The sample collections were done in conformity with the National Ambient Air Quality Standard (NAAQS) as specified by Department of Environment and Natural Resources (DENR) Administrative Order No.93-14.

The location and its corresponding description of the ambient air and noise sampling stations are shown **Figure 7.3-6** and **Table 7.3-4**.



FIGURE 7.3-6 SAMPLING STATIONS FOR AIR QUALITY AND NOISE ASSESSMENT



TABLE 7.3-4 AIR AND NOISE SAMPLING STATIONS

Station No.	Location	Remarks	Photos
1	14° 41' 05" N, 120° 33' 41" E	Near Project Site	
2	14° 41' 04" N, 120° 33' 41" E	Along Diversion Road, Tamontaka 1	

C. Ambient Air Sampling Result

DENR defined clean air based on Ambient air quality standards (AAQS) to protect the most sensitive and vulnerable individual in any community. An air quality standard defines the maximum amount of a pollutant that can be present in the open air without compromising the health of the public.

The sampling activity was conducted on a sunny to slightly windy weather condition. The results of the sampling activity were compared to the National Ambient Air Quality Standards for Sources Specific Air Pollutants from industrial sources/ operation (NAAQSSAP).

The results of sampling and analysis concludes that the ambient concentrations of NO₂, SO₂, and PM 10 are within the acceptable limits of the standards stipulated in the IRR of the Philippine Clean Air Act.

The ambient air sampling results is given in **Table 7.3-5**. All supporting field data, analytical reports and calibration records are provided as attachments.

TABLE 7.3-5 AMBIENT AIR SAMPLING RESULT

Station No.	Location	NO ₂ (µg/Nm ³)	SO ₂ (µg/Nm ³)	PM 10 (µg/Nm ³)	TSP (µg/Nm ³)	CO (µg/Nm ³)	O ₃ (µg/Nm ³)
1	Location 1	0.97	2.30	57	66	<1	<1.0
2	Location 2	6.22	3.00	132	247	<1	<1.0
DENR NAAQSSAP (DAO 2000-81 Standards)		150	180	150	230	9	60



D. Noise Assessment Sampling Result

Noise is defined as unwanted or excessive sound which interferes with the normal activities within the work premises. Noise is described in terms of loudness, frequency, and duration. Loudness is the sound level measured on a logarithmic scale in units of decibels (dB).

To measure the sound level frequency characteristics an A-weighted [dB (A) frequency filter is used to approximate human hearing of sounds. An EXTECH Model SL-4033SD was used to measure the noise level of the sampling points. Such measuring device has +/- 1.5 dB accuracy with 0.1 dB resolution.

The sampling locations are shown in **Table 7.3-6**. Sampling period is 10 minutes with ten seconds interval.

TABLE 7.3-6 SAMPLING LOCATION FOR NOISE ASSESSMENT

Station No.	Location	Remarks
1	14° 41' 05" N, 120° 33' 41" E	Near Project Office
2	14° 41' 04" N, 120° 33' 41" E	Near Water Tank in the middle of Fishpond area

D. Environmental Quality Standards for Noise

Noise pollution becomes evident in the environment when it contaminates the order of the surrounding by becoming nuisance and affect the health and way of life of people. Although noise have not yet defined in any statute, it is now included as an environmental pollutant in Section 78 of Ambient Quality and Emission Standards for Noise Act of 1980, therefore recognizing it as a kind of air pollution. **Table 7.3-7** indicate the limits for noise for different types of areas at different applicable sampling time.

TABLE 7.3-7 LIMITS FOR NOISE FOR DIFFERENT TYPES OF AREAS PER SAMPLING TIME

Area Category	Limit Daytime (dB)	Limit Morning and Evening (dB)	Limit Nighttime (dB)
AA- Areas within 100m from Schools, Hospitals, etc.	50	45	40
A - Residential	55	50	45
B - Commercial	65	60	55
C - Light Industrial	70	65	60
D - Heavy Industrial	75	70	65

D. Results and Conclusion

The results of the noise level measurement are presented in **Table 7.3-8**. The results were compared to the standards based on the proposed land use within the sampling location. The sampling location was considered as Category A (Residential).

TABLE 7.3-8 RESULTS OF NOISE SAMPLING

Station No.	Sampling Time (1hr)	Morning	Daytime	Evening	Nighttime
1	24-Hr	41	51	42	38



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Station No.	Sampling Time (1hr)	Morning	Daytime	Evening	Nighttime
2	24-Hr	54	58	40	37
NPCC Standards (Class A)		50	55	50	45

The Occupational safety and Health Agency (OSHA) has set the danger level at 95 decibels (dB) and above for four or more hours per day as likely to induce permanent hearing impairment. As observed from the table the Max (dBA) were only read momentarily and will not affect the result in general. Noise level measured for all stations are below the Standard Limits.

For this sampling activity, the following has contributed to the measured noise level values: passing vehicles and residential noise, animal sound like insects and birds.

7.4 THE PEOPLE

A. Socio-Demographic Profile

Background

The Project is geographically located in Barangay Tamontaka II, City of Cotabato in the Province of Maguindanao (**Figure 7.4-1**). The data and information presented in this document were generated from secondary sources and primary data generated through surveys undertaken in the additional sites. The survey instrument used during the survey is in **Appendix 2**.

According to the Philippine Statistics Authority, the City has a land area of 37.60 square kilometres (176 km²) constituting 1.81% of the 9,729.04 square kilometres total area of Maguindanao.



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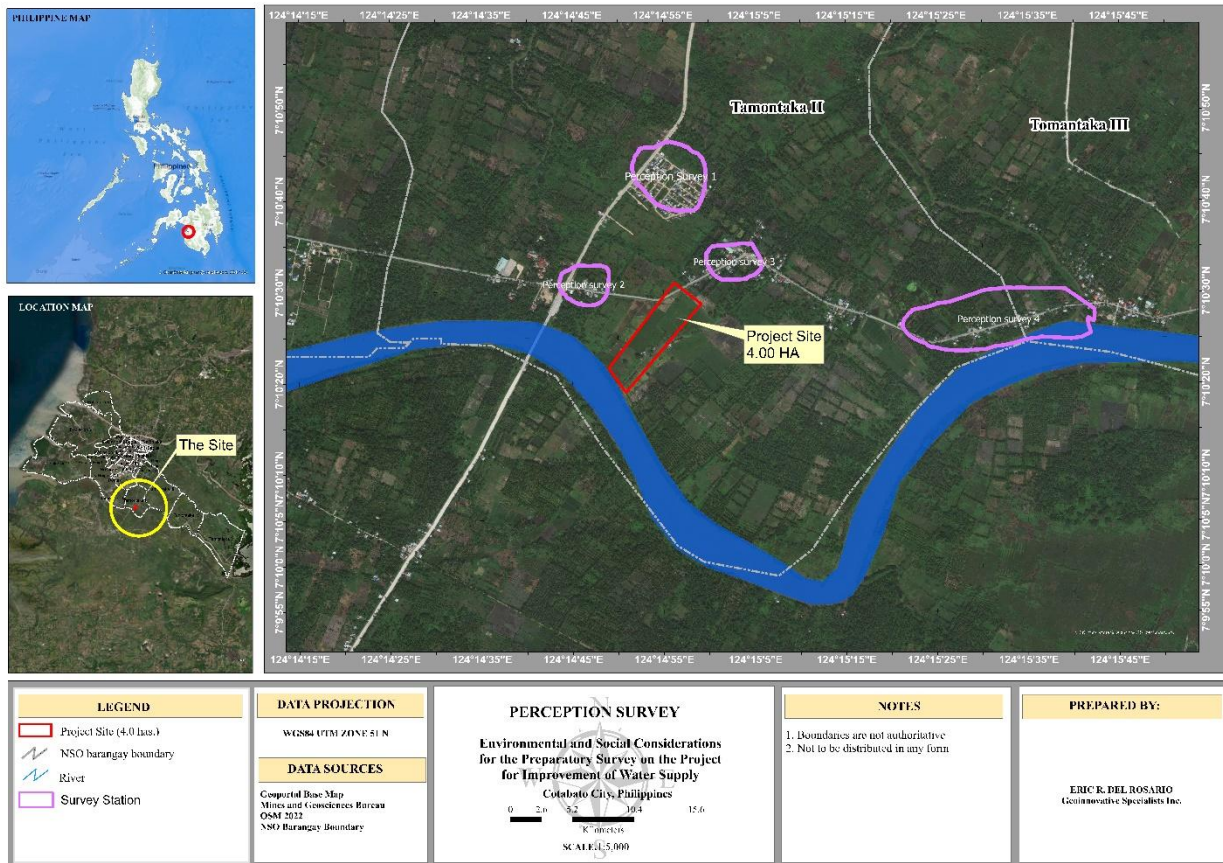


FIGURE 7.4-1 LOCATION MAP AND BOUNDARIES OF PROJECT

B. Socio-Economic Features of Cotabato City

Population

The Philippine population increased by 1.5 % on an average during the period 2000-2022 (Table 7.4-1).

TABLE 7.4-1 POPULATION OF THE PHILIPPINES (2000, 2010, 2015 CENSUS)

Census Year	Census Reference Date	Population (in millions)
2000	May 1, 2000	76.51
2010	May 1, 2010	92.34
2015	August 1, 2015	100.98
2022	August 1, 2022	115.6
2024	May 1, 2024	116.2

While there was an increase in the nationwide total population in the 15-year period, the annual population growth rate had decreased to 1.72% (2010-2015) from 1.90% (2000-2010).

Maguindanao's population increases annually at the rate of 2.74%. Of the Region's provinces, the province had the biggest population in 2024 with 926,037 people (Table 7.4-2).

TABLE 7.4-2 2020 POPULATION



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Area	2020 Population
BARRM	1,448,347
Maguindanao del Norte	926,037
Cotabato City	325,079

Source: PSA, 2020

Poverty

Poverty incidence, among Filipinos for the Year 2021 was reported at 18.1%. This shows a 6% increase from the poverty incidence in 2018 of 12.1% for the same period. On the other hand, a decreasing trend had been observed in the per capita poverty threshold of the city and province where the project is located – that is in BARRM and Cotabato, correspondingly as shown in **Table 7.4-3** below.

For the country’s 2021 subsistence incidence, a figure of 18.1% was reported compared to the 2015 figure of 12.1% for the first semesters of both years. This means that there are about 6 million Filipinos whose minimum income is still below the income required to meet the basic food needs and satisfy the nutritional requirements set by the Food and Nutrition Research Institute (FNRI). For the first semester of 2021, a family of five (5) needed at least PHP 6,365.00 on average per month to meet the family’s basic food needs; and at least PHP 9,140.00 on the average per month to meet the basic food needs and non-food needs (e.g., clothing, housing, transport, education, health). These figures represent the monthly *food threshold* and monthly *poverty threshold*, respectively.

TABLE 7.4-3 PER CAPITA POVERTY THRESHOLD AND POVERTY INCIDENCE FOR THE COUNTRY AND PROVINCIAL PROJECT AREA

Coverage	Per Capita Poverty Threshold (PHP)			Poverty Incidence (%)		
	2015	2018	2021	2015	2018	2021
Philippines	22,747.00	25,813	28,871	23.5	12.1	18.1
NCR	25,188.00	28,682	32,978	4.1	2.2	3.5
BARRM	22,650.00	27,715	28,293	59.4	61.8	29.8
Cotabato City	25,581.00	30,349	33,890	48.7	42.0	39.7

Source: PSA 2023 Statistical Year

Income and Expenditures

The host community has relatively rural economy with only few investors/ companies having business ventures in the city. The Barangay is one of the thirty-seven (37) barangays comprising the City. Barangay Tamontaka II is currently among the least populous barangay and is the site where most of the rice growing activities are located (PSA, 2025).

Many of the community are employed by the crop land owner. Most of which are engaged in the preparation, operation, and harvesting of agricultural products.

Social Services

The City of Cotabato is a 1st-class City which mainly relies on commercial and industrial establishments. With annual income of PHP 100,158,000.00 in 2020. As provided for in the “Local Government Code” no less than 20% of the annual IRA should be allotted for Development Projects. The IRA of the City are now pegged at PHP 231 million which is being utilized for all the operations of the local government (PSA, 2023, Wikipedia, 2025).



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- **Water**

The Metro Cotabato Water District (MCWD) is serving all juridical Barangays of the City. Although there are still some communities who rely on shallow wells, deep wells, free-flowing springs, and even open dug wells especially in low lying areas.

- **Sanitation**

Sanitation covers, among others, proper waste disposal whether it be human waste or domestic solid waste. It is very much associated with water availability/accessibility.

In the census 2000, only 1% of the households have no water-sealed toilet facilities. Domestic solid wastes are disposed by the community mainly regular garbage collection and some by burying.

The LGUs are trying to address the full observance of sanitary means of waste disposal by the concerned communities through the conduct of health education campaigns.

Several health/medical facilities are available in the city where the project will be located (**Table 7.4-4**).

TABLE 7.4-4 HEALTH SERVICES

Health Facilities	Cotabato City
Hospitals/Medical Clinic	10
Rural Health Center (RHU)	37
Barangay Health Stations	37
Birthing Facility	15
Day Care Center	37
Family Planning Center	10
Nutrition Center	10
Botikang Barangay	9
Drug Store (private)	50
Dental Clinic (private)	15
Medical Laboratory (private)	10

Source: Cotabato City Health Office

Almost all Barangays is serving by the 2 Rural Health Units provided by the local government. 12 health personnel are servicing the whole populace attending to all health needs of the populace.

- **Education**

The municipality provides services for preparatory education and secondary education which are availed by the community because of the proximity to their homes (**Table 7.4-5**). It hosts 8 universities and colleges including the Cotabato State University. The current literacy rate is around 87%.



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TABLE 7.4-5 AVAILABLE SCHOOLS IN THE MUNICIPALITY

Levels	City
Day Care Center	37
Elementary (public)	37
Elementary (private)	No Data
Secondary (public)	37
Secondary (private)	No Data
Tertiary	20
Special Education	2

- **Transportation**

Cotabato City has become a pivotal hub for bus route transport connectivity, linking it to major cities across Mindanao. To the east, routes extend to Davao City, Digos City, and Cotabato Province. Heading south, connections are available to General Santos City, South Cotabato, and Sultan Kudarat Provinces. To the north, routes reach the Province of Bukidnon, Lanao Del Sur (Wao), and Cagayan De Oro City. Additionally, recent developments have expanded connectivity to the western side of Mindanao, including cities such as Dipolog, Pagadian, and Zamboanga.

- **Communication**

Reliable communication processes the awareness of people and makes them a potent instrument of development and partner of social improvement. Mass communication facilities and services for telephones, telegraphs and postal are in existence.

The Philippine Postal Corporation is responsible for postal services such as domestic and foreign mails and money orders. The office is in the municipal hall.

Communications, Globe Telecom, and Dito Telcom. Internet Service providers in the city are PLDT, Smart, Globe, and Dito. Cable services are being handled by local-based Cotabato Cable and national-based Signal and Sky Cable.

- **Electricity**

Power is handled by Cotabato Light and Power Company, a private firm owned by Aboitiz who gets power resources from the National Grid Corporation of the Philippines. (NGCP). It also operates a bunker fuel-fired stand-by power engines to address emergency situations like power failures, trip-offs and fluctuations.

- **Religion**

As reported by Philippine Statistics Authority (PSA) in 2015, 92.15% of the people of Cotabato City are adherents of Sunni Islam. The followers of Islam are mainly Maguindanaon, Iranun, Maranao, and Tausug. The remaining proportion belong to non - Islamic belief such as Christianity, Buddhism and other sects.

C. Social Development Plan



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The ultimate goal of the project Proponent is to alleviate the quality of life of host barangays. In order to foresee these a Social Development Program shall be developed for the host community.

The main target interest group of the SDP is the host barangay and should be the institutions that will be implementing the project.

1. For the host barangays, the specific goals are:
 - a. Contributing to the provision of meaningful livelihood training and employment
 - b. Promotion of health, education, and environmental initiatives
2. For other Barangays ad LGU:
 - c. Providing the LGUs technical support on how they can access benefits due to the host barangays based on the IRA and Local Government Code.

There are ten (10) areas of concern which will be the focus of SDP discussed in the following **Table 7.4-6:**

TABLE 7.4-6 TEN AREAS OF CONCERNS

Areas of Concern	Project
1. Displacement of settlers	The project area is not situated in a settlement area. The land is privately owned.
2. Impact of in-migration patterns as a result of project implementation	No impact of in-migration since employees hired from nearby Barangay and City do not stay in the vicinity
3. Impact on IPs culture and lifestyle if any	None
4. Project implementations' threat to public health	No threat to public health whatsoever since the Company will provide health benefits to its employees. Also, the company is partner of the host Barangay in its implementation of its health programs
5. Local benefits expected from project implementation	<ul style="list-style-type: none"> • Increase land value • Improve waste management system • Provision of financial assistance • Increase on LGU annual income and revenue
6. Effect on the delivery of basic services and resource competition in the area	None
7. Effect on traffic situation in the area	Not to a critical level in the national highway as delivery equipment/ vehicles will be located inside the facility.
8. Entity to be accountable for environmental management in the area	The local LGUs will be the primary body that will lead in the environmental management monitoring in the area in cooperation with other stakeholders (communities in the area, MENRE/EMS) operation phase of the project. Environmental accountability should be for all sectors and all people that will be benefitting from the project



Areas of Concern	Project
9. Effect on existing properties in the area in terms of relocation and devaluation	None
10. Other affected properties	None identified

D. Perception Survey

The planning and training of enumerators were conducted on October 28, 2024. A pre-test of the survey instrument was facilitated for 50 respondents to check the capability of the enumerators to conduct the survey. The survey team is composed of local individuals with previous experience in similar surveys. The actual survey was facilitated from October 29-November 2, 2024, covering the 4 Barangays with around 305 respondents sampled.

- **Objective**

The survey was meant to generate pertinent socio-economic information on the actual demographic profile, perceptions, and issues and concerns related to the impact mitigation measures of the community respondents who reside and are occupying the immediate proximity of the project area. The project area has no existing occupants; hence, the subjects of the survey are those living near the proposed area.

- **Methodology and Scope of Coverage**

Based on initial information searched from Phil. Statistics Authority (PSA), the total Population of Barangay Tamontaka II is about 5,964. To determine the number of households, per PSA, the average household size is about 4.1 people per household. Dividing with the total population will give us a household size of 1,453. The sampling procedure to determine the sample size (respondents' size) shall use the formula prescribed for random sampling:

Sample size = $N / (1 + Ne^2)$ Where:

N = estimated size of base population

e = margin of error (equal to or less than 10%)

Setting the margin of error at 10 percent and from the base population, the sample size for the survey area is estimated at 304 households.

The survey utilized a pre-tested questionnaire comprising about 50 items spread over 5 major sections probing on the respondent's personal details, migration/settlement history, household income and employment, livelihood and employment, housing and utilities, community perceptions and perceptions on the project.

The perception survey initially solicits the demographic and socio-economic characteristics of respondents to provide an overview of their lifestyle and living standards as stakeholders to be impacted by the project. Other highlight of the survey includes solicitation of sample experience/s with similar (past and existing) projects. Finally, the perception survey shall elaborate and solicit the knowledge and sentiments of respondents on the project and the relatedness of these perceptions to their personal attributes and locality needs. Five (5) survey enumerators were hired from the local community to undertake a perception survey. Prior to the actual survey, these



enumerators were briefed and trained by the consultant. The covered the 4 barangays where respondents are randomly selected (**Figure 7.4-2**).

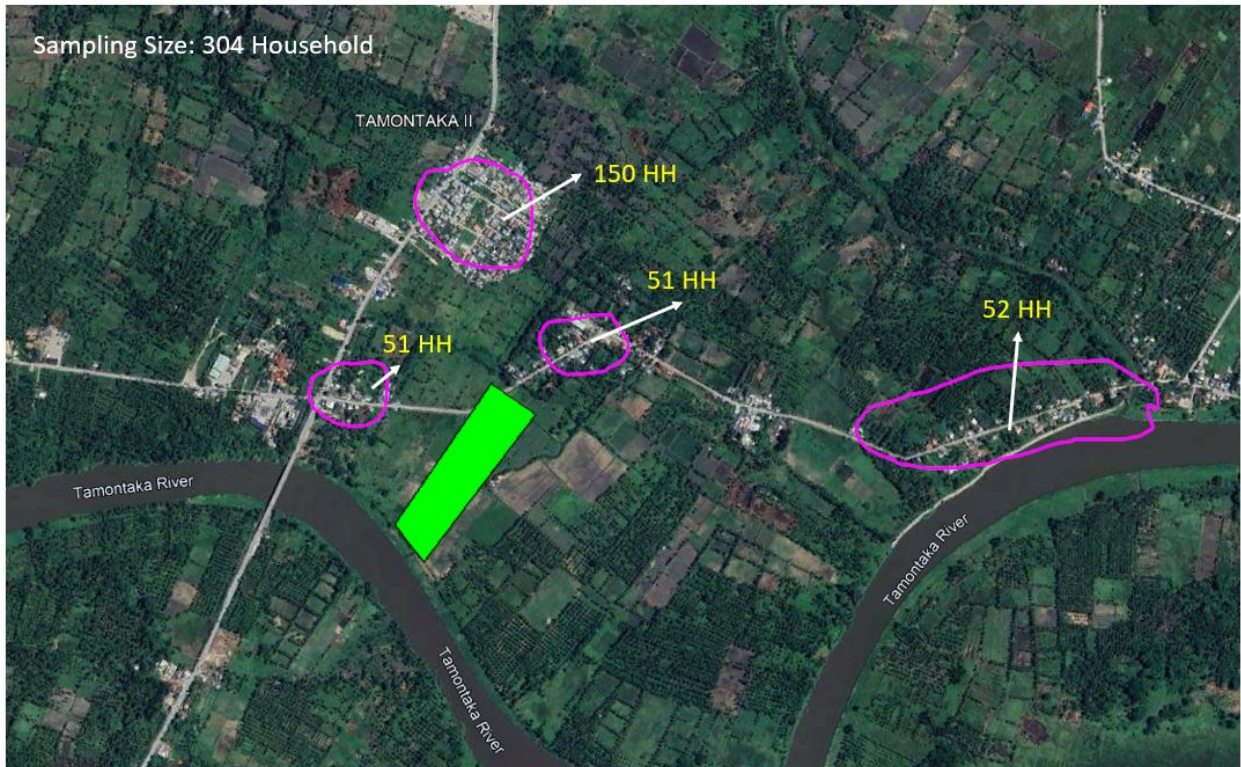


FIGURE 7.4- 2 HOUSEHOLD SAMPLING DISTRIBUTION

- **Discussion of Survey Results**

The discussion in this section focuses on the highlights and main points of the results of the survey.

Gender Distribution of Respondents: There were more Male than Female respondents during the conduct of the survey: 161 Male to 143 Female. It is noteworthy to ascertain the views expressed in this survey as the result may have some skewness in favor of the male viewpoint.

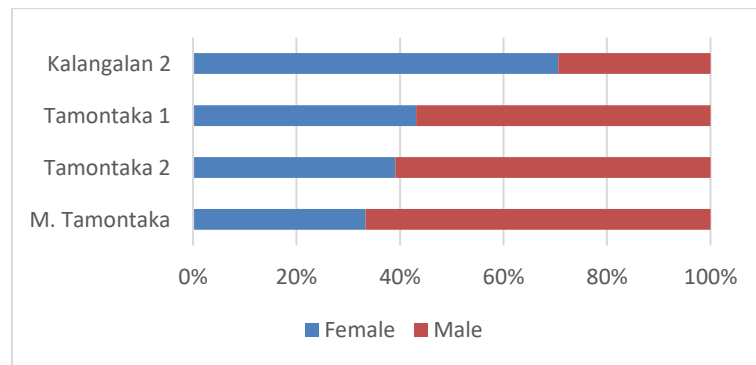


FIGURE 7.4-3 GENDER DISTRIBUTION OF RESPONDENTS

Household Head (HHH) as Respondents: A little over 62% of the survey respondents claimed to be the household heads while spouses came at 36%. The rest of the respondents were either children, parents or siblings of the household head.

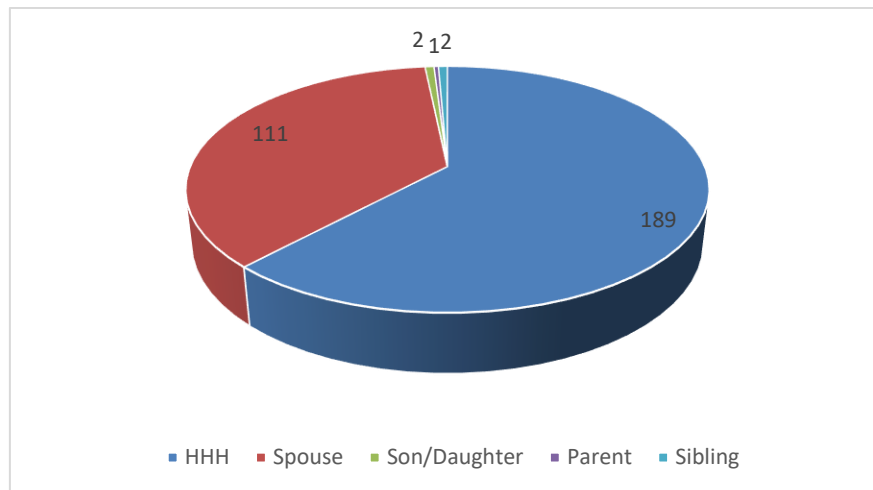


FIGURE 7.4-4 TYPE OF RESPONDENTS

Ethnicity of Households: More than 94% of the households claim to be Maguindanaoan while only a paltry percentage (3.92%) claimed to be Ilonggo/Bisaya. There was one household that claimed to be a Tausug.

Household Size: The average household size across all survey areas is 4, although across all Barangays, the largest household size reached 10. Barangay Kalangalan 2 indicated the smallest average household size of only 3, with the largest being 7.

A total of 967 constitutes the household population from the household respondents.

Household Ages: Nearly three-quarters of the respondents' household population is aged between 15-64 years old, suggesting a largely economic age bracket. About a fifth are aged from 0-14 years old, while only about 6% belong to the age group of 65 years and above. The latter suggests that more than a quarter of the household population is composed of dependents.

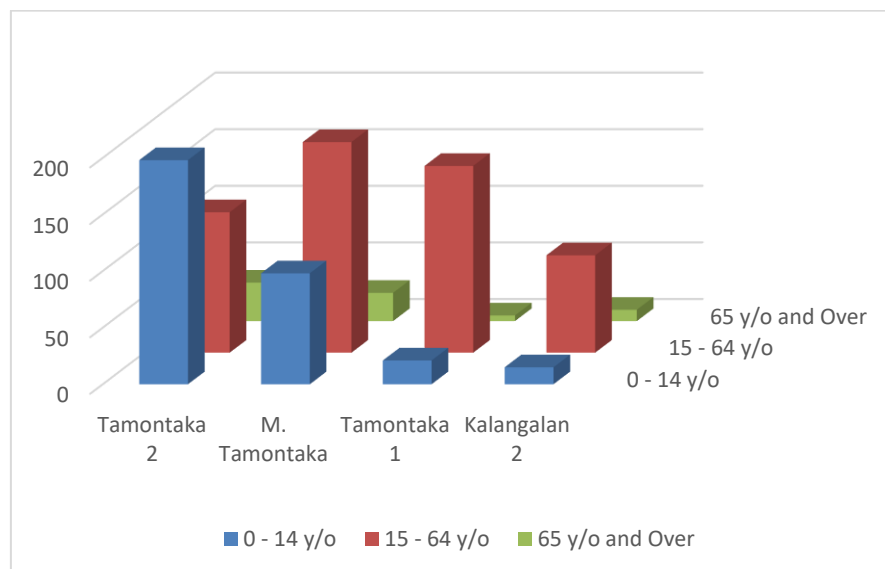


FIGURE 7.4-5 AGE DISTRIBUTION OF HOUSEHOLD POPULATION

Sex Distribution of Households: There is a 1:0.97 male-female sex ratio among the household population across all Barangays although in Barangay Tamontaka 1 there are more female household member population than males.



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Marital Status of Households: In terms of marital status, there are more single individuals than married ones. Curiously, more than 5% claimed other type of relationship.

Barangay Mother Tamontaka (MT) and Barangay Tamontaka 2 had more Single persons among the household population. Further, there are more couples in a Co-habiting relationship in Barangay Tamontaka 2 than in the other Barangays.

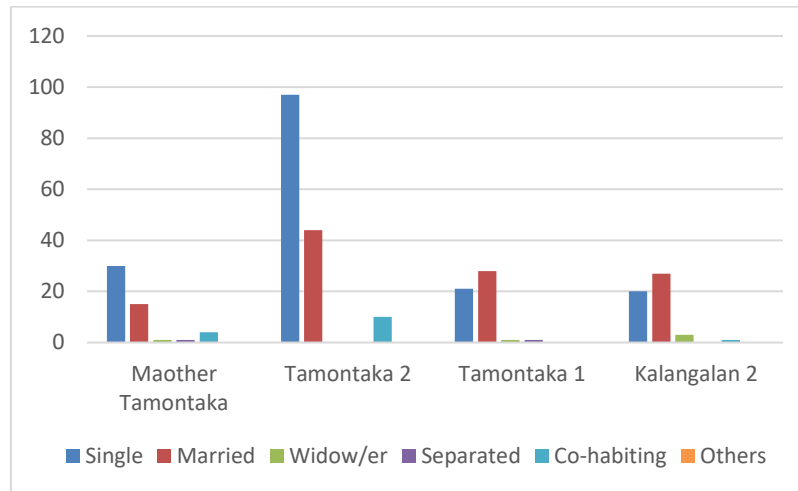


FIGURE 7.4-6 MARITAL STATUS OF HOUSEHOLD POPULATION

Educational Attainment of Household Population: More than a fifth of the household population had only completed Secondary (High School) education while a little than a fifth did not graduate from Secondary School. More than 14% had a college degree although more than 16% were unable to graduate from college. Curiously, more than 5% were elementary school graduates and this group population could be the parents and/or grandparents of the younger household members.

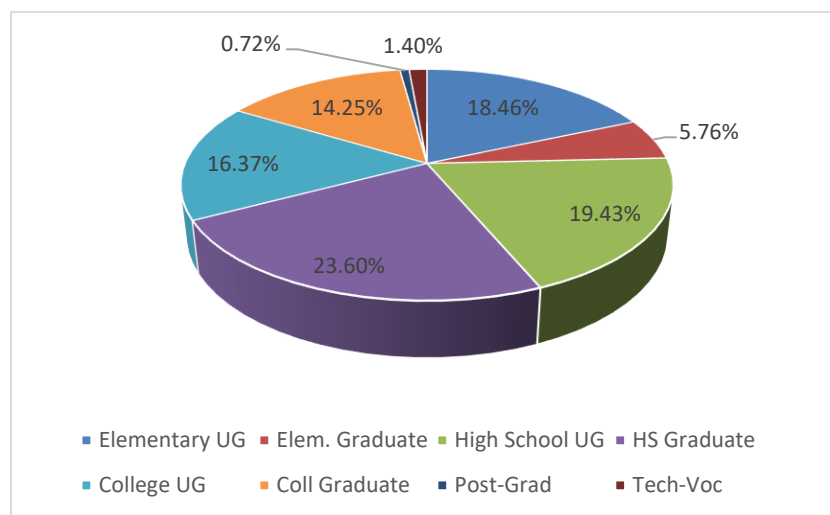


FIGURE 7.4-7 HIGHEST EDUCATIONAL ATTAINMENT OF HOUSEHOLD POPULATION

It is noteworthy that only about a third of the household members are still In-School while the rest have already ceased schooling.

Occupation/Employment of Household Population: More than 12% of the household population are farmers while nearly half (45%) are unemployed. Others who are employed



are employees of government (7.87%), service workers like drivers (8.08%), laborers (7.02%) and about 3.55% are employees of private enterprises. Some 4.77% are self-employed.

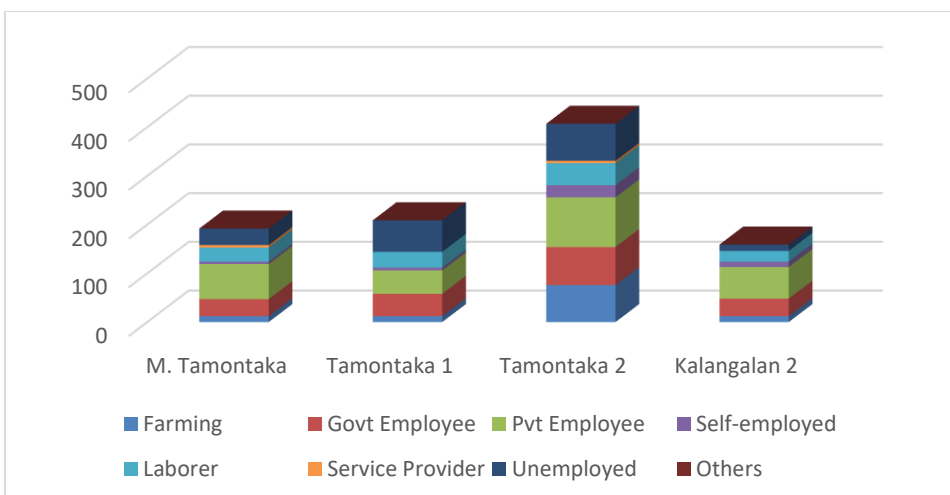


FIGURE 7.4-8 OCCUPATION/EMPLOYMENT OF HOUSEHOLD POPULATION

Aggregate Monthly Income of Households: The aggregate monthly income of 23.14% of the employed members of the households are within the range of PHP 1,000-5,000 while 13.44 are within the range of PHP 5,000-10,000 which is much below the national poverty threshold and even the regional poverty threshold. Only about 6.27% of the employed household population earn a monthly income of PHP 10,001-15,000. Considering that more than 45% of the household population is without work, it goes without saying that that much proportion also had no income.

In terms of their views regarding the sufficiency of their income, nearly three-quarters claimed that their income is insufficient. Nearly a third (32.31%) ascribed the insufficiency to “too many expenses” while almost an equal number ascribe it to high prices as well as to small amount of income.

House Tenure and Years of Occupancy: Nearly 89% of the households are homeowners while only 11% are not. Also, more than 18% of the households have resided in their houses from at least one generation (≈30 years) to two (≈60 years)

House Floor Size and Number of Levels: The average floor area of houses among the household-respondents range from 54 m² (Tamontaka 2) to 112 m² (Mother Tamontaka). There are, however, house structures that has a floor area of as much as 300 m² (Tamontaka 1).

More than 93.8% of all houses are single-storey structures, which could be said to be vulnerable to flooding.

Lot Ownership and Years of Occupancy: Nearly two-thirds of the household respondents own the land on which they occupy with those from the Barangay Mother Tamontaka yielding as much as 85.19% who are lot owners. However, as must as nearly 52% of the households in the Tamontaka 1 do not own the lot they are occupying and in the Kalanganan 2, about 48% of the households likewise do not own the land they are occupying.

Nearly one-thirds of the respondents claimed that they have occupied the land for at least more than 30 years to nearly two generations (≈60 years).



Further, more than one-third (37%) of the respondents claimed that they own the farmlands they are farming (with the respondents from the Barangay Tamontaka 2 having as much as 56% of the respondents being farmland owners) while two-thirds are not farmland owners themselves.

Years of Residency in the Barangay: More than 50% of the respondents claimed that they have been residents of their respective barangays for 31 to more than 60 years, approximately a minimum of one generation and a maximum of two generations.

Proximity to a River: More than three-quarters of the respondents stated that they live within the proximity of a river with some as near as 10 meters from the river. Further, more than a third of the respondents claimed that their workplace is near the river with some as near as 10 meters.

Gender Roles: Generally, there is shared role and responsibility between the gender in terms of making purchases (land, house, vehicle, appliances, furniture, food, farm animals and others) although it can be gleaned that there are purchases where there is a residual gender stereo-typing. For instance, while there is shared role in purchasing food, women take on a more dominant role while the men take on a more dominant role in purchasing farm animals.

In terms of taking out loans, the female member of the households appears to take on the lead role across all loan sources.

Perceptions: Based on the responses, there is a general view that the Project can provide higher benefits to the population of the city and that access to cleaner water is the most perceived benefit. This is followed by almost same degree of frequency by Progress of Barangay/ City, cheaper water bills, and uninterrupted supply of water.

Needs: About 38% of the respondents ranked the Water Distribution System as the primary need of their community. This is followed by Dikes, Riverbank Protection and Roads.

Project Awareness and Acceptance: Nearly two-thirds of the respondents affirmed that they are aware of the proposed treatment plant project, and they had known this through their barangay officials as well as from surveys/ research. More than 98% of the respondents accepted the proposed project and are willing to support it.

E. Consultations, Participation and Public Disclosures

The first stakeholder consultation was done last 24 June 2025 at the Sardonyx Plaza at Gov. Gutierrez Ave. in Cotabato City. The primary objective of the activity was to openly disclose the ongoing Feasibility Study and the Environmental Impact Assessment study, the status of the study and primarily to solicit active support and participation from the stakeholders. Please refer to **Appendix 4** for the Program of Activities and the list of invitees.

The main objective of the Public Consultation is to:

- Present and disclose the project details to stakeholders
- Initiate stakeholder collaboration and gather insights
- Share data and identify problems and solutions
- Establish partnerships for project success



The project overview was presented by Mr. Konno (JICA Survey Team, Consultant) discussing the background, scope, and rationale of the project while Mr. Del Rosario of the EIA Team presented EIA process, baseline findings, and identified impacts. The list of participants and their roles is presented in **Table 7.4-7**.

TABLE 7.4-7 SUMMARIZED LIST OF PARTICIPANTS DURING THE PUBLIC CONSULTATION

Organization	Representative/s	Roles/Remarks
Metro Cotabato Water District (MCWD)	Mr. Winston L. Sapal	Proponent/ Technical Panel
Japan International Cooperation Agency (JICA)	JICA Study Team	Funding agency and technical partner; Presented project overview and description
Geoinnovative Specialist Inc.	Mr. Eric Del Rosario, Mr. Mark Anthony Aldeco	EIA Consultant; Presented EIA methodology and findings
MENRE – Forest Management Services (FMS)	Mr. Datu Danny Maagsabing, Mr. Guiamel Abdul	BARMM environmental authority; Raised coordination and ecological fee issues
Ministry of Health – BARMM	Ms. Ayessa Yussop	Regulator of public health and potability; Asked about water testing and certification
Action Against Hunger/ Plan International (NGO's)	Mr. Abdulla Taluson	Civil society stakeholder; Raised concerns about impacts, timeline, and benefits
LGUs (Tamontaka 2, Tamontaka 1, Mother Tamontaka)	Multiple LGU representatives	Local governance support; Expressed full cooperation and partnership

Note: For a complete list and attendance, please refer to **Appendix 4**. Aside from the LGU's, some members of the community from the project affected barangays attended the meeting and were included in the attendance sheets.

The main points raised by the participants during the consultation were:

- Coordination with other MENRE branches/ Service during the application of the ECC;
- Justification why Tamontaka River was chosen as source of water;
- Water quality testing/ assessment and monitoring;
- Application of potability clearances from City Health office;
- Potential environmental impact of the project to the host barangay;
- Expected time frame of the project;
- Coordination protocol with BARMM agencies;
- Creation of livelihood opportunities for local communities;
- Key focus of the environmental impact assessment;
- Addressing the environmental and social impact of the project on land: mitigation and compensation;
- Ecological fees;
- Other sources of water other than Tamontaka River and;
- MWCD facilities in watershed.

The summary of inquiries raised during the meeting with corresponding responses is shown in **Table 7.4-8**.



TABLE 7.4-8 SUMMARY OF ISSUES AND CONCERNS RAISED DURING THE PUBLIC CONSULTATION MEETING

Stakeholder	Issue/Question Raised	Response Given
MENRE – FMS (Mr. Maagsabingat)	Why choose Tamontaka River as source instead of Rio Grande?	JICA assessment revealed high salinity in Rio Grande; Tamontaka is more viable.
MENRE – FMS	Coordinate with other MENRE offices and consider the local GTZ project.	Consultant confirmed ongoing and future coordination with MENRE services.
Ministry of Health – BARMM	How was water quality testing done? Will MCWD secure potability clearance?	Testing done by a 3rd-party lab; MCWD to establish its own lab and coordinate with MOH for certification.
Action Against Hunger (Mr. Taluson)	What are the expected environmental impacts?	Already explained in the EIA presentation, mostly manageable with mitigation.
Action Against Hunger	When will the project be implemented? Any plan to benefit local communities?	Project completion expected by 2029; MCWD is committed to creating opportunities for locals.
Action Against Hunger	What is the main EIA focus?	Ensuring a consistent, clean water supply to the populace.
Action Against Hunger	When will the project be implemented? Any plan to benefit local communities?	Project completion expected by 2029; MCWD is committed to creating opportunities for locals.
Action Against Hunger	What is the main EIA focus?	Ensuring a consistent, clean water supply to the populace.
MENRE (Mr. Guiamel Abdul)	Need for coordination on ecological fees in MENRE-managed lands.	MCWD is arranging coordination with MENRE and AFP over shared watershed claims.

For the full proceeding of the consultation, please refer to **Appendix 4**.

F. Indigenous People

- Legal Framework

The rights and welfare of Indigenous Peoples (IPs) in the Philippines are protected under Republic Act No. 8371 or the Indigenous Peoples’ Rights Act (IPRA) of 1997, which recognizes the rights of IPs to ancestral domains, self-governance, social justice, and cultural integrity. The National Commission on Indigenous Peoples (NCIP) is the primary agency responsible for IP-related matters, including the issuance of Certification Precondition (CP) and Free, Prior, and Informed Consent (FPIC).

- Indigenous Peoples in Cotabato City

Cotabato City is considered part of Central Mindanao, a culturally diverse region. While the city is a highly urbanized area, pockets of ancestral and traditional territories exist near its boundaries, particularly in areas adjacent to the municipalities of North Cotabato and Maguindanao del Norte (**Table 7.4-9**).



TABLE 7.4-9 INDIGENOUS PEOPLE IN AND AROUND COTABATO CITY

Indigenous Group	Estimated Presence	Areas of Cultural Significance
Teduray	Significant presence, especially in adjoining areas of Maguindanao	Upi, South Upi, and the fringes of Cotabato City
Dulangan Manobo	Sporadic presence in forested areas of Maguindanao and Cotabato	Upland zones and forest reserves
Blaan, Higaonon	Small, transient or intermarried groups	Migration-related settlements

Source: NCIP Regional Office XII; Community-Based Monitoring System (CBMS) Reports

It should be noted that Cotabato City proper is predominantly Muslim (Moro) and Christian settlers, but no IP ancestral domain claims and traditional territory rights were present within its administrative territory; hence, no IP group shall be affected by the project. Nevertheless, IP groups maintain cultural ties in nearby ancestral domains that may be affected indirectly by the project through employment and livelihood opportunities.

- IP Ancestral Domains and Legal Recognition

As of the latest NCIP records, no CADT (Certificate of Ancestral Domain Title) has been officially issued within the administrative boundaries of Cotabato City, although adjacent municipalities such as Upi and Datu Odin Sinsuat in Maguindanao del Norte contain recognized and claimed ancestral domains.

- Cultural and Socioeconomic Profile

The Teduray and other IP groups traditionally practice upland farming, swidden agriculture (kaingin), and maintain ritual practices tied to natural features such as rivers, springs, and sacred forests. Indigenous knowledge systems are evident in land use, herbal medicine, and conflict resolution.

Social structures are clan-based, with tribal elders or leaders (datu or bae) maintaining authority on customary law and decision-making. Customary laws are still observed in community disputes and governance, even where formal political units exist.

- Potential Project Impacts

While Cotabato City proper does not currently host major ancestral domains within its boundaries, its proximity to known IP territories necessitates screening and stakeholder mapping. The proponent must coordinate with the NCIP Regional/Provincial Office to determine any overlaps and, where applicable, initiate the FPIC process to ensure the project is socially acceptable and culturally sensitive.



CHAPTER 8 ENVIRONMENTAL/ECOLOGICAL RISK ASSESSMENT

As stated in DAO 2003-30, Environmental Risk Assessment is concerned primarily with safety risks, which are characterized by low probability, high consequence, accidental nature, and acute effects and focus on human safety (DENR-EMB-Environmental Impact Assessment and Management Division, 2007).

Based on screening applicability, as indicated in Section II-A of Annex 2-7e of the Revised DAO 2003-30, the Project does not involve any of the processes stated in the DAO and hence does not need an ERA (**Table 8.1-1**).

TABLE 8.1-1 RISK SCREENING APPLICABILITY

Activities Requiring Risk Screening Exercise	ERA Applicability to the proposed Project															
1. Facilities for the production or processing of organic/inorganic chemicals using:	Not Applicable															
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%;">Alkylation</td> <td style="width: 33%;">Esterification</td> <td style="width: 33%;">Polymerization distillation</td> </tr> <tr> <td>Amination</td> <td>Halogenation</td> <td>Sulphonation extraction</td> </tr> <tr> <td>Carbonylation</td> <td>Hydrogenation</td> <td>Sedulphurization solvation</td> </tr> <tr> <td>Condensation</td> <td>Hydrolysis nitration products</td> <td>Pesticide and pharmaceutical products</td> </tr> <tr> <td>Dehydrogenation</td> <td>Oxidation Phosphorus products</td> <td></td> </tr> </table>	Alkylation	Esterification	Polymerization distillation	Amination	Halogenation	Sulphonation extraction	Carbonylation	Hydrogenation	Sedulphurization solvation	Condensation	Hydrolysis nitration products	Pesticide and pharmaceutical products	Dehydrogenation	Oxidation Phosphorus products		Not Applicable
Alkylation	Esterification	Polymerization distillation														
Amination	Halogenation	Sulphonation extraction														
Carbonylation	Hydrogenation	Sedulphurization solvation														
Condensation	Hydrolysis nitration products	Pesticide and pharmaceutical products														
Dehydrogenation	Oxidation Phosphorus products															
2. Installation for distillation, refining, and other processing of petroleum products	Not Applicable															
3. Installation for total or partial disposal of solid or liquid substances by incineration or chemical decomposition	Not Applicable															
4. Installation for the production or processing of energy gases (i.e. LPG, LNG, SNG)	Not Applicable															
5. Installation for the distillation of coal or lignite	Not Applicable															
6. Installation for the production of metals and non-metals by wet process or electrical energy	Not Applicable															
7. Installation for the loading and unloading of hazardous materials as defined by RA 6969 (or DAO 29)	Not Applicable															

Other environmental risk identified deals with construction and other physical components. Project knowledge and EIA Team’s professional experience served as basis in identifying the risks associated in the project and in enumerating possible scenarios. Safety regulations were also identified to prevent and mitigate the risks.

The following are the identified risks:

(a) Construction-related accidents

Construction workers, and personnel may be subject to mishaps during the construction and renovation, if safety measures are not observed and followed. The following are a few of the possibilities that may occur: (1) accidental fall of construction workers from an elevated position and upper portion of construction site; (2) injury from construction materials; and (3) fire from electrical equipment used during construction.



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Safety procedures must be strictly observed by all. During construction, caution signages must be installed in the area.

(b) Structural Failure

Natural and human-made hazards might lead to structural failure, which could result primarily in human injury and damage of property. Another cause is the natural tearing off of the structures that are frequently used or that are exposed to the elements. Thus, regular maintenance and monitoring are required.

Risk Assessment Conclusion

The proponent has several efforts, both structural and non-structural, to prevent and mitigate accidents. Staff are trained in safety measures and first aid. A safety engineer will always be present to oversee all activities during construction and operation. Safety regulations are also explained to all personnel and with strict compliance with guests and/ or visitors. An on-site emergency plan will also be formulated.



CHAPTER 9

IMPACT MANAGEMENT PLAN

Pre-construction

Properly planned work activities and appropriate designs must be prepared and rigorously followed. This should follow all regulations of the national agencies and local government including among others, DILG, DOLE, DENR, etc. All permits and clearances shall be acquired prior to construction.

Operation

During the operation phase, impacts to land such as increase in solid wastes will be mitigated by implementing proper solid waste management and IEC for staff, on proper solid waste practices. Impacts on water and air such as increase in liquid wastes generation and increase in noise generation due to vehicles and equipment will be mitigated by regular maintenance of drainage, IEC for staff on proper water use, and scheduling of vehicular use. Impacts to people such as increased risk of accidents employees and increase road traffic would be mitigated by the strict observance of rules on safety measures, establishing medical station, continued capacity building on security and safety, formulation and implementation of disaster risk reduction plan and traffic management plan, and establishing appropriate parking space. While other impacts such as an increase in employee awareness on natural resources conservation, increase in local pride or their natural wealth and additional source of income for barangay and city are perceived to be beneficial.

Abandonment/De-commissioning

During the abandonment stage, perceived impacts are property relinquishment and unemployment. The property, building, and equipment may either be sold or leased to any interested party who may wish to venture on the same project and the workers would be given proper work compensation.

The impacts identified in every environmental module and the proposed mitigation on its respective impact are presented in **Table 9.1-1**.



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TABLE 9.1-1 POSSIBLE ENVIRONMENTAL/SOCIAL IMPACTS IN ENVIRONMENTAL MODULES AND THEIR PROPOSED MITIGATION

Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
LAND						
	<p><i>Land Use and Classification</i></p> <ul style="list-style-type: none"> Land use / land cover of the site is predominantly and residential /Built-Up. Land Classification maps from NAMRIA revealed that the project area is considered alienable and disposable. <p><i>Geology and Soils</i></p> <ul style="list-style-type: none"> Geologic data show that the project site stood along Recent rocks. <ul style="list-style-type: none"> Key Geohazards affecting the project areas are Flooding. Soil cover is represented by the Faraon Clay. <p><i>Terrestrial Flora and Fauna</i></p> <ul style="list-style-type: none"> A total of 30 floral species belonging from 	- Consistency with land use	<p>Current land use w/in 1km radius (as per zoning ordinance):</p> <ul style="list-style-type: none"> Industrial <p>Actual land uses w/in 1km radius:</p> <ul style="list-style-type: none"> Built-up/Residential 	- Ensure compatibility with land use		



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
	<p>19 different families were tabulated at the site represented by 5 species of herbs and fern, 1 palms, 13 grasses, 3 shrubs, 2 vines and 6 species of trees.</p> <p>Generally, all species encountered in the area were not listed and not evaluated in the IUCN Red list of endangered species as well as the DENR DAO 20107-101 listing of threatened Philippine plants. One species of tree, Narra, is considered Vulnerable</p>					
			<p>Existing vegetation in the area:</p> <ul style="list-style-type: none"> - Crop land - Marshland 	<ul style="list-style-type: none"> - Compliance with conditions of DENR/LGU - Promote restoration of damaged or destroyed vegetation where 	<ul style="list-style-type: none"> - Annual inspection of area replanted/re vegetated 	<ul style="list-style-type: none"> - Cost integrated in the construction/ operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				possible (e.g., tree planting);		
		<ul style="list-style-type: none"> - Change in surface landform/topography/ terrain/slope - Soil Erosion 	<p>Slope:</p> <ul style="list-style-type: none"> - Level to Nearly Level (0-3%) - The project site is not located in an area identified by MGB/PAG-ASA/PHIVOLCS as hazard prone 	<ul style="list-style-type: none"> - Provide erosion control and slope protection measures - 	<ul style="list-style-type: none"> - Regular inspection of slope protection measures in erosion-prone areas - Regular inspection for new eroded areas near the site 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost
		<ul style="list-style-type: none"> - Soil/Land contamination due to improper solid waste disposal 	<ul style="list-style-type: none"> - Existing soil type in the area: <ul style="list-style-type: none"> - Clay 	<ul style="list-style-type: none"> - Implementation of the Ecological Solid Waste Management Plan (ESWMP) - Implement waste minimization, reuse and recycling of solid waste materials - Implement proper segregation, 	<ul style="list-style-type: none"> - Daily inspection of waste/recycling bins for segregated solid waste collection - Daily inspection for the presence of un-segregated 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				<ul style="list-style-type: none"> collection and disposal of domestic wastes; assign designated areas as collection points - Provide receptacle/ bins for solid wastes - Coordinate with the municipal solid waste unit for garbage collection (if possible) or acquire the services of a private solid waste hauling contractor 	<ul style="list-style-type: none"> garbage in the facility - Weekly inspection of solid waste accumulated 	
		<ul style="list-style-type: none"> - Soil Contamination during construction of water intake facility or water treatment plants due to cement-based solidifiers 	<ul style="list-style-type: none"> - Existing soil type in the area: Clay 	<ul style="list-style-type: none"> - Conduct of leaching test and/ or soil contamination analysis before and during construction 	<ul style="list-style-type: none"> - In the Philippines, there are no laws or standards regarding soil contamination. Japan's Soil 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
		that may cause leaching of hexavalent chromium			Contamination Countermeasures Act sets the standard for leaching levels of hexavalent chromium at 0.05 mg/ L or less	
		- Increase in waste	-During construction, topsoil will be removed during the embankment work at the water treatment plant, and the resulting excavated soil will be disposed of. Additionally, asphalt and concrete debris will be generated during pipeline installation. Furthermore, general waste will be	-MCWD owns a 1.0-hectare site approximately 7 km from the water treatment plant that can be used as a waste disposal facility. Construction waste generated will be transported to this site for landfill disposal. General waste generated at the construction site will be disposed of	- Monitoring of Waste production - Regular scheduling of waste collection activities	- Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
			generated at the construction site by on-site workers.	appropriately in accordance with municipal regulations.		
WATER						
		<ul style="list-style-type: none"> - Increased in siltation due to project activities 	<ul style="list-style-type: none"> - Distance to nearest/ receiving water body is less than 1 km - Fresh water classification is Class C - Distance of project area to the nearest well used is within project site - The nearest well is used for drinking/domestic and production use 	<ul style="list-style-type: none"> - Set-up proper and adequate sanitary facilities - Strictly require the contractor and its workers to observe proper waste disposal and proper sanitation - Strictly observe proper waste handling and disposal - Provision of wastewater treatment facility (e.g. septic tank, chemical treatment, etc.) - Provision of three-chambered septic 	<ul style="list-style-type: none"> - Regular (ocular) inspection of: <ul style="list-style-type: none"> - Drainage /canal systems - Water treatment facility (i.e., grease trap, septic tank, etc.) - Quarterly monitoring of the following: pH, TSS concentration, BOD, total coliform, 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				tank for domestic sewage - Provide bund walls on all chemical storage tanks and processing tanks which are connected directly to WTP	Color, Oil and grease	
		- Competition in water use	- The population using receiving surface water is greater than 1,000 and less than or equal to 5,000 persons - The available/nearest water sources are deep wells and Level III water supply system	- Observe water conservation measures; - Careful selection of project sites to avoid disruption of traditional water uses	- Regular coordination with concerned agencies	- Cost integrated in the construction/operation cost
		- increased occurrence of flooding	- The project site is located in an area identified by	- Use appropriate design for project facilities	- Regular coordination with	- Cost integrated in the construction/operation cost



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			MGB/PAG-ASA as flood-prone	<ul style="list-style-type: none"> - Implement an appropriate drainage system - Regularly remove debris and other materials that may obstruct water flow - Use appropriate technology (e.g. raised hand-pumps) to protect drinking water from flood contamination 	concerned agencies	
AIR/NOISE						
		<ul style="list-style-type: none"> - Air quality degradation 	<ul style="list-style-type: none"> - Distance to the nearest community is 0.5 to 1 km - High concentration of Total Suspended Solid with 247 ug/n3. 	<ul style="list-style-type: none"> - Properly operate and maintain all emission sources (e.g. vehicles, pumps, generators, etc.) - Install when applicable, the appropriate air pollution control device/s 	<ul style="list-style-type: none"> - Regularly monitor presence/absence of complaints - Regular (ocular) inspection of: <ul style="list-style-type: none"> - Absence of white or black 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				<ul style="list-style-type: none"> - Strictly enforce good housekeeping practices - Control vehicle speed to lessen suspension of road dust - Conduct water spraying to suppress dust sources and minimize discomfort to nearby residents - Use covered vehicles to deliver materials that may generate dust 	<ul style="list-style-type: none"> - smoke from vehicles, heavy equipment and generator - Regularly monitoring of buffer zones 	
		<ul style="list-style-type: none"> - Nuisance due to noise generation 	<ul style="list-style-type: none"> - Distance to the nearest community is 0.5 to 1 km - Location 2 has above noise level results in the 	<ul style="list-style-type: none"> - Properly operate and maintain all noise sources (e.g. vehicles, pumps, generator, etc.) - Install when applicable, the 	<ul style="list-style-type: none"> - Regularly monitor presence/absence of complaints - Regularly monitoring of buffer zones 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
			morning and daytime.	<ul style="list-style-type: none"> appropriate noise control device/s (e.g., mufflers, silencer, sound barriers, etc.) Provide adequate buffer and/or planting of trees 		
PEOPLE						
		<ul style="list-style-type: none"> Enhanced employment and/or livelihood opportunities Increased revenues for LGU Enhanced delivery of public services (e.g., education, health care peace and order, etc.) 	<ul style="list-style-type: none"> Size of population of host Barangays (PSA, 2020): Barangay Mother Tamontaka – largest at 14,099; Tamontaka II where the WTP is located has 5980; Classification of host barangays is rural Available social services within/near the 	<ul style="list-style-type: none"> Prioritize local residents for employment Promptly pay local taxes and other financial obligations Regular coordination with LGU. Prior consultation & coordination to minimize disruption of daily domestic activities 	<ul style="list-style-type: none"> Regularly monitor presence/absence of complaints Regular coordination with LGU 	<ul style="list-style-type: none"> Cost integrated in the construction/operation cost



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			<p>host barangay are schools (e.g., elementary, high school), Health facilities (e.g., clinics, hospitals, etc.), peace and order (e.g., police outpost, barangay tanods, etc.), Recreation and sports facilities</p>	<p>& respect for cultural practices</p> <ul style="list-style-type: none"> - Ensure participation of the community in consultations and dialogues - Provide appropriate traffic/warning signs, lighting, etc. 		
		<ul style="list-style-type: none"> - Impacts on community health and safety 	<ul style="list-style-type: none"> - Increase provision of healthy and safer drinking water - Infectious Diseases such as HIV/AIDS 	<ul style="list-style-type: none"> - Regular coordination with LGU - Provide appropriate warning signs, lighting and barricades, whenever practicable - Observe proper housekeeping - Provide on-site medical services 	<ul style="list-style-type: none"> - Presence/Ab presence of complaints from the community - Regular coordination with LGU - Regular submission of reports to the concerned agency. To prevent the 	<ul style="list-style-type: none"> - Cost integrated in the construction/operation cost



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				<ul style="list-style-type: none"> for any emergency - Participate in public awareness programs on health and safety - Implement appropriate safety programs for both community and workers - Strictly comply with fire, safety and similar regulatory requirements - Strictly comply with requirements of RA 6969 specifically on the storage, transport, and disposal of hazardous wastes generated on site, if any. - The influx of foreign workers 	<p>spread of infectious diseases, it is deemed necessary to implement tailored awareness and education campaigns.</p>	



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Key Environmental Aspects	Summary of Findings	Possible Environmental/Social Impacts	Baseline Environment	Preventive/Mitigating Measures	Monitoring Parameters/Implementation	Cost of Mitigation/Monitoring
				<p>associated with this project will primarily consist of construction workers, with a maximum of approximately 100 individuals. Most are expected to be employed locally, and the influx of foreign workers is not anticipated to be significant.</p>		



CHAPTER 10

SOCIAL DEVELOPMENT PLAN (SDP) AND IEC IMPLEMENTATION

A. Proposed Social Development Program (SDP)

This proposed SDP of the MCWD will primarily focus on the requirements set forth by the MENRE-EMS. The underlying principles of a “community driven development” is what the development interventions of the SDP grounds: needs based, inclusive, participative, empowering, to wit:

- Needs based: Interventions are in response to the concerns by the community members and leaders generated during IEC activities;
- Inclusive: the benefits with accrue to all members of the community and not only to selected few;
- Participative: the SDP is through an active multi-stakeholder’s participation; and
- Empowering: the plan was developed through the minds and ideas of the locales; implementations of some interventions are through their own initiatives and efforts (internally generated) and can be owned by the communities.

Figure 10.1-1 below shows the SDP framework for the Project.

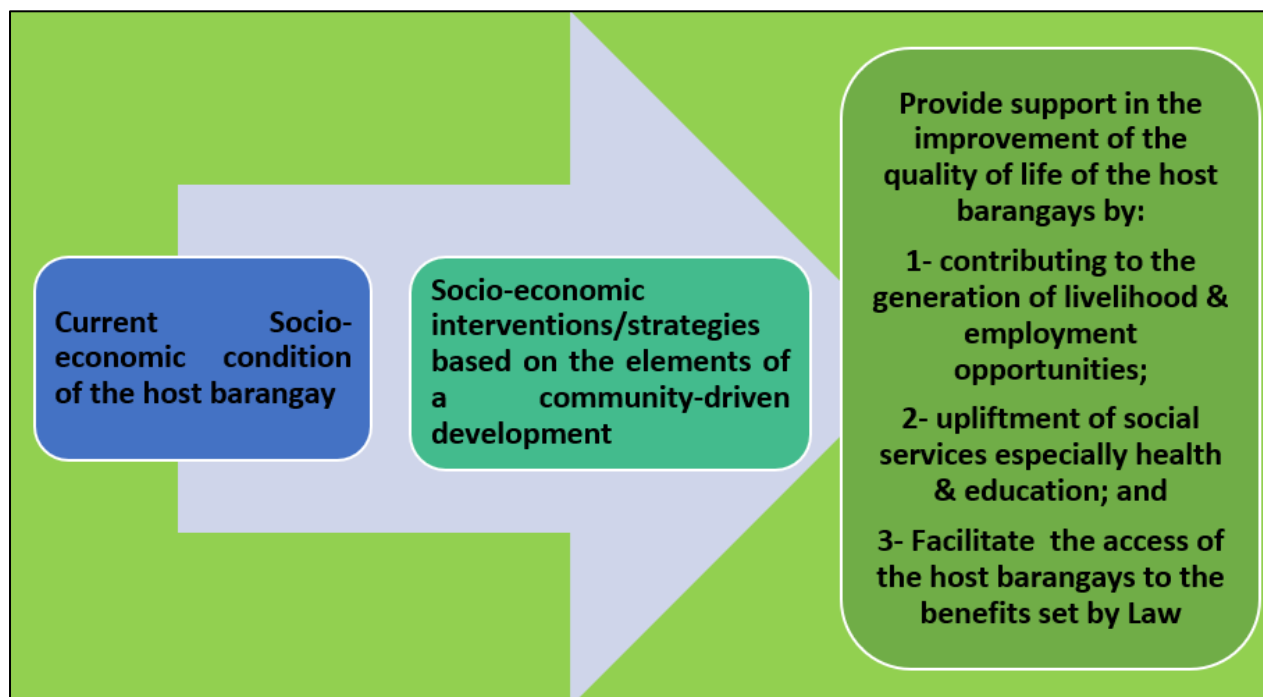


FIGURE 10.1-1 FRAMEWORK OF THE SDP FOR THE MCWD

B. Social Development Interventions

i. Enabling policy environment by the LGU

- Orientation/Workshop/ Activities of LGUs about best management practices on environmental management such as clean-up drives of river, Tree planting, etc.



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- Forge an agreement with the proponent that will ensure that the priority workforce will be sourced out from members of the recipient barangay;
- ii. Inclusive coverage in health and basic education**
- Upgrading of the barangay health stations
 - Construction of additional classrooms for the elementary and high school levels considering the student-classroom ratio in the recipient barangays is increasing.
- iii. Enhancing the competence of the bureaucratic players (LGU)**
- Provide training to LGUs on governance and mentoring and on the “hows” of forging alliances with other LGUs/NGOs and private entities
 - Re-orientation of the LGUs on the Local Government Code
 - Commitment with the prompt payment of taxes as stipulated on the internal revenue code
- iv. Mainstreaming climate change adaptation and disaster risk preparedness**
- Building LGUs’ capacities in terms of knowledge, skills, equipment, and infrastructure to respond to any disaster that may strike the Barangay
 - Orientation/Awareness training of the community members on Climate Change in general.
 - Conduct of relief activities during the times of calamities
- v. Provide livelihood trainings to members of the community which are practical and immediately applicable in coordination with Government Agencies (DTI, TESDA, ATI) and NGAs (Nego-Eskwela, Go-Negosyo) and other institutions which have the mandate.**

The above interventions should be a part of the LGU’s Budget for the year and with some equity from the proponent of the project in order to be realized. Specific interventions needing the Proponent’s counter parting are those related to infrastructure development. The Project proponent can provide for these gaps in a shorter period of time. However, in case the proponent will be selective on what areas it be providing, an LGU fund source is the LGU share from the National Wealth.

As stated in DAO 2003-30, the objective of conducting IEC is to inform through the process of education using communication mediums public consultations, social media, flyers, posters, and public consultation are some of the media that can be utilized to gather feedback from the stakeholders. Feedback and comments from the stakeholders are vital input in the improvement of project implementation. The IEC can also be maximized to increase the understanding of the stakeholders regarding the projects. Mediums will be based on the objective of the particular activity and target audience. Suggested IEC activities are presented in **Table 10.1-1**.



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TABLE 10.1-1 INFORMATION, EDUCATION AND COMMUNICATION PLAN/Framework

Target Sector Identified as Needing Project IEC	Major Topic/s of Concern in Relation to Project	IEC Scheme Strategy/ Methods	Information Medium	Indicative Timelines and Frequency	Indicative Cost
General Population of the Host Barangays focusing on: <ul style="list-style-type: none"> Household Heads (especially heads of households) Mothers Barangay Council Community Leaders Barangay Health Workers School Teachers Church Leaders 	<ul style="list-style-type: none"> Nature and Character of the Project Economic opportunities such as employment Best practices on Environmental Management Solid waste management 	<ul style="list-style-type: none"> Community Assembly Regular barangay level gatherings and discussions to know project details and the issues, problems and concerns of the communities in the area that related to the implementation of the project Social Development Plan <ul style="list-style-type: none"> The proponent will disseminate information on the SDP and its components which will include: <ul style="list-style-type: none"> Employment and Generation of Skills Livelihood and Enterprise Development Local Capacity Building Enhancement of Health and Safety Environmental Stewardship 	Community Forums Billboards Hand-outs Classroom lectures/ presentation	operation	Cost of Meetings: <ul style="list-style-type: none"> Materials Food PHP 100,000.00



CHAPTER 11

ENVIRONMENTAL COMPLIANCE MONITORING

A. Environmental Monitoring Plan

The environmental monitoring plan is implemented to ensure that the impacts of the project are controlled, if not minimized. It is the proponent's responsibility to monitor the project activities, especially during the operation phase. **Table 11.1-1** shows the environmental monitoring plan for the project.



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TABLE 11.1-1 ENVIRONMENTAL MONITORING PLAN FOR THE PROJECT

Environmental Item	Item	Monitoring	Location	Frequency	Responsibility (Implementation) Agency	Supervising Agency
Construction Phase						
Air Pollution	Exhaust Gas	Inspection of construction machinery and construction vehicles	Construction Site	Once a month	• MCWD • Contractor	• MENRE
	Dust	Visual Inspection	Construction Site	Every Day	• MCWD • Contractor	• MENRE
		Measures to Prevent Dust Dispersion	Construction Site	Every Day when Construction Vehicles are in Operation	• MCWD • Contractor	• MENRE
Water Pollution · Sediment	Turbidity and Oil Content	Visual Inspection	Water Intake Point	Every Day during Water Intake Construction	• MCWD • Contractor	• MENRE
	Water Quality	Same 32 items as in this survey	Water Intake Point	When an Abnormality Occurs	• MCWD • Contractor	• MENRE
Waste	Proper Disposal of Waste	General Waste	Construction Site	Once a Week	• MCWD • Contractor	• MENRE
		Construction Waste	Landfill Site	Once a Week at the Time of Disposal	• MCWD • Contractor	• MENRE
Soil Contamination	Hexavalent Chromium	Results of Leaching Test for Hexavalent Chromium	Construction Site	Before Ground Improvement Work	• MCWD • Contractor	• MENRE
Noise and Vibration	Compliance with Operating Hours (8 a.m. to	Operating time records	Construction Site	Every Day	• MCWD • Contractor	• MENRE



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Environmental Item	Item	Monitoring	Location	Frequency	Responsibility (Implementation) Agency	Supervising Agency
	5 p.m.)					
	Management of Sources	Inspection of Construction Machinery and Construction Vehicles	Construction Site	Once a Month	• MCWD • Contractor	• MENRE
	Operator Training	Training Record	Construction Site	Once during Construction	• MCWD • Contractor	• MENRE
Ecosystem	Conservation of Valuable Species (trees)	Transplantation	Construction Site	Once during Construction	• MCWD • Contractor	• MCWD
	Conservation of Valuable Species (Fauna)	Training Record	Construction Site	Once during Construction	• MCWD • Contractor	• MCWD
Existing social infrastructure and social services	Traffic Congestion Mitigation Measures	Monthly Construction Report	Construction Site	Once a Month	• MCWD • Contractor	• MCWD
Infectious Diseases such as HIV/AIDS	Instructions on Infection Prevention Measures	Training Record	Construction Site	Once during Construction	• MCWD • Contractor	• MENRE
Working Environment (Including Occupational Safety)	Safety Awareness	Training Record	Construction Site	Once during Construction	• MCWD • Contractor	• MENRE
Accidents	Safety Education	Training Record	Construction Site	Once during Construction	• MCWD • Contractor	• MENRE
Overall	Complaint Handling	Complaint Record Analysis	Construction Site	Once a Month	• MCWD • Contractor	• MENRE



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Environmental Item	Item	Monitoring	Location	Frequency	Responsibility (Implementation) Agency	Supervising Agency
Operation Phase						
Waste	Proper Treatment of Solid Waste	Dried sludge	Landfill Site	Once Every Three Months	• MCWD	• MENRE
Noise and Vibration	Monitoring based on Procedures	Monitoring Records	Water Treatment Plant	Once Every Three Months	• MCWD	• MENRE
	Operator Guidance	Training Record	Water Treatment Plant	Once Every Three Months	• MCWD	• MENRE
Accidents	Operator Guidance	Training Record	Water Treatment Plant	Once Every Three Months	• MCWD	• MENRE



CHAPTER 12

ENVIRONMENTAL RESPONSE POLICY AND GENERIC GUIDELINES

The Proponent shall ensure that any response to emergency planning is in accordance with the Site emergency management plan and where applicable in response to Environmental issues in the environmental management plan. This will include:

1. Foreseeable emergency situations
2. Fire
3. Explosion
4. Adverse weather
5. Biological incident
6. Impact of civil action such as demonstrations
7. Collapse of temporary structure
8. Details of emergency organization (emergency control officer, assistant emergency control officer)
9. Responsibilities (first aid workers, wardens)
10. Emergency evacuation systems
11. Site assessment and Contractor's Equipment needs
12. Listing of Key Personnel with contact details, including all-hours telephone numbers
13. Details of emergency services contacts (e.g. ambulance, fire brigade, spill clean-up services)
14. Information on Hazardous Substances storage (quantities, type) including each material's potential impact to Personnel upon exposure and measures to be taken in the event of accidental release, and
15. Compliance with statutory and regulatory requirements for the provision of emergency Contractor's Equipment and signage.

Information on emergency procedures and responses will be made available to all personnel through the site induction process and application of other site procedures.

Key emergency information will be displayed on notice boards.

As part of the site emergency readiness, in any site evacuation situation a head count will be undertaken and re-entry into the work area will not be allowed until such time as the "all clear" is given.

Nominated fire wardens will be assigned to the site and will be equipped with the necessary items to assist in the evacuation of the site and accounting for all Personnel.



CHAPTER 13

ABANDONMENT/DECOMMISSIONING/REHABILITATION POLICY

The general intent of the abandonment plan is to ensure that the natural characteristics of the surrounding environment are preserved and that the project does not pose an ongoing risk for the environment and the people. In the event of occurrence of untoward incident or 'force majeure' that will render the project site unworkable for longer periods than anticipated during the operation phase, protection and rehabilitation of the site shall be implemented by the proponent or contractor.

The decommissioning and abandonment plan will be prepared for the project before the decommissioning phase starts and will be developed in consultation with the project stakeholders and relevant regulatory agencies.



CHAPTER 14

INSTITUTIONAL PLAN FOR EMP IMPLEMENTATION

An Institutional Plan is necessary to delineate the roles and responsibilities of the key players who will be directly involved in the implementation of the project in general and the Environmental Management Plan (EMP) in particular. The key players include the project proponent, MENRE-EMS, representatives of stakeholders from barangays affected, NGOs/POs and other civic entities. It also defines the coordination mechanisms and strategies for improving agency involvement in environmental protection.

In the case that a Multi-Monitoring Team is not required, an Environmental Unit (EU) will be organized. **Figure 15.1-1** presents the mechanism to be used for the environmental management and monitoring of the project.

The EU will closely coordinate with the MENRE-EMS throughout the construction and operation of the project. A CMR/SMR will be prepared by the EU and be submitted to the MENRE-EMS for validation. A pollution control officer (PCO) will be employed and will be in charge with the day-to-day monitoring of the environmental components. An approved monitoring report will lead to the issuance of a Compliance Evaluation Report.

The EU will also oversee and supervise the proponent's implementation of sound environmental practices as stipulated in the EMP and their contract and other environmental regulations of MENRE. The contractor, on the other hand, shall be bound by contract agreement with the proponent to implement sound environmental protection and safety measures in the execution of the project, and to comply with all requirements of MENRE and the EMS for the project.

Moreover, the EU will continue to provide and conduct intensive IEC campaigns to the community to dispel any misinformation and to continually explain the stakeholders on the status of the project. Issues raised and received from the community should be addressed and well taken care of.

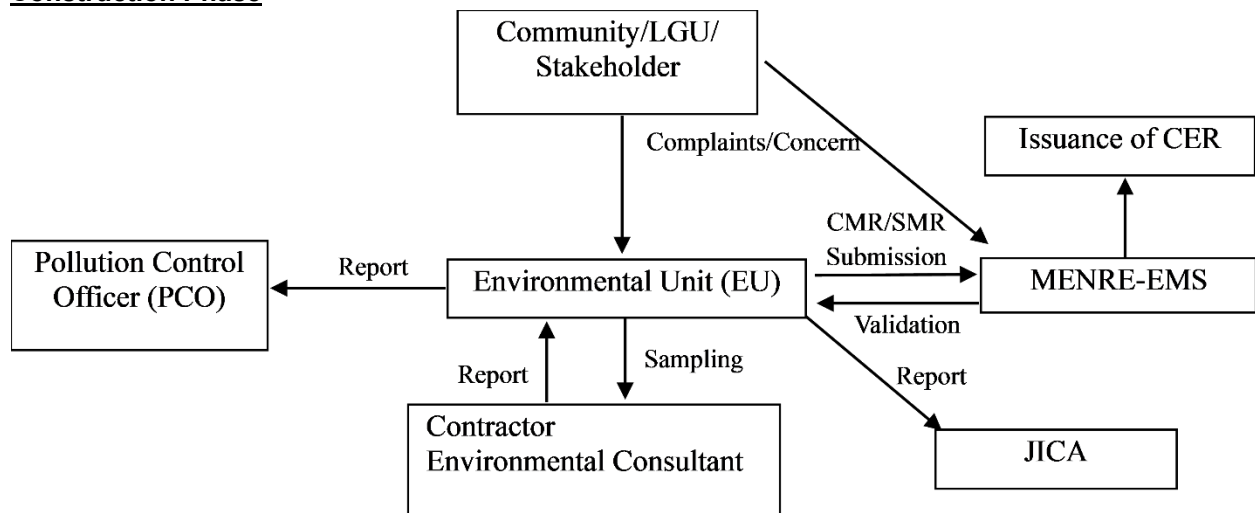
All documents pertaining to the monitoring of the project's impact and compliance should be properly maintained and regularly reported to the proponent.



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Construction Phase



Operation Phase

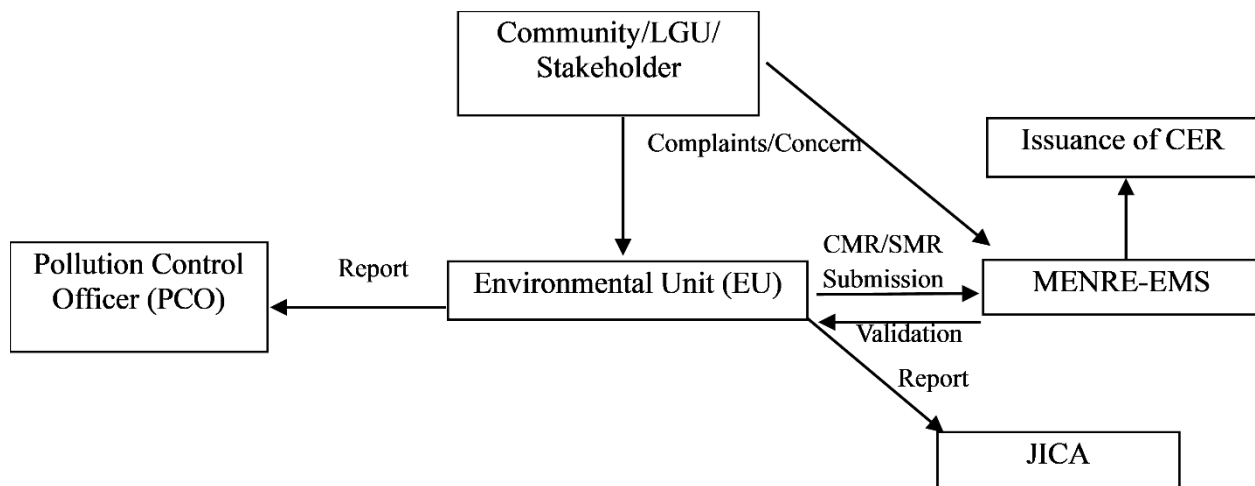


FIGURE 14.1-1 INSTITUTIONAL MECHANISM FOR THE ENVIRONMENTAL MANAGEMENT AND MONITORING FOR THE PROJECT DURING CONSTRUCTION AND OPERATION PHASES



CHAPTER 15

GRIEVANCE REDRESS MECHANISM

GRM General Guiding Principles

JICA ESC Guidelines require that a grievance redress mechanism be established and maintained. It should be designed to efficiently receive and facilitate the resolution of affected peoples' concerns and grievances about project-level social and environmental issues within a reasonable timeframe. The GRM should be scaled to the risks and impacts of the project. It will address affected people's concerns and complaints promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the community. The GRM may be revised once the project commences to ensure that its provisions are relevant and practical. It should also be updated as required during the construction process to optimize the redress process.

During project implementation, it is possible that people may have concerns about the project's environmental performance. People may perceive negative impacts during the construction or operational phase, and they have the right to have their complaint fairly heard and acted on. Many issues can be resolved effectively through timely communication, inquiry, and mitigation measures.

The grievance redress process will be widely disseminated to all project-affected persons during project consultations and focus group discussions before the construction and operation phase. The GRM is in place for all safeguard issues, providing a streamlined process for any concerns or issues in relation to resettlement, social safeguards, and environmental impacts.

GRM Requirements

JICA mandates that project proponents and their contractors establish a GRM to facilitate the resolution of complaints related to the project's environmental performance during construction and operation. The GRM must:

- I. Be proportionate to the risks and adverse impacts of the project.
- II. Address affected people's concerns promptly through an understandable and transparent process.
- III. Be accessible to all community members at no cost and without risk of retribution.
- IV. Not obstructing access to judicial, administrative, or JICA review panel remedies

Integrated Grievance Redress Structure

The project GRM consolidates resettlement, environmental, social, and technical issues into a single system, incorporating Philippine laws and cultural considerations related to lodging complaints. Key features include:

- Local-Level Resolution Priority – Complaints are addressed locally whenever possible before escalating to higher levels.
- Grievance Receipt and Registration – Multiple channels (telephone, email, text, letter, in-person) allow community members to submit complaints and receive confirmation.
- Eligibility Assessment – Complaints are reviewed to determine if they fall within the GRM's scope.
- Assessment and Investigation – Concerns are clarified, relevant information is gathered, and resolution options are identified.
- Joint Problem-Solving – Stakeholders engage in dialogue and action planning to resolve grievances.



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- Grievance Tracking and Reporting – Written records of grievances, investigations, and resolutions are maintained, with regular public disclosures.
- Closure and Feedback – Complainants receive confirmation of resolution and can provide feedback.

Eligible complaints include land acquisition, resettlement concerns, compensation entitlements, property/structure damage during construction, environmental effects such as noise, vibration, air and water pollution, among others.

GRM Institutional Framework

The MCWD will establish the GRM and oversee complaint resolution related to the project's environmental performance. The mechanism may be disclosed during environmental assessment consultations or before project initiation.

MCWD will appoint an Environmental Officer/s responsible for organizing the Grievance Redress Committee (GRC), chaired by the MCWD General Manager. The GRC will mainly consist of the following:

- Chairperson: MCWD General Manager (or designated representative)
- Members: Representatives from LGU (Barangay Chair or City Environment Officer), CSO/NGO (e.g., Action Against Hunger), community leaders, and legal/environmental experts (as needed).
- Secretariat: MCWD Environmental Management Unit (EMU)/ Operation Department
- As an option, to further create impartiality, a third-party organization may be hired to handle consultation desks or grievance points.

Grievance Redress Process

The GRM for the project will adhere to the principles and steps stipulated in JICA ESC Guidelines. The GRM levels, procedures, and expected resolution of the project are as follows:

- I. Complaint Submission – Affected persons may submit complaints verbally or in writing via phone, email, text, letter, or in person to project representatives (contractor, foreman, supervising engineer, GRC Secretariat, or Barangay officials).
- II. Immediate Action – The contractor must immediately address valid complaints and record them in a complaint registry logbook maintained on-site.
- III. Escalation to MCWD GRC – If unresolved, complaints are submitted to the MCWD GRC, where complainants receive assistance in completing a Grievance Intake Form
- IV. Preliminary Discussion (Within 2 Days) – The GRC Secretariat, the contractor's representative, and the complainant discuss whether the issue can be resolved without a GRC meeting.
- V. Written Feedback (Within 3 Days) – The Secretariat informs the complainant of the process, steps, and timeframe for resolution.
- VI. GRC Meeting (Within 5 Days, If Required) – If unresolved, a GRC meeting is convened with the complainant. GRC has 15 days to reach a resolution.
- VII. Final Feedback (Within 5 Days Post-Resolution) – The GRC provides the complainant with feedback on the resolution outcome.
- VIII. Judicial and Administrative Recourse – If unsatisfied, complainants may pursue legal action or seek intervention of the concerned agency, such as the MENRE – EMS/ FMS/BERDE, BARRM, in case the issue is related to the environmental and social compliance of the project or the City LGU for issues for general issues and concerns.



Establishment of a Consultation Desk

As part of an inclusive and transparent Grievance Redress Mechanism (GRM), the establishment of consultation desks or grievance points managed by a third-party organization can significantly enhance the credibility, accessibility, and effectiveness of the process.

The main purpose of which is for:

- **Impartiality and Trust:** Third-party organizations (e.g., NGOs, community-based groups, or academic institutions) serve as neutral intermediaries, helping to build trust between the project proponent and affected stakeholders.
- **Accessibility:** Community members may feel more comfortable raising issues to a known local organization rather than directly to the proponent, especially in cases involving fear of retaliation or complex power dynamics.
- **Transparency and Accountability:** An independent facilitator helps ensure that complaints are objectively documented, fairly assessed, and transparently resolved.

Key Functions of a Third-Party Consultation Desk:

1. Receive and log grievances via walk-ins, hotlines, email, or drop boxes.
2. Facilitate communication between complainants and project authorities.
3. Assist in grievance documentation and classification (urgent, environmental, livelihood-related, etc.).
4. Support mediation or resolution processes, where appropriate.
5. Track and monitor grievance resolution timelines and provide regular reports to stakeholders.
6. Ensure inclusivity, especially for vulnerable groups such as women, IPs, or the elderly.

Implementation Considerations:

- The third-party organization must be credible, community-trusted, and trained in grievance handling, confidentiality, and reporting protocols.
- The roles and responsibilities should be clearly defined through a Memorandum of Agreement (MOA) with the project proponent.
- Regular capacity building and coordination with the project's internal GRM team are essential to maintain consistency and accountability.

Information about the third-party grievance points must be widely disseminated in local languages through IEC materials, public announcements, and barangay channels.



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GRM Monitoring & Reporting

The GRC will document all complaints, investigations, and follow-ups and prepare monthly reports summarizing grievances, resolutions, and actions taken. A summary of complaints will be included in the Self-Monitoring Report and Compliance Monitoring Reports to be submitted to MENRE-EMS.

For JICA ESC guidelines and reporting, JICA appoints independent "Examiners" to oversee the GRM process. These Examiners report directly to the JICA President and are separate from project management or environmental review departments. Their role is to investigate complaints, facilitate dialogue, and report their findings to JICA.



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Environmental Impact Assessment (Final Report)

For the Improvement of Water Supply Project in Cotabato City

ANNEXES

ANNEX 1
1ST PROGRESS
REPORT



ENVIRONMENTAL IMPACT ASSESSMENT (1ST PROGRESS REPORT)

CTI ENGINEERING INTERNATIONAL CO., LTD.

For the Improvement of Water Supply Project in
COTABATO CITY



[AUGUST 2024]



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1.0 INTRODUCTION

This Field Survey Report covers the activities and accomplishments of the Environmental Impact Assessment for the Improvement of Water Supply Project in Cotabato City from commencement until the field survey completion

The services involve the conduct of an Environmental Impact Assessment Study, which aims to obtain the baseline environmental condition for the components to be affected by the implementation of the project, identify and assess potential impacts on the physical, chemical, biological, and social environment components, and public pollution and nuisance by the project, and prepare an Environmental Management and Monitoring Plans (EMP and EMoP) for the application of an Environmental Compliance Certificate. **Figure 1-1** shows the map of the study area.

2.0 SCOPE OF SERVICES

The scope of services to be rendered by **Geoinnovative Specialists Inc. (GSI)**, in accordance with the Terms of Reference (TOR) includes the following:

- 1.) Collection and review of existing data
- 2.) Field surveys for environmental baseline conditions, which include:
 - air sampling and analysis including noise and vibration level measurement;
 - survey on terrestrial biota;
 - survey on aquatic biota; and
 - social consideration study excluding those related to project-affected people.
- 3.) Impact prediction and assessment
- 4.) Preparation of Environmental Management and Monitoring Plans (EMP and EMoP)
- 5.) Preparation of Environmental Impact Statement Report

Table 2-1 shows the activity schedule for the Environmental and Social Study required for the above Scope of Services while **Table 2-2** shows the intended schedule of planned survey activity for the study.



FIGURE 1-1 SITE MAP



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TABLE 2-1 ACTIVITY SCHEDULE FOR THE STUDY

PHASE		ACTIVITIES	DURATION (days)
1	Preparatory Activities	Involves all activities immediately following the receipt of the notice-to-proceed (NTP) to ensure smooth conduct of the baseline study and to ensure that all services to be executed are in full accordance with the consulting contract.	25
		1.1 Kick-off/ Technical Meeting	1
		1.2 Initial Planning Activities	5
		1.3 Review of secondary data and materials	10
		1.4 Planning and formulation of site and field surveys	5
		1.5 Preparation and submission of Field Survey Plan	4
2	Data Gathering/ Conduct of Survey	Involves the actual conduct of field work to gather data, both quantitative and qualitative, and site and field surveys for environmental conditions.	11
		2.1 Air, including noise and vibration sampling and analysis	2
		2.2 Survey on terrestrial and aquatic biota	2
2	Data Gathering/ Conduct of Survey	2.3 Survey of Social Environment	5
		2.4 Coordination meetings	2
3	Analysis and Preparation of Survey Report	Involves all activities covering the generation of analysis/findings and the preparation of reports.	87
		3.1 Impact prediction and assessment	20
		3.2 Preparation of Environmental Management and Monitoring Plans	25
		3.3 Preparation and submission of Draft Survey Report	15
		3.4 Presentation of findings with the Client	2
		3.5 Preparation and submission of Final Survey Report	25



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TABLE 2-2 INTENDED SCHEDULE OF PLANNED FIELD SURVEY ACTIVITIES FOR THE STUDY

Particulars	July 25, 2024	July 26, 2024	July 27, 2024	July 28, 2024	July 29, 2024	July 30, 2024	July 31, 2024
Activity	Departure from Manila - Cotabato	Flora and Fauna Survey (AM)	Preparation of Materials for Perception Survey	Start of Perception Survey	Socio-Economic and Perception Survey	Socio-Economic and Perception Survey	Socio-Economic and Perception Survey
	Accommodations Settlement and Vehicle Rental Outsourcing	Coordination Meeting with LGU (Barangay Tamontaka II)					
	Reconnaissance Survey Coordination with CTI and Escort Team	Coordination Meeting with EMS - MENRE	Meeting/ briefing with Enumerator				
	Coordination Meeting with MCWD						
	Procurement of needed materials	Flora and Fauna Survey (PM)	Conduct of Air, Noise, Vibration Survey at Location 1	Conduct of Air, Noise, Vibration Survey at Location 2			
	Setting up for Fauna Survey (i.e. Mist nets, Cage Traps, etc.)						
Outcomes	Schedule of Public Consultation/ Scoping	Survey Data for Flora and Fauna	Survey Data for Air, Noise, and Vibration; Trained enumerators	Perception survey data; Survey data for Air, Noise and Vibration	Socio-Economic and Perception Survey data	Socio-Economic and Perception Survey data	Socio-Economic and Perception Survey data



3.0 ACTIVITIES PERFORMED

3.1 Kick-off / Coordination Meetings

The activities were commenced on July 26, 2024 with Ms. Maria Melinda Claire Balaimo, OIC General Manager of MCWD, spearheading the meeting. The client, CTII, was represented by Engr. Domingo Guarino, while the environmental survey team, GSI, was represented by Mr. Mark Anthony Aldecoa, Project Management Officer, Mr. Jerald Bartolome, Site-Coordinator, and Mr. Eric Del Rosario, Environmental Survey Team Leader.

During the meeting, GSI discussed the details of the activities to be undertaken. A reconnaissance survey was scheduled to verify the location of the sampling sites which were identified by the study team.

The Minutes of the Meeting for the said activity can be found in **Annex A** of this report.

3.2 Initial Planning Activities

This activity was conducted on **July 11, 2024** and was facilitated by the GSI Project Manager, Envi. survey team leader and other staff members. The details of the activities are shown below:

- Review of the Term of Reference
- Overview of the upcoming site procedure/ field survey plan
- Identification of possible data to be used for the study
- Logistics and financial discussion

3.3 Review of Secondary Data and Materials

As part of the preparatory activities, all pertinent data was gathered from the websites of local government units and the archives of national government agencies such as DENR, NAMRIA, etc. Likewise, data from the CTII were also provided. The following data are enumerated below:

- Copy of the Final Report for the “Consultancy Services for the Conduct of Master Plan and Feasibility Study of Flood Risk Management Projects of Allah River Basin dated June 2023
- Copy of Dao 03-30 “Revised Procedural Manual”, EMB August 2007
- Copy of Memo Circular 005-2011 “EIA Technical Guidelines Incorporating Disaster Risk Reduction (DRR) and Climate Change (CCA) Concerns”
- Maps of Sampling Locations for the different EIA study components
- Map of the Survey Area showing the extent of the Survey Area
- Copy of the Cotabato City Comprehensive Land Use Plan 2020-2029
- Copy of the 2nd Bangsamoro Development Plan 2023-2028
- Copy of the Provincial Ecological Profile 2021 of North Cotabato
- Other primers/ Pamphlets



3.4 Reconnaissance Survey

The reconnaissance survey was conducted on July 26, 2024, with the environmental survey team, assisted by the CTII study team. A representative from the MCWD was also present. All sampling sites were verified and properly documented as shown in **Table 3.1**.

TABLE 3-1 SAMPLING POINTS DURING RECONNAISSANCE SURVEY

No.	Northing	Easting	Elev (m)	Name/Description of Location	Parameters				
					Air	Noise	Vibration	Aquatic Biota	Terrestrial Flora and Fauna
1	7°10'29.15"N	124°14'54.72"E	85	Old waiting shed near the project site	1	1	1		
2	7°10'43.70"	124°13'59.72"	82	Along Tamontaka-Bubog Road	1	1	1		
3	7°10'23.53"	124°14'53.23"E	52	Within Project Site				1	1

3.5 Preparation and Submission of Progress Report

The Field Survey Report will be submitted on August 20, 2024. The report will be checked and commented by the CTII Study Team until approval of the client.

3.6 Planning and Formulation of Site and Field Surveys

A planning and pre-site survey meeting was conducted on July 22, 2024 together with the different teams for each study components.

3.7 Data Gathering and Conduct of Survey

Based on actual implementation, the sampling schedule was adjusted, and the survey for each component was undertaken in accordance to the following dates:

- Air Quality, Vibration, and Noise – July 27-28, 2024
- Terrestrial Flora and Fauna – July 26-27, 2024
- Aquatic Biota – July 26-27, 2024
- Socio-economic and perception Survey – TBA

Details for each component surveys as well as photo documentation for each component where prepared and described in **Annex C to E**. The status of the accomplishment for the study is presented in **Table 3-2**.



4.0 PROBLEMS ENCOUNTERED AND ACTIONS TAKEN

- 1) **Social and Perception Survey** – Probably has the most concerns during the field survey activity. The entire schedule for the survey was postponed until such time that the client has scheduled a meeting with the Barangay Captain. During the first coordination/ courtesy meeting, the Barangay Captain was not present and the team was only received by a Barangay Kagawad. A communication letter was provided by the CTII representative to reiterate the activities that the Environmental survey team will conduct. The environmental survey team requested the Barangay Kagawad to provide enumerators/interviewers which the official nodded in agreement. The day after the meeting, the team again proceeded to the Barangay Hall to meet the enumerators. The Barangay Kagawad was not present and the team was approached by another Barangay Official. The Barangay official was reluctant to look for possible interviewers that will be hired by the team. The Barangay Captain then appeared and the environmental survey team explained the activities to be conducted again. Similar to the barangay official, the barangay captain was reluctant as well to endorse possible manpower who will conduct the interview.
- 2) **Terrestrial and Aquatic Flora and Fauna** – During the survey, the project area was submerged to knee-deep flooding therefore the original transect and plot survey is not possible. Instead, an opportunistic survey was facilitated to collect the required data.
- 3) **Air Quality, Vibration and Noise** – No issues were encountered at Location 1 near the project site. At Location 2, the actual sampling point is situated in an area where space is limited and crown coverage is evident. The equipment for the noise and sound survey needs to be covered by a tent. The tent's dimensions were around 3m x 3m and will be placed at the corners of two busy streets which may cause traffic congestion. The apparatus for the Air survey, on the other hand, needs to be placed in an open area avoiding crown cover of trees. With such difficulties, the team decided to transfer the survey location along the Tamontaka-Bubong road to an adjacent lot around 40 meters away from the original survey location.

5.0 PLANNED ACTIVITIES

As stipulated in the study schedule of activities, **Table 5-1** shows the planned activities to be undertaken with an estimated period/ time of accomplishment.

TABLE 5-1 PLANNED ACTIVITIES WITH ESTIMATED PERIOD/ TIME OF ACCOMPLISHMENT

Planned Activities	Estimated Period/ Time
1. Collection and gathering of survey results for each study component	August 21, 2024
2. Analysis of results	August 28, 2024
3. Impact prediction and assessment	August 28, 2024
4. Conduct of Public Consultation	September 13, 2024
5. Preparation of Environmental Management and Monitoring Plans	September 16, 2024
6. Preparation and submission of Draft EIA Report	September 28, 2024
7. Preparation and submission of Final EIA Report	October 23, 2024



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6.0 DELIVERABLES

A draft format of the table of contents will be provided on/ or before the start of the preparation of the report. The proposed sets of deliverables are scheduled to be submitted on the following dates:

- 1) Draft Final Report (soft copy) – September 28, 2024
- 2) Final EIA Report (soft copy) – October 23, 2024

7.0 OTHER MATTERS

As agreed during the exit meeting with the MCWD, **the socio-economic and perception survey will be conducted after the public consultation meeting that is proposedly set on September 13, 2024** provided the issues with the Barangay Officials are settled by the Client.

Other secondary data from the City Planning and Development Coordinator were collected such as a draft copy of the Comprehensive Land Use Plan (i.e., Economic, Social, and Infrastructure Sub-Sectors) and various thematic maps.

The scoping for the ECC application with MENRE and other stakeholders will be facilitated in conjunction with the scheduled Public Consultation meeting. Details and invitations and list of attendees will be provided later.

ANNEXES

ANNEX A



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Annex A Client Visit Form / Minutes of Meeting

Date of Visit:	26 July 2024	Time:	1:00 – 2:00 pm
Name of Client:	Metro Cotabato Water District	Office:	Metro Cotabato Water District Conference Room
Name of Project: Environmental Impact Assessment for the Improvement of Water Supply Project in Cotabato City			
Agenda: Courtesy Call and Coordination Meeting of Envi. Survey Team			
ATTENDEES:	<u>METRO COTABATO WATER DISTRICT:</u> Maria Melinda Claire V. Baraimo. - Presiding Officer/ OIC-General Manager Not in attendance sheets - Assistant GM Winston L. Sapal - Division Manager Bernardo M. Furog - Watershed Management Division <u>CTII:</u> Engr. Domingo L. Guarno Jr. - Local Chief Engineer <u>GSI:</u> Jerald Bartolome - Site Coordinator Eric del Rosario - Project Team Leader Mark Anthony Aldecoa - Project Management Officer Keith Bitao - Project Consultant		
<u>HIGHLIGHTS:</u> Schedule of Field Activities was presented to OIC General Manager Baraimo. These include coordination meeting with the 55 th Marine Company stationed at Brgy. Tamontaca II, Cotabato City, Environmental Management Services of the Ministry of Environment and Natural Resources and Energy and Local Government Unit of Tamontaca II. Location and setting-up of traps and observation posts for the flora and fauna surveys as well as the stations for the environmental parameters. These activities will be done as follows: <ul style="list-style-type: none">• Coordination with the Military and LGUs – July 26, 2024• Flora and Fauna Survey – July 27 and 28, 2024• Survey data for Air, Noise, and Vibration – July 27 to 29, 2024• Meeting/ Training with Enumerators for the Perception Surveys – July 27, 2024• Conduct of Perception Surveys – July 28 to August 2, 2024• Coordination with the EMS-MENRE – July 29, 2024 The GSI Team also requested for a copy of the Site Development which will be provided by MCWD.			
<u>OTHERS:</u> <ul style="list-style-type: none">• GM Baraimo and Engr Guarno reminded the team to always coordinate with the Philippine Marines and have them accompany the team during the field surveys.			

Prepared by:	Mark Anthony Aldecoa
Designation:	Project Management Officer
Date:	August 20, 2024



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Photo documentation:



ANNEX B



GEOINNOVATIVE SPECIALISTS INC.

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Annex B Client Visit Form / Minutes of Meeting

Date of Visit:	29 July 2024	Time:	11:00 – 12:00 am
Name of Client:	MENRE	Office:	EMS-MENRE
Name of Project: Environmental Impact Assessment for the Improvement of Water Supply Project in COTABATO CITY			
Agenda: Coordination Meeting With EMS-MENRE-BARMM			
ATTENDEES:	<u>EMS-MENRE</u> Engr. Nasser M. Awal. - Chief, CPD, EMS-MENRE <u>CTI:</u> Engr. Domingo L. Guarno Jr. - Local Chief Engineer <u>GSI:</u> Jerald Bartolome - Site Coordinator Eric del Rosario - Project Team Leader Mark Anthony Aldecoa - Project Management Officer Keith Bitao - Project Staff		
HIGHLIGHTS: <p>The tentative schedule of public consultation/ scoping which is within the week of Aug 19-28 was presented to the Chief of CPD, EMS-MENRE. He advised the team to coordinate also with the Biodiversity Ecosystem, Research and Development Services (BERDS) as well as the City Health Office and invite them to the activity. Invitation letter for the MENRE should be addressed to Minister Ahkmad Ibrahim thru the EMS and BERDS Director.</p> <p>The requirements for the ECC Application for non-environmentally critical projects was discussed by Engr. Awal to the team. He highlighted the LGU Resolutions supporting the project for a smooth project implementation. The checklist of requirements was provided to the team.</p> <p>Upon submission of the requirements, it will be subjected for a Technical Review by the Technical Working Group which will be conducted online. However, the proponent is required to appear in the MENRE Office in Cotabato City during the presentation. A maximum of 3 meetings will be held for the proponent to address issues and concerns with the ECC application.</p>			
OTHERS: <ul style="list-style-type: none">The team requested data, including air quality, noise and vibration, and water sector. They mentioned that the data is currently unavailable and instructed the team to submit a formal request letter so they can double-check the availability of the data on their end.			
Prepared by:	Mark Anthony Aldecoa		
Designation:	Project Management Officer		
Date:	August 20, 2024		



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Photo documentation:





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Republic of the Philippines
Bangsamoro Autonomous Region in Muslim Mindanao
Ministry of Environment, Natural Resources and Energy
ENVIRONMENTAL MANAGEMENT SERVICES



Bangsamoro Government Center, Gov. Gutierrez Ave., RH-7, Cotabato City
Telefax No. (064) 4214387/552-0393

General Checklist of Requirements for ECC Application For Non-Environmentally Critical Projects (NECPs)

Initial Environmental Examination (IEE) Report – Main document to be submitted to MENRE. It shall be prepared by an accredited EIA Consultant/Preparer

Attachments:

1. Cover letter addressed to Akmad A. Brahim, Minister, MENRE-BARMM applying for Environmental Compliance Certificate (ECC)
2. Letter requesting PENRE Officer for the conduct of site inspection
3. Barangay Resolution Interposing No Objection to the Project
4. Municipal/City Zoning Certification from MPDC/CPDC
5. Mayor's Endorsement or Clearance
6. Photocopy of Land Title/Tax Declaration
7. Location/Vicinity Map and Site Development Plan
8. Sketch Plan prepared by a Geodetic Engineer for **CSAG, ISAG, GSQP & Earthfill Quarry**
9. Area Status Clearance for River Sand and Gravel Quarry only (from MGS)
10. Engineering Geology and Geo-Hazard Assessment Report (EGGAR)/Geohazard Certification for **Housing Project and Sanitary Landfill Facility (SLF) only**
11. Certification from City/Municipal Engineer's Office (for **CSAG, ISAG and Earthfill Quarry only**) certifying that the project site is at least one (1) kilometer away from any major infrastructure projects

Engr. Nasser M. Awal
Chief, Clearance and Permitting Division
09169356318
nashembarmm@gmail.com

ANNEX C



Annex C

Air Quality, Noise, and Vibration Sampling

The two identified sampling stations for air quality, noise, and vibration level surveys were carried out at pre-determined sampling stations selected by the Client (**See Figure C-1**). The locations of these stations were based on the proximity of the proposed project to critical receptors like communities, schools, and hospitals. The coordinates of each observation site were recorded using a GPS-abled smart phones. The parameters to be measured shall include Total Suspended Particulates (TSP), Sulfur Dioxide (SO₂), PM₁₀, Nitrogen Oxides (NO₂), and Carbon Monoxide (CO) Photochemical Oxidants as Ozone for 24 hours.

The 24-hour air sampling for the two sampling stations was conducted on July 27-28, 2024. The sampling locations for air are as follows: Location 1 in Barangay Tamontaka 2, adjacent to the project site (**See Photo C-1 and Photo C-2**), Location 2 in Barangay Tamontaka 1 (**See Photo C-3 and Photo C-4**).

The designated DENR-accredited laboratory for the sampling is Ostrea General Santos with a business address at DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City.

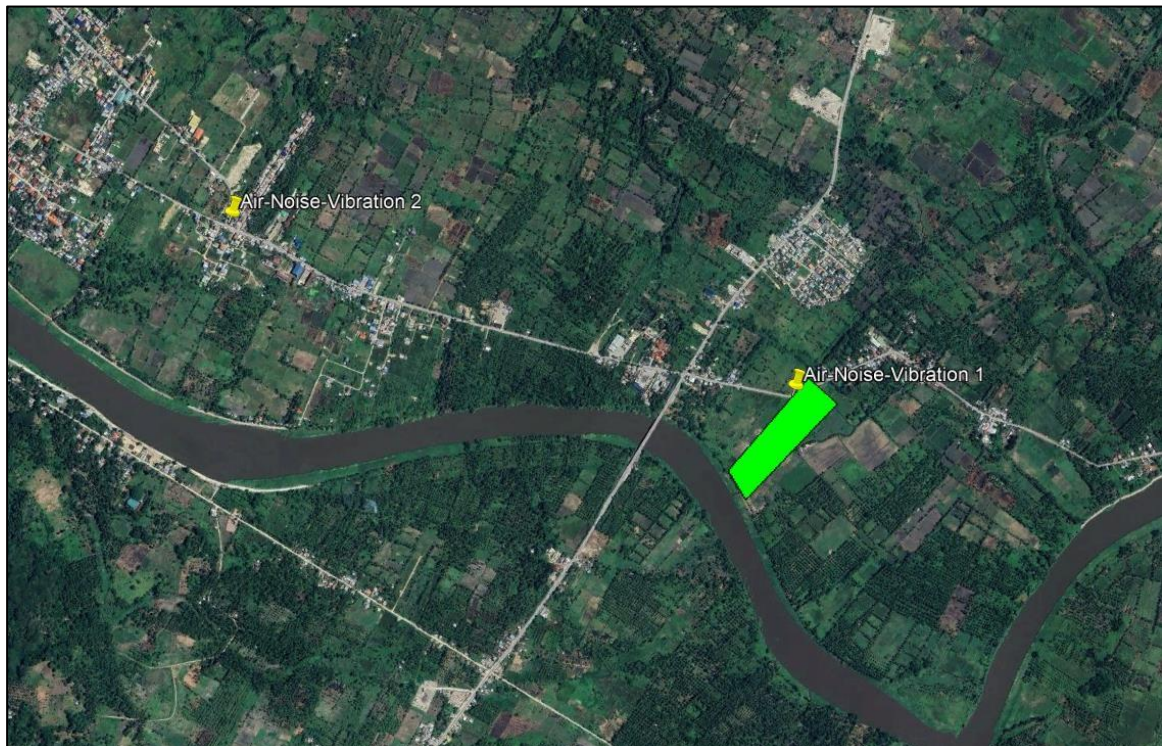


FIGURE C- 1 MAP OF AIR QUALITY, NOISE, AND VIBRATION SAMPLING STATIONS



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Air Noise Vibration 2

The 1st station is located in Barangay Tamontaka II. The timing was at 1100h of July 27, 2024 to 1100h of July 28, 2024



PHOTO C-1 AIR QUALITY SAMPLING STATION



PHOTO C-2 NOISE AND VIBRATION SAMPLING STATION



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Air Noise Vibration 3

The 2nd station for the air quality is located in Barangay Tamontaka I. Timing was at 1300h of July 28, 2024 to 1300h of July 29, 2024.



PHOTO C-3 AIR QUALITY SAMPLING STATION

ANNEX D



Annex D Terrestrial Flora and Fauna

The Flora and Fauna Survey was conducted on July 26-27, 2024 with the Team Leader and Terrestrial Fauna Expert. The survey started at 1600h until 1700h on the first day to capture the evening survey. A Modified Plotless Transect Method was employed to have since the original plot sampling method is not possible since the whole project area is submerged to flood and transect walks are practically not feasible. The Plotless method was commonly used as an alternative method because it is fast and easy to implement but sufficiently provides the level of detail required in the conduct of a flora and fauna assessment. Opportunistic surveys were established using imaginary transects laid out lengthwise throughout river route, starting from the barangay road up to the Tamontaka River (Polagui River) (**See Figure D-1**). The location of the Mist nets and Cage Traps for fauna surveys is shown **Photo D-1**. The actual field assessment activity is shown in **Photo D-2 to Photo D-9**.

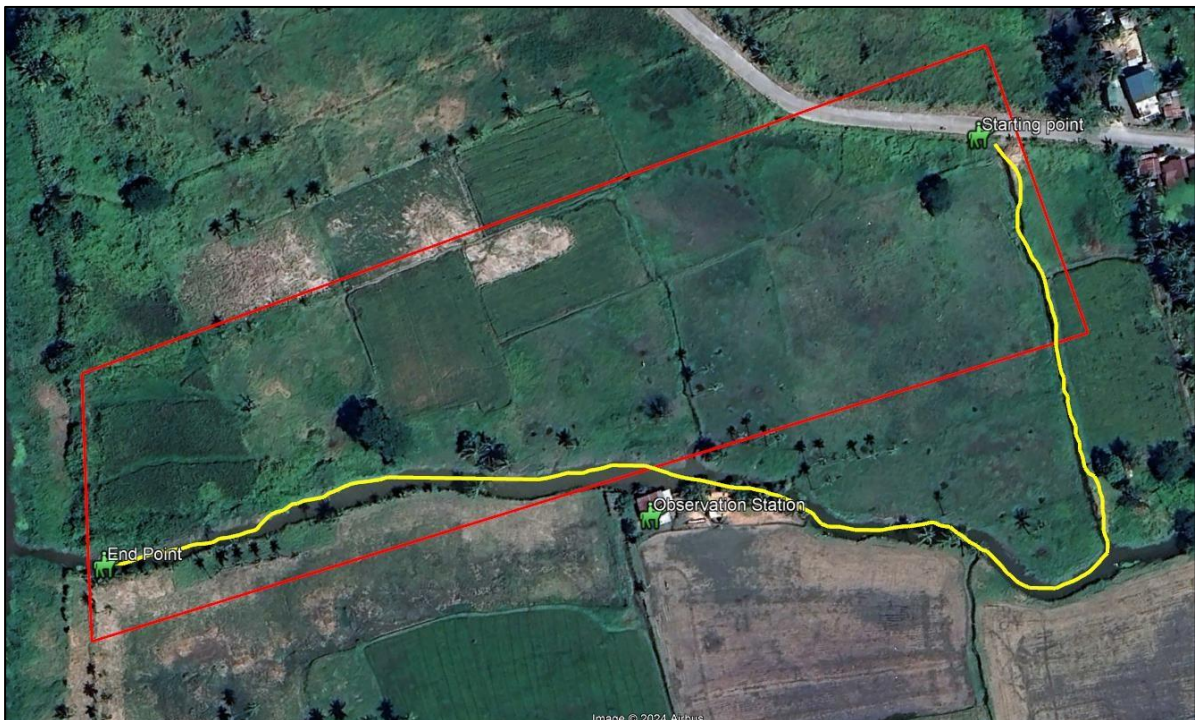


FIGURE D-1 MAP SHOWING TRANSECT LINE USED FOR FLORA AND FAUNA SURVEY



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PHOTO D-1 LOCATION OF MIST NET AND CAGE TRAPS



PHOTO D-2 SURVEY TEAM DURING FLORA AND FAUNA ASSESSMENT



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**Cotabato
City, Maguindanao, Philippines**

Tamontaka II, Cotabato City, 9600,
Maguindanao, Philippines

Lat 7.174790, Long 124.248633

07/27/2024 07:24 AM GMT+08:00

Note : Captured by GPS Map Camera

PHOTO D-3 FAUNA ASSESSMENT CONDUCTED BY FAUNA EXPERT



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Initial result of the flora and fauna assessment shows a mix between agricultural crops and aquatic species for both plant and animals. The photographs of observed flora and fauna are shown below.



PHOTO D-4 MIXED AGRICULTURAL CROPS



PHOTO D-5 COCONUT PLANTATION



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PHOTO D-6 GRASS VEGETATION



PHOTO D-7 A MIX OF FRUIT-BEARING AND FOREST TREE SPECIES



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PHOTO D-8 MIST NETS ESTABLISHED AT THE STUDY SITE



PHOTO D-9 SPECIES OF BAT CAPTURED DURING THE ASSESSMENT

ANNEX E



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Annex E Aquatic Biota

A survey for the presence of aquatic species was conducted around the vicinity of the project site along the river estuary using the same transect line with that of the flora and fauna survey. The survey was conducted on July 27-28 at 0700h to 1700h. The objective of the aquatic ecology baseline study is to evaluate important components of the aquatic ecosystems in the primary impact area of the Project. The method used to catch aquatic specimens is the common fish traps used by local fishers (**See Photo E-1**) while the location of the fish traps along the study area is shown in **Photo E2**. The location of the transect line for the aquatic biota survey is shown in **Photo E-3**.



PHOTO E-1 COMMON FISH TRAPS USED BY LOCAL FISHER



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PHOTO E-2 LOCATION OF FISH TRAPS

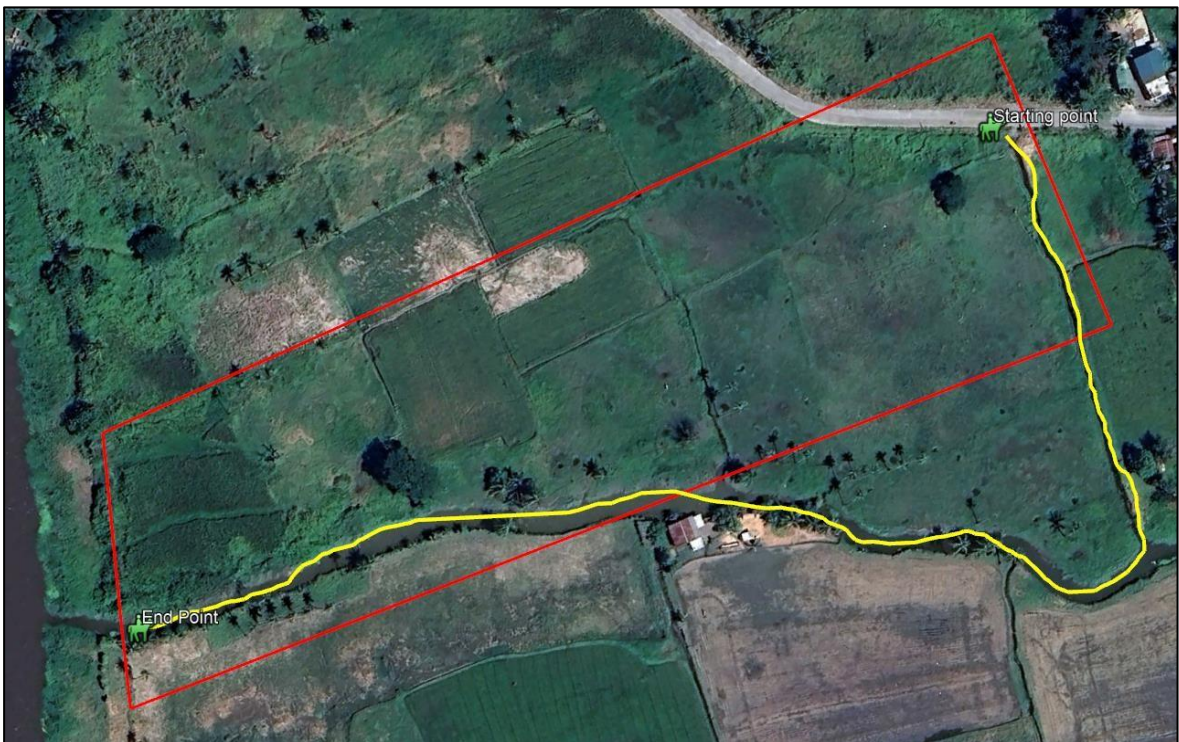


PHOTO E-3 AQUATIC BIOTA TRANSECTS LINE OBSERVATION ROUTE



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Photos of the aquatic species assessed during the survey are shown below in **Photo E-4** to **Photo E-8**:



PHOTO E-4 FISH COLLECTED DURING THE AQUATIC SURVEY



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PHOTO E-5 FISH COLLECTED DURING THE AQUATIC SURVEY



PHOTO E-6 AQUATIC FLORA OBSERVED DURING ASSESSMENT



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PHOTO E-7 AQUATIC FLORA OBSERVED DURING ASSESSMENT



PHOTO E-8 AQUATIC FLORA OBSERVED DURING ASSESSMENT

ANNEX 2
2ND PROGRESS
REPORT



ENVIRONMENTAL IMPACT ASSESSMENT (2ND PROGRESS REPORT)

CTI ENGINEERING INTERNATIONAL CO., LTD.

For the Improvement of Water Supply Project in
COTABATO CITY



[DECEMBER 2024]



GEOINNOVATIVE SPECIALISTS INC.

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1.0 INTRODUCTION

The 2nd Progress Report covers the recent updates on the perception survey and the result of the Environmental and Social Considerations for the Preparatory Survey on the Project for the Improvement of Water Supply in Cotabato City.

The report will provide a summary of the Environmental Impact Assessment Study, which obtained the baseline environmental condition of the project area. It also provides reasons and the ensuing methods for conducting the perception survey. The full results of the environmental impact assessment and the analyses are included in the Final Report submission. **Figure 1-1** shows the Map of the Study Area.

2.0 SCOPE OF SERVICES

The scope of services to be rendered by **Geoinnovative Specialists Inc. (GSI)**, in accordance with the Terms of Reference (TOR) includes the following:

- 1) Collection and review of existing data
- 2) Field surveys for environmental baseline conditions, which include:
 - air sampling and analysis including noise and vibration level measurement;
 - survey on terrestrial biota;
 - survey on aquatic biota; and
 - social consideration study excluding those related to project-affected people.
- 3) Impact prediction and assessment
- 4) Preparation of Environmental Management and Monitoring Plans (EMP and EMoP)
- 5) Preparation of Environmental Impact Statement Report

Table 2-1 shows the Activity Schedule for the Environmental and Social Study required for the above Scope of Services while **Table 2-2** shows the Intended Schedule of Planned Survey Activity for the Study.



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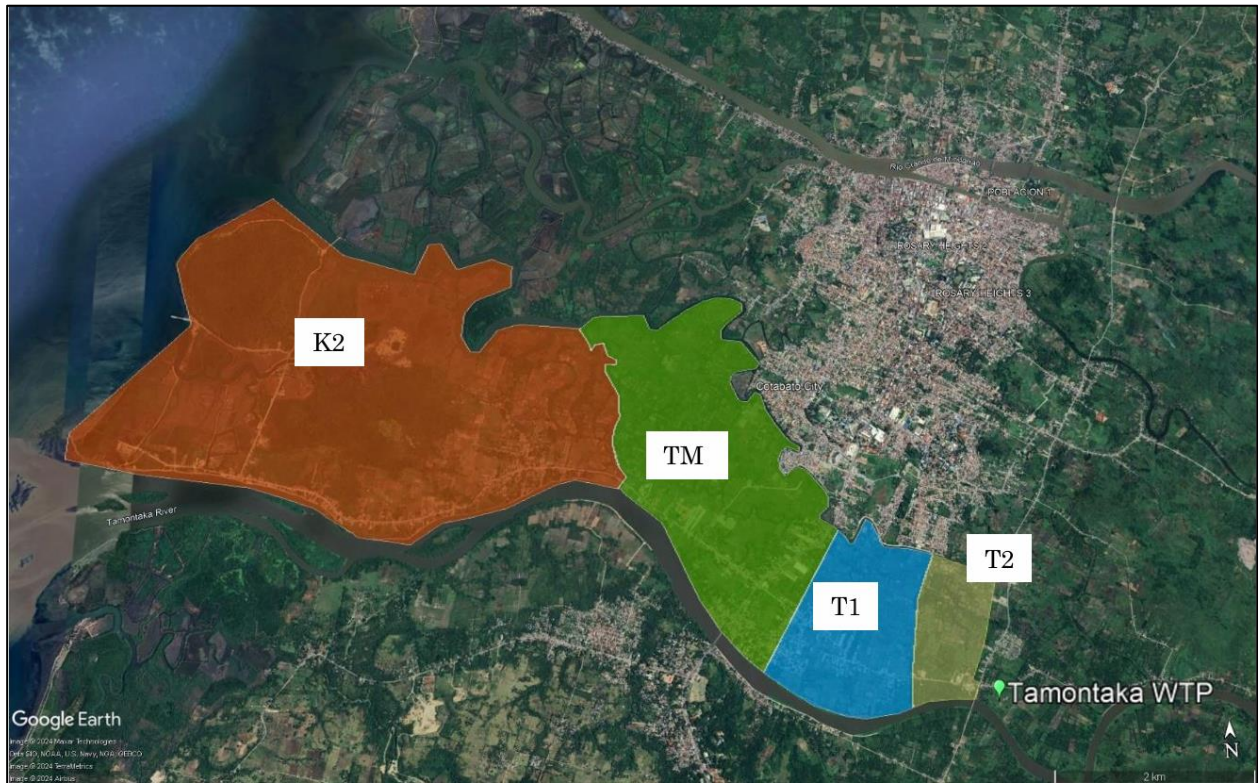


FIGURE 1-1 MAP OF THE STUDY AREA

TABLE 2-1 ACTIVITY SCHEDULE FOR THE STUDY

Phase		Activities	Duration (Days)
1	Preparatory Activities	Involves all activities immediately following the receipt of the notice-to-proceed (NTP) to ensure smooth conduct of the baseline study and to ensure that all services to be executed are in full accordance with the consulting contract	11
		1.1 Kick-off/ Technical meeting with the GSI Team	1
		1.2 Initial Planning Activities	2
		1.3 Review of secondary data and materials	3
		1.4 Planning and formulation of site and field surveys	2
		1.5 Preparation and submission of Field Survey Plan	3
2	Data Gathering/ Conduct of Survey	Involves the actual conduct of field work to gather data, both quantitative and qualitative, and site and field surveys for environmental conditions	11
		2.1 Air, including noise and vibration sampling and analysis	2
		2.2 Survey on terrestrial and aquatic biota	2
		2.3 Survey of Social Environment	5
		2.4 Coordination meetings	2
3		3.1 Coordination for Perception survey	1
		3.2 Conduct of Perception survey	7



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Phase		Activities	Duration (Days)
4	Analysis and Preparation of Survey Report	Involves all activities covering the generation of analysis/findings and the preparation of reports	62
		4.1 Impact prediction and assessment	10
		4.2 Preparation of Environmental Management and Monitoring Plans	20
		4.3 Preparation and submission of Draft Survey Report	10
		4.4 Presentation of findings with the Client	2
		4.5 Preparation and submission of Final Survey Report	20



TABLE 2-2 UPDATED SCHEDULE OF ACTIVITIES FOR THE STUDY

Particulars	21-25-Oct	27-Oct	28-Oct	29-Oct	30-Oct	31-Oct
Activities	Distribution of Invitation letters for Public Consultation to Lgu's, BARMM	Location of possible Public Consultation Venue	Final coordination meeting with Client, MENRE, and JICA Team	Perception Survey of selected stakeholders	Public Consultation Meeting	Perception Survey of selected stakeholders
	Coordination with Client, MENRE, and JICA Team for the PCM presentation	Preparation of materials for PCM	Meeting/ Training with Enumerators	Flora and Fauna re-survey		
Outcomes	Confirmed attendees to the PCM	Confirmed venue for PCM	Confirmed attendance of Client, MENRE, and JICA Team Trained enumerators	Perception survey data; Survey data for Flora and Fauna	List of issues; Agreed resolution	Perception survey data



3.0 ACTIVITIES PERFORMED

3.1 Coordination Meetings

The meeting was held online last August 22, 2024 to discuss the tentative schedule and details of the Public Consultation Meeting. The meeting was attended by GSI experts and staff with the JICA Study Team (Engr. Doms Duarino and Mr. Yuta Yamauchi). On October 21, 2024, a meeting with the JICA survey team was concluded to discuss the Public Consultation Meeting (PCM) especially all activities relating to the PCM such as the preparation of letter invitations, IEC materials, and venue.

On October 22, 2024, GSI Survey Team also met with the MENRE - Environmental Management Systems Director. The meeting culminated with the agreed-upon schedule of the PCM and the requirements that the MCWD should prepare to acquire the required ECC.

The Minutes of Meeting for the said activity can be found in **Annex A** of this report.



FIGURE 3-1 COORDINATION MEETING WITH MENRE-EMS DIRECTOR

3.2 Location of Venue for Public Consultation Meeting

With the recommendation from the MENRE-EMS Director, several event venues were checked to identify which was more appropriate for the public consultation meeting. The list of venues is listed in **Table 3-1**.



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TABLE 3-1 POSSIBLE VENUES INSPECTED

No.	Name	Location	Capacity
1	Sardonyx Plaza	Gov. Gutierrez Ave.	50-100
2	Grand Pagana Function Hall	Manara St.	50-100
3	Brgy. Mother Tamontaka Covered Court	Brgy. Hall of Mother Tamontaka	50-100
4	Brgy. Kalanganan Covered Court	Brgy. Hall of Kalanganan	50-100



FIGURE 3-2 FUNCTION HALL OF BARANGAY MOTHER TAMONTAKA

3.3 Preparation and Submission of Progress Report

The 2nd Progress Report was submitted immediately after the field work activities as agreed in the Contract. The Report will be checked and commented by the CTII/ JICA Study Team until the Final version is approved by the client.

3.4 Planning and Conduct of Perception Survey

The planning and training of enumerators were conducted on October 28, 2024. A pre-test of the survey instrument was facilitated for 50 respondents to check the capability of the enumerators to conduct the survey. The survey team is composed of local individuals with previous experience on similar surveys. The actual survey was facilitated from October 29-November 2, 2024, covering the 4 Barangays with around 305 respondents sampled.



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FIGURE 3-3 MEMBERS OF SOCIO-ECONOMIC SURVEY TEAM (PERCEPTION SURVEY)

3.5 Re-Assessment of Flora and Fauna

Per the comment and suggestion of the JICA survey team, the flora and fauna assessment was re-conducted to utilize the methodology approved during the submission of the Field Survey Plan. The assessment for flora and fauna was undertaken on October 29, 2024.

3.6 Result of Assessment for Each EIA Component

Details of the assessment for each component as well as photo documentation were prepared and described in **Annex C to F**. The status of the accomplishment for the study is presented in **Table 3-2**.



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4.0 PROBLEMS ENCOUNTERED AND ACTIONS TAKEN

- 1) **Social and Perception Survey** – The perception survey was pushed through on October 29-November 2, 2024 with the approval of the Jica Survey Team even without the endorsement of the host Barangay Chairman. Locals from Cotabato were hired as enumerators. These enumerators is familiar with the area and the local dialects since they were previously involved in PSA Census interviews and surveys.
- 2) **Terrestrial and Aquatic Flora and Fauna** – During the survey, the project area was submerged in knee-deep flooding therefore the original transect and plot survey is impossible. Instead, an opportunistic survey was facilitated to collect the required data. After comments were received from the JICA survey team regarding the survey methodology, the consultants made a re-assessment using the required method.

5.0 PLANNED ACTIVITIES

As stipulated in the Study Schedule of Activities, **Table 5-1** shows the planned activities to be undertaken with an estimated period/ time of accomplishment.

TABLE 5-1 PLANNED ACTIVITIES WITH ESTIMATED PERIOD/ TIME OF ACCOMPLISHMENT

Planned Activities	Estimated Period/ Time
1. Re-assessment of Flora and Fauna	October 29
2. Meeting/ Coordination with MENRE-EMS Director	October 28
3. Perception Survey	Oct. 31-Nov. 2
4. Conduct of Public Consultation	To be determined

6.0 DELIVERABLES

The proposed sets of deliverables are scheduled to be submitted on the following dates:

- 1) Draft Final EIA Report (soft copy) – November 11, 2024
- 2) Final EIA Report (soft copy) – December 15, 2024

7.0 OTHER MATTERS

The Scoping for the ECC application with MENRE and other stakeholders will be facilitated in conjunction with the scheduled Public Consultation meeting. Details, invitations, and a list of attendees were provided and discussed with MENRE. As indicated in the invitations, MENRE will be included as one of the resource persons.

ANNEXES

ANNEX A



GEOINNOVATIVE SPECIALISTS INC.

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Annex A Client Visit Form / Minutes of Meeting

Date of Visit	29 October 2024	Time	4:00 –5:00 pm
Name of Client	MENRE	Office	EMS-MENRE
Name of Project	Consultancy Services for the Surveys on Environmental and Social Considerations for the Preparatory Survey on the Project for Improvement of Water Supply in Cotabato City, Philippines		
Agenda:	Coordination Meeting With EMS-MENRE-BARMM		
ATTENDEES	<u>EMS-MENRE</u> Director Ustadh Jalani M. Pamilian, EMS-MENRE Engr. Nasser M. Awal. – Chief, CPD, EMS-MENRE <u>GSI</u> Eric del Rosario – Project Team Leader Keith Bitao – Project Staff		
HIGHLIGHTS:	<p>The tentative schedule of public consultation/ scoping was presented to the Director of EMS-MENRE. He advised the team to prepare a letter to the Minister and included all other officers under the MENRE.</p> <p>The director provided insights on what should be included during the scoping. He also suggested several venues for the PCM considering the number of attendees who will participate.</p>		
<u>OTHERS</u>	<ul style="list-style-type: none">• None		
<u>NOTE:</u>			
Prepared by:	GSI		
Designation:	Project Staff		
Date:	November 25, 2024		



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Photo:





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ANNEX B



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Annex B Air Quality, Noise, and Vibration Sampling Result

The ambient air, noise, and vibration sampling activity was conducted by an independent consultant on July 27-28, 2024. The samples were submitted and analyzed by Ostrea Incorporated a registered and accredited environment laboratory by the DENR EMB 3.

The location and its corresponding description of the ambient air and noise sampling stations are shown Figure B-1 and Table B-1.



Figure B-1. Sampling stations for Air Quality and Noise Assessment

Table B-1 Air and Noise Sampling Stations

Station No.	Location	Remarks	Photos
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1	14° 41' 05" N, 120° 33' 41" E	Near Project Site	
2	14° 41' 04" N, 120° 34' 41" E	Slong Diversion road Tamontaka 1	

A. Air Quality Assessment

The equipment used for the collection of NO₂ and SO₂ was a Tri-Gas Sampler and High Volume Sampler with 10-micron particle-size inlet for PM 10. The methods used in analyses of PM 10 concentrations were determined by gravimetric method, Tetra-chloromercurate (TCM) absorber - Pararosaniline Colorimetric for sulfur dioxide and Impinger Griess-Saltzman method for nitrogen dioxide. The sample collections were done in conformity with the National Ambient Air Quality Standard (NAAQS) as specified by Department of Environment and Natural Resources (DENR) Administrative Order No.93-14.

Sampling Result

DENR defined clean air based on Ambient air quality standards (AAQS) to protect the most sensitive and vulnerable individuals in any community. An air quality standard defines the maximum amount of a pollutant that can be present in the open air without compromising the health of the public.

The sampling activity was conducted in sunny to slightly windy weather conditions. The results of the sampling activity were compared to the National Ambient Air Quality Standards for Sources Specific Air Pollutants from industrial sources/operation (NAAQSSAP).



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The results of sampling and analysis conclude that the ambient concentrations of NO₂, SO₂, and PM 10 are within the acceptable limits of the standards stipulated in the IRR of the Philippine Clean Air Act.

The ambient air sampling results is given in Table B-2. All supporting field data, analytical reports, and calibration records are provided as attachments.

Table B-2 Ambient air sampling result

Station No.	Location	NO ₂ (µg/Nm ³)	SO ₂ (µg/Nm ³)	PM 10 (µg/Nm ³)	TSP (µg/Nm ³)	CO (µg/Nm ³)	O ₃ (µg/Nm ³)
1	Location 1	0.97	2.30	57	66	<1	<1.0
2	Location 2	6.22	3.00	132	247	<1	<1.0
DENR NAAQSSAP (DAO 2000-81 Standards)		150	180	150	230	9	60

B. Noise Level Sampling Result

Noise is defined as unwanted or excessive sound that interferes with the normal activities within the work premises. Noise is described in terms of loudness, frequency, and duration. Loudness is the sound level measured on a logarithmic scale in units of decibels (dB).

To measure the sound level frequency characteristics an A-weighted [dB (A)] frequency filter is used to approximate human hearing of sounds. An EXTECH Model SL-4033SD was used to measure the noise level of the sampling points. Such measuring device has +/- 1.5 dB accuracy with 0.1 dB resolution.

The sampling locations are shown in Table B-3. The sampling period is 10 minutes with ten ten-second intervals.

Table B-3 Sampling location for Noise assessment

Station No.	Location	Remarks
1	14° 41' 05" N, 120° 33' 41"	Near Project Office
2	14° 41' 04" N, 120° 33' 41"	Near Water Tank at middle of Fishpon area



Sampling Result

The results of the noise level measurement are presented in Table B-4. The results were compared to the standards based on the proposed land use within the sampling location. The sampling location was considered as Category A (Residential).

Table B-4 Results of Noise Sampling

Station No.	Sampling Time (1hr)	Morning	Daytime	Evening	Nighttime
1	24-Hr	41	51	42	38
2	24-Hr	54	58	40	37
NPCC Standards (Class A)		50	55	50	45

The Occupational safety and Health Agency (OSHA) has set the danger level at 95 decibels (dB) and above for four or more hours per day as likely to induce permanent hearing impairment. As observed from the table the Max (dBA) were only read momentarily and will not affect the result in general. Noise level measured for all stations are below the Standard Limits.

For this sampling activity, the following have contributed to the measured noise level values: passing vehicles and residential noise, and animal sounds like insects and birds.

C. Vibration Level Assessment

The methods used for the determination of the identified parameters are itemized in Table B-5.

Vibration levels are measured using a vibration meter capable of measuring acceleration and velocity. The meter is mounted on a concrete surface using an adhesive. The vibration meter was set up to collect readings for every 10 minutes in 24-hour duration.

Table B-5: Methods of Sampling and Analysis

Parameter	Methodology
-----------	-------------



Vibration	Data Logger / Vibration Meter
-----------	-------------------------------

Sampling Result

The results of the 24-hour monitoring which includes velocity and acceleration measurements are presented below. The acceleration is presented in unit (g) gravitational force while the velocity is presented in unit (in/s) inches per second.

Table B-6. Vibration Average Results for Location 1

Location 1 For Ground Vibration Monitoring					
Parameter	Date	Time	Average Results		
			X	Y	Z
Velocity, (in/s)	7/27-28/24	11:49 AM - 11:49 AM	0.0113	0.0184	0.0098
Acceleration, (g)	7/28-29/24	11:49 AM - 11:49 AM	0.014	0.017	0.009

The velocity-based vibration average falls within the range of 0.0098 in/s to 0.0113 in/s, while the average acceleration-based vibration spans from 0.009 g to 0.017 g.

Table B-7. Vibration Average Results for Location 2

Location 2 For Ground Vibration Monitoring					
Parameter	Date	Time	Average Results		
			X	Y	Z
Velocity, (in/s)	7/28-29/24	01:12PM - 01:12PM	0.0154	0.0238	0.0112
Acceleration, (g)	7/28-29/24	01:12PM - 01:12PM	0.009	0.009	0.006

The velocity-based vibration average falls within the range of 0.0112 in/s to 0.0238 in/s, while the average acceleration-based vibration spans from 0.006 g to 0.009 g.

ANNEX C



Annex C Terrestrial Flora and Fauna

The Flora and Fauna Survey was re-assessed on October 29, 2024 based on the comment of the Jica Survey Team. The result of the assessment are as follows.

Flora Assessment

The vegetation assessment was conducted to establish baseline vegetation conditions in the project site relating to species composition and structure, vegetation types or communities, endemicity and conservation status. Obtained baseline vegetation condition was used to determine potential impacts of the project and enumerate appropriate mitigation measures. Specifically, the assessment analyzed the potential impacts of the project to floristic composition, existence of endemic and threatened species, and local abundance and distribution of native species.

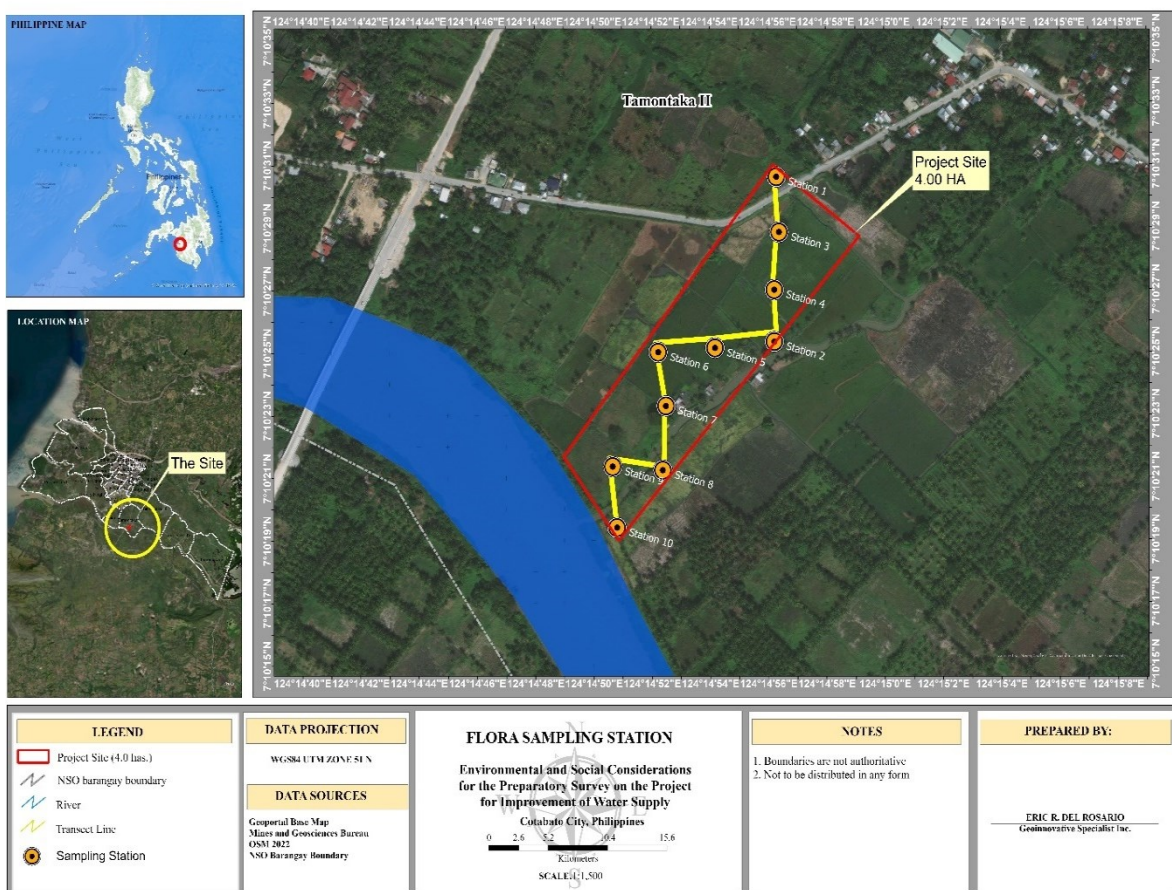


Figure C-1. Location of Flora sampling stations

The study utilized both primary and secondary data to characterize the vegetation at the project site. A transect surveys and the establishment of ten (10) quadrats



at 10 x 10 meters within the project site. Identification and listing of vegetation were carried out. The parameters assessed included cover, dominance, abundance, relative frequency, uses and economic relevance, endemism, and conservation status.

The study site is an existing crop land that is submerged in water due to the overflowing of the Tamontaka River. Based on current vegetation cover and location, habitat conditions for vegetation in the project sites could be described as fragmented with frequent anthropogenic activities.

i. Location of Flora Sampling Points

Ten quadrats were established in strategic areas of the project sites to represent various vegetation cover. A transect survey was employed to include vegetation noticeable clumps in the fishpond. Table C-1 presents the geographical locations of the vegetation quadrats and transects line.

Figure C-2 and Figure C-3 show the existing vegetation/ and or land use during the time of the sampling in the survey area.

Table C-1. Location and General habitat of vegetation

Sampling Station	COORDINATES	LOCALITY	GENERAL HABITAT DESCRIPTION
Station 1	120° 33' 55.53 E 14° 41' 20.710 N	Barangay Tamontaka 2	Majority of agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 2	120° 33' 55.47 E 14° 41' 13.390	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 3	120° 33' 55.63 E 14° 41' 6.280" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.



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Sampling Station	COORDINATES	LOCALITY	GENERAL HABITAT DESCRIPTION
Station 4	120° 33' 59.45 E 14° 40' 44.670 N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 5	120° 34' 2.210" E 14° 40' 35.750" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 6	14° 40' 22.550" E 120° 34' 7.170" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 7	123°34'45.71" E 10°15'34.54" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 8	120°33'30.84 E 14°40'37.240" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.
Station 9	120°33'35.70" E 14°40'35.230" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low



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Sampling Station	COORDINATES	LOCALITY	GENERAL HABITAT DESCRIPTION
			valued plants of the grass family.
Station 10	120°33'41.58" E, 14°40'33.940" N	Barangay Tamontaka 2	Majority agricultural crops like Rice, Maize, Coconuts, Banana, Tapioca and other fruit trees such as Mango. Presence of riparian species such as lagolo, and other low valued plants of the grass family.



Figure C-2. Vegetation in the project site

ii. Flora Methods and Sampling Techniques

Quadrat sampling

The standard sampling technique utilized for the assessment of the flora was the quadrat sampling method. There were ten quadrats with 10 m x 10 m dimension were established representing the various vegetation cover. All samples/stems encountered within the quadrats including annual and perennial shrubs, grasses and legumes were identified to its corresponding taxon (i.e. species, genus, family). Abundance or the number of individuals per species was also recorded.



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Figure C-3. Quadrat sampling assessment

Transect survey

To include the other vegetation along the project site area, a supplemental transect line survey was conducted. Plant forms and species not encountered in the quadrats were included in this method. Similarly, all samples/stems encountered focusing on small trees and woody shrubs were identified to its corresponding taxon (i.e. species, genus, family).





Figure C-4. Transect survey

Data analysis

- General Statistics and Biodiversity Indices

The different plant forms including trees, shrubs, grasses, herbs and legumes in the project site were assessed based on taxonomy (i.e. species, genus and family) and ecology (i.e. biodiversity indices). The quantitative measures of diversity and evenness of each species within the quadrats were calculated using Shannon’s Diversity Index and Equitability Index formulas, Dominance were measured using the Berker Parker equation.

A total of 30 floral species were tabulated at the site represented by 1 species of herbs and fern, 7 species of grass, 2 species of vine, 1 palm, and 18 species of shrubs and trees. Listed in Table C-2 are their scientific, as well as, common names, the conservation status and C-2economic relevance and use. Generally, shrubs, weed, and fern, and some species encountered in the area were either under the category of least concern, not listed and not evaluated in the IUCN and not listed at all in DENR DAO2007-01 listing.

Table C-2. Species Listing of Vegetation surveyed in the Project Site

Common name	Scientific name	Family name	Life Form	IUCN Status	DENR DAO 2007-01
1 Himbabao	<i>Alleaenthus luzonica</i>	Moraceae	Tree	Not Listed	Not Listed
2 Tibig	<i>Ficus nota</i>	Moraceae	Tree	Not Listed	Not Listed
3 Tan-ag	<i>Kleinhovia hospita</i>	Sterculiaceae	Tree	Not Listed	Not Listed
4 Alim	<i>Melanolepis multiglandulosa</i>	Euphorbiaceae	Tree	Not Listed	Not Listed
5 Coconut	<i>Cocus nucifera</i>	Arecaceae	Palm	Not Listed	Not Listed
6 Lantana	<i>Lantana camara</i>	Verbenaceae	Herb	Not Listed	Not Listed
9 Kawayan tinik	<i>Bambus spinusa</i>	Poaceae	Grass	Not Listed	Not Listed
7 Ipil-ipil	<i>Leucaena leucocephala</i>	Fabaceae	Tree	Not Listed	Not Listed



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8	Mango	<i>Mangifera indica</i>	Moringaceae	Tree	Not Listed	Not Listed
9	Banana	<i>Musa sapientum</i>	Musaceae	Herb	Not Listed	Not Listed
10	Raintree	<i>Albizia saman</i>	Fabaceae	Tree	Not Listed	Not Listed
11	Hauli	<i>Ficus septica</i>	Moraceae	Tree	Not Listed	Not Listed
12	Pako	<i>Diplazium esculentum</i>	Athyriaceae	Fern	Not Listed	Not Listed
13	Takip kuhol	<i>Nephelium lappacium</i>	Sapindaceae	Tree	Not Listed	Not Listed
14	Kalios	<i>Streblus asper</i>	Moraceae	Tree	Not Listed	Not Listed
15	Cogon	<i>Imperata Cylindrica</i>	Poaceae	Grass	Not Listed	Not Listed
16	Indian lanutan	<i>Polyalthia longifolia</i>	Anonaceae	Tree	Not Listed	Not Listed
17	Talahib	<i>Saccharum spontaneum</i>	Poacea	Grass	Not Listed	Not Listed
18	Tambo	<i>Phragmites vulgaris</i>	Poaceae	Grass	Not Listed	Not Listed
19	Quiapo	<i>Pistia stratiotes</i>	Poaceae	Grass	Not Listed	Not Listed
20	Datiles	<i>Muntingia calabura</i>	Muntingiaceae	Tree	Not Listed	Not Listed
21	Malubago	<i>Hibiscus tiliaceus</i>	Malvaceae	Tree	Not Listed	Not Listed
22	Maize	<i>Zea maize</i>	Poaceae	Grass	Not Listed	Not Listed
24	Rice	<i>Oryza sativa</i>	Poaceae	Grass	Not Listed	Not Listed
25	Atsuete	<i>Bixa orellana</i>	Bixaceae	Tree	Not Listed	Not Listed
26	Lagolo	<i>Acrostichum aureum</i>	Pteridaceae	Fern	Not Listed	Not Listed
27	Cassava	<i>Manihot esculenta</i>	Euphorbiaceae	Shrub	Not Listed	Not Listed
28	Sweet Potato	<i>Ipomoeae batatas</i>	Convolvulaceae	Vine	Not Listed	Not Listed
29	Kangkong	<i>Ipomoeae aquatica</i>	Convolvulaceae	Vine	Not Listed	Not Listed
30	Narra	<i>Pterocarpus indicus ssp. indicus</i>	Fabaceae	Tree	Vulnerable	Vulnerable

Note: Based on International Union for Conservation of Nature (IUCN Red list), Near Threatened (NT)- A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future; Least Concern (LC) - A taxon is Least Concern when it has been evaluated against



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the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category; Not Evaluated (NE) - A taxon is Not Evaluated when it has not yet been evaluated against the criteria but is in the Catalogue of Life

- Species Richness and Composition

Table C-3 shows a total of 2243 individuals surveyed along the established 10 quadrats belonging to 10 different families recorded.

Table C-3 Number of Species/ individuals Recorded

Species	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total
Takip kuhol	3	8	9	10	0	0	0	0	0	0	30
Quiapo	1	0	0	2	17	7	0	3	0	0	32
Sweet potato	1	0	0	0	2	1	0	0	0	0	4
Tambo	0	5	1	0	5	1	0	0	0	0	12
Kangkong	7	13	7	0	0	0	0	2	0	0	29
Talahib	14	6	10	2	18	15	0	4	0	0	69
Narra	0	0	1	0	0	0	0	0	0	0	1
Malubago	0	0	0	0	0	0	1	0	1	1	3
Maize	0	0	0	0	0	0	1	0	1	0	2
Cogon	0	0	0	0	0	0	0	0	10 x 100	10 x 100	2000
Kawayan	0	0	0	0	0	0	2	0	1	3	6
Mango	0	0	0	0	0	0	0	0	1	0	1
Datiles	0	0	0	0	0	0	0	0	1	5	6
Lagolo	5	0	0	0	0	0	0	0	0	0	5
Ipil-ipil	0	0	0	0	0	0	0	0	2	10	12
Banana	0	0	0	0	0	0	3	0	2	5	10
Kalios	3	0	0	1	2	1	0	0	0	5	12
Pako	3	0	1	1	1	1	1	0	0	1	9
Total	32	32	29	16	45	26	8	9	1014	1030	2243

The dominant species came from the Family Poaceae (*Imperata Cylindrica*) which is a type of grass plant that covers the ground with considerable number. Srubs and Ferns came second comprising to 11 different species, followed by Trees. families. Only 2 species of Fern was observed (*Lagolo and Pako*).

Table C-4 shows the result of the computed diversity indices used for the analysis of the flora identified during the survey.



Table C-4. Diversity indices of surveyed flora

Diversity Index	Quadrats/ Transect Line									
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Total Number of Individuals	32	32	29	16	45	26	8	9	1014	1030
S - Number of Species	7	4	6	5	6	6	6	9	9	8
H	-0.3671	-0.2331	-0.233	-0.115	-0.1445	-0.0889	-0.0889	-0.2733	-0.2733	-0.2723
H' - Shannon	0.36713	0.23309	0.23303	0.11501	0.14447	0.08885	0.08885	0.27332	0.27332	0.26232
Hmax	1.60944	1.38629	1.60944	1.09861	1.38629	1.38629	1.38629	2.19722	2.19722	2.29523
E - equitability	0.22811	0.16814	0.14479	0.10469	0.10421	0.06409	0.06409	0.1244	0.1244	0.1046
D - Berger parker	0.0619	0.04332	0.05748	0.07847	0.03301	0.05776	0.05776	0.00217	0.00217	0.00226

Fauna Assessment

The fauna assessment was conducted to establish baseline data on wildlife assemblage and to describe existing ecological values they represent in the area. Moreover, the assessment was undertaken to determine potential impacts of the project to wildlife and provide site specific mitigation measures to the said impacts.

i. Location and General Description of the Project Site and Transect Lines/ Sampling Points

The study area is primarily a rice field and riparian community and is characterized as frequently submerged area in the brought by the overflowing of Tamontaka River. The study site is composed of vast vegetation of grasses and other riparian species at the time of assessment (Figure C-3 and Figure C-4).



Figure C-3. Faunal survey on July 27, 2024

Figure C-4. Faunal survey on Oct. 29, 2024

Line transects, point observations, bioacoustics, and interviews with the local residents conducted in the late afternoon of July 26, 2024 and early morning of



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July 27, 2024 revealed that bird species found in the area belong to grasslands and waterbirds categories. Site observation to assess the faunal resources within and vicinity of the project site was done through quadrat sampling, Cage traps, and opportunistic Transect survey. The transect line used in the Floral assessment was the same survey line established to conduct the faunal assessment. It started at the left side of the Barangay Road near location bench mark of JICA (PS) in Barangay Tamontaka II (Figure C-5) following a south-west direction that bisects through the vast grass vegetation and adjacent to rice field areas.

ii. Faunal Assessment

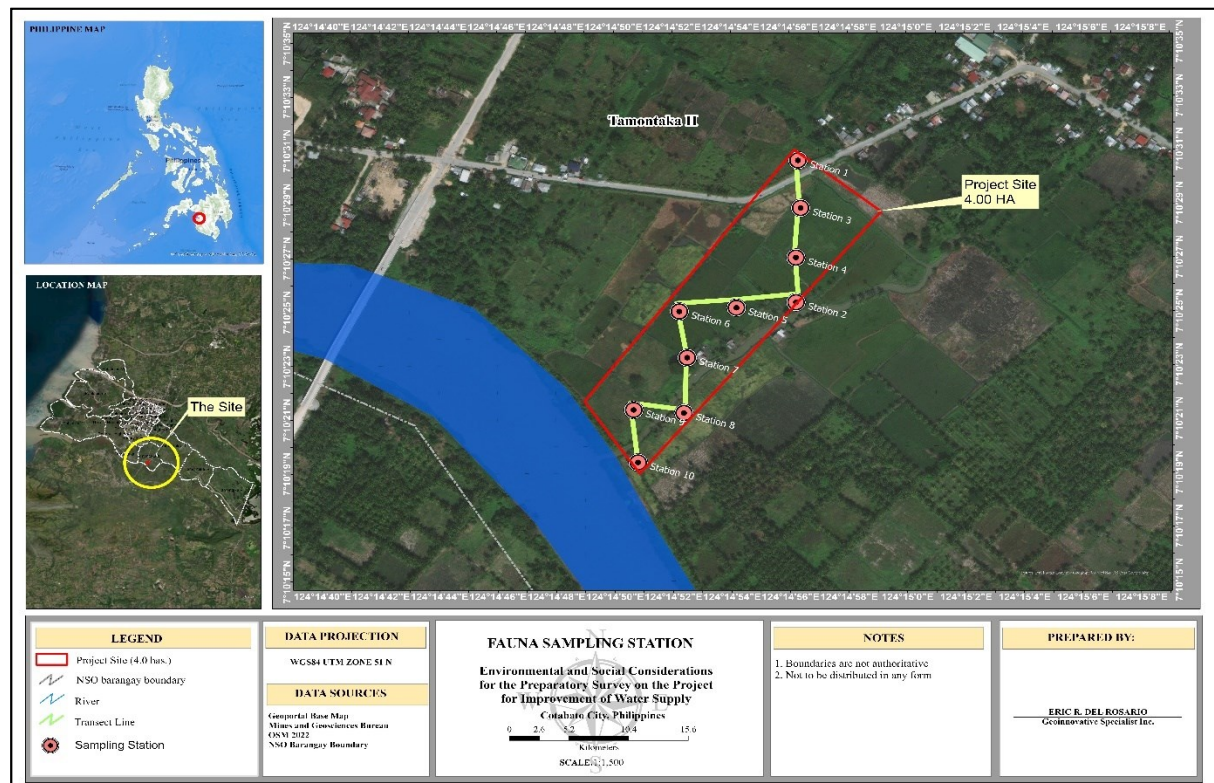


Figure C-5. Transect and quadrat sampling for faunal assessment

Table C-5 below shows that one (1) bird species is categorized as Vulnerable based on the 2016 IUCN Red List of Threatened Species. The Philippine Duck is also listed as Vulnerable Species in the DENR Administrative Order No. 2004-15, Establishing the List of Terrestrial Threatened Species and their Categories and the List of other Wildlife Species pursuant to Republic Act 9147 otherwise known as the Wildlife Resources Conservation and Protection Act of 2001.

Table C-5. Endemic Bird Species and IUCN 2016 Category	
Species	Conservation Category
Philippine Coucal (<i>Centropus viridis</i>)	Least Concern
Collared Kingfisher (<i>Todiramphus chloris</i>)	Least Concern
Rufous Night-heron (<i>Nycticorax caledonicus</i>)	Least Concern
Philippine Duck (<i>Anas luzonica</i>)	Vulnerable



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Cattle Egret (<i>Bubulcus ibis</i>)	Least Concern
Eurasian Tree Sparrow (<i>Passer montanus</i>)	Least Concern
Yellow-vented Bulbul (<i>Pycnonotus goiavier</i>)	Least Concern
Barred Rail (<i>Hypotaenidia torquate</i>)	Least Concern
Philippine Bush-warbler (<i>Horornis seebohmi</i>)	Least Concern



Figure C-5. Collared Kingfisher found in the Project Site.



Figure C-6. Philippine Bush Warbler found in the Project Site.

The project area, being marshy in nature attracts birds as the area offers abundant supply of food. It was found out that there are at least nine (9) species of birds in the area namely: (1) Philippine Coucal (*Centropus viridis*); (2) Collared Kingfisher (*Todiramphus chloris*); (3) Rufous Night-heron (*Nycticorax caledonicus*); (4) Philippine Duck (*Anas luzonica*); (5) Cattle Egret (*Bubulcus ibis*); (6) Eurasian Tree Sparrow (*Passer montanus*); (7) Yellow-vented Bulbul (*Pycnonotus goiavier*); (8) Barred Rail (*Hypotaenidia torquate*); and (9) Philippine Bush-warbler (*Horornis seebohmi*). The preceding table shows the actual bird count during the assessment.

Table C-6. Bird species surveyed in the project sit with their ecological importance value

Species	Number			Fre q.	RA	RF	IV
	Late Aftern oon	Early Morn ing	To tal				
(1) Cattle Egret (<i>Bubulcus ibis</i>)	45	60	105	2	0.27062	0.15385	0.42446
(2) Philippine Bush-warbler (<i>Horornis seebohmi</i>)	0	1	1	1	0.00258	0.07692	0.07950
(3) Philippine Coucal (<i>Centropus viridis</i>)	0	1	1	1	0.00258	0.07692	0.07950
(4) Eurasian Tree Sparrow (<i>Passer montanus</i>)	80	125	205	2	0.52835	0.15385	0.68220
(5) Yellow-vented Bulbul (<i>Pycnonotus goiavier</i>)	3	5	8	2	0.02062	0.15385	0.17446



(6) Collared Kingfisher (<i>Todiramphus chloris</i>)	1	0	1	1	0.00 258	0.07 692	0.07 950
(7) Philippine Duck (<i>Anas luzonica</i>)	12	20	32	2	0.08 247	0.15 385	0.23 632
(8) Barred Rail (<i>Hypotaenidia torquata</i>)	15	20	35	2	0.09 021	0.15 385	0.24 405
(9) Rufous Night-heron (<i>Nycticorax caledonicus</i>)	0	2	2	1	0.00 258	0.07 692	0.07 950
Total	156	234	39 0	13	1	1	2

Note: Freq. (Frequency), RA (Relative Abundance), RF (Relative Frequency), IV (Importance Value)

Per individual counts, the most abundant species were the Eurasian Tree Sparrow and the Cattle Egrets. These types of species common in marshy areas and rice fields nationwide found gleaning or any other potential food found thereof.

iii. Other Fauna

- Bats

Mist nets installed in the early dusk of July 26, 2024 and removed in the dawn of July 27, 2024 captured 14 individuals of Hill Long-tongued Fruit Bat (*Macroglossus sobrinus*), a Least Concern species with a Stable population trend based on 2016 IUCN List. It is found in secondary habitats and old fruit orchards, villages, and banana plantations. It is commonly associated with human settlements under roof of houses (Bates and Harrison 1997). Figures C-6 and C7 shows the Bat species captured and released during the study.



Figure C-6. Long-tongued Fruit Bats found in the Project Site.



Figure C-7. Mist nets traps installed during assessment Site.

- Murids

Cage traps were installed in the site using burnt coconut as baits. Unfortunately, the trapped murids were able to escape the cage traps primarily because these murids have grown enough in size. It is suspected that they belong to species of Ricefield Rat (*Rattus argentiventer*) considering the ecosystem of the area. This species is categorized as a Least Concern species based on the IUCN List.

- Reptiles and Amphibians

Observations and interviews with the local people in the area revealed that there are sightings of the critically endangered Philippine crocodile (*Crocodylus mindorensi*). This is due to the proximity of the project site to Ligawasan Marsh, a known habitat and geographic range of the species based on IUCN May 2012 assessment.

Local folklore in the area is that, mentioning its name attracts them which validates the presence of the species in the area.

Another species of reptiles reported by the local people is the Common Water Monitor (*Varanus salvator*), a Least Concern species that thrives in a wide range of ecosystem, from forests to mangroves, agricultural areas, shrubland and wetlands. Other probable wildlife mentioned by locals are listed in Table C-7.

Table C-7. List of other probable wildlife species in the project site

Species	English Name	Distribution
Herpeto-Fauna		
<i>Phyton reticulates</i> *	Reticulated phyton	Widespread
<i>Varanus spp.</i> *	Monitor lizard	Widespread
<i>Gecko gecko</i> *	Common Tockay Gecko	Widespread
<i>Lamprolepis spp</i> *	Tree Skink	Widespread



<i>Rhinella marina</i> *	Marine Toad	Global
Non-Flying Mammals		
<i>Rattus tanezumi</i> **	Oriental House Rat	Widespread
<i>Suncus murinus</i> **	Asian house shrew	Widespread
<i>Mus musculus</i> **	House Mouse	Widespread

Notes: *Secondary data and Ethno-biological interview; **probability of occurrence”

- Insects

Transect walks, observations acoustics and light traps were used to record the insect species in the area. Table C-8 below shows that there are at least nine (9) Orders of Insects found in the area. Figure C-8 shows the collected insects during field assessment.

Table C-8. Insects found in Project Site.

Order	Species
Hemiptera	Cicads
Lepidoptera	Moths and butterflies
Coleoptera	Beetles
Hymenoptera	Bees and wasps
Diptera	Flies
Araneae	Spiders
Blattodea	Cockroaches and termites
Orthoptera	Grasshoppers, locusts, and crickets
Odonata	Dragonflies

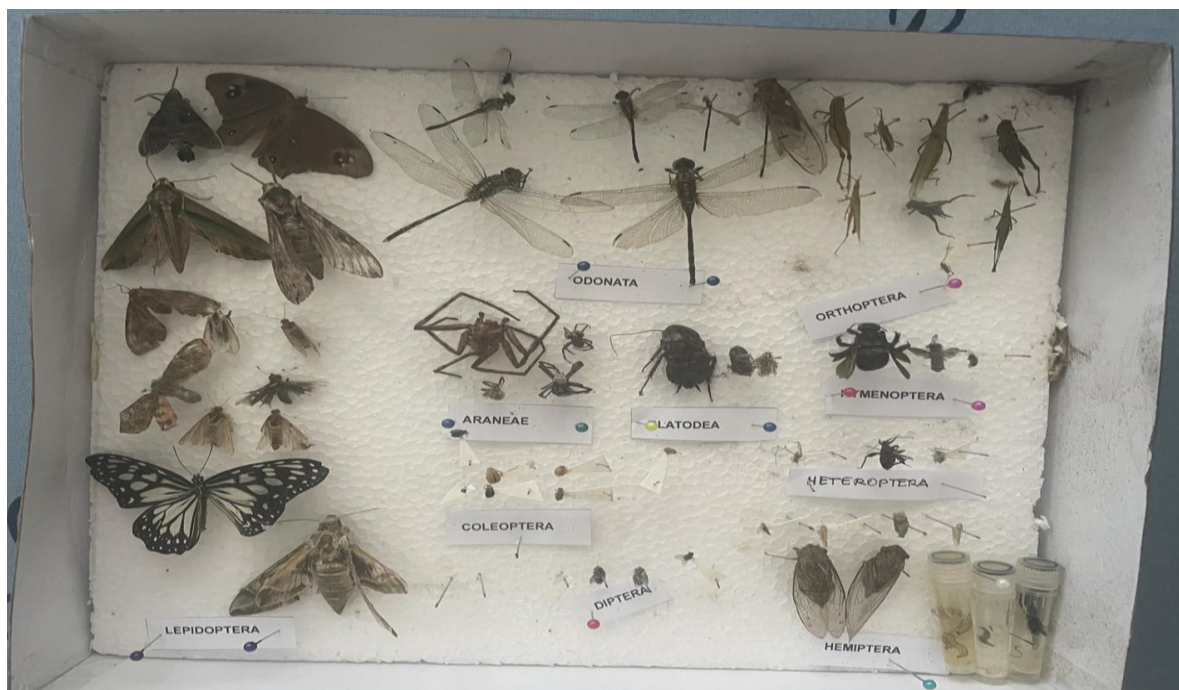


Figure C-8. Mist nets traps installed during assessment

ANNEX D



Annex D Perception Survey

The planning and training of enumerators were conducted on October 28, 2024. A pre-test of the survey instrument was facilitated for 50 respondents to check the capability of the enumerators to conduct the survey. The survey team is composed of local individuals with previous experience on similar surveys. The actual survey was facilitated from October 29-November 2, 2024, covering the 4 Barangays with around 305 respondents sampled. Photographs of the actual survey are included below.

Photo D-1

Actual survey interview of households in Mother Tamontaka





Photo D-2
Interview with local transport riders



Photo D-3
Actual survey interview of household in Tamontaka II



Photo D-4
Interview with a local household head



Photo D-5
Survey team in action



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Photo D-6
Interview with local vendors





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Photo D-7
During the Training of Enumerators and survey planning activity



APPENDIX 1
RESULTS OF
WATER
QUALITY
ASSESSMENT

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	<1.0	CFU/ml	<500	Pour Plate
pH (on-site)	7.2	-	6.5-8.5	Electrometric
Temperature (on-site)	31	°C	-	Laboratory and Field
Color	<5	ACU	10	Visual Comparison
Odor	Non-Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Taste	Non-Objectionable	-	No Objectionable Taste	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	410	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	325	mg/L	300	EDTA Titrimetric
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Nitrate as NO ₃ ⁻ -N	1.90	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	17.1	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	322	mg/L	-	Titration
Electrical Conductivity	731	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.60	mg/L	1.50	Ion-Selective Electrode
Boron (B)	<1.00	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	9	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	3.00	Diazotization
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/ distillation)
Turbidity	0.16	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	<0.10	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.031	mg/L	0.70	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	<0.002	mg/L	1.0	ICP-OES
Iron (Fe)	<0.007	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	<0.007	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	<0.004	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	24.05	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.016	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	0.046	mg/L	-	Combustion
Bromoform	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS
Chloroform	<0.005	mg/L	0.3	Purge and Trap Capillary-Column Gas Chromatographic-MS
Bromodichloromethane	<0.005	mg/L	0.06	Purge and Trap Capillary-Column Gas Chromatographic-MS
Dibromochloromethane	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS

Sample Description	
Date Sampled	09:35AM 04/25/2024
Date Analyzed	04/25-30/2024
Location Sampled	Near Grand Mosque

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	<1.1	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	<1.0	CFU/ml	<500	Pour Plate
pH (on-site)	7.5		6.5-8.5	Electrometric
Temperature (on-site)	30	"C	-	Laboratory and Field
Color	<5	ACU	10	Visual Comparison
Odor	Non-Objectionable		No Objectionable Odor	Sensory Evaluation Technique
Taste	Non-Objectionable		No Objectionable Taste	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	287	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	240	mg/L	300	EDTA Titrimetric
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Nitrate as NO ₃ ⁻ -N	0.91	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	4.7	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	229	mg/L	-	Titration
Electrical Conductivity	485	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.28	mg/L	1.50	Ion-Selective Electrode
Boron (B)	<1.00	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	5	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	3.00	Diazotization
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/distillation)
Turbidity	1.28	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	<0.10	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium(Ba)	0.021	mg/L	0.70	JCP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	<0.002	mg/L	1.0	ICP-OES
Iron (Fe)	<0.007	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	<0.007	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	<0.004	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	9.61	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.012	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	0.415	mg/L	-	Combustion
Bromoform	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS
Chloroform	0.011	mg/L	0.3	Purge and Trap Capillary-Column Gas Chromatographic-MS
Bromodichloromethane	0.005	mg/L	0.06	Purge and Trap Capillary-Column Gas Chromatographic-MS
Dibromochloromethane	<0.005	mg/L	0.1	Purge and Trap Capillary-Column Gas Chromatographic-MS

Sample Description	
Date Sampled	10:09AM 04/25/2024
Date Analyzed	04/25-30/2024
Location Sampled	Near Tamontaka Bridge2

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli</i> (<i>E. coli</i>)	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	est. 680	CFU/ml	<500	Pour Plate
pH (on-site)	7.1	-	6.5-8.5	Electrometric
Temperature (on-site)	32	°C	-	Laboratory and Field
Color	25	ACU	10	Visual Comparison
*Odor	Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	227	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	124	mg/L	300	EDTA Titrimetric
Total Suspended Solids (TSS)	46	mg/L	-	Gravimetric (dried at 103-105 °C)
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Ammonia as NH ₃ -N	0.16	mg/L	-	Ammonia-Selective Electrode
Nitrate as NO ₃ ⁻ -N	0.17	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	13.3	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	131	mg/L	-	Titration
Electrical Conductivity	324	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.11	mg/L	1.50	Ion-Selective Electrode
Boron (B)	0.170	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	11	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	3.00	Diazotization
Total Nitrogen	1.2	mg/L	-	Kjeldahl/By-Calculation
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/distillation)
Turbidity	9.55	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.010	mg/L	0.01	ICP-OES
Aluminum (Al)	2.45	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.020	mg/L	0.7	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	0.005	mg/L	1.0	ICP-OES
Iron (fe)	2.273	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	0.080	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	0.008	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	16.99	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.013	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	1.127	mg/L	-	Combustion

Sample Description	
Date Sampled	07:41AM 04/25/2024
Date Analyzed	04/25-30/2024
Location Sampled	Near WTP Intake Site

Different method indicated

Note: *Smell - like stagnant water

Parameters	Results	Unit	PNSDW Standard	Methods
Total Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Thermotolerant Coliform	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
<i>Escherichia coli (E. coli)</i>	>8.0	MPN/100 ml	<1.1	Multiple Tube Fermentation Technique
Heterotrophic Plate Count (HPC)	est. 460	CFU/ml	<500	Pour Plate
pH (on-site)	8.1	-	6.5-8.5	Electrometric
Temperature (on-site)	33	°C	-	Laboratory and Field
Color	20	CU	10	Visual Comparison
*Odor	Objectionable	-	No Objectionable Odor	Sensory Evaluation Technique
Total Dissolved Solids (TDS)	232	mg/L	600	Gravimetric (dried at 180 °C)
Total Hardness	132	mg/L	300	EDTA Titrimetric
Total Suspended Solids (TSS)	70	mg/L	-	Gravimetric (dried at 103-105 °C)
Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	0.05	Iodometric
Oil and Grease	<1	mg/L	-	Liquid-Liquid, Partition-Gravimetric
Ammonia as NH ₃ -N	0.06	mg/L	-	Ammonia-Selective Electrode
Nitrate as NO ₃ ⁻ -N	0.28	mg/L	50.00	Nitrate Electrode
Chloride (Cl ⁻)	8.6	mg/L	250	Argentometric
Alkalinity (as CaCO ₃)	133	mg/L	-	Titration
Electrical Conductivity	330	µS/cm	-	Conductivity Meter
Fluoride (F ⁻)	0.10	mg/L	1.50	Ion-Selective Electrode
Boron (B)	0.487	mg/L	2.00	Carmine
Sulfate (SO ₄ ²⁻)	13	mg/L	250	Turbidimetric
Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	3.00	Diazotization
Total Nitrogen	1.1	mg/L	-	Kjeldahl By-Calculation
Total Cyanide (CN ⁻)	<0.01	mg/L	0.50	Cyanide-Selective Electrode (w/distillation)
Turbidity	17.5	NTU	5	Nephelometric
Antimony (Sb)	<0.005	mg/L	0.02	Direct Air-Acetylene Flame
Arsenic (As)	<0.01	mg/L	0.01	ICP-OES
Aluminum (Al)	4.26	mg/L	0.2	Direct Nitrous Oxide-Acetylene Flame
Barium (Ba)	0.026	mg/L	0.70	ICP-OES
Cadmium (Cd)	<0.002	mg/L	0.003	ICP-OES
Copper (Cu)	0.007	mg/L	1.0	ICP-OES
Iron (Fe)	4.043	mg/L	1.0	ICP-OES
Total Chromium (Cr)	<0.010	mg/L	0.05	ICP-OES
Lead (Pb)	<0.007	mg/L	0.01	ICP-OES
Manganese (Mn)	0.131	mg/L	0.4	ICP-OES
Total Mercury (Hg)	<0.0004	mg/L	0.001	Cold Vapor AAS
Nickel (Ni)	0.013	mg/L	0.07	ICP-OES
Selenium (Se)	<0.0002	mg/L	0.04	Manual Hydride Generation AAS
Sodium (Na)	15.81	mg/L	200	Direct Air-Acetylene Flame
Zinc (Zn)	0.012	mg/L	5.0	ICP-OES
Total Organic Carbon (TOC)	1.409	mg/L	-	Combustion
Benzo(a)pyrene	<0.0003	mg/L	0.0007	Gas Chromatographic-MS
Organophosphate Pesticides (OPP)				
Malathion	<0.04	µg/L	-	Gas Chromatographic-MS
Dichlorvos	<0.06	µg/L	-	Gas Chromatographic-MS
Demeton-S-methyl	<0.02	µg/L	-	Gas Chromatographic-MS
Dimethoate	<0.02	µg/L	-	Gas Chromatographic-MS
Tolclofos-methyl	<0.01	µg/L	-	Gas Chromatographic-MS
Pirimphos-methyl	<0.01	µg/L	-	Gas Chromatographic-MS
Chlorpyrifos	<0.02	µg/L	-	Gas Chromatographic-MS

Sample Description	
Date Sampled	02:16PM 04/25/2024
Date Analyzed	04/25-30/2024
Location Sampled	Near WTP Intake Site

Different method indicated

Methodathion	<0.04	µg/L	-	Gas Chromatographic-MS
Prothiofos	<0.02	µg/L	-	Gas Chromatographic-MS
Profenofos	<0.04	µg/L	-	Gas Chromatographic-MS
Ethion	<0.01	µg/L	-	Gas Chromatographic-MS
Pyrazophos	<0.13	µg/L	-	Gas Chromatographic-MS
Phenol	<0.001	mg/L	-	Chloroform Extraction
Benzene	<0.0003	mg/L	0.01	Purge & Trap Capillary-Column Gas Chromatographic-MS
Toluene	<0.0003	mg/L	0.7	Purge & Trap Capillary-Column Gas Chromatographic-MS
Ethylbenzene	<0.0002	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
Total Xylene	<0.0002	mg/L	0.5	Purge & Trap Capillary-Column Gas Chromatographic-MS
Styrene	<0.002	mg/L	0.02	Purge & Trap Capillary-Column Gas Chromatographic-MS
Tetrachloroethene	<0.005	mg/L	0.04	Purge & Trap Capillary-Column Gas Chromatographic-MS
Carbon tetrachloride	<0.005	mg/L	0.004	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichlorobenzene	<0.005	mg/L	1	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,4-Dichlorobenzene	<0.005	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichloroethane	<0.005	mg/L	0,03	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dichloroethene	<0.003	mg/L	0.05	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dibromo-3-Chloropropane	<0.00005	mg/L	0.001	Purge & Trap Capillary-Column Gas Chromatographic-MS
1,2-Dibromoethane /Ethylene Dibromide (EDB)	<0.0003	mg/L	0.0004	Purge & Trap Capillary-Column Gas Chromatographic-MS
Bromoform	<0.005	mg/L	0.1	Purge & Trap Capillary-Column Gas Chromatographic-MS
Chloroform	<0.005	mg/L	0.3	Purge & Trap Capillary-Column Gas Chromatographic-MS
Bromodichloromethane	<0.005	mg/L	0.06	Purge & Trap Capillary-Column Gas Chromatographic-MS
Dibromochloromethane	<0.005	mg/L	0.1	Purge & Trap Capillary-Column Gas Chromatographic-MS
Aldrin	<0.00002	mg/L	0.00003	Gas Chromatography- ECD
Dieldrin	<0.00001	mg/L	0.00003	Gas Chromatography- ECD
Chlordane	<0.00002	mg/L	0.0002	Gas Chromatography- ECD
Endrin	<0.00002	mg/L	0.0006	Gas Chromatography- ECD
Lindane	<0.00002	mg/L	0.002	Gas Chromatography- ECD
Dichlorodiphenyltrichloroethane (DDT)	<0.00003	mg/L	0.001	Gas Chromatography- ECD
Dichloromethane	0.010	mg/L	0.02	Gas Chromatography
Vinyl Chloride	<0.0002	mg/L	0.0003	Gas Chromatography
Di(2-ethylhexyl)phthalate	<0.005	mg/L	0.008	Gas Chromatography
Carbamates				
Oxamyl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Methomyl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
3-Hydroxy Carbofuran	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Aldicarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Bendiocarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Thiodicarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Carbaryl	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Methiocarb	<0.2	ug/L	-	Liquid Chromatographic-MS/MS
Carbofuran	<0.0002	mg/L	0.007	Liquid Chromatographic-MS/MS
Atrazine and its Chloro-s-Triazine Metabolites				
Atrazine	<0.01	ug/L	-	Gas Chromatography
Atrazine-desethyl	<0.1	ug/L	-	Gas Chromatography
Atrazine-desisopropyl	<0.1	ug/L	-	Gas Chromatography
Carbofuran	<0.0002	mg/L	0.007	Liquid Chromatographic-MS/MS
Glyphosatec	<0.01	mg/L	1	Gas Chromatography
Pendimethalin	<0.00005	mg/L	0.02	Gas Chromatography

Note:

*Smell - like stagnant water



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for Drinking Water
Accreditation No.
12-053-2426-LW-2

Original Issue	<input checked="" type="checkbox"/>
Duplicate Issue by Request	<input type="checkbox"/>
Revision Copy	<input type="checkbox"/>

CERTIFICATE OF ANALYSIS

Customer : CTI ENGINEERING INTERNATIONAL CO., LTD.

Address : Zone 072, Rm 200 S&L Bldg, 1500 Roxas Blvd, Ermita, Manila, Metro Manila

Attention : Mr. Akimasa Mochizuki

Location : Metro Cotabato Water District (MCWD), Governor Gutierrez Avenue, Rosary Heights, Cotabato City

Contact Information : 0916-494-3419/mochizuki.akimasa@ctii.co.jp

CAN : C24-05-054G-1

Date of Issue : 05/25/2024

RAN : R24-04-073G

Invoice No. :-

Date Received : 04/25/2024

Date Sampled : 04/25/2024

Date Analyzed : 04/25-30/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Date and Time Analyzed	Results	Units	Methods
Tap Water					
04-218G	Total Coliform	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
Station 1	Thermotolerant Coliform	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
Near Grand Mosque	<i>Escherichia coli</i> (<i>E. coli</i>)	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
09:35 am	Heterotrophic Plate Count (HPC)	04/25/2024 04:30 pm	<1.0	CFU/mL	Pour Plate
04-219G					
Station 2	Total Coliform	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
Near Tamonkata	Thermotolerant Coliform	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
Bridge 2,	<i>Escherichia coli</i> (<i>E. coli</i>)	04/25/2024 04:30 pm	<1.1	MPN/100 mL	Multiple Tube Fermentation Technique
Along CCEDR	Heterotrophic Plate Count (HPC)	04/25/2024 04:30 pm	<1.0	CFU/mL	Pour Plate
10:09 am					

Note : -

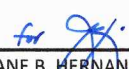
Total No. of Samples: 2 **Total Analysis:** 8

Sample Submission : Sampled by OMLI-GenSan Staff.


Reference : Standard Methods for the Examination of Water and Wastewater, 22nd 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 clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:


RENE JANE B. HERNANDEZ, RMT
Microbiology Laboratory Head
PRC No. 0031190

Certified Correct and Approved by:

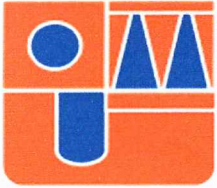

ALVIN P. BASCO, RCh
Group Vice President for Operations
PRC No. 0011786

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Accreditation No.
12-053-2426-LW-2

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Revision Copy	<input type="checkbox"/>

CERTIFICATE OF ANALYSIS

Customer : CTI ENGINEERING INTERNATIONAL CO., LTD.

Address : Zone 072, Rm 200 S&L Bldg, 1500 Roxas Blvd, Ermita, Manila, Metro Manila

Attention : Mr. Akimasa Mochizuki

Location : Metro Cotabato Water District (MCWD), Governor Gutierrez Avenue, Rosary Heights, Cotabato City

Contact Information : 0916-494-3419/mochizuki.akimasa@ctii.co.jp

CAN : C24-05-054G-2

Date of Issue : 05/25/2024

RAN : R24-04-073G

Invoice No. :-

Date Received : 04/25/2024

Date Sampled : 04/25/2024

Date Analyzed : 04/25-30/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Date and Time Analyzed	Results	Units	Methods
04-217G	Total Coliform	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
High Tide	Thermotolerant Coliform	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
07:41 am	<i>Escherichia coli</i> (<i>E. coli</i>)	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
	Heterotrophic Plate Count (HPC)	04/25/2024 04:30 pm	est. 680	CFU/mL	Pour Plate
04-220G	Total Coliform	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
Low Tide	Thermotolerant Coliform	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
02:16 pm	<i>Escherichia coli</i> (<i>E. coli</i>)	04/25/2024 04:30 pm	>8.0	MPN/100 mL	Multiple Tube Fermentation Technique
	Heterotrophic Plate Count (HPC)	04/25/2024 04:30 pm	est. 460	CFU/mL	Pour Plate

Note : -

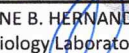
Total No. of Samples: 2 **Total Analysis:** 8

Sample Submission : Sampled by OMLI-GenSan Staff.


Reference : Standard Methods for the Examination of Water and Wastewater, 22nd 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 clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:


RENE JANE B. HERNANDEZ, RMT
Microbiology Laboratory Head
PRC No. 0031190

Certified Correct and Approved by:

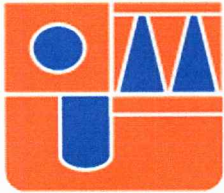

ALVIN P. BASCO, RCh
Group Vice President for Operations
PRC No. 0011786

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C.R. No. 011/2021

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CERTIFICATE OF ANALYSIS

Customer	: CTI ENGINEERING INTERNATIONAL CO., LTD.	CAN	: C24-05-054G-3
Address	: Zone 072, Rm 200 S&L Bldg, 1500 Roxas Blvd, Ermita, Manila, Metro Manila	Date of Issue	: 5/25/2024
Attention	: Mr. Akimasa Mochizuki	RAN	: R24-04-073G
Location	: Metro Cotabato Water District (MCWD), Governor Gutierrez Avenue, Rosary Heights, Cotabato City	INVOICE #	:
Contact Information	: 0916-494-3419/mochizuki.akimasa@ctii.co.jp	Date Received	: 4/25/2024
		Date Sampled	: 4/25/2024
		Date Analyzed	: 4/25-5/4/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
Tap Water					
04-218G	pH (on-site)	7.2	-	Electrometric	6.5-8.5
Station 1	Temperature (on-site)	31	°C	Laboratory and Field	-
Near Grand	Color	<5	ACU	Visual Comparison	10
Mosque	Odor	Non-Objectionable	-	Sensory Evaluation Technique	No Objectionable Odor
09:35 am	Taste	Non-Objectionable	-	Sensory Evaluation Technique	No Objectionable Taste
	Total Dissolved Solids (TDS)	410	mg/L	Gravimetric (dried at 180 °C)	600
	Total Hardness	325	mg/L	EDTA Titrimetric	300
	Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	Iodometric	0.05
	Nitrate as NO ₃ ⁻ -N	1.90	mg/L	Nitrate Electrode	50.00
	Chloride (Cl ⁻)	17.1	mg/L	Argentometric	250
	Alkalinity (as CaCO ₃)	322	mg/L	Titration	-

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Electrical Conductivity	731	µS/cm	Conductivity Meter	-
	Fluoride (F ⁻)	0.60	mg/L	Ion-Selective Electrode	1.50
	Boron (B)	<1.00	mg/L	Carmine	2.00
	Sulfate (SO ₄ ²⁻)	9	mg/L	Turbidimetric	250
	Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	Diazotization	3.00
	Total Cyanide (CN ⁻)	<0.01	mg/L	Cyanide-Selective Electrode (w/ distillation)	0.50
	Turbidity	0.16	NTU	Nephelometric	5
	Antimony (Sb)	<0.005	mg/L	Direct Air-Acetylene Flame	0.02
	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
	Aluminum (Al)	<0.10	mg/L	Direct Nitrous Oxide-Acetylene Flame	0.2
	Barium (Ba)	0.031	mg/L	ICP-OES	0.70
	Cadmium (Cd)	<0.002	mg/L	ICP-OES	0.003
	Copper (Cu)	<0.002	mg/L	ICP-OES	1.0
	Iron (Fe)	<0.007	mg/L	ICP-OES	1.0
	Total Chromium (Cr)	<0.010	mg/L	ICP-OES	0.05
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Manganese (Mn)	<0.007	mg/L	ICP-OES	0.4
	Total Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nickel (Ni)	<0.004	mg/L	ICP-OES	0.07
	Selenium (Se)	<0.0002	mg/L	Manual Hydride Generation AAS	0.04
	Sodium (Na)	24.05	mg/L	Direct Air-Acetylene Flame	200
	Zinc (Zn)	0.016	mg/L	ICP-OES	5.0
	Total Organic Carbon (TOC)	0.046	mg/L	Combustion	-
	Bromoform	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.1
	Chloroform	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.3

Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Bromodichloromethane	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.06
	Dibromochloromethane	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.1
04-219G	pH (on-site)	7.5	-	Electrometric	6.5-8.5
Station 2	Temperature (on-site)	30	°C	Laboratory and Field	-
Near Tamonkata	Color	<5	ACU	Visual Comparison	10
Bridge 2,	Odor	Non-Objectionable	-	Sensory Evaluation Technique	No Objectionable Odor
Along CCEDR	Taste	Non-Objectionable	-	Sensory Evaluation Technique	No Objectionable Taste
10:09 am	Total Dissolved Solids (TDS)	287	mg/L	Gravimetric (dried at 180 °C)	600
	Total Hardness	240	mg/L	EDTA Titrimetric	300
	Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	Iodometric	0.05
	Nitrate as NO ₃ ⁻ -N	0.91	mg/L	Nitrate Electrode	50.00
	Chloride (Cl ⁻)	4.7	mg/L	Argentometric	250
	Alkalinity (as CaCO ₃)	229	mg/L	Titration	-
	Electrical Conductivity	485	µS/cm	Conductivity Meter	-
	Fluoride (F ⁻)	0.28	mg/L	Ion-Selective Electrode	1.50
	Boron (B)	<1.00	mg/L	Carmine	2.00
	Sulfate (SO ₄ ²⁻)	5	mg/L	Turbidimetric	250
	Nitrite (NO ₂ ⁻ -N)	<0.01	mg/L	Diazotization	3.00
	Total Cyanide (CN ⁻)	<0.01	mg/L	Cyanide-Selective Electrode (w/ distillation)	0.50
	Turbidity	1.28	NTU	Nephelometric	5
	Antimony (Sb)	<0.005	mg/L	Direct Air-Acetylene Flame	0.02
	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
	Aluminum (Al)	<0.10	mg/L	Direct Nitrous Oxide-Acetylene Flame	0.2
	Barium (Ba)	0.021	mg/L	ICP-OES	0.70

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Cadmium (Cd)	<0.002	mg/L	ICP-OES	0.003
	Copper (Cu)	<0.002	mg/L	ICP-OES	1.0
	Iron (Fe)	<0.007	mg/L	ICP-OES	1.0
	Total Chromium (Cr)	<0.010	mg/L	ICP-OES	0.05
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Manganese (Mn)	<0.007	mg/L	ICP-OES	0.4
	Total Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nickel (Ni)	<0.004	mg/L	ICP-OES	0.07
	Selenium (Se)	<0.0002	mg/L	Manual Hydride Generation AAS	0.04
	Sodium (Na)	9.61	mg/L	Direct Air-Acetylene Flame	200
	Zinc (Zn)	0.012	mg/L	ICP-OES	5.0
	Total Organic Carbon (TOC)	0.415	mg/L	Combustion	-
	Bromoform	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.1
	Chloroform	0.011	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.3
	Bromodichloromethane	0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.06
	Dibromochloromethane	<0.005	mg/L	Purge and Trap Capillary-Column Gas Chromatographic-MS	0.1

Note : The customer is given 7 days upon receipt to raise questions or clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 2


Total Analysis : 76

Sample Submission : Sampled by OMLI-GenSan Staff.


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.

Certified Correct by:


 MA. CRISTINA F. REFERENTE, RCh
 PRC No. 0007398
 Laboratory Head

Approved by:


 ALVIN P. BASCO, RCh
 PRC No. 0011785
 Group Vice President for Operations

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CERTIFICATE OF ANALYSIS

Customer	: CTI ENGINEERING INTERNATIONAL CO., LTD.	CAN	: C24-05-054G-4
Address	: Zone 072, Rm 200 S&L Bldg, 1500 Roxas Blvd, Ermita, Manila, Metro Manila	Date of Issue	: 5/25/2024
Attention	: Mr. Akimasa Mochizuki	RAN	: R24-04-073G
Location	: Metro Cotabato Water District (MCWD), Governor Gutierrez Avenue, Rosary Heights, Cotabato City	INVOICE #	:
Contact Information	: 0916-494-3419/mochizuki.akimasa@ctii.co.jp	Date Received	: 4/25/2024
		Date Sampled	: 4/25/2024
		Date Analyzed	: 4/25-5/3/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
04-217G	pH (on-site)	7.1	-	Electrometric	6.5-8.5
High Tide	Temperature (on-site)	32	°C	Laboratory and Field	-
07:41 am	Color	25	ACU	Visual Comparison	10
	*Odor	Objectionable	-	Sensory Evaluation Technique	No Objectionable Odor
	Total Dissolved Solids (TDS)	227	mg/L	Gravimetric (dried at 180 °C)	600
	Total Hardness	124	mg/L	EDTA Titrimetric	300
	Total Suspended Solids (TSS)	46	mg/L	Gravimetric (dried at 103-105 °C)	-
	Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	Iodometric	0.05
	Ammonia as NH ₃ -N	0.16	mg/L	Ammonia-Selective Electrode	-
	Nitrate as NO ₃ ⁻ -N	0.17	mg/L	Nitrate Electrode	50.00
	Chloride (Cl ⁻)	13.3	mg/L	Argentometric	250

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Alkalinity (as CaCO ₃)	131	mg/L	Titration	-
	Electrical Conductivity	324	µS/cm	Conductivity Meter	-
	Fluoride (F ⁻)	0.11	mg/L	Ion-Selective Electrode	1.50
	Boron (B)	0.170	mg/L	Carmine	2.00
	Sulfate (SO ₄ ²⁻)	11	mg/L	Turbidimetric	250
	Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	Diazotization	3.00
	Total Nitrogen	1.2	mg/L	Kjeldahl/By-Calculatation	-
	Total Cyanide (CN ⁻)	<0.01	mg/L	Cyanide-Selective Electrode (w/ distillation)	0.50
	Turbidity	9.55	NTU	Nephelometric	-
	Antimony (Sb)	<0.005	mg/L	Direct Air-Acetylene Flame	0.02
	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
	Aluminum (Al)	2.45	mg/L	Direct Nitrous Oxide-Acetylene Flame	0.2
	Barium (Ba)	0.020	mg/L	ICP-OES	0.70
	Cadmium (Cd)	<0.002	mg/L	ICP-OES	0.003
	Copper (Cu)	0.005	mg/L	ICP-OES	1.0
	Iron (Fe)	2.273	mg/L	ICP-OES	1.0
	Total Chromium (Cr)	<0.010	mg/L	ICP-OES	0.05
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Manganese (Mn)	0.080	mg/L	ICP-OES	0.4
	Total Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nickel (Ni)	0.008	mg/L	ICP-OES	0.07
	Selenium (Se)	<0.0002	mg/L	Manual Hydride Generation AAS	0.04

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Sodium (Na)	16.99	mg/L	Direct Air-Acetylene Flame	200
	Zinc (Zn)	0.013	mg/L	ICP-OES	5.0
	Total Organic Carbon (TOC)	1.127	mg/L	Combustion	-
04-220G	pH (on-site)	8.1	-	Electrometric	6.5-8.5
Low Tide	Temperature (on-site)	33	°C	Laboratory and Field	-
02:16 pm	Color	20	ACU	Visual Comparison	10
	*Odor	Objectionable	-	Sensory Evaluation Technique	No Objectionable Odor
	Total Dissolved Solids (TDS)	232	mg/L	Gravimetric (dried at 180 °C)	600
	Total Hardness	132	mg/L	EDTA Titrimetric	300
	Total Suspended Solids (TSS)	70	mg/L	Gravimetric (dried at 103-105 °C)	-
	Hydrogen Sulfide (H ₂ S)	<0.05	mg/L	Iodometric	0.05
	Oil and Grease	<1	mg/L	Liquid-Liquid, Partition-Gravimetric	-
	Ammonia as NH ₃ -N	0.06	mg/L	Ammonia-Selective Electrode	-
	Nitrate as NO ₃ ⁻ -N	0.28	mg/L	Nitrate Electrode	50.00
	Chloride (Cl ⁻)	8.6	mg/L	Argentometric	250
	Alkalinity (as CaCO ₃)	133	mg/L	Titration	-
	Electrical Conductivity	330	µS/cm	Conductivity Meter	-
	Fluoride (F ⁻)	0.10	mg/L	Ion-Selective Electrode	1.50
	Boron (B)	0.487	mg/L	Carmine	2.00
	Sulfate (SO ₄ ²⁻)	13	mg/L	Turbidimetric	250
	Nitrite (NO ₂ ⁻ -N)	0.02	mg/L	Diazotization	3.00

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Total Nitrogen	1.1	mg/L	Kjeldahl By-Calculation	-
	Total Cyanide (CN ⁻)	<0.01	mg/L	Cyanide-Selective Electrode (w/ distillation)	0.50
	Turbidity	17.5	NTU	Nephelometric	-
	Antimony (Sb)	<0.005	mg/L	Direct Air-Acetylene Flame	0.02
	Arsenic (As)	<0.010	mg/L	ICP-OES	0.01
	Aluminum (Al)	4.26	mg/L	Direct Nitrous Oxide-Acetylene Flame	0.2
	Barium (Ba)	0.026	mg/L	ICP-OES	0.70
	Cadmium (Cd)	<0.002	mg/L	ICP-OES	0.003
	Copper (Cu)	0.007	mg/L	ICP-OES	1.0
	Iron (Fe)	4.043	mg/L	ICP-OES	1.0
	Total Chromium (Cr)	<0.010	mg/L	ICP-OES	0.05
	Lead (Pb)	<0.007	mg/L	ICP-OES	0.01
	Manganese (Mn)	0.131	mg/L	ICP-OES	0.4
	Total Mercury (Hg)	<0.0004	mg/L	Cold Vapor AAS	0.001
	Nickel (Ni)	0.013	mg/L	ICP-OES	0.07
	Selenium (Se)	<0.0002	mg/L	Manual Hydride Generation AAS	0.04
	Sodium (Na)	15.81	mg/L	Direct Air-Acetylene Flame	200
	Zinc (Zn)	0.012	mg/L	ICP-OES	5.0
	Total Organic Carbon (TOC)	1.409	mg/L	Combustion	-
	Benzo(a)pyrene	<0.0003	mg/L	Gas Chromatographic-MS	0.0007
	Organophosphate Pesticides (OPP)				
	Malathion	<0.04	µg/L	Gas Chromatographic-MS	-

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Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Dichlorvos	<0.06	µg/L	Gas Chromatographic-MS	-
	Demeton-S-methyl	<0.02	µg/L	Gas Chromatographic-MS	-
	Dimethoate	<0.02	µg/L	Gas Chromatographic-MS	-
	Tolclofos-methyl	<0.01	µg/L	Gas Chromatographic-MS	-
	Pirimphos-methyl	<0.01	µg/L	Gas Chromatographic-MS	-
	Chlorpyrifos	<0.02	µg/L	Gas Chromatographic-MS	-
	Methidathion	<0.04	µg/L	Gas Chromatographic-MS	-
	Prothiofos	<0.02	µg/L	Gas Chromatographic-MS	-
	Profenofos	<0.04	µg/L	Gas Chromatographic-MS	-
	Ethion	<0.01	µg/L	Gas Chromatographic-MS	-
	Pyrazophos	<0.13	µg/L	Gas Chromatographic-MS	-
	Phenol	<0.001	mg/L	Chloroform Extraction	-
	Benzene	<0.0003	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.01
	Toluene	<0.0003	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.7
	Ethylbenzene	<0.0002	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.008
	Total Xylene	<0.0002	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.5
	Styrene	<0.002	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.02
	Tetrachloroethene	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.04
	Carbon tetrachloride	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.004
	1,2-Dichlorobenzene	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	1
	1,4-Dichlorobenzene	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.3
	1,2-Dichloroethane	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.03

Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	1,2-Dichloroethene	<0.003	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.05
	1,2-Dibromo-3-Chloropropane	<0.00005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.001
	1,2-Dibromoethane /Ethylene Dibromide (EDB)	<0.0003	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.0004
	Bromoform	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.1
	Chloroform	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.3
	Bromodichloromethane	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.06
	Dibromochloromethane	<0.005	mg/L	Purge & Trap Capillary-Column Gas Chromatographic-MS	0.1
	Aldrin	<0.00002	mg/L	Gas Chromatography- ECD	0.00003
	Dieldrin	<0.00001	mg/L	Gas Chromatography- ECD	0.00003
	Chlordane	<0.00002	mg/L	Gas Chromatography- ECD	0.0002
	Endrin	<0.00002	mg/L	Gas Chromatography- ECD	0.0006
	Lindane	<0.00002	mg/L	Gas Chromatography- ECD	0.002
	Dichlorodiphenyltrichloroethane (DDT)	<0.00003	mg/L	Gas Chromatography- ECD	0.001
	Dichloromethane	0.010	mg/L	Gas Chromatography	0.02
	Vinyl Chloride	<0.0002	mg/L	Gas Chromatography	0.0003
	Di(2-ethylhexyl)phthalate	<0.005	mg/L	Gas Chromatography	0.008
	Carbamates				
	Oxamyl	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Methomyl	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	3-Hydroxy Carbofuran	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Aldicarb	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Bendiocarb	<0.2	ug/L	Liquid Chromatographic-MS/MS	-

Sample Descriptions	Parameters	Results	Units	Methods	PNS for Drinking Water 2017
	Thiodicarb	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Carbaryl	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Methiocarb	<0.2	ug/L	Liquid Chromatographic-MS/MS	-
	Carbofuran	<0.0002	mg/L	Liquid Chromatographic-MS/MS	0.007
Atrazine and its Chloro-s-Triazine Metabolites					
	Atrazine	<0.01	ug/L	Gas Chromatography	-
	Atrazine-desethyl	<0.1	ug/L	Gas Chromatography	-
	Atrazine-desisopropyl	<0.1	ug/L	Gas Chromatography	-
	Carbofuran	<0.0002	mg/L	Liquid Chromatographic-MS/MS	0.007
	Glyphosatec	<10	ug/L	Gas Chromatography	-
	Pendimethalin	<0.05	ug/L	Gas Chromatography	-

Note : * Smell - like stagnant water

The customer is given 7 days upon receipt to raise questions or clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Total No. of Samples: 2

Total Analysis : 128

Sample Submission : Sampled by OMLI-GenSan Staff.

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.

Certified Correct by:

for
 MA. CRISTINA F. REFERENTE, RCh
 PRC No. 0007398
 Laboratory Head

Approved by:

ALV
 ALVIN P. BASCO, FCh
 PRC No. 0011785
 Group Vice President for Operations

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APPENDIX 2
PERCEPTION
SURVEY

Code "A":				Code "B":					
1	Elementary undergraduate	5	College undergraduate	1	Farming	6	PUB Driver	10	Government Employee
2	Elementary graduate	6	College graduate	2	Fishing	7	Tricycle Driver	11	Private company Employee
3	High schools undergraduate	7	Post-graduate	3	Sales/Vending	8	Habal-habal Driver	12	Service worker (laundry/ironing, manicurist etc)
4	High school graduate	8	Technical-Vocational	4	Manufacturing/Factory worker	9	Pedicab Driver	13	Pensioner
								14	Own business: Specify please

8. House & Lot Tenure and Length of Residency/Use (indicate no. of years as applicable):

Tenure	House/Structure			Other Improvements*		Lot		Farmland	
	Floor area (in meters)	Number of Level	Years of residency	Floor area (in meters)	Years of usage	Lot area (in meters)	Years of occupancy	Land area (in meters)	Years of use
Owned									
Renting/Leasing									
Caretaker									
Tenant									
Free use									

* Other improvements include: Built-up fence, garage, external toilet, workshop etc.

<p>9. Number of years residing in the barangay? _____</p> <p>10. If less than 5 years, where were you residing before? _____</p> <p>11. Why did you transfer here? _____</p> <p>12. How many household members left the barangay to reside elsewhere? _____ Male _____ Female _____ Other</p> <p>13. Why did they leave? _____</p>	<p>14. Is your house near a river? _____ How near? _____ meters</p> <p>15. Is your workplace near a river? _____ How near? _____ meters</p> <p>16. What river is this near your house? _____</p> <p>17. What river is this near your workplace? _____</p>
---	---

B. Economic Aspect

<p>1. How many family members contribute to the monthly family income? _____</p>	<p>2. What is the main source of income of the family? _____</p>
<p>3. Other Sources of Income: _____</p>	

<i>Source</i>	<i>Amount received</i>	<i>Source</i>	<i>Amount received</i>	<i>Source</i>	<i>Amount Received</i>
Income from main occupation		Income from trading		Wages from labor in other farms	
Income from secondary occupation		Income from enterprise		Remittances from family member	
Income from farming		Commissions from sales		Pension	
Income from fishing		Income from rental fees		Government assistance	
				Others: Specify	

4. How many of your children work for a living? ____ How much are they paid? _____ How are they paid? _____

5. Do you think your monthly family income is sufficient? _____ If No, why is it insufficient? _____

6. What are your daily expenses? Please rank them according to importance & indicate cost.

<i>Item</i>	<i>Rank</i>	<i>Cost per Month</i>	<i>Item</i>	<i>Rank</i>	<i>Cost per Month</i>
House rent/amortization			Communication		
Land rent/amortization			Internet		
Food			School expenses (baon)		
Water			Transportation (to school)		
Electricity			Transportation (to work)		
Fuel (kerosene, wood, LPG)			Cooking oil, salt, groceries etc.		
Medicine (maintenance)			Agricultural input products		
Medicine (on-need basis)			Agricultural equipment		
Health services (lab test etc.)			Fuel for vehicle		
Family Debt			Others: Specify		
Clothing					

7. Where do you purchase your needs? _____ 8. How often? _____

9. Do you buy in cash ____ or credit? ____ Why? _____

10. Who does the purchasing? _____ Why? _____

C. Health Aspect

1. Which food do you eat more frequently three times a week? <input type="checkbox"/> - Vegetables <input type="checkbox"/> - Fish <input type="checkbox"/> - Chicken <input type="checkbox"/> - Pork <input type="checkbox"/> - Beef <input type="checkbox"/> - Others (specify please): _____
2. Do you eat together as a family? (Y/N) _____ Why? _____
3. Who has the bigger share of the food? <input type="checkbox"/> Father <input type="checkbox"/> Mother <input type="checkbox"/> Eldest Son <input type="checkbox"/> Eldest Daughter <input type="checkbox"/> Youngest Son <input type="checkbox"/> Youngest Daughter <input type="checkbox"/> Others (specify)
4. Who decides who gets the bigger share of the food? _____
5. Are there medical visits to your barangay health facility by any of the family members (specify)? _____ How often in a year? _____
6. Does pregnant family member regularly seek medical attention? _____ How frequent? _____
7. How does female HH member give birth? <input type="checkbox"/> Doctor-assisted <input type="checkbox"/> Midwife-assisted <input type="checkbox"/> Manghihilot
8. How far is the nearest health facility? _____ kms
9. What services are offered in the barangay health facility? _____

D. Culture and Cultural Heritage

1. To what indigenous group do you belong? _____	2. How long has your group been in this location? _____
3a. In your opinion how can the proposed MCWD project can help your indigenous group? _____	
3b. Why do you think so? _____	
5. In your opinion how can your indigenous group help the proposed MCWD project? _____	
6. In your opinion are there problems in the acceptance or approval of your group on the proposed project? <input type="checkbox"/> Yes <input type="checkbox"/> No	

7. If yes, what are the problems and how it can be addressed?

E. Project Needs, Awareness and Perceptions

1. Name projects most needed by your community and rank them according to importance.

<i>Project</i>	<i>Level of Importance</i>	<i>Urgency</i>
Water Distribution System		
Water Supply System		
Electrification		
Roads		
Bridges		
Sewerage system		
Drainage system		
Dikes		
River bank protection		
Others: specify		

Ranking:

<i>Importance</i>		<i>Urgency</i>	
5	Very important	5	Very urgent
4	Important	4	Urgent
3	Better to have	3	Better to have
2	Nice to have	2	Nice to have
1	Least important	1	Least urgent

2a. Are you aware of the MCWD Project?

1 Yes 2 No

2b. If yes, how did you hear the project?

- Govt./ Barangay Official.
- Neighbors/ relatives
- MCWD officials
- Radio/ TV/ Newspaper

3. Perceived Project Benefits (Specify please)

- Creation of jobs and livelihood opportunities
- Progress in the barangay/ municipality
- Opportunities for business
- Better access to clean water supply.
- Continues and uninterrupted water supply.
- Cheaper water bills
- others
- Don't know/ have any answer/ idea

4. Perceived Project Issues/ Concerns (Specify please):

- Los of property
- Air pollution
- Water pollution
- Loss or contamination of drinking water
- Loss of plants and natural habitats
- Loss of jobs or livelihood
- Damage or pollution of the environment
- Don't know/ have any answer/ idea

<input type="checkbox"/> Barangay meetings/ consultation <input type="checkbox"/> Survey / Research <input type="checkbox"/> others		
5. In your opinion, how should the negative effects be addressed?	6. In your opinion how can be the MCWD project help the community and its residents?	7. Are you in favor of the proposed MCWD Project? <input type="checkbox"/> 1 Yes <input type="checkbox"/> 2 No 8. Why do you say so?

----THANK YOU VERY MUCH----

Name of Enumerator: _____

NOTE: Please do not forget to take photograph of the house/structure/other improvements and its surrounding (trees, crops), as well as the interviewed respondent (in front of the house). Further, please remember to get the geo-reference reading (GPS).

APPENDIX 3
AMBIENT AIR AND
NOISE REPORT



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

Date: August 14, 2024

To: **Mr. Eric Del Rosario**
Pollution Control Officer
Geoinnovative Specialists, Inc.
Geoinnovative Compound,
Sitio Radar, Antipolo, 1870 Rizal

Subject: July 2024 Ambient Air Quality and Noise Level Monitoring Report

Dear Mr. Del Rosario,

We are pleased to submit this report for the month of July 2024, the Ambient Air Quality and Noise Level Monitoring as a result of our sampling conducted in Tamontaka II, Cotabato City, Maguindanao.

We hope that this report addresses your requirements.

Signed by:

ALVIN P. BASCO, RCh
Group Vice President for Operations

RAN: **R24-07-079G**

GEOINNOVATIVE SPECIALISTS, INC.



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

AMBIENT AIR QUALITY & NOISE LEVEL MONITORING REPORT

(July 27-29, 2024)

Prepared for:

GEOINNOVATIVE SPECIALISTS, INC.

Geoinnovative Compound,
Sitio Radar, Antipolo, 1870 Rizal

Prepared by:

Ostrea Mineral Laboratories, Inc.

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang,
General Santos City 9500

RAN: **R24-07-079G**

GEOINNOVATIVE SPECIALISTS, INC.



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

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B	METEOROLOGICAL OBSERVATIONS AND RECORD OF MEASUREMENTS
C	LOCATION MAP
D	PHOTO DOCUMENTATION
E	CALIBRATION CERTIFICATES
F	QUALITY CONTROL
G	SAMPLING PARTICIPANTS



EXECUTIVE SUMMARY

GEOINNOVATIVE SPECIALISTS, INC. commissioned **OMLI WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC. (OMLI-WEM)** to conduct Ambient Air and Noise Monitoring on July 27-29, 2024 located in Tamontaka II, Cotabato City, Maguindanao. Environmental Monitoring Team of OMLI-WEM conducted the measurements in two (2) stations in compliance to applicable standards and to determine the levels of chemical emissions present in the ambient air.

Based on the results of the 24-Hour ambient air monitoring, Total Suspended Particulates (**TSP**) of Station 2 Location 2 does not conform to the standards set by Department Administrative Order 2000-81 of the Department of Environment and Natural Resources (**DENR**). The elevated TSP levels can be attributed to the residents working nearby and vehicular activities.

Based on the results of the 24-Hour Noise monitoring, two (2) time zones of Station 2 Location 2 do not conform to the 1980 NPCC Memorandum Circular No. 002 standard for Class A. A variety of noises contributed to the elevated noise levels during the sampling period, such as noises coming from the residence nearby and noises coming from the horn of the vehicles.



1. INTRODUCTION

GEOINNOVATIVE SPECIALISTS, INC. commissioned **OMLI WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC. (OMLI-WEM)** to conduct Ambient Air and Noise Monitoring on July 27-29, 2024 located in Tamontaka II, Cotabato City, Maguindanao.

This report presents the sampling procedure and analytical test results of ambient air sampled in two (2) stations for Total Suspended Particulates (**TSP**), Particulate Matter 10 (**PM₁₀**), Sulfur Dioxide (**SO₂**), Nitrogen Dioxide (**NO₂**), Carbon Monoxide (**CO**) and Ozone (**O₃**). Noise level was monitored for a 15-minute duration, which sets the median of the seven (7) highest readings out of the sixty (60) gathered values as outlined by Wilson (1989).

2. OBJECTIVE OF THE MONITORING

The monitoring was conducted to check compliance with the standards set in the Department of Environment and Natural Resources (**DENR**) Administrative Order No. 2000-81-Implementing Rules & Regulations of the Philippine Clean Air Act of 1999.

3. METHODOLOGY

The methods used for the determination of the identified parameters are itemized on Table 1.

Table 1. Methods of Sampling and Analysis

Pollutant	Methodology	Reference
Total Suspended Particulate (TSP)	High Volume / Gravimetric	USEPA CFR 40, part 50, Appx. B
Particulate Matter 10 (PM₁₀)	High Volume / Gravimetric	USEPA CFR 40, part 50, Appx. J
Sulfur Dioxide (SO₂)	Gas Bubbler / Pararosaniline	USEPA CFR 40, part 50, Appx. A
Nitrogen Dioxide (NO₂)	Gas Bubbler / Griess-Saltzman	Method of Air Sampling and Analysis 3rd ed. By J.P Lodge
Carbon Monoxide (CO)	Direct Reading / Electrochemical Sensor	
Ozone (O₃)	Neutral Buffer Potassium Iodide (NBKI)	Lodge Method 411
Noise	Direct Reading / Sound Level Meter	



Total Suspended Particulates (TSP). An air sampler draws ambient air at a constant flow rate into a specially shaped inlet and through a filter. The sampler flow rate and the geometry of the shelter favors the collection of particles up to 25-50 μm (aerodynamic diameter). Filter samples are then analyzed gravimetrically.

Particulate Matter 10 (PM₁₀). Air is drawn into a covered housing and through a filter by means of a high-flow-rate blower at a flow rate that allows suspended particles having diameter of 10 microns to pass to the filter surface. The mass concentration of suspended particulate is computed by measuring the mass of collected particulate and the volume of the air sampled.

Sulfur Dioxide (SO₂). This method is based on the absorption of sulfur dioxide from the air in a solution of potassium tetrachloromercurate. A dichlorosulfitomercurate complex that resists oxidation by oxygen in the air is formed and is made to react with pararosaniline methyl sulfonic acid. The intensity of the color produced is measured by means of a spectrophotometer and is related directly to the amount of sulphur dioxide present in the corresponding air sample by means of calibration curve.

Nitrogen Dioxide (NO₂). The nitrogen dioxide is absorbed in an azo dye-forming reagent. A stable pink color is produced within 15 minutes which may be read visually or in appropriate instrument at 550 nm.

Carbon Monoxide (CO). Was measured directly using a gas analyzer with electrochemical sensor and with non-dispersive infrared respectively.

Ozone (O₃). Micro-amounts of ozone and other oxidants liberate iodine when absorbed in a 1% solution of potassium iodide buffered at pH 6.8 ± 0.2 . The iodine is determined spectrophotometrically by measuring the absorption of triiodide ion at 352 nm wavelength.

Noise. Was directly measured using a digital sound level meter.



4. RESULTS AND EVALUATION

Based on the results of 24-Hour ambient air monitoring found in **Tables 2 and 3**, Total Suspended Particulates (**TSP**), Particulate Matter 10 (**PM₁₀**), Sulfur Dioxide (**SO₂**), Nitrogen Dioxide (**NO₂**), Carbon Monoxide (**CO**) and Ozone (**O₃**) of Station 1 Location 1, Particulate Matter 10 (**PM₁₀**), Sulfur Dioxide (**SO₂**), Nitrogen Dioxide (**NO₂**), Carbon Monoxide (**CO**) and Ozone (**O₃**) of Station 2 Location 2 conform to the Standards set by DENR DAO 2000-81.

However, the Total Suspended Particulates (**TSP**) of Station 2 Location 2 does not meet the standards set by DENR DAO 2000-81. The elevated TSP levels can be attributed to the residents working nearby and vehicular activities including heavy trucks loaded with gravel and sand.

Based on the 24-Hour Noise monitoring found in **Table 5**, two (2) time zones of Station 2 Location 2 do not conform to the 1980 NPCC Memorandum Circular No. 002 standard for Class A. A variety of noises contributed to the elevated noise levels during the sampling period, such as noises coming from the residence nearby and noises coming from the horn of the vehicles.

The laboratory test certificates, meteorological observations and record of measurements, location map, photo documentation, calibration certificates, quality control and sampling participants are presented in Annexes A, B, C, D, E, F & G respectively.

Table 2. Test Results
24-Hour Ambient Air Monitoring

Locations	Date Sampled	Time	TSP, µg/Ncm	PM ₁₀ , µg/Ncm	SO ₂ , µg/Ncm
Location 1	July 27-28, 2024	11:49 am – 11:49 am	66	57	2.30
Location 2	July 28-29, 2024	01:12 pm – 01:12 pm	247	132	3.00
DAO 2000-81 Standards			230	150	180



Table 3. Test Results
24-Hour Ambient Air Monitoring

Locations	Date Sampled	Time	NO ₂ , µg/Ncm	CO, ppm	O ₃ , µg/Ncm
Location 1	July 27-28, 2024	11:49 am – 11:49 am	0.97	<1	<1.0
Location 2	July 28-29, 2024	01:12 pm – 01:12 pm	6.22	<1	<1.0
DAO 2000-81 Standards			150	9*	60*

*8-hour Monitoring

Table 4. Noise Results
Location 1
24-Hour Noise Monitoring

Time Zone	Date Sampled	Time	Noise, dBA	NPCC Standard Class A	Source/s of Noise
Morning	July 28, 2024	06:16 am - 06:31 am	41	50	1 vehicle passed by and birds chirping.
Daytime	July 27, 2024	05:20 pm - 05:35 pm	51	55	2 vehicles passed by and birds chirping.
Evening	July 27, 2024	07:10 pm - 07:25 pm	42	50	Noise from crickets.
Nighttime	July 28, 2024	03:25 am - 03:40 am	38	45	Noise from crickets.

Table 5. Noise Results
Location 2
24-Hour Noise Monitoring

Time Zone	Date Sampled	Time	Noise, dBA	NPCC Standard Class A	Source/s of Noise
Morning	July 29, 2024	06:37 am - 06:52 am	54	50	28 vehicles passed by and birds chirping.
Daytime	July 29, 2024	11:05 am - 11:20 am	58	55	2 babies were crying, horns blowing and birds chirping.
Evening	July 28, 2024	08:45 pm - 09:00 pm	40	50	1 vehicle passed by and noise from insects.
Nighttime	July 28, 2024	11:10 pm - 11:25 pm	37	45	Noise from insects.



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ANNEX A

LABORATORY TEST CERTIFICATES



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

RJ Duano Building, M.C. Briones Street, Highway, Bakilid Mandaue City, Cebu
Telephone : (032) 343-6472; (032) 383-8077
Email : customerservice.ostrealabs@gmail.com

DENR Recognized
Laboratory with
C.R No. 041/2023

Original Issue	<input checked="" type="checkbox"/>
Duplicate Issue by Request	<input type="checkbox"/>
Revision Copy	<input type="checkbox"/>

CERTIFICATE OF ANALYSIS

Customer : GEOINNOVATIVE SPECIALISTS INC.

Address : Geoinnovative Compound, Sitio Radar, Antipolo, 1870 Rizal

Attention : Mr. Eric Del Rosario

Location : Tamontaka II, Cotabato City, Maguindanao

Contact Information : 0962- 940-6582/ erdelrosario.96@gmail.com

CAN : C24-08-024G-1

Date of Issue : 08/12/2024

RAN : R24-07-079G

Invoice No. :--

Date Received : 07/30/2024

Date Sampled : 07/27-29/2024

Date Analyzed : 08/01-06/2024

RESULTS OF ANALYSIS

Sample Descriptions	Parameters	Results	Units	DAO 2000-81 Standards	Methods
24 Hours Ambient Air Monitoring					
07-209G	Total Suspended Particulates (TSP) ^a	66	µg/Ncm	230	Gravimetric
Location 1	Particulate Matter 10 (PM ₁₀) ^b	57	µg/Ncm	150	Gravimetric
Date Sampled: July 27-28, 2024	Nitrogen Dioxide (NO ₂) ^d	0.97	µg/Ncm	150	Griess-Saltzman
11:49 am - 11:49 am	Sulfur Dioxide (SO ₂) ^c	2.30	µg/Ncm	180	Pararosaniline
	Carbon Monoxide (CO)	<1	ppm	9*	Direct Reading - Electrochemical Sensor
	Ozone (O ₃) ^d	<1.0	µg/Ncm	60*	Neutral Buffer Potassium Iodide (NBKI)
07-210G	Total Suspended Particulates (TSP) ^a	247	µg/Ncm	230	Gravimetric
Location 2	Particulate Matter 10 (PM ₁₀) ^b	132	µg/Ncm	150	Gravimetric
Date Sampled: July 28-29, 2024	Nitrogen Dioxide (NO ₂) ^d	6.22	µg/Ncm	150	Griess-Saltzman
01:12 pm - 01:12 pm	Sulfur Dioxide (SO ₂) ^c	3.00	µg/Ncm	180	Pararosaniline
	Carbon Monoxide (CO)	<1	ppm	9*	Direct Reading - Electrochemical Sensor
	Ozone (O ₃) ^d	<1.0	µg/Ncm	60*	Neutral Buffer Potassium Iodide (NBKI)

Note : *8 hours sampling

*Parameter outside the DENR 041/2023 accreditation.


Total No. of Samples: 2 **Total Analysis:** 12


Sample Submission : Sampled by OMLI-GenSan Staff.

Reference : USEPA 40 CFR, Part 50, Appendices ^a B, ^b J, ^c A, and ^d Method of Air Sampling and Analysis 3rd ed. By J.P Lodge.

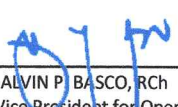
Remarks : Results relate only to the items tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:


AL DEXTER Y. JABONILLO, RCh
Deputy Laboratory Head
PRC No. 0014690


SHEENA JOY C. CADELINIA, RCh
Laboratory Head
PRC No. 0013180

Approved by:


ALVIN P. BASCO, RCh
Group Vice President for Operations
PRC No. 0011786

Not valid without OMLI dry seal

Page 1 of 1

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Uninterrupted Total Quality Service Since
1976



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

RJ Duano Building, M.C. Briones Street, Highway, Bakilid Mandaue City, Cebu
Telephone : (032) 343-6472, (032) 383-8077
Email : customerservice.ostrealaba@gmail.com

Original Issue	<input checked="" type="checkbox"/>
Duplicate Issue by Request	<input type="checkbox"/>
Revision Copy	<input type="checkbox"/>

CERTIFICATE OF ANALYSIS

Customer : GEOINNOVATIVE SPECIALISTS INC.

CAN : C24-07-024G-2

Address : Geoinnovative Compound, Sitio Radar, Antipolo, 1870 Rizal

Date of Issue : 08/12/2024

Attention : Mr. Eric Del Rosario

RAN : R24-07-079G

Invoice No. :-

Location : Tamontaka II, Cotabato City, Maguindanao

Date Analyzed : 07/27-29/2024

Contact Information : 0962- 940-6582/ erdelrosario.96@gmail.com

RESULTS OF ANALYSIS

Location	Date and Time Analyzed	Morning	Daytime	Evening	Night Time
		5:00am- 9:00am dBA	9:00am- 6:00pm dBA	6:00pm- 10:00pm dBA	10:00pm- 5:00am dBA
24 Hours Noise Monitoring					
07-209G	07/27/2024 05:20 pm	41	51	42	38
Location 1					
07-210G	07/28/2024 08:45 pm	54	58	40	37
Location 2					
NPCC Memorandum Circular No. 002 Series of 1980, Class A		50	55	50	45

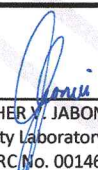
Note : -


Total No. of Sample: 2 **Total Analysis: 8**

Sample Submission : Sampled by OMLI-GenSan Staff.


Remarks : Results relate only to the items tested and received by the laboratory.
The customer is given 7 days upon receipt to raise questions or clarification on any part or content of the certificate, otherwise the result(s) is/are deemed accepted.

Certified Correct by:


AL DEXTER Y. JABONILLO, RCh
Deputy Laboratory Head
PRC No. 0014690


SHEENA JOY C. CADELINIA, RCh
Laboratory Head
PRC No. 0013180

Approved by:


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OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

ANNEX B

METEOROLOGICAL OBSERVATIONS AND RECORD OF MEASUREMENTS



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

General Information:

Company Name: **Geoinnovative Specialists, Inc.**

Date Sampled: July 27-28, 2024

Sampled by: I. A. O. Dagum, J. B. Cagas, E. R. U. Generalao, J. A. Menguita

CAN No.: **C24-08-024G-1**

Description: **Location 1**

Coordinates: N= 7°10'29" E= 124°14'54"

Meteorological Measurements

Readings	Time	Temp, ° C	RH, %	Wind Speed, m/s	Wind Direction	Weather Condition	Atm. Pressure, mm Hg
1	3:49 pm	31.6	66.1	0.4	SW to NE	Cloudy	754.8
2	7:49 pm	28.2	88.9	0.1	SW to NE	Cloudy	755.3
3	11:49 pm	27.8	92.3	0.3	SW to NE	Cloudy	755.7
4	3:49 am	26.5	94.7	0.6	SW to NE	Cloudy	754.6
5	7:49 am	27.6	91.4	0.1	SW to NE	Partly Cloudy	754.2
6	11:49 am	31.1	63.5	0.1	SW to NE	Sunny	755.1



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Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

General Information:

Company Name: **Geinnovative Specialists, Inc.**

Date Sampled: **July 28-29, 2024**

Sampled by: **I. A. O. Dagum, J. B. Cagas, E. R. U. Generalao, J. A. Menguita**

CAN No.: **C24-08-024G-1**

Description: **Location 2**

Coordinates: **N= 7°10'43" E= 124°13'59"**

Meteorological Measurements

Readings	Time	Temp, °C	RH, %	Wind Speed, m/s	Wind Direction	Weather Condition	Atm. Pressure, mm Hg
1	5:12 pm	29.7	83.1	0.3	SW to NE	Partly Cloudy	755.6
2	9:12 pm	28.1	86.3	0.1	SW to NE	Cloudy	756.1
3	1:12 am	26.2	97.6	0.1	SW to NE	Cloudy	755.8
4	5:12 am	25.9	95.8	0.4	SW to NE	Partly Cloudy	755.3
5	9:12 am	29.4	76.5	0.1	SW to NE	Partly Cloudy	754.7
6	1:12 pm	32.1	63.9	0.3	SW to NE	Sunny	754.4



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Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

General Information:

Company Name: **Geinnovative Specialists, Inc.**

Date Sampled: **July 27-28, 2024**

Sampled by: **I. A. O. Dagum, J. B. Cagas, E. R. U. Generalao, J. A. Menguita**

CAN No.: **C24-08-024G-1**

Description: **Location 1 (Ozone)**

Coordinates: **N= 7°10'29" E= 124°14'54"**

Meteorological Measurements

Readings	Time	Temp, °C	RH, %	Wind Speed, m/s	Wind Direction	Weather Condition	Atm. Pressure, mm Hg
1	10:34 pm	27.9	93.4	0.1	SW to NE	Cloudy	755.6
2	11:34 pm	27.7	91.8	0.2	SW to NE	Cloudy	755.8
3	12:34 am	27.4	94.3	0.4	SW to NE	Cloudy	755.7
4	1:34 am	27.1	96.1	0.1	SW to NE	Cloudy	755.4
5	2:34 am	26.9	95.5	0.3	SW to NE	Cloudy	754.9
6	3:34 am	26.6	94.1	0.1	SW to NE	Cloudy	754.7



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Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

General Information:

Company Name: Geoinnovative Specialists, Inc.
Date Sampled: July 28-29, 2024
Sampled by: I. A. O. Dagum, J. B. Cagas, E. R. U. Generalao, J. A. Menguita

CAN No.: C24-08-024G-1
Description: Location 2 (Ozone)
Coordinates: N= 7°10'43" E= 124°13'59"

Meteorological Measurements

Readings	Time	Temp, °C	RH, %	Wind Speed, m/s	Wind Direction	Weather Condition	Atm. Pressure, mm Hg
1	2:12 pm	31.6	74.3	0.8	SW to NE	Sunny	755.4
2	3:12 pm	31.0	76.1	0.6	SW to NE	Sunny	755.3
3	4:12 pm	30.5	79.7	0.1	SW to NE	Sunny	755.4
4	5:12 pm	29.7	83.1	0.3	SW to NE	Partly Cloudy	755.6
5	6:12 pm	29.6	81.8	0.1	SW to NE	Cloudy	755.5
6	7:12 pm	29.4	83.9	0.2	SW to NE	Cloudy	755.8



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Email: customerservice.ostrealabs@gmail.com

ANNEX C

LOCATION MAP



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

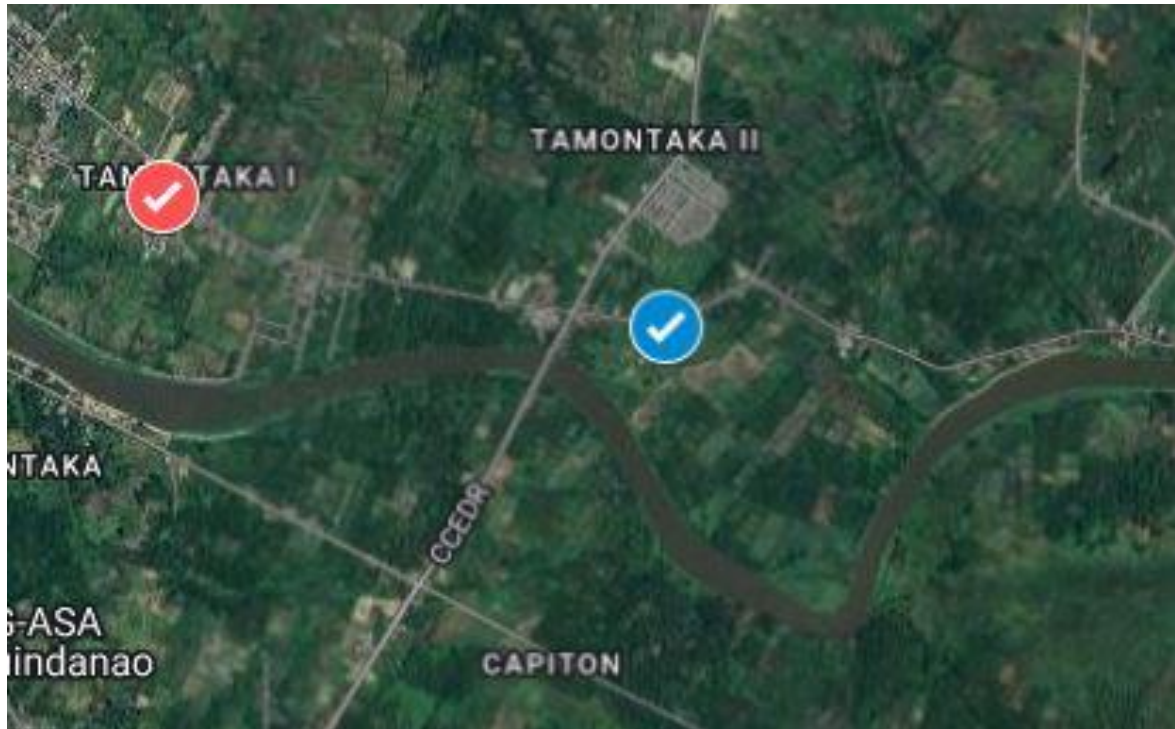
DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676



Email: customerservice.ostrealabs@gmail.com

Ambient Air and Noise Monitoring Stations

Geoinnovative Specialists, Inc.



Legend:

-  **Location 1**
-  **Location 2**



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Assaying and Environmental Testing Specialist

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ANNEX D

PHOTO DOCUMENTATION



OSTREA MINERAL LABORATORIES, INC.

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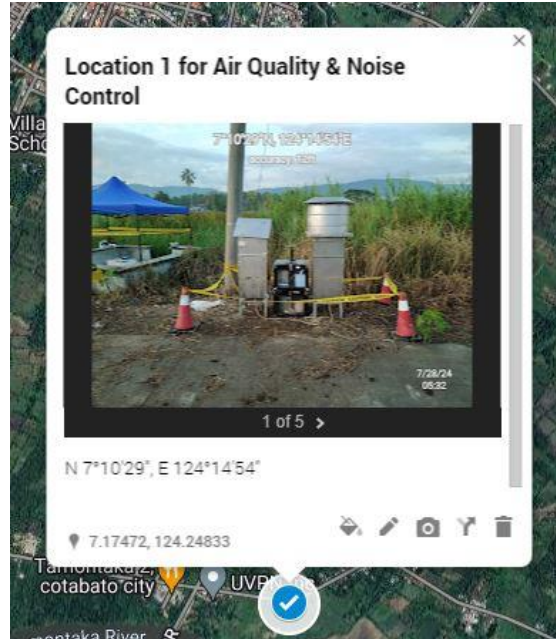
DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

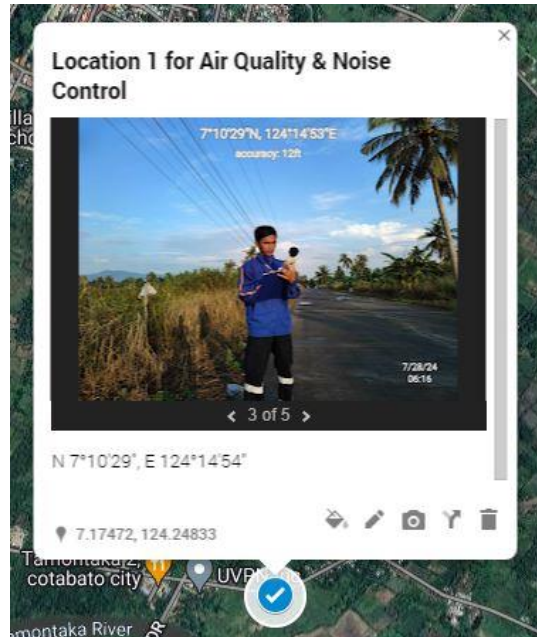
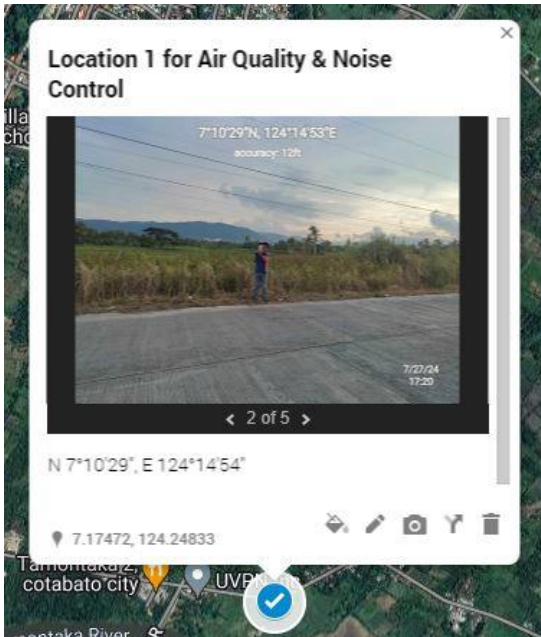
Email: customerservice.ostrealabs@gmail.com

24-Hours Ambient Air and Noise Monitoring

Station 1: Location 1 for Air Quality & Noise Control



Station 1: Location 1 for Air Quality & Noise Control Noise Monitoring





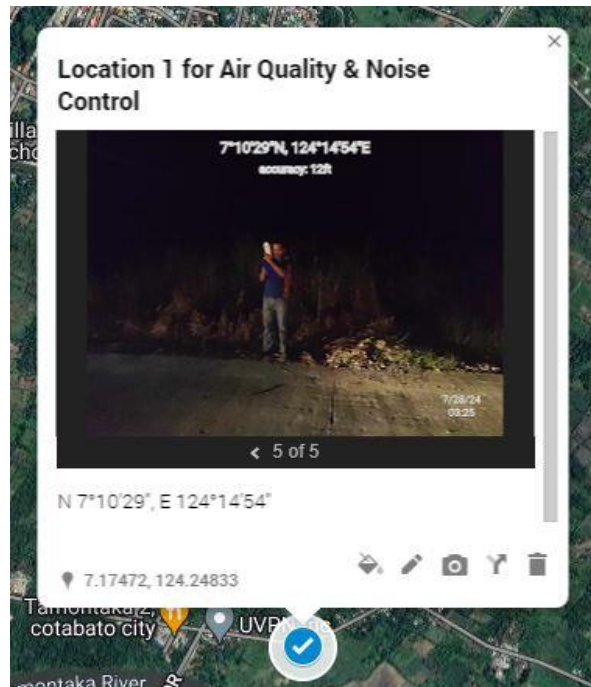
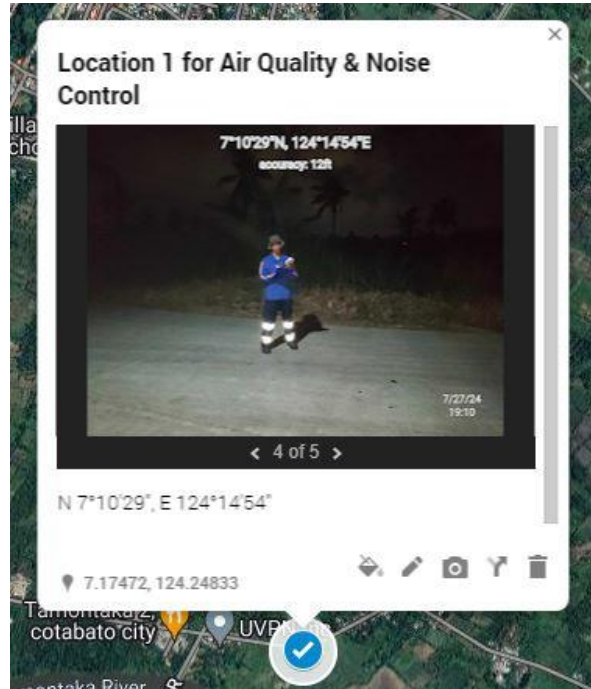
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Telephone No. (083)878-1676

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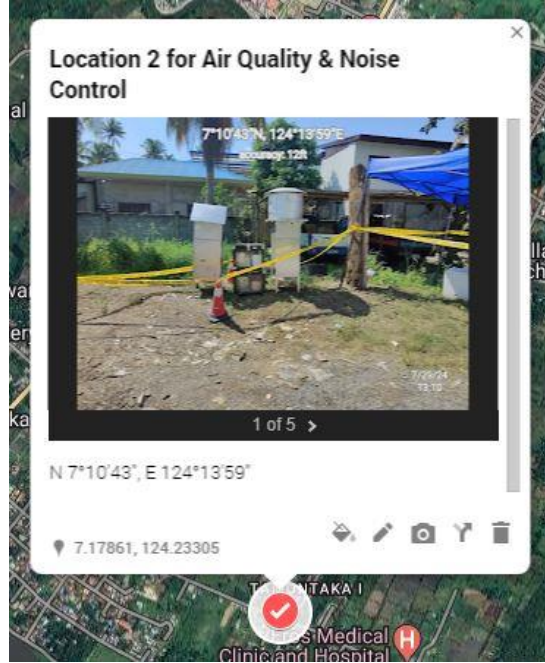
Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

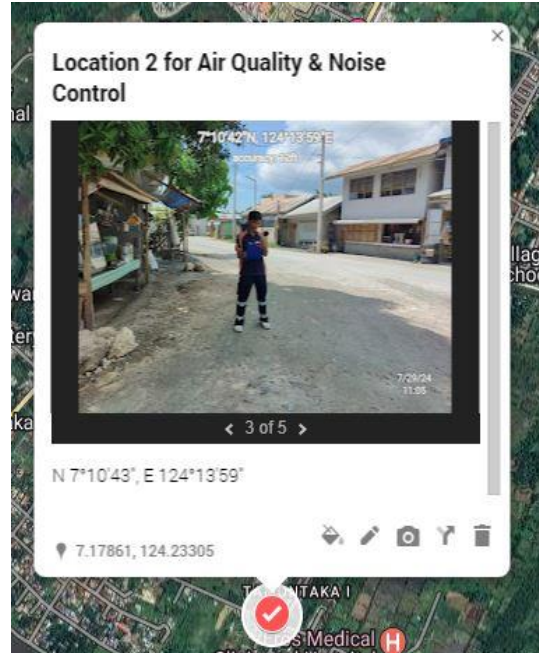
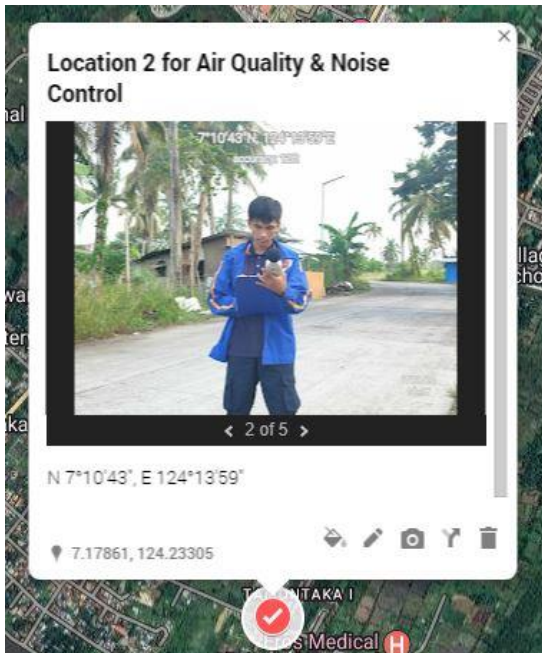
Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

Station 2: Location 2 for Air Quality & Noise Control



Station 2: Location 2 for Air Quality & Noise Control Noise Monitoring





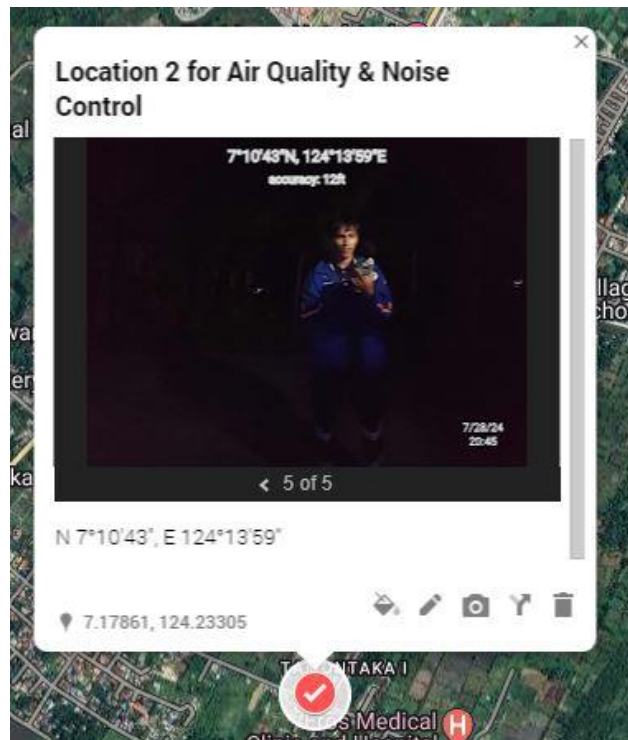
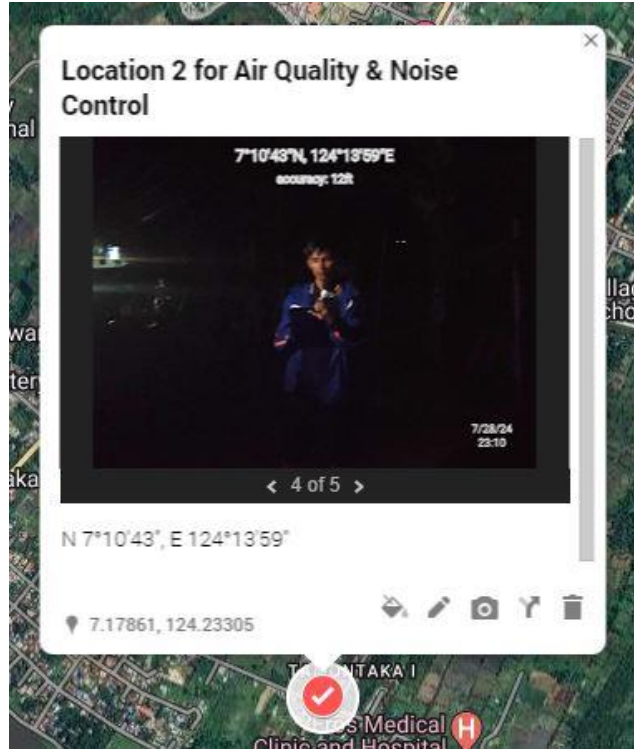
OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

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Telephone No. (083)878-1676

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DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

ANNEX E

CALIBRATION CERTIFICATES



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



Site Information

Location: OMLI WEM	Site ID: PM10	Date: 22-Sep-23
Sampler: Prop. ID# 2022-023-02	Serial No: 4870	Tech: Joel Lincopines

Site Conditions

Barometric Pressure (in Hg): 29.88	Corrected Pressure (mm Hg): 759.0
Temperature (deg F): 89.0	Temperature (deg K): 304.8
Average Pressure (in Hg): 29.85	Corrected Average Pressure (mm Hg): 758.2
Average Temperature (deg F): 87.0	Average Temperature (deg K): 303.7

Calibration Orifice

Make: TISCH ENVIRONMENTAL	Qstd Slope: 1.61094
Model: TSP/PM10 CALIBRATOR	Qstd Intercept: -0.05250
Serial#: 82	Calibration Due Date: 22-Sep-24

Calibration Information

Plate or Test #	Pressure (in H ₂ O)	Qstd (m ³ /min)	Flow (mano)	Flow (corrected)	Linear Regression
1	4.30	1.304	22.0	4.63	Slope: 6.4110 Intercept: -3.7852 Corr. Coeff: 0.9840 Sampler Flow: 1.280 # of Observations: 5
2	4.10	1.275	20.0	4.42	
3	3.70	1.212	15.0	3.83	
4	3.30	1.147	13.0	3.56	
5	3.10	1.113	12.0	3.42	

Calculations

$$Qstd = 1/m[\text{Sqrt}((H20)(Pa/760)(298/Ta))-b]$$

$$\text{Flow (corrected)} = \text{Sqrt}((\text{magn})(Pa/Pstd)(Tstd/Ta))$$

Qstd = standard flow rate
Flow (magn) = reading from magnehelic gauge
Flow (corrected) = corrected flow rate

m = calibrator Qstd slope
b = calibrator Qstd intercept
Ta = actual temperature during calibration (deg K)
Pa = actual pressure during calibration (mm Hg)

Tstd = 298 deg K
Pstd = 760 mm Hg
For subsequent calculation of sampler flow:
 $Qstd = 1/m[\text{Sqrt}((H20)(Pa/760)(298/Ta))-b]$

m = sampler slope
b = sampler intercept
(magn) = magnehelic reading
Tav = daily average temperature
Pav = daily average pressure

At least three of the 5 calibrator flow rates, Qa, should fall between 1.10 to 1.70 m³/min. This is the acceptable operating flow rate for High Volume PM10 Samplers. ± percent difference, %Diff. should be within +3 or

NOTE: Ensure calibration orifice has been certified within 12 months of use

Calibrated by: 
JOEL LINCOPINES

Noted by: 
RANNEL M. RAMOS



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



CALIBRATION OF PM-10 HIGH VOLUME SAMPLER PROPERTY ID NO. 2024-023-04

Site Information

Location: Trichem Office	Site ID: N/A	Date: 21-Apr-24
Sampler: PM-10	Serial No: 5040	Tech: Rannel Ramos

Site Conditions

Barometric Pressure (in Hg): 29.95	Corrected Pressure (mm Hg): 761
Temperature (deg F): 81	Temperature (deg K): 300
Avg. Barometric Press. (in Hg): 29.70	Corrected Average (mm Hg): 754
Average Temp. (deg F): 78	Average Temp. (deg K): 299

Calibration Orifice

Make: Tisch	Qstd Slope: 1.61094
Model: TE-5028A	Qstd Intercept: -0.05250
Serial#: 82	Calibration Due Date: 21-Apr-25

Calibration Information

Plate or Test #	H2O (in)	Qstd (m3/min)	Flow (mano)	Flow (corrected)	Linear Regression
1	5.50	1.484	5.9	2.42	Slope 1.4678 Intercept 0.2363 Corr. Coeff 0.9745 Sampler Flow 1.329 # of Observations: 5
2	5.10	1.430	5.3	2.29	
3	4.10	1.285	4.8	2.18	
4	4.00	1.270	4.5	2.11	
5	3.40	1.174	3.7	1.92	

Clean Filter Reading: 11.7

Calculations

H2O (in) = manometer on orifice

$Q_{std} = 1/m[\text{Sqrt}(H2O(Pa/P_{std}))(T_{std}/T_a)] - b$

FLOW (mano) = $[\text{Sqrt}(\text{in H2O})(Pa/P_{std}))(T_{std}/T_a)]$

FLOW (mano) = manometer on blower motor port

Qstd = standard flow rate

FLOW (corrected) = corrected flow reading

m = calibrator Qstd slope

b = calibrator Qstd intercept

Ta = actual temperature during calibration (deg K)

Pa = actual pressure during calibration (mm Hg)

For subsequent calculation of sampler flow:

$1/m([\text{Sqrt}(\text{in H2O})(298/T_{av})(P_{av}/760)] - b)$

(in H2O) = manometer on blower motor port

NOTE: Ensure calibration orifice has been certified within 12 months of use

m = sampler slope

b = sampler intercept

Tav = daily average temperature

Pav = daily average pressure

Tstd = 298 deg K

Pstd = 760 mm Hg



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SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2023SMCS36036

Page 1 of 3

CALIBRATION CERTIFICATE

1. CUSTOMER DETAILS

Customer:

OMLI WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC.

Address:

DCSI-A Building, Purok. Maliwanag, Barangay Calumpang, General Santos City

End-user:

The same as above

End-user Address:

The same as above

2. SPECIFICATION OF UNIT UNDER TEST

SPECIFICATION OF UUT

Unit Under Test: Gas Bubber
Range: 0.2 L/min to 2 L/min
Resolution: 0.1 L/min
Manufacturer: LZM
Model: 4-T
Serial Number: Not Indicated
Identification: 2022-022-01

3. DATE OF ACTIVITIES

Date Received: 12 Sep 2023
Date Calibrated: 18 Sep 2023
Recommended Due: 18 Sep 2024
Date Issued: 21 Sep 2023

4. APPROVAL

Calibrated By:

DHAN CHRISTOPHER C. HERRERA
Senior Applied Metrology Analyst

Approved Signatory:

DARYL ORJALEZA
Deputy Applied Metrology Manager



This certificate shall not be reproduced except in full, without the written approval of the issuing laboratory.

Artica Building, National Highway corner Almazora Street, Binan City 4024, Laguna, Philippines

Telephone: (632) 85330162 & 85330165, 09176206825; www.southernlab.com - e-mail: quality@southernlab.com & southernlab@gmail.com



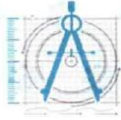
OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

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SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2023SMCS36036

Page 2 of 3

5. METHOD

Method Used: SMCS-MCP-967: Calibration of Flow Meters
 Type of Calibration: In-house Calibration
 Location: Pressure Laboratory - Southern Metrology and Calibration Services, Inc.
 Artica Building, National Highway corner Almazora Street, Canlalay
 Biñan City, Laguna

6. ENVIRONMENTAL CONDITIONS

Temperature: (23 ± 5) °C
 Relative Humidity: (50 ± 10) % RH

7. TRACEABILITY

The instrument was calibrated using reference standards traceable to International System of Units (SI) through the National Metrology Institute(s) and/or the issuing accredited laboratory(ies).

Standard Used	Manufacturer/ Model	Identification	Calibration Certificate No.	Issuing Laboratory
Gas Flow Meter	Omega Engineering, Inc. / FMA-LP1606A-I	VOL-STD-012	WK2302-135-1	National Institute of Standards and Technology through WK Electric Co., Ltd

8. CALIBRATION RESULTS

Standard Mean Reading, L/min	Unit Under Test Mean Reading, L/min	Correction, L/min	Uncertainty of Measurements, L/min
0.1994	0.2	-0.0006	0.15
0.5006	0.5	0.0006	0.15
1.0010	1.0	0.0010	0.15
1.5010	1.5	0.0010	0.15
2.0011	2.0	0.0011	0.15

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Artica Building, National Highway corner Almazora Street, Binan City 4024, Laguna, Philippines

Telephone: (632) 85330162 & 85330165, 09176206825; www.southernlab.com – e-mail: quality@southernlab.com & southernlab@gmail.com



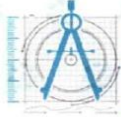
OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2023SMCS36036

Page 3 of 3

9. UNCERTAINTY OF MEASUREMENTS

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 1.98$. It has been determined in accordance with the ISO Guide to the Uncertainty of Measurements (ISO GUM). The value of the measurand lies within the assigned range of values with a probability of 95%.

10. REMARKS

- a. No adjustments were performed. End user should determine the suitability of instrument for its intended use.
- b. The above results were those obtained at the time of test and refer only to the particular item submitted.
- c. The recalibration interval shall be determined based on end-user's requirements.
- d. The context in italic form is an information derived from the data provided by the customer.

- End of Certificate -

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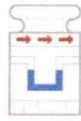
OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



PREMIER PHYSIC METROLOGIE

UG-07 Globe Telecom Plaza Tower 1, Pioneer Highlands South, Pioneer cor. Madison Sts., Mandaluyong City • (632) 856 9558, 856 6147, 720 8141, 238 4723 (FAX: 856 9556) • ppmcalab@gmail.com • www.premierphysicmetrologie.com

CERTIFICATE OF CALIBRATION

NAME AND ADDRESS

CUSTOMER

Ostrea Mineral Laboratories, Inc
DCSI-A Building, Purok Maliwanag, Lower Acharon,
Barangay Calumpang, General Santos City, General
Santos City, South Cotabato

END USER

Ostrea Mineral Laboratories, Inc
DCSI-A Building, Purok Maliwanag, Lower Acharon,
Barangay Calumpang, General Santos City, General
Santos City, South Cotabato

MEASURAND

Type Vane Anemometer
Range 0 m/s to 30 m/s
Resolution 0.1 m/s
Manufacturer Lutron
Model ABH-4225
Serial Number AK25409
Identification 2022-107-02
Date Received 20 July 2023

CALIBRATION RESULTS

The above measurand was calibrated by Premier Physic Metrologie in accordance with the methods prescribed in PPM CAL 336 "Calibration of Anemometer". The following results were obtained:

Measurand Mean Reading, m/s	Standard Mean Reading, m/s	Correction, m/s
2.4	2.48	0.08
4.9	4.97	0.07
9.9	9.98	0.08
14.9	14.96	0.06

ENVIRONMENTAL CONDITIONS

Reference Temperature: 20.0 °C ± 1.0 °C

Relative Humidity: 55.0 %RH ± 1.0 %RH

STANDARD

The standard used in the calibration is traceable to the International System of Units (SI) as maintained by the following:

Standard Used: Vane Anemometer with Company Identification Number PPM_EF_042

Traceability: National Institute of Standards and Technology through Techmaster Asia (Thailand) Co. Ltd. with Calibration Certificate Number TTH-0-61637

- Page 1 of 2 -

PPM REFERENCE

Control Number: 0723MIN05780

Date Calibrated: 11 August 2023

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Continuation of Certificate of Calibration on Vane Anemometer

STATEMENT OF UNCERTAINTY

The estimated uncertainty of the measurement is equal to ± 0.21 m/s. The uncertainties associated with the measurement results are made in accordance with the ISO Guide to the Uncertainty of Measurements (ISO GUM). The uncertainty values are calculated at 95% level of confidence with a coverage factor of $k = 2.45$.

REMARKS

1. No adjustment was made at the time of test. End user shall determine the appropriateness of its use.
2. The above results were those obtained at the time of test and refer only to the particular measurand submitted.
3. This calibration certificate was issued on 23 August 2023.

Approved Signatory:


AMELYNE D. BAYARAS
Technical Head

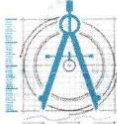
- Page 2 of 2 -

PPM REFERENCE

Control Number: 0723MIN05780

Date Calibrated: 11 August 2023

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SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2024SMCS28265

Page 1 of 3

CALIBRATION CERTIFICATE

1. CUSTOMER DETAILS

Customer:

OSTREA MINERAL LABORATORIES, INC.

Address:

DCSI-A Building, Purok. Maliwanag, Barangay Calumpang, General Santos City

End-user:

The same as above.

End-user Address:

The same as above.

2. SPECIFICATION OF UNIT UNDER TEST

Unit Under Test:

Gas Bubbler

Range:

0.3 L/min to 3 L/min

Graduation:

0.2 L/min

Manufacturer:

Cheng Xin

Model:

Not Indicated

Serial Number:

Not Indicated

Identification:

2024-022-01

3. DATE OF ACTIVITIES

Date Received:

28 May 2024

Date Calibrated:

4 Jun 2024

Recommended Due:

4 Jun 2025

Date Issued:

4 Jun 2024

4. APPROVAL

Calibrated By:

MARK RIO M. DRIZ

Senior Applied Metrology Analyst

Approved Signatory:

GLENZEN N. SALAZAR

Deputy Applied Metrology Manager



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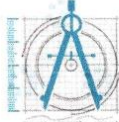
OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2024SMCS28265

Page 2 of 3

5. METHOD

Method Used: SMCS-MCP-992: Calibration of Flow Meters
 Type of Calibration: In-house Calibration
 Location & Area: Pressure Laboratory - Southern Metrology and Calibration Services, Inc.
 Artica Building, National Highway corner Almazora Street, Canlalay
 Biñan City, Laguna

6. ENVIRONMENTAL CONDITIONS

Temperature: 25.5 °C
 Relative Humidity: 50.2 % RH

7. TRACEABILITY

The instrument was calibrated using reference standards traceable to International System of Units (SI) through the National Metrology Institute(s) and/or the issuing accredited laboratory(ies).

Standard Used	Manufacturer/ Model	Identification	Calibration Certificate No.	Issuing Laboratory
Gas Flow Meter	Omega Engineering, Inc. / FMA-LP1606A-I	VOL-STD-012	WK2302-135-1	National Institute of Standards and Technology through WK Electric Co., Ltd

8. CALIBRATION RESULTS

Standard Mean Reading, L/min	Unit Under Test Mean Reading, L/min	Correction, L/min	Uncertainty of Measurements, L/min
0.2211	0.3	-0.0789	0.11
0.9069	1.0	-0.0931	0.11
1.9118	2.0	-0.0882	0.11
2.9021	3.0	-0.0979	0.11

9. UNCERTAINTY OF MEASUREMENTS

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 1.98$. It has been determined in accordance with the ISO Guide to the Uncertainty of Measurements (ISO GUM). The value of the measurand lies within the assigned range of values with a probability of 95%.

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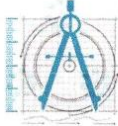
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SOUTHERN

Metrology and Calibration Services, Inc.

Traceable to International Standards of Measurements

Reference No.: 2024SMCS28265

Page 3 of 3

10. REMARKS

- a. No adjustments were performed. End user should determine the suitability of instrument for its intended use.
- b. The above results were those obtained at the time of test and refer only to the particular item submitted.
- c. The recalibration interval shall be determined based on end-user's requirements.
- d. The context in italic form is an information derived from the data provided by the customer.

- End of Certificate -

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Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com



Precision Measurement Specialists, inc.

'a metrology company'
(since 1998)

B1 L3 Macaria Business Center, Governor's Dr., Carmona, 4116 Cavite

Telefax (046) 889-0673 • (0997) 410-6031 (TM)

e-mail: info@pmsi-cal.com ~ pmsical@yahoo.com • website: www.pmsi-cal.com

CERTIFICATE of CALIBRATION

Client Name: OMLI Workplace Environment Monitoring & Allied Services Inc. **Certificate #:** 40 -55361

Address: DCSI-A Building, Purok. Maliwanag, Brgy. Calumpang
General Santos City

INSTRUMENT INFORMATION

EQUIPMENT ID: 2022-035-07
MAKE: Honeywell Rae Systems
MODEL: PGM-1860
DESCRIPTION: Gas Monitor
SERIAL No.: G024316153

CALIBRATION INFORMATION

CAL Date: 29-Dec-2023 **Temperature:** (30.8 ± 0.4) °C
Client Req. CAL DUE: 29-Dec-2024 **Humidity:** (65.4 ± 2.8) %RH
CAL Procedure: 200-210-00 **Validation:** 09

CONDITION OF INSTRUMENT

CONDITION IN: as found
CONDITION OUT: as left

Precision Measurement Specialists, inc. (PMSi) certifies that the instrument specified above was calibrated according to PMSi's Management System which is intended to meet PNS ISO/IEC 17025:2017. This instrument was calibrated with working standards whose measurement results are traceable to either the National Institute of Standards and Technology (NIST, USA), to Philippine ITDI-NML (National Metrology Lab), to other international accredited metrology labs, to NIST accepted intrinsic standards of measurement, to fundamental or physical constants, or by comparison to consensus standards. Calibration data or report is issued under separate cover that includes specific or applicable traceability.

Precision Measurement Specialists, inc. maintains traceability records on all instruments under contract. Records are on file, available for inspection by authorized representatives of the contracting party and/or representatives of the cognizant government agency.

THIS CERTIFICATE AND REPORT:

MAY NOT BE PUBLISHED OR REPRODUCED EXCEPT IN FULL WITHOUT WRITTEN AUTHORIZATION FROM PMSI
MAY NOT BE USED TO CLAIM ENDORSEMENT BY PMSI AND BY ACCREDITING OR TRACEABILITY ORGANIZATIONS MENTIONED

Calibrated by:

Certificate not valid without embossed dry seal.

29-Dec-2023
Date

Reviewed by: J. Tenorio

DCN 5-5.10.2-3 rev. 3

Page 1 of 1



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Email: customerservice.ostrealabs@gmail.com

Precision Measurement Specialists, inc.

'a Metrology Company'
(since 1998)

Equip. ID / Asset # : 2022-035-07	Serial No.: G024316153	Validation: 
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continuation MEASUREMENT RESULTS

This instrument was calibrated using standards and equipment traceable to SI units as maintained by NML Philippines - OR - accredited laboratories as follows:

I.D #	Description	CAL Due	Traceability	Certificate #
EN0067	Barometer, Dig.	05-Jun-2024	IRDU,PAGASA/DOST	PICL2023-01C-110
EN0070	Thermohygrograph	18-Jul-2024	NML - ITDI, Phils.	11-2022-RH-0177
EN0082	Calibration Gas	05-Sep-2025	NIST, USA thru Intermountain USA	23-9945

***** END of RESULTS ****



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CALIBRATION LABORATORY
PNS ISO/IEC 17025:2017
LA-2016-296B



SOUTHERN
Metrology and Calibration Services, Inc.

Reference No.: 2023SMCS32379

Page 1 of 3

CALIBRATION CERTIFICATE

1. CUSTOMER DETAILS

Customer:

OMLI WORKPLACE ENVIRONMENTAL MONITORING & ALLIED SERVICES INC.

Address:

RJ Ouano Building, Briones Highway, Bakilid, Mandaue City, Cebu

End-user:

The same as above.

End-user Address:

The same as above.

2. SPECIFICATION OF UNIT UNDER TEST

Unit Under Test: *Sound Level Meter*

Range: *30 dB to 130 dB*

Resolution: *0.1 dB*

Manufacturer: *Lutron*

Model: *SL-4030*

Serial Number: *Not Indicated*

Identification: *2021-037-01*

3. DATE OF ACTIVITIES

Date Received: *11 Sep 2023*

Date Calibrated: *13 Sep 2023*

Recommended Due: *13 Sep 2024*

Date Issued: *15 Sep 2023*

4. APPROVAL

Calibrated By:

JOEL B. SANIEL, JR.
Senior Applied Metrology Analyst

Approved Signatory:

NOMER C. NAVOA
Supervising Applied Metrology Analyst



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Page 2 of 3

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PNS ISO/IEC 17025:2017
LA-2016-296B

5. METHOD

Method Used: SMCS-MCP-951: Calibration of Sound Level Meters
Type of Calibration: In-house Calibration
Location: Electrical and Frequency Laboratory - Southern Metrology and Calibration Services, Inc.
Artica Building, National Highway corner Almazora Street, Canlalay, Biñan City, Laguna

6. ENVIRONMENTAL CONDITIONS

Temperature: (23 ± 2) °C
Relative Humidity: (50 ± 10) % RH

7. TRACEABILITY

The instrument was calibrated using reference standards traceable to International System of Units (SI) through the National Metrology Institute(s) and/or the issuing accredited laboratory(ies).

Reference Standard	Manufacturer/ Model	Identification	Calibration Certificate No.	Issuing Laboratory
Sound Level Calibrator	Lutron/ SC-942	ELE-STD-011	551220085486885	National Institute of Standards and Technology (NIST) through Microprecision Calibration, Inc.

8. CALIBRATION RESULTS

Unit Under Test Setting		Standard Setting, dB	Unit Under Test Mean Reading, dB	Correction, dB	Uncertainty of Measurements, dB
Frequency Weighting	Time Weighting				
C	Fast	94	90.3	3.7	1.2
		114	109.5	4.5	1.2
	Slow	94	90.7	3.3	1.2
		114	109.3	4.7	1.2

9. UNCERTAINTY OF MEASUREMENTS

The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k=2$. It has been determined in accordance with the ISO Guide to the Uncertainty of Measurements (ISO GUM). The value of the measurand lies within the assigned range of values with a probability of 95%.

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LA-2016-296B

10. REMARKS

- a. The context in italic form is an information derived from the data provided by the customer.
- b. No adjustments were performed. End user should determine the suitability of instrument for its intended use.
- c. The above results were those obtained at the time of test and refer only to the particular item submitted.
- d. The recalibration interval shall be determined based on end-user's requirements.
- e. Calibration points were as per customer's request.

- End of Certificate -

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Email: customerservice.ostrealabs@gmail.com

ANNEX F

QUALITY CONTROL



The continuing validity and reliability of results are accomplished by monitoring a number of factors:

A. Total Suspended Particulates (TSP)

- Analysis of blank filter is run with each batch of samples.
- Filter conditioning environment is in controlled temperature at 15 to 30°C and controlled humidity of less than 50%.

B. Particulate Matter 10 (PM₁₀)

- Analysis of blank filter is run with each batch of samples.
- Filter conditioning environment is in controlled temperature at 15-30 ± 3°C and controlled humidity of 20-45% ± 5%.

C. Sulfur Dioxide (SO₂)

- Analysis of control sample: The control sample is prepared and titrated according to USEPA Appendix A to Part 50 Section 8.2.10 and calculation of concentration is based on Section 8.2.10. Actual concentration is within the range of 320 to 400 µg SO₂ / mL. The difference between the true and analyzed values of the control standards must not be greater than 1 µg.
- Analysis of reagent blank is run with each batch of samples. The absorbance of the reagent blank must not exceed 0.170 at 22°C.
- The calibration curve must have a slope equal to 0.03 ± 0.002 absorbance unit/ µg SO₂ and the correlation coefficient must be greater than 0.998.

D. Nitrogen Dioxide (NO₂)

- Analysis of control sample
- Analysis of reagent blank run with each batch of samples

E. Ozone (O₃)

- Analysis of control standard
- Analysis of control sample
- Analysis of reagent blank run with each batch of samples



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ANNEX G

SAMPLING PARTICIPANTS



OSTREA MINERAL LABORATORIES, INC.

Assaying and Environmental Testing Specialist

DCSI-A Building, Purok Maliwanag, Brgy. Calumpang, General Santos City 9500

Telephone No. (083)878-1676

Email: customerservice.ostrealabs@gmail.com

OMLI WORKPLACE ENVIRONMENT MONITORING & ALLIED SERVICES INC.

Ian Aldrine O. Dagum
Jeson B. Cagas
Eugene Ray U. Generalao
James A. Menguita

GEOINNOVATIVE SPECIALISTS, INC.

Eric Del Rosario
Jerald Bartolome

APPENDIX 4
PUBLIC
CONSULTATION
MEETING



**Metro Cotabato Water District
Japan International Cooperation Agency**



Title/Description:

**PUBLIC CONSULTATION FOR ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE PREPARATORY SURVEY
FOR THE IMPROVEMENT OF WATER SUPPLY IN COTABATO**

Date:	Venue:
June 24, 2025, 1:00 pm (Philippine time)	Sardoyx Plaza, Cotabato City

Attendees : Refer to the attached Attendance Sheet.

Topic : Public Consultation

Session Highlights and Discussion

I. INTRODUCTION AND INVOCATION	Philippine National Anthem and Opening Invocation Introduction 1) Mr. Del Rosario facilitated the meeting and discussed the program of activities for the whole afternoon. 2) Mr. Del Rosario cited the following as this meeting's objectives: a) To disclose the project, its objectives, area coverage, schedules, present status, and other pertinent information b) To initiate collaborative links with the stakeholders c) To share pertinent data and information about the basic foundation, its problems, and take possible or alternative solutions d) To forge partnerships with relevant private or public agencies to ensure the success of the project
II. OPENING REMARKS	Engr. Domingo Guarino, on behalf of GM Baraimo, tackled the following: <ul style="list-style-type: none">○ This meeting is to get the opinions and comments from the stakeholders since they are more familiar with the area and the possible issues and concerns that may arise during its implementation, and to be addressed during this initial stage of the project.○ The MCWD and Consultant Team will gather the information from the various stakeholders to come up with a better optimal plan for the project.○ Brief history and chronology events how the project was conceptualized. Funding sources and various consultations.○ The Team is looking at the various environmental aspects coming from the water supply treatment plant to be included also in the study.○ The importance of this study in order to develop necessary plans to ensure the supply of clean water to the general populace of Cotabato city and adjacent local municipalities.○ Introduced the participants as well the Jica Study Team.



Title/Description:

**PUBLIC CONSULTATION FOR ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE PREPARATORY SURVEY
FOR THE IMPROVEMENT OF WATER SUPPLY IN COTABATO**

II. AGENDA OF THE MEETING	<p>The meeting agenda was presented by Mr. Del Rosario, to wit:</p> <ul style="list-style-type: none">• Project Description• Environmental Impact Assessment<ul style="list-style-type: none">○ EIA Process○ EIA Activities○ EIA Sampling Stations• Initial EIA Study Results• Initially Identified Impacts and Mitigation Measures• Open Forum
A. PROJECT DESCRIPTION	<p>Mr. Yuta presented the following:</p> <ul style="list-style-type: none">○ The background of the project/ project rationale: this project is part of the Preparatory Survey for the Improvement of the Water Supply in Cotabato City, a grant requested by the Metro Cotabato Water District to the Japan International Cooperation Agency (JICA).○ That MCWD is committed to providing an affordable supply of potable water to the following concessionaires:<ul style="list-style-type: none">▪ <i>36 barangays of Cotabato City</i>▪ <i>10 Barangats of Sultant Kudarat</i>▪ <i>7 Barangays in Datu Odin Sinsuat</i>▪ <i>41,686 active service connections</i>○ Demand projection for target year 2040 for additional water supply is Project Phase1-1 is + 26,000 cu.m/day. Wherein for Phase 1-1, the demand project is around 7,200 cu.m/day (this project).○ Increase in water supply population from 44,931 households from the current system to 39,017 upon project completion.○ Project facilities<ul style="list-style-type: none">▪ Intake Facilities: Intake pump station, Submersible pump, 2.8m³/min, H= 20m, 18.5kW x 3 (including 1 stand-by)▪ Conveyance: Conveyance pipe, DIP 350mm, Length : approx. 300 m▪ WTP: Design treatment capacity : 8,000 m³/day, Design water supply capacity : 7,200m³/day (daily max)▪ Distribution: Clear water reservoir, Capacity : 3,600m³, Distribution pump, Horizontal Double Suction Volute Pump, 4.4m³/min, H=30m, 37kW x 3 (including 1 stand-by)▪ Others○ Project Location<ul style="list-style-type: none">▪ Mother Tamontaka▪ Tamontaka 2



Title/Description:

**PUBLIC CONSULTATION FOR ENVIRONMENTAL IMPACT ASSESSMENT
FOR THE PREPARATORY SURVEY
FOR THE IMPROVEMENT OF WATER SUPPLY IN COTABATO**

	<ul style="list-style-type: none">▪ Tamontaka 1▪ Kalangalan 2○ Project Organization<ul style="list-style-type: none">▪ Proponent and Implementing agency: MCWD▪ Funding Organization: JICA▪ Project Consultant: JICA Study Team▪ EIA Sub-consultant: GeoInnovative Specialist Inc.
<p>B. PRESENTATION OF EIA PROCESS AND INITIAL ASSESSMENT/ STUDY RESULTS</p>	<p>Mr. Del Rosario reported the Project EIA process as well as the initial Assessment and study results:</p> <ul style="list-style-type: none">○ Discussed the processes undergone in an EIA study<ul style="list-style-type: none">▪ Stating that EIA is a process that establishes and evaluates baseline information, predicts impacts of proposed projects to the biophysical, social, and relevant socio-economic aspects, and provides mitigating measures to ensure environmental considerations are taken into account before a decision is made for their approval.▪ Discusses the EIA process flow, which explains how the study will be facilitated to achieve the goal of acquiring an Environmental Compliance Certificate.○ Presented the activities already conducted and those will be conducted for which the public consultation is one of the most important requirements.<ul style="list-style-type: none">▪ Baseline studies of all environmental aspects▪ Sampling stations where the study was conducted▪ Initial study results○ Identified impacts and mitigating measures<ul style="list-style-type: none">▪ Topography<ul style="list-style-type: none">a) Relatively flat; Riverine ecosystem▪ Socioeconomic<ul style="list-style-type: none">a) Most of the populated barangays are located in Kabankalan and Ilog.b) Population in the Tamontaka 2 where the project site is located is estimated to be among the lowest in the City.c) The project areas has no with Certificate of Ancestral Domain Title (CADT)d) Protected Areas declared by authorities is far from the project location.▪ Land Use<ul style="list-style-type: none">a) Built-up area is the prominent land use, but agriculture is the main way of living.b) Annual Crop Rice



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	<ul style="list-style-type: none"> c) Open Forest and Grassland Areas are seen in eastern mountainous area. d) Most of Residential Zone, Commercial Zone and Industrial Zone are in Flood prone areas. e) One flora species under vulnerable category and One Fauna considered as Endangered according to UN Redlist and DAO 2007-01; ▪ Air quality <ul style="list-style-type: none"> a) All parameters are within national standards except to the high TSP recorded on the site. Likewise, Noise and vibration are within standards. ▪ Water quality <ul style="list-style-type: none"> a) increase in water quality standards most especially on biological parameters such as Total coliforms.
<p>C. OPEN FORUM</p>	<p>Open Forum/Q&A – Consultant Team, LGUs, NGO’s, and Government Agencies</p> <ul style="list-style-type: none"> ○ Insights of Mr. Datu Danny Maagsabingat from MENRe-FMS <ul style="list-style-type: none"> ▪ Reminded that on the application of ECC, the proponent shall also coordinate with other services of the agency, not only the EMS. There is a local project in the area financed by the German government (GTZ). <i>Answer: The Consultant replied that the study is still on its initial stage and will coordinate with the rest of the MENRE services in future activities.</i> ○ Question of Mr. Datu Danny Maagsabingat from MENRe-FMS <ul style="list-style-type: none"> ▪ Inquired the reason why Tamontaka river was chosen as source? <i>Answer from MCWD: Mr. Winston L. Sapal explained that there are several studies conducted to identify potential water sources. One of which was a World bank study that suggested the potential of Rio Grande river over the Tamontaka River. But after JICA conducted its own study, it was revealed that Rio Grande has a high level of salinity and utilizing it as water source will be very costly. Hence, they come up with the Tamontaka River as main source.</i> ○ Question from Ms. Ayessa Yussop from Ministry of Health, BARMM <ul style="list-style-type: none"> ▪ How water quality testing was undertaken. Did MCWD will acquire potability clearance of water produced. <i>Answer from MCWD: Water assessment was undertaken by a 3rd party environmental laboratory but sooner the MCWD will have its own accredited laboratory. MCWD will coordinate with MOH for the application of Certificate of Water Potability.</i>



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	<ul style="list-style-type: none"> ○ Question of Mr. Abdulla Taluson from NGO Action Againsts Hunger <ul style="list-style-type: none"> ▪ Based on your team initial environmental impact assessment study result, what is one potential environmental impact of improving the water supply in Cotabato City? Particularly in the said Barangay as your project location. The question was wave since it was already explained during the presentation. ▪ What is the expected time frame for implementing the Project for Improvement of Water Supply in Cotabato City? Particularly in the said Barangay as your project location? Therefore, is there any future plan from your respective to create opportunities especially for the communities that is/are involved. <i>Answer from the MCWD/ CTII: The expected project completion for this phase is by early 2029.</i> ▪ What is one key focus of the environmental impact assessment for the preparatory survey of the water supply improvement project in Cotabato City? <i>Answer from the Consultant: The key focus for this project, or like in any other project is the benefits it can provide to the general populace which is to ensure the uninterrupted supply of clean water</i> ○ Insights from Guiamel Abdul <ul style="list-style-type: none"> ▪ that MCWD should coordinate with menre regarding ecological fees of all its facilities located on menre administered areas. <i>Answer from the MCWD: Mentioned that MCWD is already requesting an audience to the Minister of MENRE and will soon inquire how the possibility that the two agencies will have cooperation in the management of Dimapatoy watershed which is claimed by three (3) enties namely MWCD, MENRE, and the AFP.</i> ○ Inquiry of Engr. Domingo Aguiron of the Consultant to the local government units: <ul style="list-style-type: none"> ▪ Requested the LGU’s to give their insights and/ or perception of the project. <i>Answer from the LGU: Each LGU representatives acknowledge the request of Engr. Guarino and promised their all out support of the project and their willingness to assist MCWD in all forms they needed.</i>
<p>D. CLOSING REMARKS</p>	<p>Closing Remarks Mr. Eric Del Rosario</p> <ul style="list-style-type: none"> ○ Reiterate the importance of the project to ensure that water supply to the populace are consistent and safe.



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	<ul style="list-style-type: none"> ○ Requested the stakeholders to coordination will follow after the public consultation in relation to the EIA study and ECC application.
E. ADJOURNMENT	The meeting adjourned at 3:15 pm.

Review and Confirmation:

Prepared by:	Noted and submitted by:
<p>ERIC DEL ROSARIO EIA Team Leader, GeoInnovative Specialist Inc.</p>	<p>Yuta Konno Team Leader, Consultant</p>
Reviewed and confirmed by:	
<p>MARK ANTHONY ALDECO Project Manager, Geolnnovtive Specialists Inc</p>	




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ATTENDANCE SHEET



Metro Cotabato Water District
Environmental Impact Assessment For The Preparatory Survey
For The Improvement Of Water Supply In Cotabato City



Metro Cotabato Water District
Environmental Impact Assessment For The Preparatory Survey
For The Improvement Of Water Supply In Cotabato City

Public Consultation Meeting
Sardonyx Plaza, Cotabato City
24 June 2025

Barangay LGU					
NO.	NAME	GENDER (M/F/LGBTQ+)	AGENCY/OFFICE	CONTACT NO.	SIGNATURE
1	ANISAH S. BARAHIN	F	BLGU KIBU.	09165102448	
2	JONITA M. SEGUND	F	BRGY. PMR	09974694857	
3	NURAH DA. ISLAMI	F	BRGY. KAGU	09068917019	
4	SABITA BUWAG	F	BRGY. KAGU	09750961588	
5	ASDILL KUYAN	M	BRGY. KAGU	090667811980	
6	JURR ARBAS	M	BRGY. KAGU	090209707057	
7	JOCENY A. PLAZA	F	MOND	09171640719	
8	WINGYAN L. SPAN	M	MUND	09107229106	
9	RANDY MONTAÑA	M	MUND	0917705709	
10	URIANO S. PINGOL	M	CITY ASSISTANTS OFFICE	09176620333	
11	GUARDEL ABAY	M	MREPARE-BARAY	0959969897	
12	AMIN M. SANDA	M	BLGU - KAGU	0973065000	
13	SANDRA K. SAGK	M	BLGU - KAGU		
14	HESLIAN J. AMIL	M	BLGU - KAGU	09677156685	
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Metro Cotabato Water District
Environmental Impact Assessment For The Preparatory Survey
For The Improvement Of Water Supply In Cotabato City



Public Consultation Meeting
Sardomyx Plaza, Cotabato City
24 June 2025

NO.	NAME	GENDER (M/F/LGBTQ++)	CITY GOVERNMENT			SIGNATURE
			AGENCY/OFFICE	CONTACT NO.		
1	Japhet Al-Nizar Taulu	M	MENRE	0915727901		
2	Amurken M. Bual	F	CEPRO	0916670274		
3	LEAH I. MARUA	F	MENRE - WGS	09204185974		
4	JALEMYA MUSLINA	F	MWU	09174665456		
5	ANJESSA MUSSE	F	MWU	0915727901		
6	Bernardo M. Turan Jr. M	M	MWU	0955-108-2345		
7	Carstudin Barasua	M	LSU - CIT. CIVY	0935 185 7040		
8	Don Pedro Pascual	M	MEXE-PMS	09271910914		
9	GILBERTO PANGLOSS	F	MPN	91751204050		
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Metro Cotabato Water District
Environmental Impact Assessment For The Preparatory Survey
For The Improvement Of Water Supply In Cotabato City

Public Consultation Meeting
Sardonyx Plaza, Cotabato City
24 June 2025



NO.	NAME	GENDER (M/F/LG/BTQ++)	AGENCY/OFFICE	CONTACT NO.	SIGNATURE
1	RODOLFO RUIZ	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
2	MARIA ROSARIO	F	MUNICIPIO DE COTABATO	0917-028-7417	
3	MARY D. RIVERA	F	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
4	PONCE GONZALEZ, M.	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
5	MICHAEL W. SANTIAGO	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
6	MICHAEL W. SANTIAGO	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
7	MICHAEL W. SANTIAGO	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
8	MICHAEL W. SANTIAGO	M	Agencia de Regulacion y Supervision de Servicios Publicos	0917-028-7417	
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FOR THE IMPROVEMENT OF WATER SUPPLY IN COTABATO**

PHOTOS DURING THE MEETING



Introduction by Mr. Del Rosario



Opening Remarks by Engr. Guarino



Arrival of the Participants

Project Rationale

The MCWD is committed to provide adequate and affordable supply of potable water to all its concessionaires, it serves 36 out of 37 barangays in the City of Cotabato, 10 barangays in Sultan Kudarat Municipality, and 7 barangays in Datu Odin Sinsuat Municipality, in the province of Maguindanao. It has a total of 41,686 active service connectors, as of December 31, 2023.

The Proponent proposes the improvement of the water supply project in Cotabato City to ensure safe and stable water supply services in Cotabato City through the construction of water supply facilities, thereby contributing to the development of the entire region.

Target Area

Introduction of the Project by Mr. Yuta



Public Consultation Venue



MCWD officers and Personnel



**Metro Cotabato Water District
Japan International Cooperation Agency**



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Reception area



Physical set-up of venue



Meeting Participants



Meeting Participants



Meeting Participants



Meeting Participants

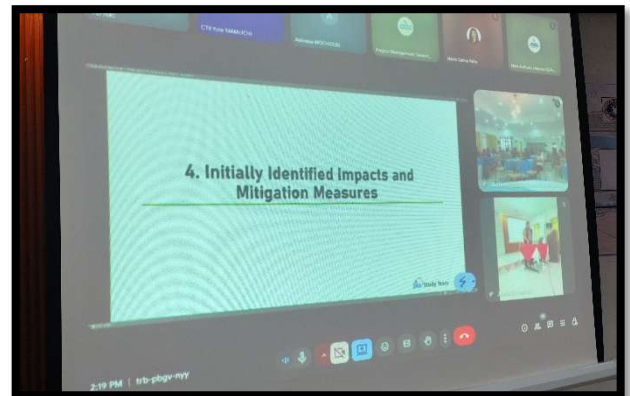


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EIA Study Presentation



EIA Study Presentation



Open Forum



Open Forum



Participants of the Public Consultation



Facilitator of Public Consultation



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PUBLIC CONSULTATION PRESENTATION

Metro Cotabato Water District
Environmental Impact Assessment For The Preparatory Survey
For The Improvement Of Water Supply In Cotabato City

Public Consultation Meeting
Cotabato City, Maguindanao Del Norte

26 June 2025
Sandaya Plaza, Cotabato City

Agenda

1. Project Description
2. Environmental Impact Assessment
 - a) EIS Process
 - b) EIS Activities
 - c) EIS Sampling Stations
3. Initial EIA Study Results
4. Initially Identified Impacts and Mitigation Measures
5. Open Forum

1. Project Description

Project Rationale

The NCWS is committed to provide adequate and affordable supply of potable water to all its communities, in particular, out of 21 barangays in the City of Cotabato, 13 barangays in Sultan Kudarat Municipality, and 7 barangays in Cotacotán District Municipality, in the province of Maguindanao. It has a total of 81,088 prime vertical connections, as of December 31, 2024.

The Proponent proposes the improvement of the water supply project in Cotabato City to ensure safe and stable water supply services in Cotabato City through the restoration of water supply facilities, thereby contributing to the development of the entire region.

Demand Projection

**Total Required Additional Water Supply :
+26,000 m³/d (Target Year 2040)**

Phase 1 : + 11,000 m³/d (Target Year: 2030 ~ 2035)

Phase 1 - 1 : + 7,208 m³/d (This Project)

Phase 1 - 2 : + 3,792 m³/d (Division Project)

Phase 2 : + 15,000 m³/d (Another Project, Target Year 2040)

Project Summary

Symbol	Item	Current Situation (in 2025)	After Project Implementation (in 2030)	New Future Proposed (in 2030) For reference (in 2030)	Incremental Project (Benefit)
-	Capacity of WTP	3,702 m ³ /day	7,208 m ³ /day	12,910 m ³ /day (Phase 1) + 3,692 m ³ /day (Phase 2)	7,208 m ³ /day
+	Population in Administrative Area	803,207 persons	873,823 persons	833,071 persons	-
+	Population in Water Supply Area	60,077 persons	60,528 persons	70,288 persons	-
+	Water Supply Population	10,540 persons	28,917 persons	32,357 persons	+ 24,402 persons
+	Water Supply Household	2,853 HHs	7,248 HHs	8,488 HHs	+ 4,401 HHs
+	Water Supply Rate for m ³ /HH	32.4 %	82.4 %	74.1 %	+ 30.0 %



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Project Facilities

Facility	Location	Capacity
Water Treatment Plant	San Juan, Cotabato City	100,000 GPD
Water Pump Station	San Juan, Cotabato City	100,000 GPD
Water Distribution Network	San Juan, Cotabato City	100,000 GPD
Water Storage Tank	San Juan, Cotabato City	100,000 GPD
Water Treatment Plant	San Juan, Cotabato City	100,000 GPD
Water Pump Station	San Juan, Cotabato City	100,000 GPD
Water Distribution Network	San Juan, Cotabato City	100,000 GPD
Water Storage Tank	San Juan, Cotabato City	100,000 GPD
Water Treatment Plant	San Juan, Cotabato City	100,000 GPD
Water Pump Station	San Juan, Cotabato City	100,000 GPD
Water Distribution Network	San Juan, Cotabato City	100,000 GPD
Water Storage Tank	San Juan, Cotabato City	100,000 GPD



Project and Study Organization

Organization	Role
Metro Cotabato Water District (MCWD)	Proposer and Implementing Agency
Japan International Cooperation Agency (JICA)	Funding Organization
JICA Study Team	Consultant for Online Design Study
Economic Specialists, Inc.	Sub-consultant for Environmental Impact Assessment

2. Environmental Impact Assessment

Environmental Impact Assessment (EIA)

•EIA is a process that establishes and evaluates baseline information, predicts impacts of proposed projects to the biophysical, social, and relevant socio-economic aspects, and provides mitigating measures to ensure environmental considerations are taken into account before a decision is made for their approval

2. Environmental Impact Assessment
a. Process



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**2. Environmental Impact Assessment
b. EIA Activities**

Schedule of EIA Activities

Work	Target Schedule
1) Kick-off Meeting with Client	July 24, 2024
2) Feasibility/Screening Survey	July 24, 2024
3) Implementation of Baseline survey	July 24 - Nov 1, 2024
4) Impact Assessment	Oct - Nov 2024
5) Draft EIA Report	February 11, 2025
6) JICA Review and JICA Advisory Committee	Ongoing
7) Public Consultation Hearing	June 20, 2025
8) EIS Review	TBD
9) Final EIA Report	TBD

Baseline Field Surveys

- Land
 - Terrestrial Ecology
- Water
 - Surface Water Quality
 - Freshwater Ecology
- Air
 - Air Quality
- Noise Level
 - Noise Level
 - Vibration Level
- People
 - Perception survey

Note: Recommendations survey for their utilization prior to conduct of fieldwork.

**2. Environmental Impact Assessment
c. Sampling Stations**





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3. Initial EIA Study Results

a. Flora and Fauna

Highly agricultural landscape for Rice, Maize, Corn, and Banana. Saplings, and other fast trees such as Mango, A species of rose tree species such as Jacaranda, and other local plants of the grass family. A total of 20 floral species were recorded and identified, complemented by 3 species of birds and fish, 7 species of frogs, 2 species of lizards, 1 snake, and 14 species of insects and bees.



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Location	Project Name	Activity	Date	Time	Length	Photo
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b. Air Quality, Noise and Vibration Level

Location	Parameter	Unit	Value	Standard	Remarks
1	Temperature	°C	28.5	35	OK
2	Humidity	%	75	85	OK
3	Relative Humidity	%	75	85	OK
4	Wind Speed	m/s	1.5	3.0	OK
5	Wind Direction	°	135	135	OK
6	Sound Pressure Level	dBA	55	70	OK
7	Vibration	mm/s	0.1	0.5	OK

c. Water Quality

- In the water intake portion of the San Mateo River, water quality samplings were conducted during low tide and high tide on April 23, 2020. Both during low tide and high tide, the levels of total coliform bacteria, thermotolerant coliform bacteria, E. coli, nitrite, nitrate, aluminum, and iron exceeded the standard values. Additionally, during high tide, the number of thermotolerant bacteria exceeded the standard values.
- However, these results are considered to be a timely results through regular participation of local residents in chlorine disinfection, and no requirements are anticipated.

c. Water Quality

Water quality survey results at low tide

Location	Date	Temperature (°C)	Humidity (%)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (°)	Sound Pressure Level (dBA)	Vibration (mm/s)
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c. Water Quality

Water quality survey results at high tide

Location	Date	Temperature (°C)	Humidity (%)	Relative Humidity (%)	Wind Speed (m/s)	Wind Direction (°)	Sound Pressure Level (dBA)	Vibration (mm/s)
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4. Initially Identified Impacts and Mitigation Measures

The Land		
IMPACT	SUBJECTIVE IMPACT	MITIGATION MEASURES
<p>Land cover transformation</p> <p>Land use / land cover of the site is predominantly residential. Such as land (Bauko/Bauko, Bagu, Bagu, Bagu) located that the project area is residential area and agriculture.</p>	<p>1) Change from residential to agricultural area.</p> <p>2) Change from residential to agricultural area.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>
<p>Ecology loss</p> <p>1) Destruction of vegetation, loss of biodiversity.</p> <p>2) Destruction of vegetation, loss of biodiversity.</p> <p>3) Destruction of vegetation, loss of biodiversity.</p>	<p>1) Avoidance of sensitive areas.</p> <p>2) Avoidance of sensitive areas.</p> <p>3) Avoidance of sensitive areas.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>

The Land		
IMPACT	SUBJECTIVE IMPACT	MITIGATION MEASURES
<p>Land cover transformation</p> <p>Land use / land cover of the site is predominantly residential. Such as land (Bauko/Bauko, Bagu, Bagu, Bagu) located that the project area is residential area and agriculture.</p>	<p>1) Change from residential to agricultural area.</p> <p>2) Change from residential to agricultural area.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>
<p>Ecology loss</p> <p>1) Destruction of vegetation, loss of biodiversity.</p> <p>2) Destruction of vegetation, loss of biodiversity.</p> <p>3) Destruction of vegetation, loss of biodiversity.</p>	<p>1) Avoidance of sensitive areas.</p> <p>2) Avoidance of sensitive areas.</p> <p>3) Avoidance of sensitive areas.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>

The Land		
IMPACT	SUBJECTIVE IMPACT	MITIGATION MEASURES
<p>Land cover transformation</p> <p>Land use / land cover of the site is predominantly residential. Such as land (Bauko/Bauko, Bagu, Bagu, Bagu) located that the project area is residential area and agriculture.</p>	<p>1) Change from residential to agricultural area.</p> <p>2) Change from residential to agricultural area.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>
<p>Ecology loss</p> <p>1) Destruction of vegetation, loss of biodiversity.</p> <p>2) Destruction of vegetation, loss of biodiversity.</p> <p>3) Destruction of vegetation, loss of biodiversity.</p>	<p>1) Avoidance of sensitive areas.</p> <p>2) Avoidance of sensitive areas.</p> <p>3) Avoidance of sensitive areas.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>

The Water		
IMPACT	SUBJECTIVE IMPACT	MITIGATION MEASURES
<p>Water quality</p> <p>1) Change in water quality.</p> <p>2) Change in water quality.</p>	<p>1) Change in water quality.</p> <p>2) Change in water quality.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>
<p>Water quantity</p> <p>1) Change in water quantity.</p> <p>2) Change in water quantity.</p>	<p>1) Change in water quantity.</p> <p>2) Change in water quantity.</p>	<p>1) Restore the site to its original state through reforestation and other measures.</p> <p>2) Carry out the necessary mitigation measures for areas not yet returned to its original state.</p>



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FOR THE IMPROVEMENT OF WATER SUPPLY IN COTABATO**

PRE-CONSULTATION AND CONSULTATION		
DATE	SUBJECT/ISSUE/IMPACT	APPROPRIATE MEASURE
10/20/2014	Requirement of water's transparency of construction works to be conducted about the ground level of water supply system to be constructed in city of Cotabato	1. Coordinate with appropriate local government in coordination with the local water utility 2. Coordinate with appropriate local government in coordination with the local water utility
10/20/2014	Requirement of water's transparency of construction works to be conducted about the ground level of water supply system to be constructed in city of Cotabato	1. Coordinate with appropriate local government in coordination with the local water utility 2. Coordinate with appropriate local government in coordination with the local water utility

ISSUE	IMPACT/ENVIRONMENTAL IMPACT	MITIGATION MEASURE
Water	During operation, the water supply system will be affected by the water supply system.	1. Coordinate with appropriate local government in coordination with the local water utility
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5. Open Forum

Thank you.