ATTACHMENT A-3

ENVIRONMENTAL MONITORING (CONSTRUCTION STAGE)

- **Contract Package – 1**
- **Contract Package – 2**
- **Contract Package - 3**

ENVIRONMENTAL MONITORING FORM FOR CONSTRUCTION STAGE
CONTRACT PACKAGE 1

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction camp site
	Construction site	Visual observation of dust			Every day	site works
	Storage facilities for dust generation		No major adverse impacts			Every day, especially in dry season
	Air-01 (23th July, 2020) UTM: X 380921, Y 1386467 Ou Sdao village, Svay Et commune, Pursat province Air-02 (23th July, 2020) UTM: X 380953, Y 1386565 Ou Sdao village, Svay Et commune, Pursat province	PM10	Air-01 = 0.067 mg/m^3 Air-02 = 0.046 mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	The air quality monitoring data was carried out by MoE. The monitored points are at the existing National Road No.5, where currently no construction activity. Meanwhile, the current construction activities are at the Pursat bypass. Therefore, exceeding data of air quality are due to natural impacts, and due to third party vehicles.
		PM2.5	Air-01 = 0.035 mg/m^3 Air-02 = 0.015 mg/m^3	0.025 mg/m^3 (WHO, average 24h)		
		SO_2	Air-01 = 0.033 mg/m^3 Air-02 = 0.012 mg/m^3	0.30 mg/m^3 (WHO average 24h)		
		NO_2	Air-01 = 0.030 mg/m^3 Air-02 = 0.008 mg/m^3	0.10 mg/m^3 (WHO average 24h)		

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Water Quality	W-01 (10th April, 2020) UTM 48 P 0382620 / 1385704 Current road site, Pursa city W-08 (10th April, 2020) UTM 48 P 0383485 / 1388051 Additional WS, Pursat city	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector
		pH	W-01 = 7.56 W-08 = 7.51	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	The water quality monitoring data is done by MoE There are some minor activities at the time. However, the data are not exceeding the standard
		TSS	W-01 = 16.00 W-08 = 30.00	25-100 mg/l (MoE)		
		BOD	W-01 = 1.38 W-08 = 2.69	1-10 mg/l (MoE)		
		COD	W-01 = 3.33 W-08 = 4.90	1-8 mg/l (MoE)		
		Total Coliform	W-01 = $9.2x10^2$ W-08 = $1.1x10^5$			
Noise	Noise-01 (09th April, 2020) UTM 48 P 0379552 / 1387050 Ou Sdao village, Svay Et commune, Pursat province	Noise Level (MoE Laboratory)	- 59.2 dB (06:00-18:00) - 56.35 dB (18;00-22:00) - 54.83 dB (22:00-06:00)	- 50 dB (06:00-18:00) - 50dB (18;00-22:00) - 45dB (22:00-06:00) (MoE)	1 time in dry season	The noise level monitoring is done by MoE There is no construction activity at the time. The data are exceeding the standard due to traveler's trucks
Vibration	Vibration-01 (09th April, 2020) UTM 48 P 0379552 / 1387050 Ou Sdao village, Svay Et commune, Pursat province	Vibration Level (MoE Laboratory)	- 19.57 Hz (5:00-17:00) - 15.92 Hz (17:00-05:00) (MoE)	- 65Hz (5:00-17:00) - 60Hz (17:00-05:00) (MoE)	1 time in wet season	The vibration level monitoring is done by MoE The data are far behind the standard while there is no construction activity at the time.

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Waste Generation	Waste storage at construction site	Construction waste	Discharged amount	The data mentioned in Table 1	No standards	Every day	Septic tank
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Local land was agreed with local resident			
		General waste	Discharged amount	The data mentioned in Table 1			
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Land-fill of waste collector			Land-fill of provincial authority
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people		No impact at construction site	No standards	1 time/week to 1 time/month (depending on situation)	Minor affects to prone locations along the project road.
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Every day	
Ecosystem	EC-01 (04th May, 2020) Sta. 185+200	Interviews of local people and visual observation of animals, reptiles, and amphibious		Mammal = 3 Amphibian = 4 Reptile = 6 Birds = 13 Flora = 6 Fish = 30 Insect = 4	No standard	1 time in dry season 1 time in rainy season	

Remarks: Past trend and current statute including remedial measures, if necessary.

Note:

WHO: World Health Organization,
MoE: Ministry of Environment,
NO_2: Nitrogen Dioxide,
SO_2: Sulfur Dioxide,
PM: Particulate Matters,
BOD: Biochemical Oxygen Demand
COD: Chemical Oxygen Demand
TSS: Total Suspended Solid

Table 1: General Waste Management

Location (Base camp, subcontractor camp)	General Waste				Construction Waste			
	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site
Ilsung-Cienco1 Office	200	10	Sold to scavenger	Dumpsite	-	-	-	-
Driving pile of Bridge 40	-	-	-		100 (scrap)	100	Sold to scaveng er	Km 179+900
Driving pile of Bridge 40	-	-	-		100 (scrap)	100	Sold to scaveng er	Km 179+900
AZI Site Camp	200	10	Sold to scavenger	Dumpsite	-	-	-	-
Thang Long Site Camp	150	9	Sold to scavenger	Dumpsite	-	-	-	-
Branch Cienco1 Site Camp	160	9	Sold to scavenger	Dumpsite	-	-	-	-
TOTAL	710	38			200 (scrap)	200		

Note: GA = Generated amount ; RA = Recycling amount ; MR = Mean of Recycling, DS = Disposal Site ; Kg/m = Kilogram per month ; Dumpsite is at Km 197+830 X: 388076 Y: 1385491

Table 2: Schedule of Seasonal Monitoring

DESCRIPTION	2019	2020				2021				2022			
	Nov. *1	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	•	•	•	•	•	•	•	•	•	•	•	•	•
Survey Date			09 Apr										
2. Water Quality	•		•		•		•		•		•		•
Survey Date			10 Apr										
3. Noise	•		•		•		•		•		•		•
Survey Date			9 Apr										
4. Vibration	•		•		•		•		•		•		•
Survey Date			9 Apr										
8. Ecosystem			•		•		•		•		•		•
Survey Date			4 May										

*1: Baseline survey before construction

Figure 1: Seasonal Monitoring Points for CP1 (Sta. 171+200 – Sta. 191+000)

ENVIRONMENTAL MONITORING FORM FOR CONSTRUCTION STAGE
CONTRACT PACKAGE 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction camp site
	Construction site	Visual observation of dust	No major adverse impacts		Every day	site works
	Storage facilities for dust generation					Every day, especially in dry season
	Air-09 (10th July, 2020) PK 209+840 Beung Kna village, Beung Kna commune, Bakan district, Pursat province	PM10	AQS1 = 0.127 mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	The air quality monitoring data is done by MoE. The exceeding data of PM10 and PM2.5 might be due to dust emission from the ground. The monitoring is on the school sport ground, which is near NR5 so dust is mainly caused by 3rd party vehicles travelling on the NR5. There is no construction activity for improvement of the NR5.
		PM2.5	AQS1 = 0.079 mg/m^3	0.025 mg/m^3 (WHO, average 24h)		
		SO_2	AQS1 = 0.043 mg/m^3	0.30 mg/m^3 (WHO average 24h)		
		NO_2	AQS1 = 0.057 mg/m^3	0.10 mg/m^3 (WHO average 24h)		

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Water Quality	River water-02 PK 216+081 at Bridge 58 River water-03 PK 219+942 at Bridge 59	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector
		pH		6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	The water quality monitoring data should be done by MoE The water quality monitoring was skipped because there is no water flow at the rivers.
		TSS		25-100 mg/l (MoE)		
		BOD		1-10 mg/l (MoE)		
		COD		1-8 mg/l (MoE)		
		Total Coliform				
Noise	Noise-01 (09th April, 2020) PK 209+840 Beung Kna village, Beung Kna commune, Bakan district, Pursat province	Noise Level (MoE Laboratory)	- 65 dB (06:00-18:00) - 71 dB (18;00-22:00) - 63 dB (22:00-06:00)	- 50 dB (06:00-18:00) - 50dB (18;00-22:00) - 45dB (22:00-06:00) (MoE)	1 time in dry season 1 time in wet season	The noise level monitoring is done by MoE The data of noise level are exceeding the standard. The reason is mainly due to the busy traffic activities on the NR5, which is the main road connected the crowded cities of Poipet & Battambang to Phnom Penh
Vibration	Vibration-01 (09th April, 2020) UTM 48 P 0379552 / 1387050 Ou Sdao village, Svay Et commune, Pursat province	Vibration Level (MoE Laboratory)	- 20 Hz (5:00-17:00) - 19 Hz (17:00-05:00) (MoE)	- 65Hz (5:00-17:00) - 60Hz (17:00-05:00) (MoE)		The presence of construction activities that consist of transportation of loading trucks from borrow pits to road construction activities, road clearing and grabbing and earth work might have contributed very little. This is because of the very few activities of the project have taken place nearby the measurement sites The vibration level monitoring is done by MoE The data of vibration level are below the standard. This means that daily traffic activities and construction activities of the project have not resulted in any concern over vibration

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Waste Generation	Waste storage at construction site	Construction waste	Discharged amount	The data mentioned in Table 1	No standards	Every day	
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Local land was agreed with local resident			
		General waste	Discharged amount	The data mentioned in Table 1			
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Land-fill of waste collector			
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people		No impact at construction site	No standards	1 time/week to 1 time/month (depending on situation)	Minor affects to prone locations along the project road.
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Every day	
Ecosystem	EC-01 (03rd April, 2020) Bridge 55 (Sta. 191+221)	Interviews of local people and visual observation of animals, reptiles, and amphibious		- Mammal = 2 - Amphibian = 3 - Reptile = 4 - Birds = 13 - Flora = 6 - Fish = 10 - Insect = 2	No standard	1 time in dry season 1 time in rainy season	
	EC-02 (03rd April,			- Mammal = 2 - Amphibian = 3 - Reptile = 5			

	2020) Bridge 57 (Sta. 208+866)		- Birds = 12 - Flora = 7 - Fish = 11 - Insect = 1			

Remarks: Past trend and current statute including remedial measures, if necessary.

Note:

WHO:	World Health Organization,	SO_2:	Sulfur Dioxide,	COD:	Chemical Oxygen Demand
MoE:	Ministry of Environment,	PM:	Particulate Matters,	TSS:	Total Suspended Solid
NO_2:	Nitrogen Dioxide,	BOD:	Biochemical Oxygen Demand		

Table 1: General Waste Management

Table 1: General Waste Management

Location (base camp, subcontractor camp)	General Waste				Construction Waste			
	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site
Obayashi office	170	7	Sold to scavenger	Dumpsite	-	-	-	-
Daun Penh Yard	110	3	Sold to scavenger	Dumpsite	48	19	Sold to scavenger	-
Norak Yard	320	7	Sold to scavenger	Dumpsite	48	19	Sold to scavenger	-
TCM Yard	370	8	Sold to scavenger	Dumpsite	20	8	Sold to scavenger	-
TOTAL	970	25	-	-	106	46	-	-

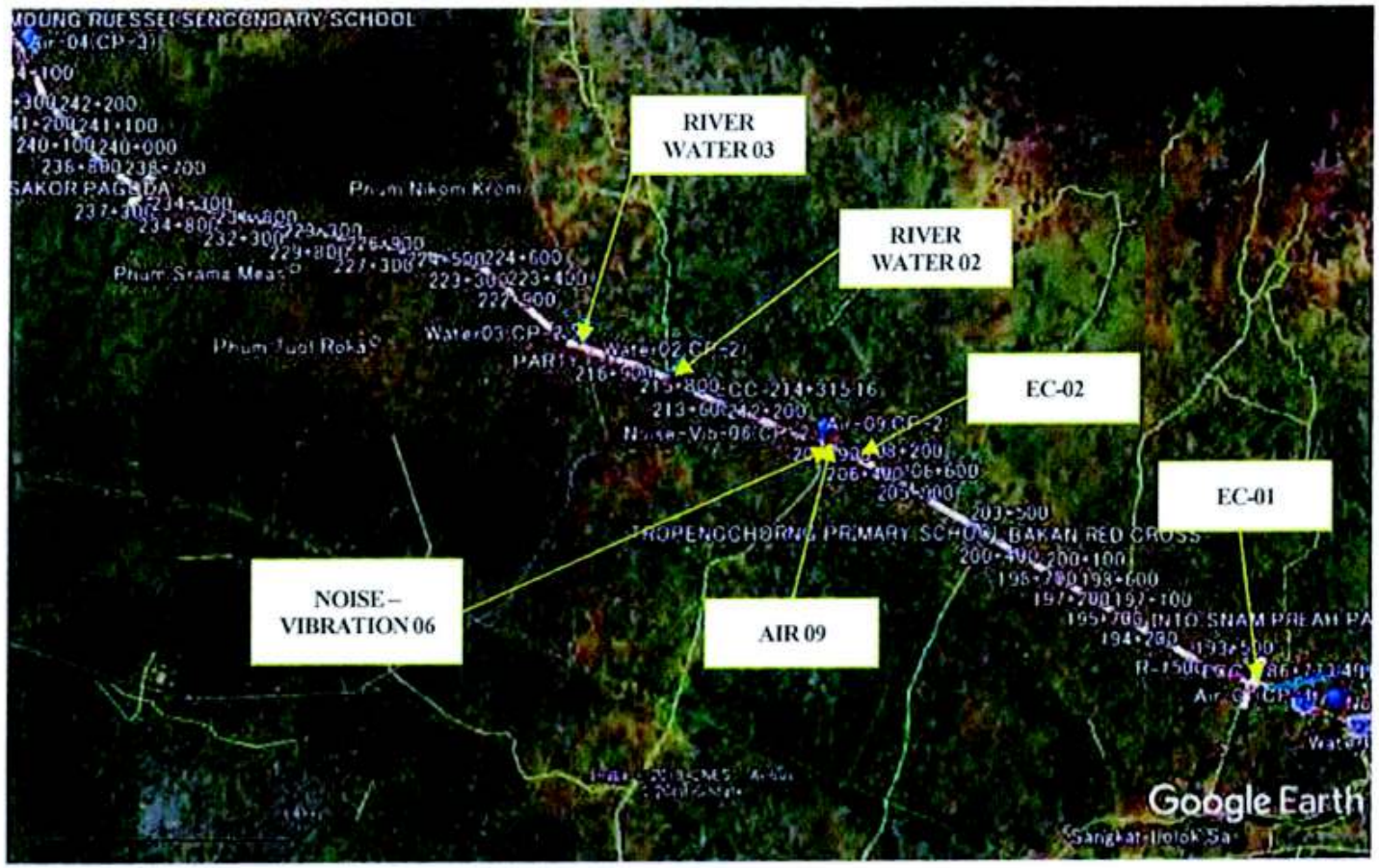
Note: GA = Generated amount; RA = Recycling amount; MR = Mean of Recycling, DS = Disposal Site;
Kg/m = Kilogram per month

Table 2: Schedule of Seasonal Monitoring

Year	2019	2020				2021				2022			
	Aug	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Item	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	•	•	•	•	•	•	•	•	•	•	•	•	•
Survey Date	26th – 27th Aug		09th – 10th April										
2. Water Quality	•		•		•		•		•		•		•
Survey Date	28th Aug		No water										
3. Noise	•		•		•		•		•		•		•
Survey Date	26th -27th		09th – 10th April										
4. Vibration	•		•		•		•		•		•		•
Survey Date	26th -27th		09th – 10th April										
8. Ecosystem			•		•		•		•		•		•
Survey Date			03rd – 4th April										

*1: Baseline survey before construction

Figure 1: Seasonal Monitoring Points for CP2 (Sta. 191+000 – Sta. 238+00)



ENVIRONMENTAL MONITORING FORM FOR CONSTRUCTION STAGE
CONTRACT PACKAGE 3

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction camp site
	Construction site				Every day	site works
	Storage facilities for dust generation	Visual observation of dust	No major adverse impacts			Every day, especially in dry season
	Air-03 (08th July, 2020) UTM: X 331653, Y 1412670	PM10	Air-03 = 0.019 mg/m^3 Air-04 = 0.015 mg/m^3 Air-05 = 0.012 mg/m^3 Air-06 = 0.010 mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	The air quality monitoring data is done by MoE. There is no construction activity for improvement of the NR5 at the time and points of the monitoring. The exceeding data of PM10 and PM2.5 might be due to dust natural impacts and due to third party vehicles travelling on the NR5.
	Air-4 (07th July, 2020) UTM: X 331741, Y 1412726	PM2.5	Air-03 = 0.015 mg/m^3 Air-04 = 0.013 mg/m^3 Air-05 = 0.010 mg/m^3 Air-06 = 0.008 mg/m^3	0.025 mg/m^3 (WHO, average 24h)		
	Air-5 (09th July, 2020) UTM: X 312075, X 1443777	SO_2	Air-03 = 0.054 mg/m^3 Air-04 = 0.031 mg/m^3 Air-05 = 0.049 mg/m^3 Air-06 = 0.020 mg/m^3	0.30 mg/m^3 (WHO average 24h)		
	Air-06 (10th July, 2020) UTM: X 312111, Y 1443641	NO_2	Air-03 = 0.041 mg/m^3 Air-04 = 0.022 mg/m^3 Air-05 = 0.050 mg/m^3 Air-06 = 0.024 mg/m^3	0.10 mg/m^3 (WHO average 24h)		

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks
Water Quality	River water-04 (30th April, 2020) UTM: X 331754, Y 1412530 River water-05 (30th April, 2020) UTM: X 325240, Y 1421604 River water-06 (30th April, 2020) UTM: X 305016, Y 1449616	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector
		pH	RW-04 = 7.38 RW-05 = 6.88 RW-06 = 7.80	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	The water quality monitoring data should be done by MoE The data of water quality monitoring are not exceeding the standard. At this time, there is no construction activity at/around the monitoring points.
		TSS	RW-04 = 31.00 mg/l RW-05 = 26.00 mg/l RW-06 = 61.00 mg/l	25-100 mg/l (MoE)		
		BOD	RW-04 = 3.20 mg/l RW-05 = 2.40 mg/l RW-06 = 2.20 mg/l	1-10 mg/l (MoE)		
		COD	RW-04 = 5.99 mg/l RW-05 = 4.97 mg/l RW-06 = 4.96 mg/l	1-8 mg/l (MoE)		
		Total Coliform	RW-04 = $9.3x10^3$ RW-05 = $4.3x10^3$ RW-06 = $1.5x10^4$			
Noise	Noise-02 (30th April, 2020) UTM: X 331653, Y 1412670 Noise-03 (29th April, 2020) UTM: X 312075, Y 1443777	Noise Level (MoE Laboratory)	- 67 dB (06:00-18:00) - 64 dB (18;00-22:00) - 62 dB (22:00-06:00) - 68 dB (06:00-18:00) - 66 dB (18;00-22:00) - 65 dB (22:00-06:00)	- 50 dB (06:00-18:00) - 50dB (18;00-22:00) - 45dB (22:00-06:00) (MoE)	1 time in dry season 1 time in wet season	The noise level monitoring is done by MoE The data of noise level are exceeding the standard. The reason is mainly due to the busy traffic activities on the NR5, which is the main road connected the crowded cities of Poipet & Battambang to Phnom Penh
Vibration	Vibration-02 (30th April, 2020) UTM: X 331653, Y 1412670 Vibration-03 (29th April, 2020) UTM: X 312075, Y 1443777	Vibration Level (MoE Laboratory)	- 31 Hz (5:00-17:00) - 30 Hz (17:00-05:00) (MoE) - 47 Hz (5:00-17:00) - 46 Hz (17:00-05:00) (MoE)	- 65Hz (5:00-17:00) - 60Hz (17:00-05:00) (MoE)		At the time of the monitoring there is no construction activity of NR5 improvement project The vibration level monitoring is done by MoE The data of vibration level are below the standard. This means that daily traffic activities and construction activities of the project have not resulted in any concern over vibration

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)		Standards (Local/Inter Standard)	Frequency	Remarks
Waste Generation	Waste storage at construction site	Construction waste	Discharged amount	The data mentioned in Table 1	No standards	Every day	
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Local land was agreed with local resident			
		General waste	Discharged amount	The data mentioned in Table 1			
			Recycled amount				
			The way of recycle	No recycle			
			Treated amount	No treat			
			Local of final disposal	Land-fill of waste collector			
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people	No impact at construction site		No standards	1 time/week to 1 time/month (depending on situation)	Minor affects to prone locations along the project road.
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow	No impacts at construction site			Every day	
Ecosystem	EC-01 (29rd April, 2020) Sta. 244+600	Interviews of local people and visual observation of animals, reptiles, and amphibious	- Mammal = 2 - Amphibian = 3 - Reptile = 4 - Birds = 4 - Flora = 6 - Fish = 5 - Insect = 2		No standard	1 time in dry season 1 time in rainy season	

	EC-02 (29th April, 2020) Sta. 255+800		- Mammal = 2 - Amphibian = 4 - Reptile = 9 - Birds = 12 - Flora = 17 - Fish = 16 - Insect = 4			

Remarks: Past trend and current statute including remedial measures, if necessary.

Note:

WHO:	World Health Organization,	SO_2:	Sulfur Dioxide,	COD:	Chemical Oxygen Demand
MoE:	Ministry of Environment,	PM:	Particulate Matters,	TSS:	Total Suspended Solid
NO_2:	Nitrogen Dioxide,	BOD:	Biochemical Oxygen Demand		

Table 1: General Waste Management

Location (base camp, subcontractor camp)	General Waste				Construction Waste			
	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site	GA Generated Amount (kg/month)	RA Recycle Amount (kg/month)	MR Means of Recycle	DS Name of Disposal Site
CP3 Office	310	10	Sold to scavenger	Dumpsite	-	-	-	-
HCH Yard	450	12	Sold to scavenger	Dumpsite	25 (scrap)		Store in CLE Yard	-
Nim Meng Yard	250	7	Sold to scavenger	-	-	-	-	-
MOTORPOOL	510	15	-	Dumpsite	69 (scrap)	69	Sold to scavenger	-
TCW Yard	195	10	Sold to scavenger	Dumpsite	-	-	-	-
TOTAL	**1520**	**54**	**-**	**-**	**94**	**69**	**-**	**-**

Note: GA = Generated amount; RA = Recycling amount; MR = Mean of Recycling, DS = Disposal Site; Kg/m = Kilogram per month

Table 2: Schedule of Seasonal Monitoring

Year	2019	2020				2021				2022			
	Aug	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Item	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	•	•	•	•	•	•	•	•	•	•	•	•	•
Survey Date			27th April										
2. Water Quality	•		•		•		•		•		•		•
Survey Date			30th April										
3. Noise	•		•		•		•		•		•		•
Survey Date			30th April										
4. Vibration	•		•		•		•		•		•		•
Survey Date			30th April										
8. Ecosystem			•		•		•		•		•		•
Survey Date			29th April										

*1: Baseline survey before construction