Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 1

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Item	Location *nearest KMP	Parameter/Means of Monitoring	Result (Average/ Max /Total…)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Contractor offices and parking of machineries	Visual inspection of mechanical conditions and exhaust gases	No major adverse impacts		Daily before working	At construction camp site
	Construction sites including construction roads	Visual observation of dust	No major adverse impacts		Daily	Site works Every day, especially in dry season
	Storage facilities for dust generating materials including plants		No major adverse impacts			
	Air-1 (Along NR5) *187+500 Data: 16th-17th January 2022 Air-2 (Residential area near Air-1) *187+500 Data: 16th-17th January 2022	**PM_{10}**	Air-1 = 0.025 mg/m³ Air-2 = 0.022 mg/m³	0.05 mg/m³ (MoE, average 24h)	1) 2 times in dry season and 2 times in rainy season 2) Dust ($PM_{2.5}$ and PM_{10}) daily check visual check/weekly mobile device check if suspected situation is caused and/or local residents complain	The monitoring of air quality is conducted by MoE. The monitoring points (Air-1 and Air-2) are out of the project area. Thus, the values are not impacted by the project.
		$PM_{2.5}$	Air-1 = 0.019 mg/m³ Air-2 = 0.009 mg/m³	0.025 mg/m³ (MoE, average 24h)		
		SO_2	Air-1 = 0.025 mg/m³ Air-2 = 0.021 mg/m³	0.30 mg/m³ (MoE, average 24h)		
		NO_2	Air-1 = 0.013 mg/m³ Air-2 = Not detected (too small value)	0.10 mg/m³ (MoE, average 24h)		
Water Quality	Construction areas including borrow pits and quarry (River, steam, reservoir, and other public water body where construction works are executed)	Visual observation	No major adverse impacts		1/ 1 time in dry season and 1 time in rainy season 2) Daily visual check/weekly mobile device check when suspected situation is caused and/or local residents complain	
	WQ-1 (Pursat River/upstream) *185+000 WQ-8 (Pursat River/downstream) *185+350	**pH**	**The Water Quality Survey will be conducted in April 2022 (No survey plan between January-March 2022)**	6.5-8.5 (MoE)	1) 1 time in dry season and 1 time in rainy season 2) Daily visual check/weekly mobile device check when suspected situation is caused and/or local residents complain	
		TSS		25-100 mg/L (MoE)		
		BOD		1-10 mg/L (MoE)		
		COD		1-8 mg/L (MoE)		
		Total Coliform		<5,000 MPN/100ml (MoE)		
Noise	NV-1 (Along NR5) *187+500	Noise Level	**The Noise and Vibration Survey will be conducted in April 2022**	- 60 dB(A) (06:00-18:00) - 50dB(A) (18;00-22:00)	1) 1 time in dry season and 1 time in rainy season	

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Vibration		Vibration Level		**(No survey plan between January-March 2022)**	- 45dB(A) (22:00-06:00) (MoE) - 65 dB (5:00-17:00) - 60 dB (17:00-05:00) (MoE)	2) Daily check/weekly mobile device check when suspected situation is caused and/or residents complain	
Waste Generation	Waste storage at construction site	Construction waste	Discharged amount	60 kg/month		Daily	
			Recycled amount	50 kg/month			
			The way of recycle	Sell to village buyers			
			Treated amount				Some liquid waste is treated by septic tanks
			Local of final disposal	Pursat Landfill			
		General waste	Discharged amount	250 kg/month			
			Recycled amount	110 kg/month			
			The way of recycle	Sell to villager buyers			
			Treated amount				Some liquid waste is treated by septic tanks
			Local of final disposal	Pursat landfill			
Subsidence	Subsidence prone locations along the road project	Visual inspection and interview with local people		No impact at construction site		1 time/week to 1 time/month depending on situations	Minor affects to prone locations along the road project
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Daily	
Ecosystem	EC-1 (Pursat River) *185+350	Interviews of local people and visual observation of animals, reptiles, and amphibious		**The ecosystem survey will be conducted in April 2022 (No survey plan between January-March 2022)**		1 time in dry season and 1 time in rainy season	

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

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 1

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

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		

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 1

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Table 1: Schedule of Seasonal Monitoring (□ target monitoring during January-March, 2022)

Year	2019	2020				2021				2022			
		Jan	Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	July	Oct
	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	×	×	•	•	•	•	•	•	•	•			
	Not conducted	Not conducted	9-10th	23-24th	23-24th	12-13th	4-5th	6-7th	3-4th	16-17th			
2. Water Quality	×		•		•		•		•				
	Not conducted		10th		27th		5th		3rd				
3. Noise	×		•		•		•		•				
	Not conducted		9-10th		23-24th		4-5th		3-4th				
4. Vibration	×		•		•		•		•				
	Not conducted		9-10th		23-24th		4-5th		3-4th				
8. Ecosystem			•		•		•		•				
			4th of May		28th		25th		17th				

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

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 2

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Item	Location *nearest KMP	Parameter/Means of Monitoring	Result (Average/ Max /Total...)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Contractor offices and parking of machineries	Visual inspection of mechanical conditions and exhaust gases	No major adverse impacts		Daily before working	
	Construction sites including construction roads	Visual observation of dust	No major adverse impacts		Daily	
	Storage facilities for dust generating materials including plants		No major adverse impacts			
	Air-9 (Additional Point) *209+840 Date: 19th-20th January 2022	**PM_{10}**	Air-9 = 0.044 mg/m³	0.05 mg/m³ (MoE, average 24h)	1) 2 times in dry season and 2 times in rainy season 2) Dust (PM2.5 and PM10) daily check visual check/weekly mobile device check if suspected situation is caused and/or local residents complain	The monitoring of air quality is conducted by MoE.
		$PM_{2.5}$	Air-9 = 0.023 mg/m³	0.025 mg/m³ (MoE, average 24h)		
		SO_2	Air-9 = 0.052 mg/m³	0.30 mg/m³ (MoE, average 24h)		
		NO_2	Air-9 = 0.035 mg/m³	0.10 mg/m³ (MoE, average 24h)		
Water Quality	Construction areas including borrow pits and quarry (River, steam, reservoir, and other public water body where construction works are executed)	Visual observation	No major adverse impacts		1) 1 time in dry season and 1 time in rainy season 2) Daily visual check/weekly mobile device check when suspected situation is caused and/or local residents complain	
	WQ-2 (Tapaong river) *216+080 WQ-3 (Svay Doun Keo river) *219+940	**pH**	**The Water Quality Survey will be conducted in April 2022** **(No survey plan between January-March 2022)**	6.5-8.5 (MoE)		
		TSS		25-100 mg/L (MoE)		
		BOD		1-10 mg/L (MoE)		
		COD		1-8 mg/L (MoE)		
		Total Coliform		<5,000 MPN/100ml (MoE)		
Noise	NV-6 (Additional point) *209+840	Noise Level	**The Noise and Vibration Survey will be conducted in April 2022** **(No survey plan between January-March 2022)**	- 60 dB(A) (06:00-18:00) - 50dB(A) (18;00-22:00) - 45dB(A) (22:00-06:00) (MoE)	1) 1 time in dry season and 1 time in rainy season 2) Daily check/weekly mobile device check when suspected situation is caused and/or residents complain	

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

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NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Vibration		Vibration Level			- 65 dB (5:00-17:00) - 60 dB (17:00-05:00) (MoE)		
Waste Generation	Waste storage at construction site	Construction waste	Discharged amount	40 kg/month		Daily	
			Recycled amount	35 kg/month			
			The way of recycle	Sell to village buyers			
			Treated amount				Some liquid waste is treated by septic tanks
			Local of final disposal	Pursat landfill			
		General waste	Discharged amount	815 kg/month			
			Recycled amount	20 kg/month			
			The way of recycle	Sell to village buyers			
			Treated amount				Some liquid waste is treated by septic tanks
			Local of final disposal	Pursat landfill			
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview with local people		No impact at construction site		1 time/week to 1 time/month depending on situations	Minor affects to prone locations along the road project
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Daily	
Ecosystem	EC-2 (Svay Art river) *191+220 EC-3 (Beung Kna river) *208+900	Interviews of local people and visual observation of animals, reptiles, and amphibious		**The ecosystem survey will be conducted in April 2022 (No survey plan between January-March 2022)**		1 time in dry season and 1 time in rainy season	

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

Note:

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 2

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

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		

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

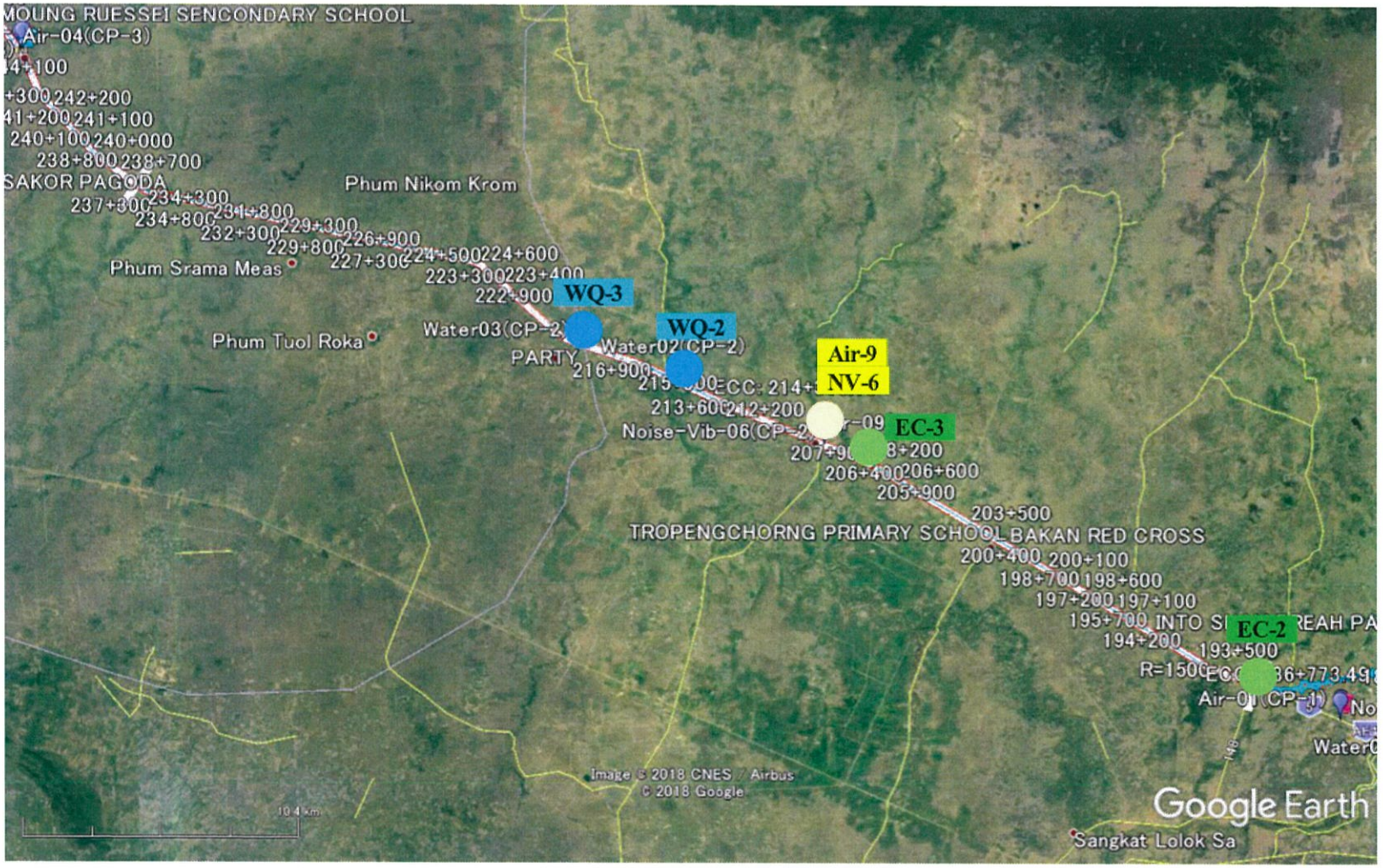
Contract Package 2

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Table 1: Schedule of Seasonal Monitoring (□ target monitoring during January-March, 2022)

Year	2019	2020				2021				2022			
	Aug	Jan	Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	July	Oct
	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	•	•	•	•	•	•	•	•	•	•			
	26-27th	15-16th	9-10th	10-11th	24-25th	11-12th	3rd-4th	5-6th	4-5th	19-20th			
2. Water Quality	•		•		•		•		•				
	28th		No Water		24th		No water		4th				
3. Noise	•		•		•		•		•				
	26-27th		9-10th		24-25th		3rd-4th		4-5th				
4. Vibration	•		•		•		•		•				
	26-27th		9-10th		24-25th		3rd-4th		4-5th				
8. Ecosystem			•		•		•		•				
			3rd-4th		24th		24th		16th				

Figure 1: Seasonal Monitoring Points for CP2 (KMP 191+000 – 238+000)



Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 3

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Item	Location *nearest KMP	Parameter/Means of Monitoring	Result (Average/ Max /Total...)	Standards (Local/Inter Standard)	Frequency	Remarks
Air Quality	Contractor offices and parking of machineries	Visual inspection of mechanical conditions and exhaust gases	No major adverse impacts		Daily before working	
	Construction sites including construction roads	Visual observation of dust			Daily	
	Storage facilities for dust generating materials including plants		No major adverse impacts			
	Air-3 (Along NR5) *244+760 Date: 19th-20th January 2022 Air-4 (Residential area near Air-3) *244+760 Date: 20th-21st January 2022 Air-5 (Along NR5) *282+180 Date: 17th-18th January 2022 Air-6 (Residential area near Air-5) *282+180 Date: 18th-19th January 2022	**PM_{10}**	Air-3 = 0.053 mg/m³ Air-4 = 0.041 mg/m³ Air-5 = 0.067 mg/m³ Air-6 = 0.062 mg/m³ (Air-3, Air-5, and Air-6 are exceeding standard)	0.05 mg/m³ (MoE, average 24h)	1) 2 times in dry season and 2 times in rainy season 2) Dust (PM2.5 and PM10) daily check visual check/weekly mobile device check if suspected situation is caused and/or local residents complain	The monitoring of air quality is conducted by MoE. The monitoring of air quality is conducted by MoE. $PM_{2.5}$ and PM_{10} are exceeding standard at the time of monitoring. However, the dust level was exceeding the standard value during FS in 2013 (before construction) already. It is supposed the project area is located near farming land, not in the urban paved land. The Contractor is taking some adequate mitigation measures based on the approved EIA such as spraying water and surface treatment.
		$PM_{2.5}$	Air-3 = 0.026 mg/m³ Air-4 = 0.022 mg/m³ Air-5 = 0.031 mg/m³ Air-6 = 0.027 mg/m³ (Air-3, Air-5, and Air-6 are exceeding standard)	0.025 mg/m³ (MoE, average 24h)		
		SO_2	Air-3 = 0.062 mg/m³ Air-4 = 0.094 mg/m³ Air-5 = 0.070 mg/m³ Air-6 = 0.065 mg/m³	0.30 mg/m³ (MoE, average 24h)		
		NO_2	Air-3 = 0.028 mg/m³ Air-4 = 0.035 mg/m³ Air-5 = 0.045 mg/m³ Air-6 = 0.033 mg/m³	0.10 mg/m³ (MoE, average 24h)		
Water Quality	Construction areas including borrow pits and quarry (River, steam, reservoir, and other public water body where construction works are executed)	Visual observation	No major adverse impacts		1/ 1 time in dry season and 1 time in rainy season 2) Daily visual check/weekly mobile device check when suspected situation is caused and/or local residents complain	
	WQ-4 (Maung river) *244+600 WQ-5 (Chak river) *255+760	**pH**	**The Water Quality Survey will be conducted in April 2022 (No survey plan between January-March 2022)**	6.5-8.5 (MoE)		
		TSS		25-100 mg/L (MoE)		
		BOD		1-10 mg/L (MoE)		
		COD		1-8 mg/L (MoE)		
		Total Coliform		<5,000 MPN/100ml		

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NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

	WQ-6 (Sangke river) * Battambang City (Out of Project area)			(MoE)		
Noise	NV-2 (Along NR5/Air-3) *244+760	Noise Level	**The Noise and Vibration Survey will be conducted in April 2022 (No survey plan between January-March 2022)**	- 60 dB(A) (06:00-18:00) - 50dB(A) (18;00-22:00) - 45dB(A) (22:00-06:00) (MoE)	1) 1 time in dry season and 1 time in rainy season 2) Daily check/weekly mobile device check when suspected situation is caused and/or residents complain	
Vibration	NV-3 (Along NR5/Air-5) *282+180	Vibration Level		- 65 dB (5:00-17:00) - 60 dB (17:00-05:00) (MoE)		
Waste Generation	Waste storage at construction site	Construction waste – Discharged amount	180 kg/month		Daily	
		Construction waste – Recycled amount	70 kg/month			
		Construction waste – The way of recycle	Sell to villager buyers			
		Construction waste – Treated amount				Some liquid waste is treated by septic tanks
		Construction waste – Local of final disposal	Battambang landfill			
		General waste – Discharged amount	760 kg/month			
		General waste – Recycled amount	285 kg/month			
		General waste – The way of recycle	Sell to villager buyers			
		General waste – Treated amount				Some liquid waste is treated by septic tanks
		General waste – Local of final disposal	Battambang landfill			
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people	No impact at construction site		1 time/week to 1 time/month depending on situations	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		Daily	
Ecosystem	EC-4 (Maung river/WQ-4) *244+600	Interviews of local people and visual	**The ecosystem survey will be conducted in April 2022**		1 time in dry season and 1 time in rainy season	

	EC-5 (Chak river/WQ-5) *255+760	observation of animals, reptiles, and amphibious	**(No survey plan between January-March 2022)**			

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

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

Contract Package 3

NATIONAL ROAD NO.5 IMPROVEMENT PROJECT (Middle Section / Thlea Ma'am- Battambang Section)

Year	2019	2020				2021				2022			
	Aug	Jan	Apr	July	Oct	Jan	Apr	July	Oct	Jan	Apr	July	Oct
	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	× Not conducted	• 26-28th of May	• 27-30th	• 8-10th	• 24-27th	• 15-19th	• 9-13th	• 6-10th	• 8-11th	• 17-20th			
2. Water Quality	× Not conducted		• 30th		• 26th		• 12th		• 11th				
3. Noise	× Not conducted		• 27-29th		• 24-26th		• 10-13th		• 8-11th				
4. Vibration	× Not conducted		• 24-26th		• 24-26th		• 10-13th		• 8-11th				
8. Ecosystem	× Not conducted		• 25th		• 25th		• 22nd		• 15-16th				

Table 1: Schedule of Seasonal Monitoring (□ target monitoring during January-March, 2022)
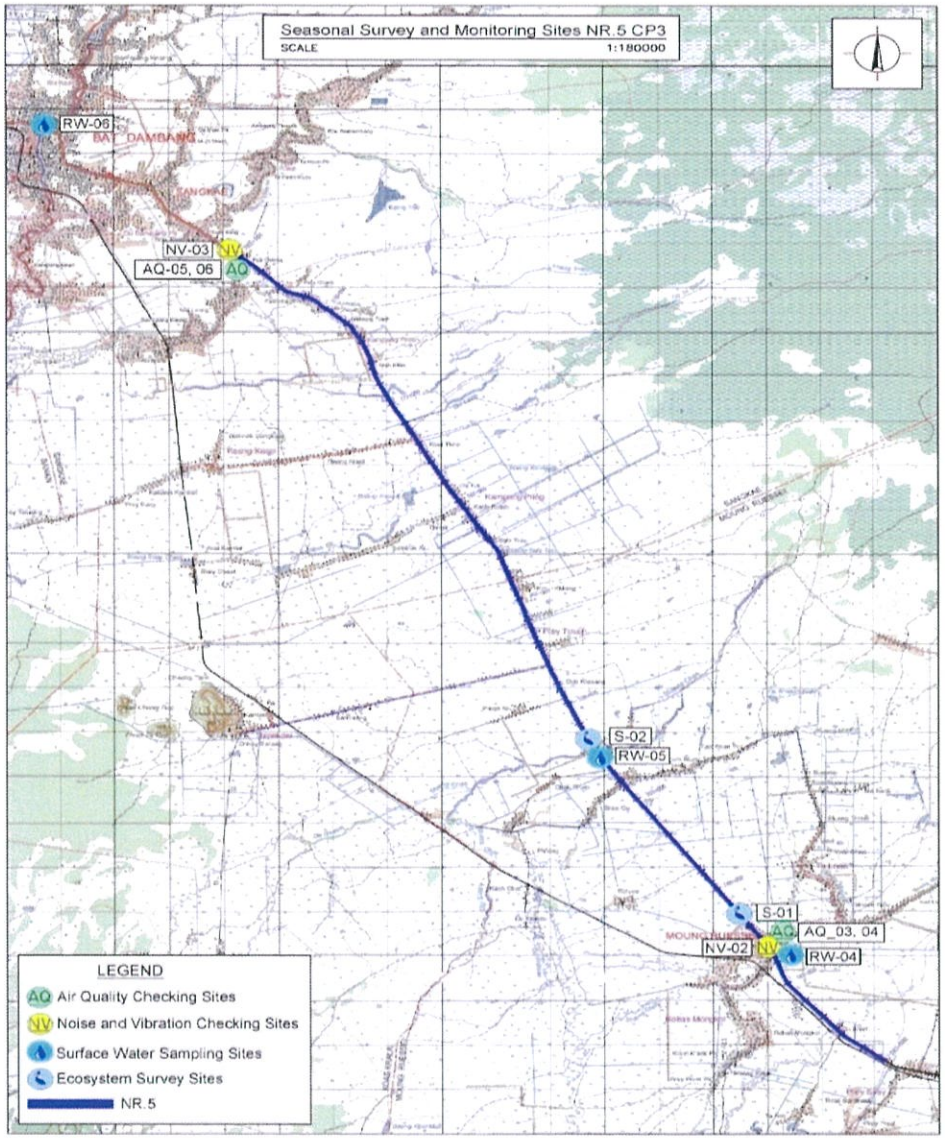
Figure 1: Seasonal Monitoring Points for CP3 (Sta. 238+000 – 282+101)