






Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report Fourth Quarter of 2021

October to December 2021

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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
CA	Concession Agreement between the NNP1PC and GOL
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
EC	Electrolytic Conductivity
EIA	Environmental Impact Assessment
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
kV	kilo-Volt
LTA	Lender's Technical Advisor
MAF	Ministry of Agriculture and Forestry

MEM	Ministry of Energy and Mines, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
OAA	Other aquatic animals
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
PONRE	Provincial Department of Natural Resource and Environment, MONRE
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SMO	Social Management Office of ESD within NNP1PC
SMART	Spatial Monitoring and Reporting Tool
SOP	Standard Operating Procedure
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Wastewater Treatment System

1. EXECUTIVE SUMMARY

The quarterly environment monitoring reports of Nam Ngiep 1 Hydropower Project provides information and analysis of compliance with the environmental and social obligations of the Project stipulated in the Concession Agreement between the Nam Ngiep 1 Power Company (NNP1PC) and the Government of Lao PDR (GOL), and as required by environmental legislation of the Lao PDR, the ADB Safeguard Policy Statement and IFC Performance Standards. The Company ensures compliance with these requirements through implementation of project specific sub-plans, programmes and activities prepared as part of the Environmental and Social Management and Monitoring Plan for the Operation Phase (ESMMP-OP).

During Q4 2021, NNP1PC continued developing and improving some pending documents related to ISO14001:2015. A letter to the Ministry of Natural Resource and Environment (MONRE) requesting the Government of Lao PDR (GOL) to consider a 1-year extension of time for NNP1PC to obtain the ISO14001 accreditation was prepared and submitted in October 2021. The Stage 2 ISO14001:2015 Certification Audit by SGS was agreed to be postponed and confirmed to be conducted remotely via the Microsoft Team application on 21-24 February 2022.

EMO received one Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP), and one standard operating procedure for review and approval. Six Observations of Non-Compliance (ONCs) and three Non-Compliance Reports (NCRs) were active (four ONCs were carried over from last quarter, two ONCs and three NCRs were newly opened) during Q4 2021. Out of these, four ONCs and two NCRs were resolved, two ONCs and one NCR were carried over to January 2022.

The operation and adjustment of the newly constructed wastewater treatment systems are still in process. EMO requires more time during Q1 of 2022 to analyse the results and the sampling schedule is now adjusted from fortnightly to weekly basis to get a better understanding of the wastewater treatment conditions and thereby design relevant solutions to any problems that may be identified.

During Q4 2021, EMO continued to monitor the progress of revegetation at two sites including the former LILAMA10 camp and the Phouhomxay village's irrigation canal spoil disposal both of which the EMU had not accepted during their site visit in January 2021. EMO also inspected the other 30 rehabilitated sites that were initially accepted by the EMU. Additional topsoil was placed on some part of the former LILAMA10 camp by NNP1PC to promote revegetation. The overall percentage of vegetation cover on all 32 sites (except Borrow pit P1) were assessed to be similar to the observed vegetation cover in Q3 2021. The borrow pit P1-site is occupied by EDL to develop for a substation.

A total of 76.0 m³ of solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 18.1 m³ compared with Q3 2021. A total of 78.8 m³ solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill, a decrease of 34.3 m³ compared with Q3 2021. The Community Waste Bank did not receive any recyclables in Q4 2021 and no recyclable waste was stored at the site.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the results show full compliance with the requirements, except for the thalweg water depth

measurements that indicated occasional depths below the required 0.5 m at 5.7 km from the Re-regulation Dam during times with dam discharge less than 30 m³/s.

During Q4 2021, water quality monitoring was not carried out at the upper Main Reservoir (R01, R02 and R03) and Nam Phouan (NPH01) due to security concerns of the sampling locations.

The concentration of dissolved oxygen (DO) at the surface level in R05 (Main Reservoir immediately upstream of the main dam) ranged between 4.8 mg/L and 7.8 mg/L. In addition, the DO concentrations in Nam Xao and Nam Houay Soup were above 6 mg/L.

The DO concentrations at the surface level in the Re-regulation Reservoir (R07) were between 3.2 and 6.1 mg/L.

The DO levels in Nam Ngiep downstream the Re-regulation Dam during periods with only turbine discharge or a combination of turbine and gate discharges were between 4.1 mg/L and 5.9 mg/L for the first few kilometres gradually increasing to about 5 mg/L or above 6 mg/L over the following 25 km.

The depth profile monitoring during the period indicates formation of oxyclines in the Main Reservoir at the monitored stations at varying depths.

The management activities as per the approved Watershed Management AIP2020 and AIP2021 under the component of forest cover maintenance and reservoir management progressed during this reporting period.

The management activities as per the approved NC-NX Biodiversity Offset Management AIP2020 and AIP2021 under the component of law enforcement, community outreach, and conservation linked livelihood progressed during this reporting period.

2. INTRODUCTION

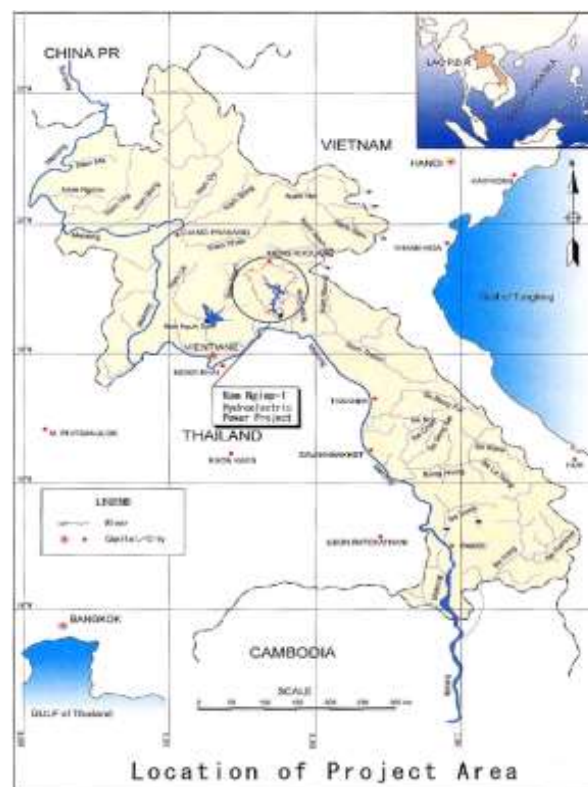
The Nam Ngiep originates in the mountains of Xiengkhouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhamxay District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

Two dams and power stations were constructed along the Ngiep River in Bolikhamxay. At the main dam site, a primary power station generated around 1,546 GWh of electricity for export to Thailand and release water to a regulating pond where a second dam and power station generate around 105 GWh of electricity for local use.

The Project Commercial Operation Date was achieved on 05 September 2019.

This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during **Q4 2021**. The report is published on the Company website (<https://namngiep1.com/>).

Related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website as required under the Concession Agreement.



3. ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental management and monitoring activities reported in this section document implementation of the relevant sub-plans and programmes of the Environmental and Social Management and Monitoring Plan for the Operation Phase during Q4 2021.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q4 2021, NNP1PC continued developing and improving some pending documents related to ISO14001:2015. A letter to the Ministry of Natural Resource and Environment (MONRE) requesting the Government of Lao PDR (GOL) to consider a 1-year extension of time for NNP1PC to obtain the ISO14001 accreditation was prepared and submitted in October 2021. The Stage 2 ISO14001:2015 Certification Audit by SGS was agreed to be postponed and confirmed to be conducted on 21-24 February 2022.

The progress on establishing the EMS according to ISO14001:2015 follows the tentative work plan as shown in **Table 3-1**.

TABLE 3-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021				Year 2022	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Continue to prepare EMS documents (8 Standard Operating Procedures are completed)								
2	NNP1PC Environmental Policy announcement								
3	NNP1PC ISO Committee establishment								
4	Training relevant staff on: <ul style="list-style-type: none"> - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit 								
5	Implement the EMS procedures and processes								
6	ISO14001:2015 Internal Audit								
7	Implement the corrective actions and preventive actions according to the Internal Audit								
8	Management Review by NNP1PC Management								
9	ISO 14001:2015 Assessment and Certification Audit – Stage 1 (remote audit on the documentation review)								
10	Implement the corrective actions and preventive actions according to the Stage 1 Audit								
11	ISO 14001:2015 Assessment and Certification Audit – Stage 2 (remote audit, 4 man-days)								
12	Implement the corrective actions and preventive actions according to the Stage 2 Audit								
13	Certify of ISO14001:2015 upon successful completion of the audit								
	Completed activities per the plan								
	Plan to achieve the activities								

3.2 CONTRACTOR SS-ESMMPs

During Q4 2021, the Environment Management Office (EMO) of NNP1PC received one Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP), and one standard operating procedure for review and approval. All of these submitted documents were cleared as shown in **Table 3-2** and more details can be found in **Appendix 1**.

TABLE 3-2: DOCUMENTS REVIEWED DURING Q4 2021

Document Name	Rev. 1	Rev. 2	Rev. 3	Approved
DWP & SS-ESMMP for improvement of damaged irrigation canal and leveling access road in Phouhomxay village	√			√
Standard Operating Procedure for PLC controller for the WWTS-SBR at OSOV2	√	√		√

3.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

During Q4 2021, EMO conducted weekly independent site inspections and bi-weekly joint site inspections at a total of 13 sites. These included the two sites that are still not fully rehabilitated as previously commented by the EMU, the two landfills, the Main Dam's grouting work, the Contractor's temporary camp (rental houses) and at the construction sites for the improvement and modification of the wastewater treatment systems at OSOV1, OSOV2, the Main Powerhouse. A decrease of five monitoring sites compared with Q3 2021. Due to the Covid-19 situation and the GOL's lockdown measures, the joint site inspections continued to be suspended at villages and in Zone 2UR during the reporting period

Six Observations of Non-Compliance (ONCs) and three Non-Compliance Reports (NCRs) were active (four ONCs were carried over from last quarter, two ONCs and three NCRs were newly opened) during Q4 2021. Out of these, four ONCs and two NCRs were resolved, two ONCs and one NCR were unresolved and carried over to January 2022.

The status of the ONCs and NCRs is summarized in **Table 3-3**, and **Figure 3-1** and **Figure 3-2**. The progress of corrective actions is presented in **Appendix 2**.

TABLE 3-3: STATUS OF NON-COMPLIANCE REPORT DURING Q4 2021

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR from the previous quarter	4	0	0	0	0
Newly opened ONC/NCR	2	3	0	0	0
Total No. of ONC/NCR	6	3	0	0	0
Resolved ONC/NCR	4	2	0	0	0
Unresolved ONC/NCR carried forward to the next quarter	2	1	0	0	0

FIGURE 3-1: STATUS OF ONCs DURING Q4 2021

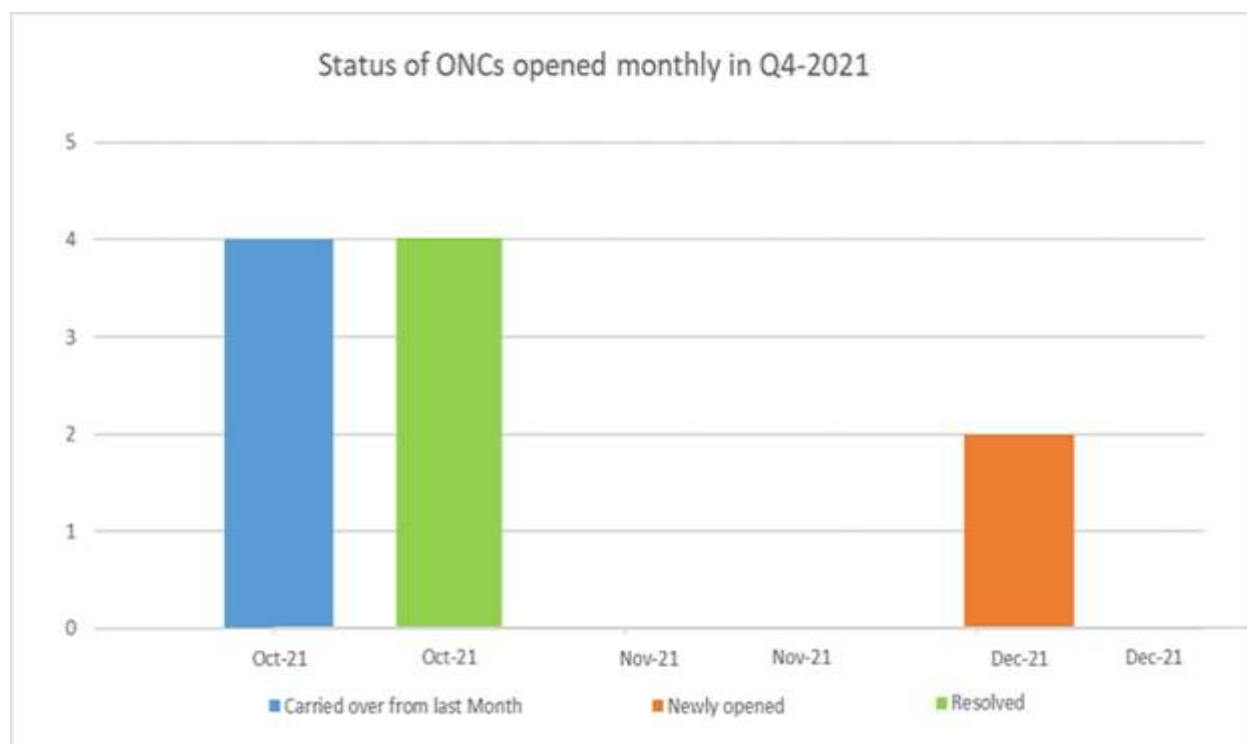
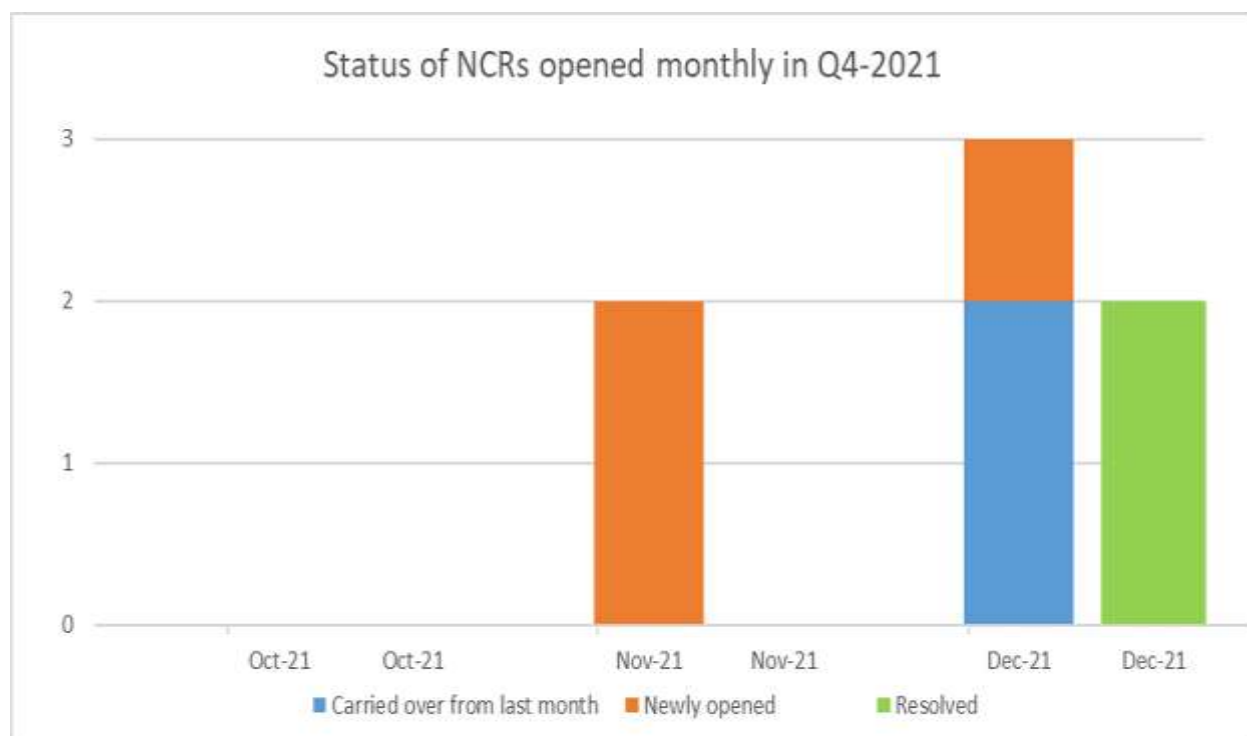


FIGURE 3-2: STATUS OF NCRs DURING Q4 2021



<p>PHOTOGRAPH 1: JOINT SITE INSPECTION AND HAZARDOUS MATERIAL MANAGEMENT AUDIT AT NNP1PC'S TEMPORARY WAREHOUSE</p>	<p>PHOTOGRAPH 1: JOINT SITE INSPECTION FOR THE WWTS OPERATION AT MAIN POWERHOUSE</p>
	
<p>PHOTOGRAPH 2: SITE INSPECTION AT NNP1PC LANDFILL</p>	<p>PHOTOGRAPH 3: SITE INSPECTION AT MAIN DAM GROUTING AREA</p>
	

3.4 RESULTS OF SITE DECOMMISSIONING AND REHABILITATION

During Q4 2021, EMO continued to monitor the progress of rehabilitation at two sites, the former LILAMA10 camp and the Phouhomxay Village irrigation canal spoil disposal both of which the EMU had not accepted during their site visit in January 2021 due to the low percentage of vegetation cover and for which the EMU had requested additional measures to be carried out. EMO conducted site inspection and visually evaluated that the percentage of vegetation cover by the end of Q4 2021 has remained the same as in Q3 2021. This excludes the borrow pit P1 as it is occupied by EDL to develop as a station.

The status of site rehabilitation and revegetation is summarized in **Table 3-4** and the revegetated sites are shown on photographs in **Figure 3-3**.

TABLE 3-4: SUMMARY STATUS OF CONSTRUCTION SITES REHABILITATION AS OF DECEMBER 2021

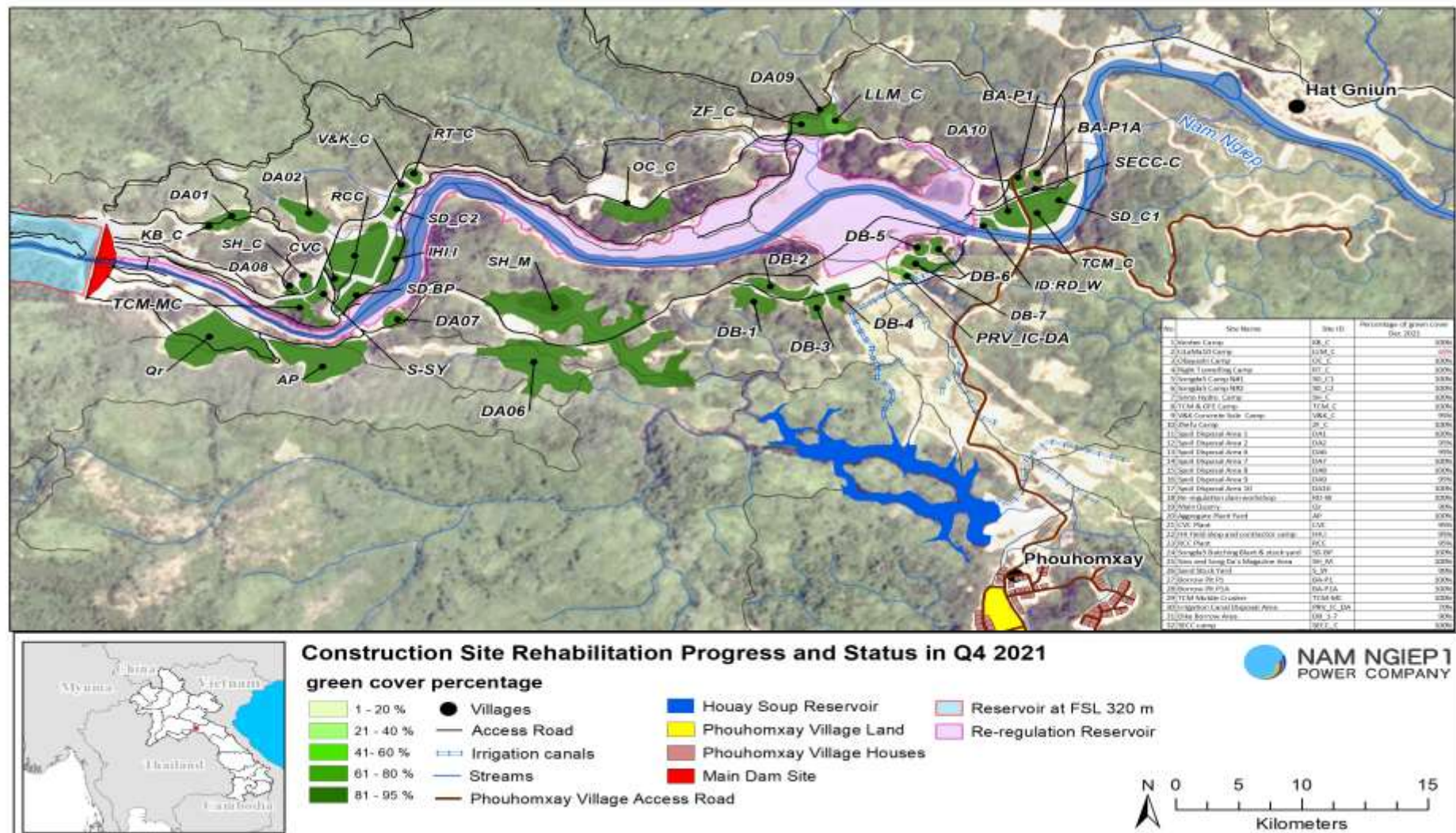
No	Site Name	Status of Decommissioning ¹	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
01	TCM & GFE Camp	Completed	70%	90%	90%	90%	100%	100%
02	Spoil Disposal Area 7	Completed	-	98%	98%	98%	100%	100%
03	Spoil Disposal Area 9	Completed	-	75%	75%	75%	90%	95%
04	Spoil Disposal Area 10	Completed	80%	95%	95%	95%	100%	100%
05	Borrow Pit P1	No need for decommissioning, it is currently occupied by the EDL	-	95%	95%	95%	100%	100%
06	Borrow Pit P1A	No need for decommissioning	-	80%	80%	80%	95%	100%
07	TCM Mobile Crusher	Completed	-	90%	90%	90%	100%	100%
08	Dike Borrow Areas	No need for decommissioning	-	75%	75%	75%	85%	90%
09	SECC camp	Completed	-	90%	90%	90%	100%	100%
10	KENBER Camp	Completed	80%	95%	95%	95%	100%	100%
11	LILAMA10 Camp	Completed	5%	20%	40%	45%	50%	65%
12	Obayashi Camp	Completed	80%	90%	90%	90%	95	100%
13	Right Tunnelling Camp	Completed	70%	90%	90%	90%	95	100%
14	Songda5 Camp N#1	Completed	90%	98%	98%	98%	100%	100%
15	Songda5 Camp N#2	Completed	80%	95%	95%	95%	100%	100%
16	Sino Hydro Camp	Completed	80%	95%	95%	95%	100%	100%
17	V&K Concrete Sole Camp	Completed	50%	70%	70%	70%	85%	95%

¹ Decommissioning here refers to dismantling and removal of structures, installations and any waste or other left-over materials. "No need for decommissioning" means that there were no installations, structures or other things to be removed from the site






No	Site Name	Status of Decommissioning ¹	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
18	Zhefu Camp	Completed	60%	75%	75%	75%	100%	100%
19	Spoil Disposal Area 1	Completed	80%	90%	90%	90%	100%	100%
20	Spoil Disposal Area 2 & main dam workshop	Completed	60%	75%	75%	75%	90%	95%
21	Spoil Disposal Area 6	Completed	70%	75%	75%	75%	90%	95%
22	Spoil Disposal Area 8	No need for decommissioning	40%	60%	60%	60%	100%	100%
23	Re-regulation dam workshop	Completed	80%	85%	85%	85%	95%	100%
24	Main Quarry	Completed	50%	70%	70%	70%	85%	90%
25	Aggregate Plant Yard	Completed	80%	85%	85%	85%	95%	100%
26	CVC Plant	Completed	60%	70%	70%	70%	85%	95%
27	IHI Field shop and contractor camp	Completed	70%	85%	85%	85%	95%	95%
28	RCC Plant	Completed	50%	70%	70%	70%	80%	95%
29	Songda5 Batching Plant & Stock yard	Completed	80%	95%	95%	95%	100%	100%
30	Sino and Song Da's Magazine Area	Completed	70%	80%	80%	80%	95%	100%
31	Sand Stock Yard	No need for decommissioning	-	60%	60%	60%	75%	90%
32	Irrigation Canal Spoil Disposal Area Phouhomxay Village	No need for decommissioning	-	5%	10%	15%	20%	70%

Note: No need for decommission means 'no structure was installed on site for decommissioning'.

FIGURE 3-3: REVEGETATION SITES MAP DURING Q4 2021



The photos below present the vegetation cover of two sites (the former LILAMA10 camp and the disposal area for rock excavated for the irrigation canal). The overall status of vegetation cover percentage in Q4 2021 is the same as in Q3 2021, although the green colour is slightly less noticeable during the dry season in Q4 of 2021.

FORMER LILAMA10 CAMP COMPARE Q3 AND Q4 2021	
Q3 2021 	Q4 2021 
PHOUHOMXAY VILLAGE'S IRRIGATION CANAL SPOIL DISPOSAL AREA COMPARES Q3 AND Q4 2021	
Q3 2021 	Q4 2021 
BORROW PIT P1 CURRENTLY OCCUPIED BY EDL	
	

A plan for handover of decommissioned and rehabilitated sites back to the GOL is in process and expected to be completed within Q1 2022. The following documents are under preparation and will also be handed over to the GOL:

- A plan of the sites (map at suitable scale);
- A description of former (temporary) use;
- A description of rehabilitation measures;
- Information on any items on site (e.g., a former landfill or other buried structures or materials, with exact coordinates and/or location shown on the map) which could mean a restriction for future use.

3.5 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

3.5.1 General Waste Management

A total of 76.0 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 18.1 m³ compared with Q3 2021.

During the Q4 2021, the local waste collection contractor carried out landfill operation and maintenance which included daily and weekly waste cover, repairing the damaged perimeter fence at the landfill, grass mowing, storage cleaning and clean-up of sediment in the open ditches around the leachate ponds.

The amount of recyclable waste managed on site during the reporting period is shown in **Table 3-5** and **Table 3-6**.

TABLE 3-5: AMOUNTS OF RECYCLABLE WASTE DURING Q4 2021

Source and Type of Recyclables		Unit	Total in Q4 2021 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	0	0	0
Sub-Total 1		kg	0	0	0
Operation camp					
2	Plastic bottle	kg	30	25	5
3	Aluminium Can	kg	27	0	27
4	Paper/Cardboard	kg	28	28	0
5	Glass	kg	15	15	0
Sub-Total 2		kg	100	68	32
Grand Total 1+2		kg	100	68	32

Note: Total in Q4 2021 includes the amount remaining from the previous quarter and the amount collected during the quarter.

TABLE 3-6: AMOUNTS OF RECYCLABLE WASTE COLLECTED AND SOLD IN QUARTER 1 - 4 OF 2021

Quarter	Remaining from Previous Quarter (A) (kg)	Collected during the Quarter (B) (kg)	Sold during the Quarter (C) (kg)
Q1 2021	350.5	269.7	216
Q2 2021	404	206	0
Q3 2021	612	102	665
Q4 2021	49	50.5	67.5

3.5.2 Hazardous Waste Management

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q4 2021 are shown in **Table 3-7**.

During Q4 2021, the authorized recycle waste company (Panitha Export-Import Sole Co., Ltd.) came to site and traded the recyclable waste for recycling including 8,600 litres of hazardous waste (used oil from the Re-regulation Powerhouse, TD is in process of finding the solutions to reduce this waste together with a Contractor, HM Hydro) for recycling and elimination.

TABLE 3-7: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q4 2021

No.	Type of Hazardous Material	Unit	Total in Q3 2021	Used/ Disposed	Remaining
1	Diesel	Litre	6,998	5,425	1,573
2	Gasoline	Litre	1,345	835	510
3	Lubricant (Turbine oil)	Litre	17,727	5,205	12,522
4	Colour paint	Litre	242	0	242
5	Tinner	Litre	8	1	7
6	Grease oil	Litre	220	0	220
7	Gear Oil	Litre	468	0	468
8	Chlorine Liquid	Litre	140	40	100
9	Chlorine Powder	Kg	65	0	65
10	Sika	Litre	7	0	7
	Type of Hazardous Waste				
11	Used Oil (Hydraulic + Engine)	Litre	320	0	320
12	Used oil mixed with water	Litre	10,600	8,600	2,000
13	Empty used oil drum/container (drum 200L)	Unit	22	0	22
14	Contaminated soil, sawdust and textile material	M3	1	0	1
15	Used tyre	Piece	0	0	0
16	Empty used chemical drum/container (drum 20L)	Unit	18	0	18
17	Lead acid batteries	Unit	7	0	7
18	Empty paint and spray cans	Can	0	0	0
19	Halogen/fluorescent bulbs	Unit	390	112	278

No.	Type of Hazardous Material	Unit	Total in Q3 2021	Used/ Disposed	Remaining
20	Empty cartridge (Ink)	Piece	21	0	21
21	Clinic Waste	Kg	4.7	0	4.7

3.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q4 2021, local villagers collected 528 kg food waste from the Owner's Site Office and Village (OSOV) for feeding their animals.

3.5.4 Community Solid Waste Management and Recycling Programme

Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have not yet resumed their recyclable waste trading in the community area. The community recycle waste bank did not receive or sell any recyclables in Q4 2021.

3.5.5 Houay Soup Landfill

During Q4 2021, a total of 78.8 m³ solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill, a decrease of 34.3 m³ compared with Q3 2021. Basic landfill maintenance was carried out which included fixing the fence, cleaning up the open ditches and mowing grass. It is noted that the increase of solid waste from the three villages during Q3 2021 compared with Q2 2021 was due to strict GOL COVID-19 lockdown measures limiting the Company staff to conduct the site inspection of properly waste separation and the access of the local recyclables trading company into the areas.

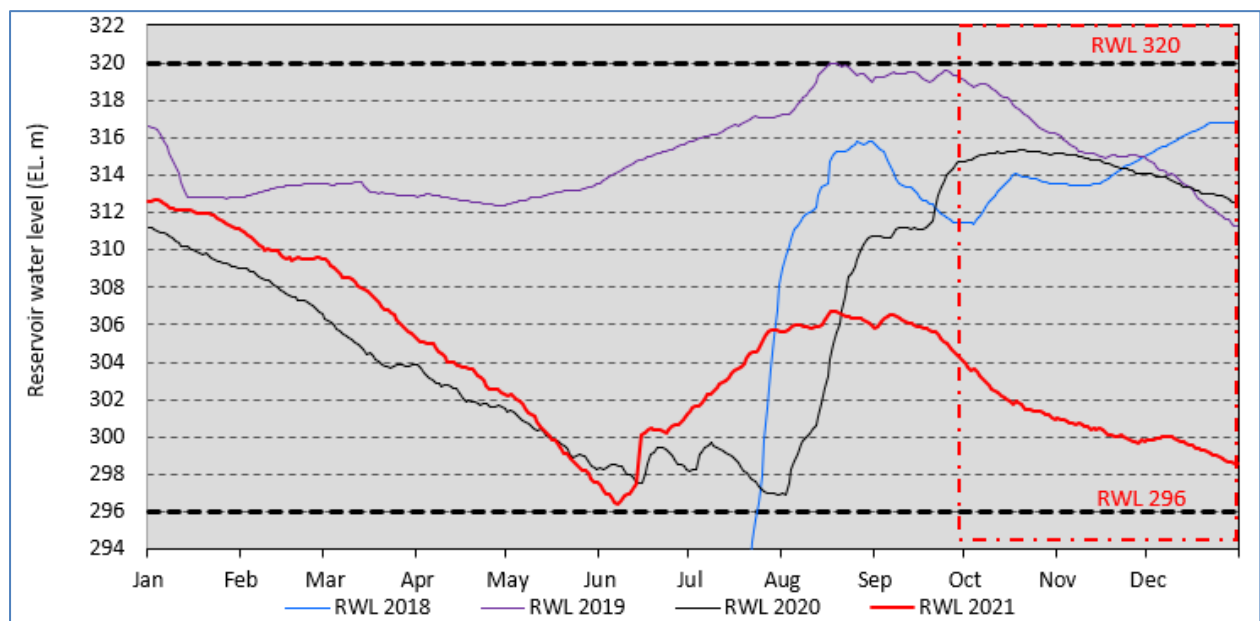
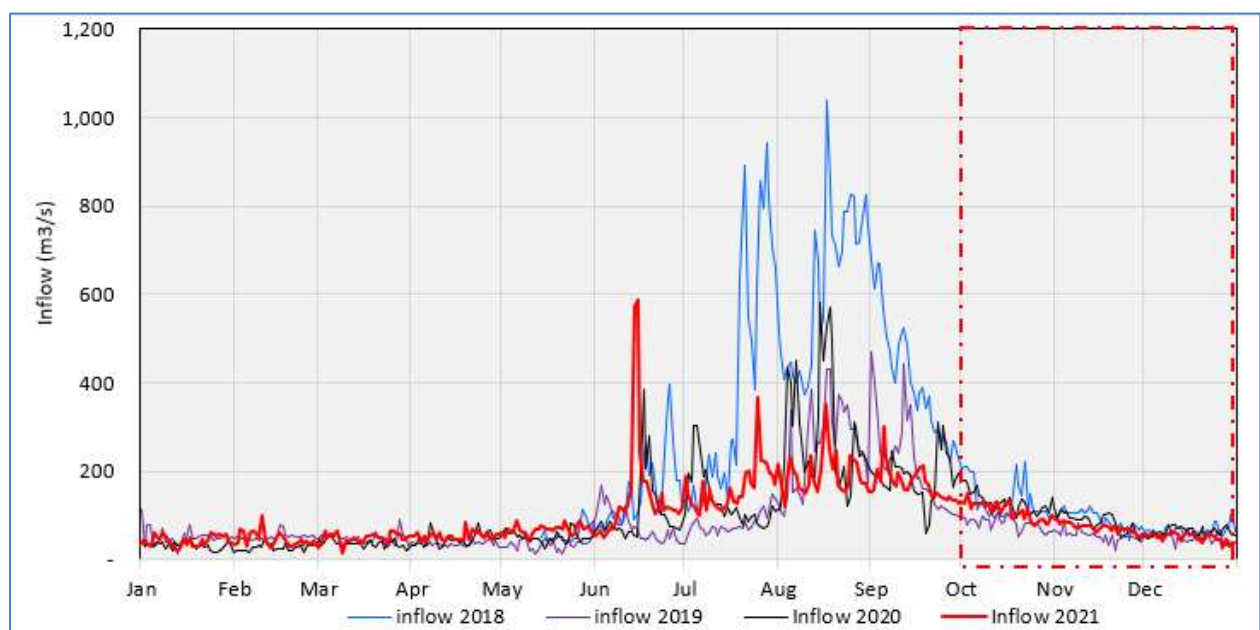
3.6 RESERVOIR OPERATIONS

3.6.1 Main Reservoir

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir since May 2019 are displayed in the graph in **Figure 3-4** and **Figure 3-5**.

During Q4 2021, the mean daily inflow to the main reservoir was 77 m³/s. The minimum daily inflow was 26 m³/s, maximum daily inflow was recorded at 152 m³/s, and 25th percentile of 56 m³/s and 75th percentile of 93 m³/s. **Figure 3-5** clearly shows that the inflow in 2021 was significantly lower than the two previous years.

The water level in the main reservoir decreased with 5.32 m from El. 303.88 m asl. on 01 October 2021 to El. 298.56 m asl. on 31 December 2021.

FIGURE 3-4: WATER LEVEL OF THE MAIN RESERVOIR**FIGURE 3-5: INFLOW TO THE MAIN RESERVOIR**

3.6.2 Environmental Flow Requirements (EFRs) for the Operation Phase

NNP1PC has monitored compliance with the Environmental Flow Requirements (EFRs) stipulated in the CA, Annex C, Clause 53 (g) and as further modified in the Environmental Flow Assessment

Report of July 2014 approved by MONRE². The EFRs have been monitored in accordance with the monitoring programme outlined in the ESMMP-OP 2019 (Vol. II, Part 2 on Subplan 1 on Reservoir and River Health Management).

The results of the EFR compliance monitoring during Q4 2021 are summarized in **Table 3-8**.

TABLE 3-8: SUMMARY OF EFRS COMPLIANCE MONITORING IN Q4 2021

No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
1	Min flow 27 m ³ /s at all times	100% of observations comply
2	Thalweg water depth at least 0.5 m in the entire reach from immediately downstream of the Re-regulation dam until 4.3 km downstream the dam (measured at cross-sections where visual observations or boat navigation indicate shallow waters)	Three measurement points located within 4.3 km from the re-regulation dam did not comply during two missions with dam discharge less than 30 m ³ /s
3	Maximum rate of change (both rise and fall, separately) in stage of 0.6 m per hour	100% of hourly fluctuations comply
4	Maximum fluctuation in stage of 1.7 m over 24-hour (this requirement is about range and determines the maximum difference in stage height over 24-hour periods)	100% of 24-hour fluctuations comply
5	Maximum fluctuation in stage of 1.7 m over 7-days (this requirement is about range and determines the maximum difference in stage height over 7-day periods)	All 7-day fluctuations comply

3.6.2.1 Minimum Flow Requirements

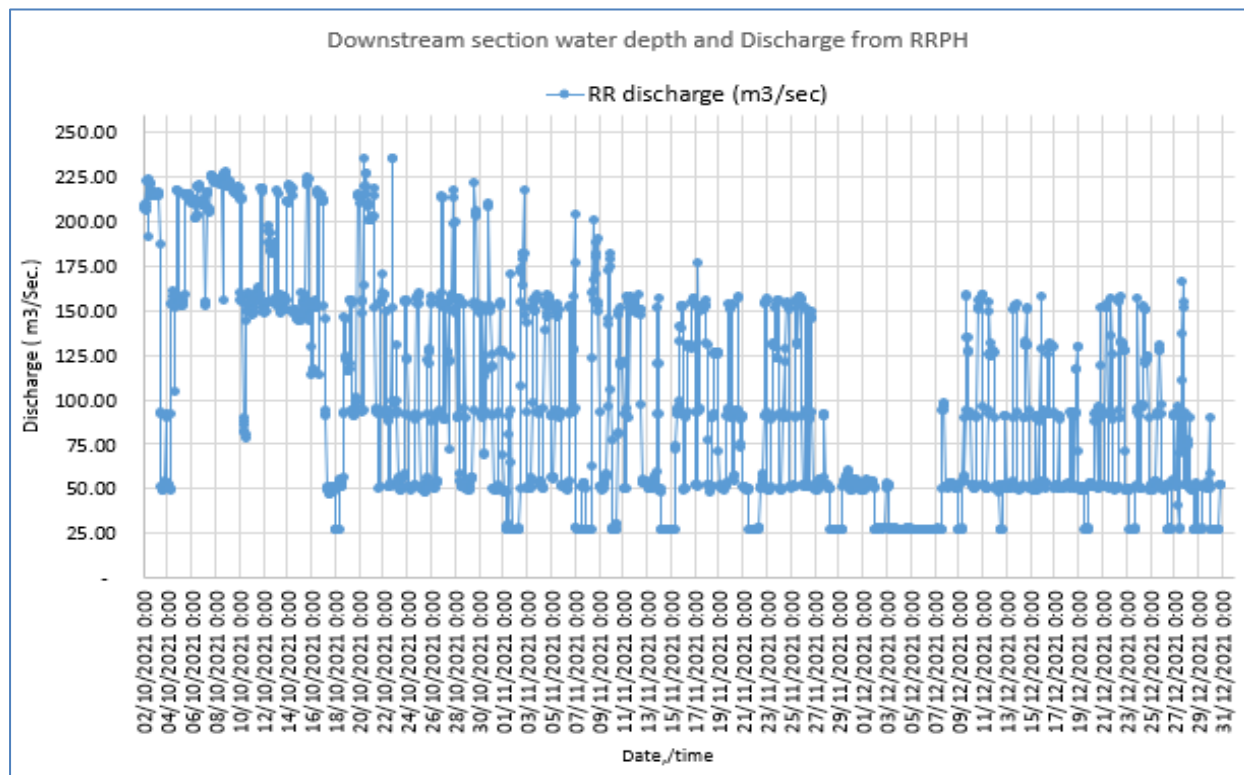
The discharge monitoring data for the re-regulation dam during Q4 2021 indicates that the minimum flow requirement of 27 m³/s has been met at all times. The Re-regulation Dam discharge graph can be found in **Figure 3-6**.

During Q4 2021, the mean discharge from the re-regulation dam was about 146 m³/s in October 2021 and about 83 m³/s and 61 m³/s in November and December 2021 respectively.

² The modifications include: (i) Revision of the absolute minimum discharge from the re-regulation dam during the operational phase of the project from 5.5 m³/s to 27 m³/s; and (ii) determining that during the operational phase of the project, the thalweg depth shall be at least 0.5 m downstream of the re-regulation pond until 4.3 km

The changes in the discharge from the re-regulation dam were informed in advance to the RMU and to the heads of the downstream villages, who then announced the changes to the communities over the village speaker systems. There were no complaints related to the flow discharges or fluctuation levels downstream the Re-regulation dam during the reporting period.

FIGURE 3-6: DISCHARGE FROM THE RE-REGULATION DAM DURING Q4 2021



3.6.2.2 Minimum Water Depth

Since 18 July 2018, NNP1PC has carried out weekly monitoring of river depths at 19 locations downstream the re-regulation dam as shown on **Figure 3-7**. These locations represent cross-sections with possible shallow water depths at low discharge rates.

The monitoring is undertaken to confirm compliance with the water depth requirements in the Concession Agreement, Annex C, and the approved Environmental Flow Assessment (at least 0.5 m measured downstream the re-regulation dam until 4.3 km from the dam).

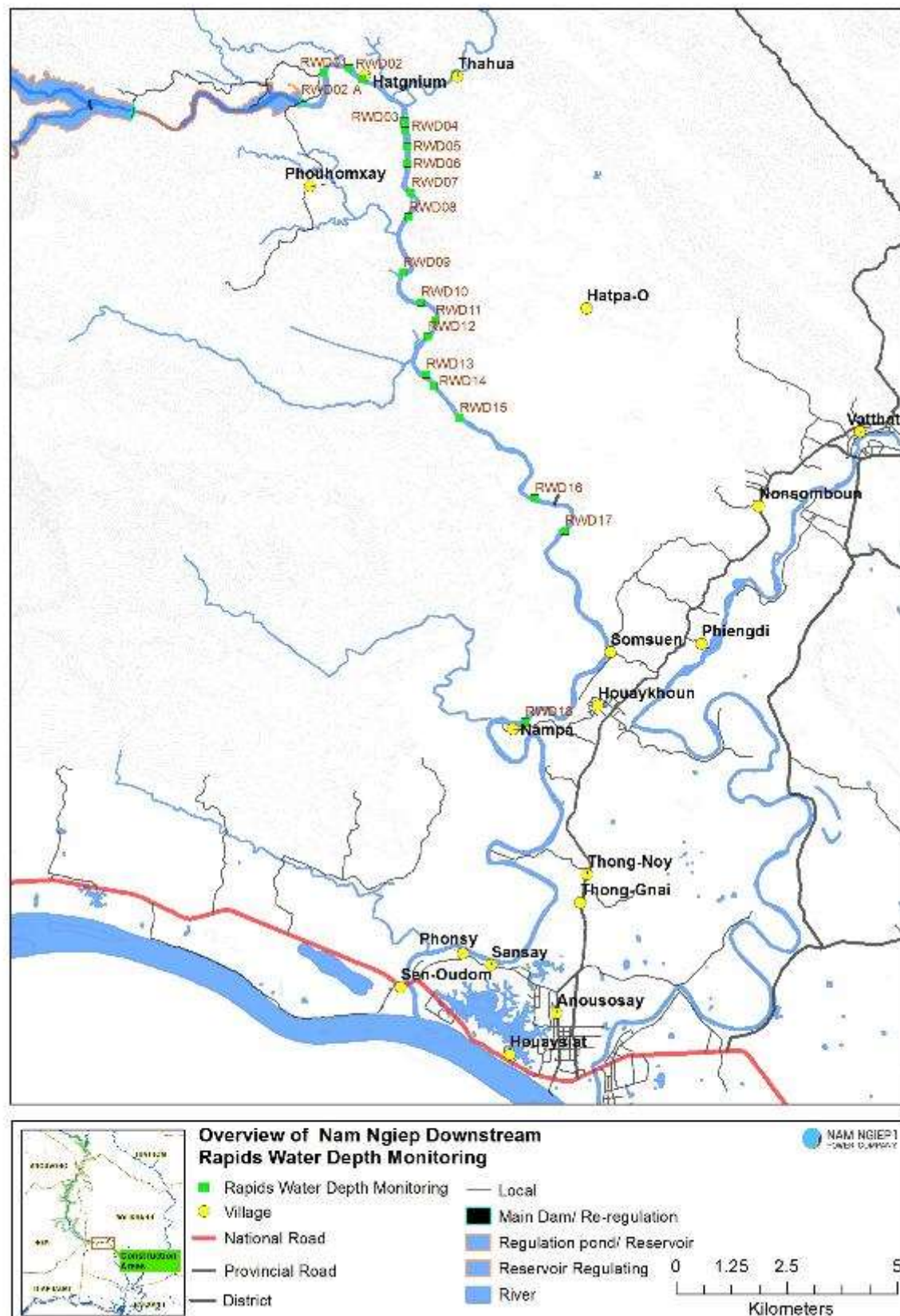
Starting in December 2020, the water depths were measured across the river channel where visual observations or boat navigation indicate shallow waters to ensure that the measurements represent the river thalweg.

The results of the monitoring are presented in **Table 3-9**. During two monitoring missions in Q4 2021, three measuring points located within 4.3 km downstream of the re-regulation dam and one measuring point 5.7 km from the dam had depths less than 0.5 m but none of them were found to be difficult to navigate. These two missions were carried out during times when the Re-regulation Dam discharge was less than 30 m³/s. All other missions were carried out during times with discharge above 30 m³/s. There were no complaints related to the water depth less than 0.5 m downstream the Re-regulation dam during the reporting period.

TABLE 3-9: RIVER DEPTH MEASUREMENTS IN NAM NGIEP DOWNSTREAM THE RE-REGULATION DAM

Station ID		RWD 01	RWD 02	RWD 02.a	RWD 03	RWD 04	RWD 05	RWD 06	RWD 07	RWD 08	RWD 09	RWD 10	RWD 11	RWD 12	RWD 13	RWD 14	RWD 15	RWD 16	RWD 17	RWD 18
Distance from Re-regulation Dam (km)		1.55	2.43	2.97	4.9	5.2	5.66	6.16	7.13	8.01	9.97	11.31	12.08	12.62	14.1	14.49	15.77	19.76	21.58	30.09
Date	Discharge (m ³ /s)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)
4-Nov-21	50	0.75	0.65	0.76	0.83	0.86	0.5	0.84	0.88	0.98	0.85	0.89	1.1	0.96	1.26	1.37	1.54	1.6	1.79	1.3
14-Nov-21	27.4	0.47	0.4	0.48	0.55	0.6	0.32	0.62	0.64	0.74	0.6	0.63	0.73	0.64	0.82	0.97	1.17	1.22	1.32	0.92
17-Nov-21	117.45	1.15	1.09	1.16	1.23	1.28	1	1.3	1.32	1.38	1.25	1.28	1.4	1.3	1.42	1.55	1.75	1.8	1.84	1.42
24-Nov-21	90.5	1.1	1.04	1.1	1.17	1.22	0.95	1.24	1.25	1.3	1.17	1.2	1.31	1.21	1.3	1.42	1.62	1.68	1.71	1.3
30-Nov-21	53.4	0.77	0.67	0.78	0.85	0.88	0.52	0.86	0.9	1	0.89	0.95	1.15	1.1	1.2	1.33	1.51	1.76	1.62	1.14
7-Dec-21	28	0.45	0.38	0.46	0.53	0.58	0.3	0.6	0.61	0.7	0.56	0.58	0.67	0.59	0.76	0.88	0.97	1	1.05	0.7
15-Dec-21	50	0.77	0.7	0.78	0.85	0.9	0.63	0.95	0.96	1.05	1	1.02	1.11	1.07	1.24	1.36	1.46	1.5	1.55	1.1

FIGURE 3-7: LOCATION MAP OF RIVER DEPTH MONITORING POINTS



3.6.2.3 Stage Height Fluctuations

The requirements on stage height fluctuations constitute a rise or a fall in water elevation and include two aspects:

1. A requirement on the rate of change which is set at 0.6 m per hour.
2. Requirements on the range in fluctuations over 24-hour periods and 7-day periods respectively, which is set at a maximum of 1.7 m for both periods. In other words, the range requirements determine the maximum difference in stage height over 24-hour periods and 7-day periods respectively.

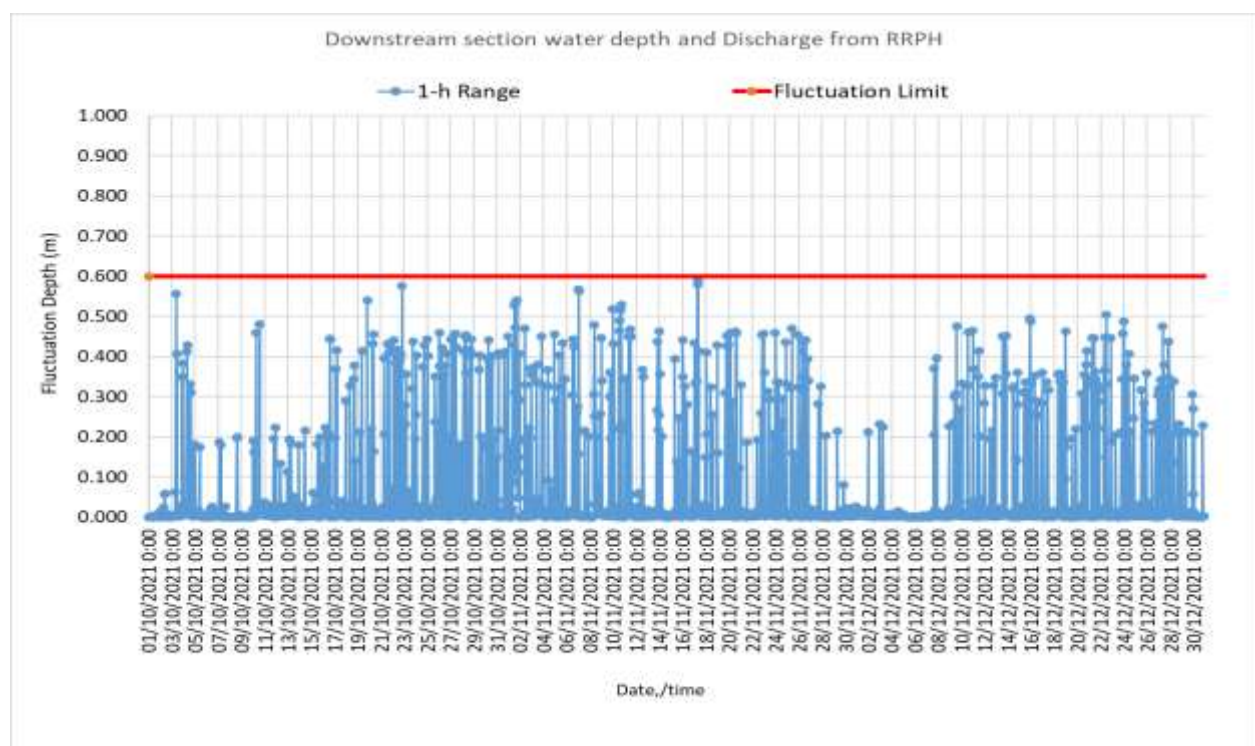
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

Compliance with the 24-hour maximum fluctuation EFR is determined by calculating the difference between the maximum and the minimum stage height over each 24-hour period. In the same way, the 7-day maximum fluctuation EFR, is determined by calculating the difference between the maximum and the minimum stage height over each 7-day period. There is no compulsion for the Company to meet the stage height fluctuation EFRs after a high flow event passes over the Re-regulation dam spillway.

In practice, meeting stage height fluctuation EFRs are managed through controlling the rate of change in discharge from the re-regulation dam/powerhouse. This is done using established rating relationships between stage height and discharge, as set out in the Re-regulation dam operation manual. These relationships are regularly checked and revised as necessary, as they would change whenever the channel morphology changes due to significant erosion or deposition.

During Q4 2021, the maximum rate of change of 0.6 m over 1-hour was complied with for 100% of the hourly fluctuations. The results are presented in **Figure 3-8**.

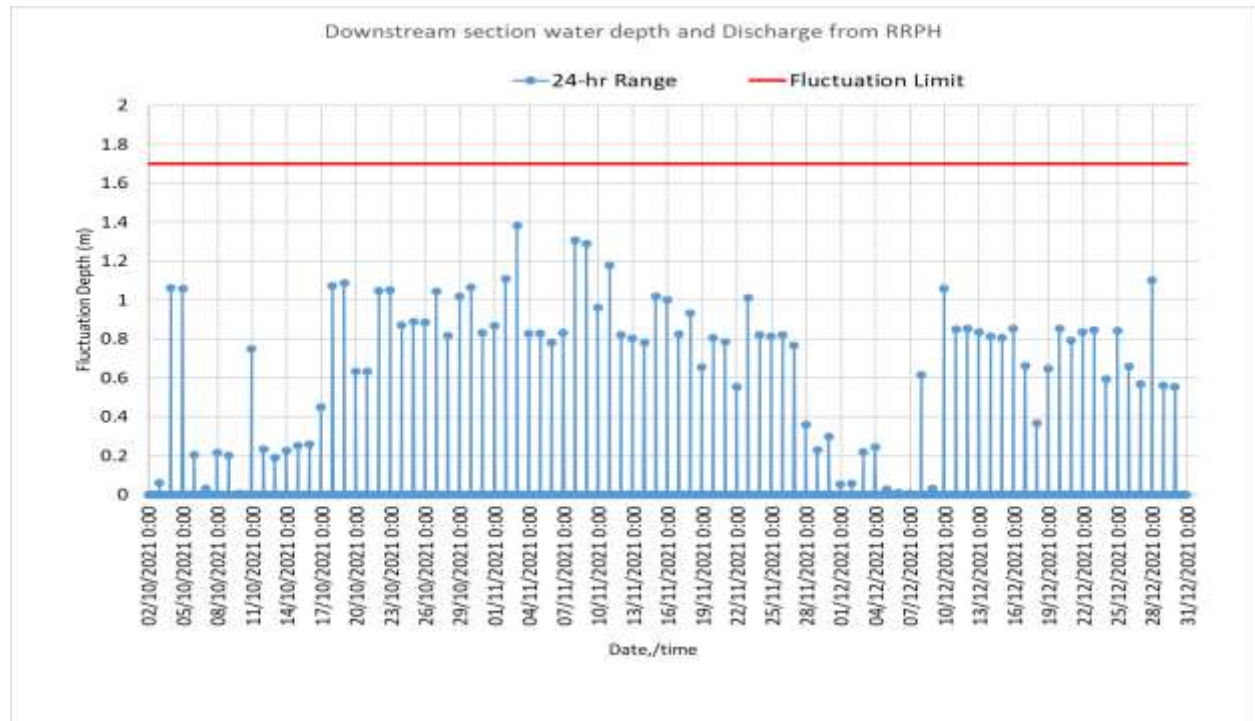
FIGURE 3-8: HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q4 2021



During Q4 2021, the maximum range in stage of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:00).

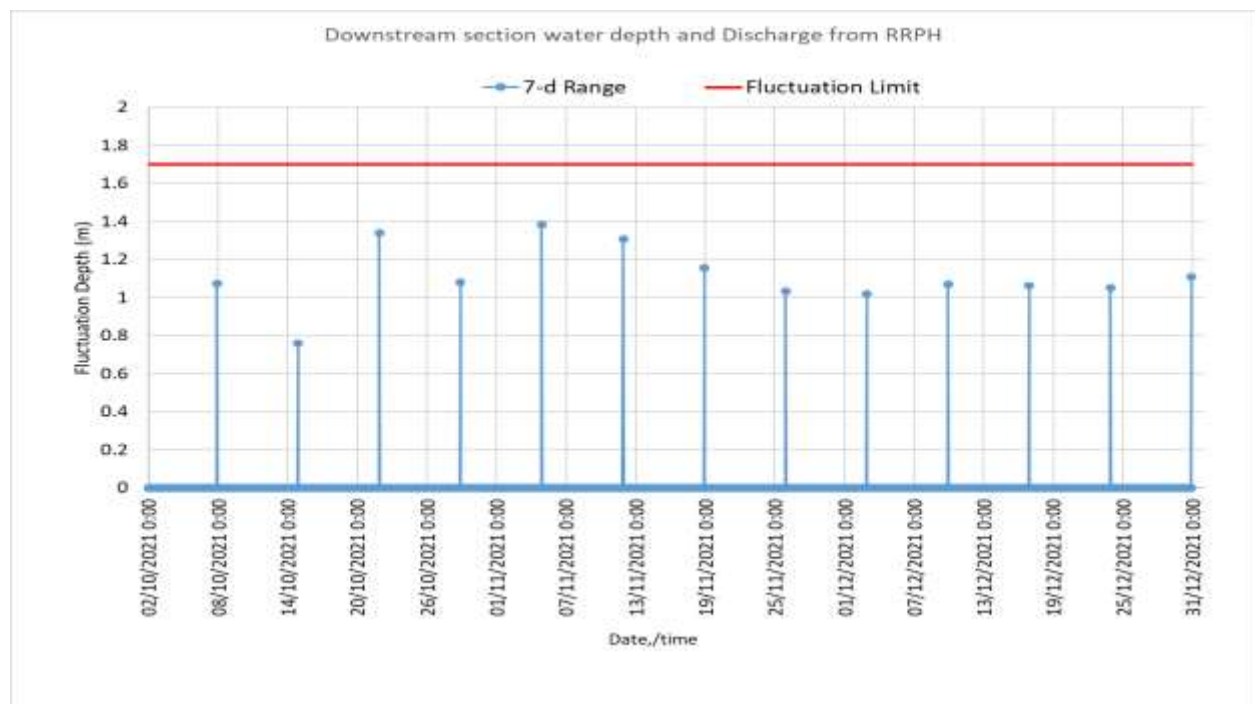
The results of the monitoring are presented in **Figure 3-9**.

FIGURE 3-9: 24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q4 2021



During Q4 2021, the maximum range in stage of 1.7 m over 7-days was complied with for all 7-day periods. The results are presented in **Figure 3-10**.

FIGURE 3-10: 7-DAY STAGE HEIGHT DIFFERENCE (M) DURING Q4 2021



3.7 WATER QUALITY MONITORING

Descriptions of each monitoring station, water quality monitoring parameters, and the location of the monitoring stations can be found in **Appendix 3** and all surface water quality data for Q4 2021 are listed in **Appendix 5.1**.

3.7.1 Dissolved Oxygen

Main Reservoir

The full set of dissolved oxygen (DO) data are shown in **Table 3-10**. Due to security concerns in the area, water quality monitoring was suspended in the upper reservoir (R01, R02 and R03) during Q4 2021.

Figure 3-15 presents the DO and water temperature depth profiles in the Main Reservoir (R04 and R05) from September 2018 to December 2021. The graphs clearly show seasonal variations in water temperatures and a deepening of the thermocline during periods with cooler water leading to a corresponding deepening of the oxycline.

The depth profile monitoring during Q4 2021 indicates formation of oxyclines in the main reservoir at the monitored stations at varying depths. At R05 (which is the station in the main reservoir of most relevance to the downstream water quality), the thermocline gradually deepened from depths of about 10 m - 15 m in October and November 2021 to depths of 20 m - 26 m in December 2021. The oxycline followed a similar pattern, however, in December 2021, the DO levels show a notable equalization over the epilimnion. The deepening of the thermocline combined with the lowering of the reservoir water table resulted in increasing DO concentrations at the level of the intake - from concentrations of 1.4 - 2.7 mg/L in October/November 2021 to about 4.5 mg/L in December 2021. When comparing the R05 profiles for Q4 2021 with the profiles for Q4 2020, a similar pattern emerges (see **Figure 3-14**).

Anoxic levels were deepened from 34 m in October 2021 to 32 m in December 2021 corresponding to 7 m below the centre line of the intake in early October 2021 to 9 m below the centre line by mid-December 2021.

Re-regulation Reservoir (R6 and R7)

There is no indication of a thermocline at R06 and R07 in the re-regulation reservoir, because the re-regulation reservoir behaves more like a river than a lake.

The DO concentrations at R06 gradually increased over the course of the quarter from a monthly average over the entire water column of 4.1 mg/L in October, 3.8 mg/L in November to 4.8 mg/L in December 2021. A similar pattern was found at R07. This corresponds well with the increase in DO concentrations at the intake level in the main reservoir although the DO concentrations in R06 and R07 were slightly higher than the corresponding DO concentrations at or near the intake level in R05. However, it should be noted that the actual flow patterns and movements of water from R05 to the intake is not known and is likely rather complex with circulation patterns or other complex water movements near the intake, which adds uncertainties to correlating water quality data at or near the intake depth at R05 in the main reservoir with water quality data in the Re-regulation Reservoir.

Nam Ngiep Upstream and Tributaries

No measurement due lockdown in the area according to the GOL COVID-19 prevention measures applied during the Quarter.

Downstream Stations

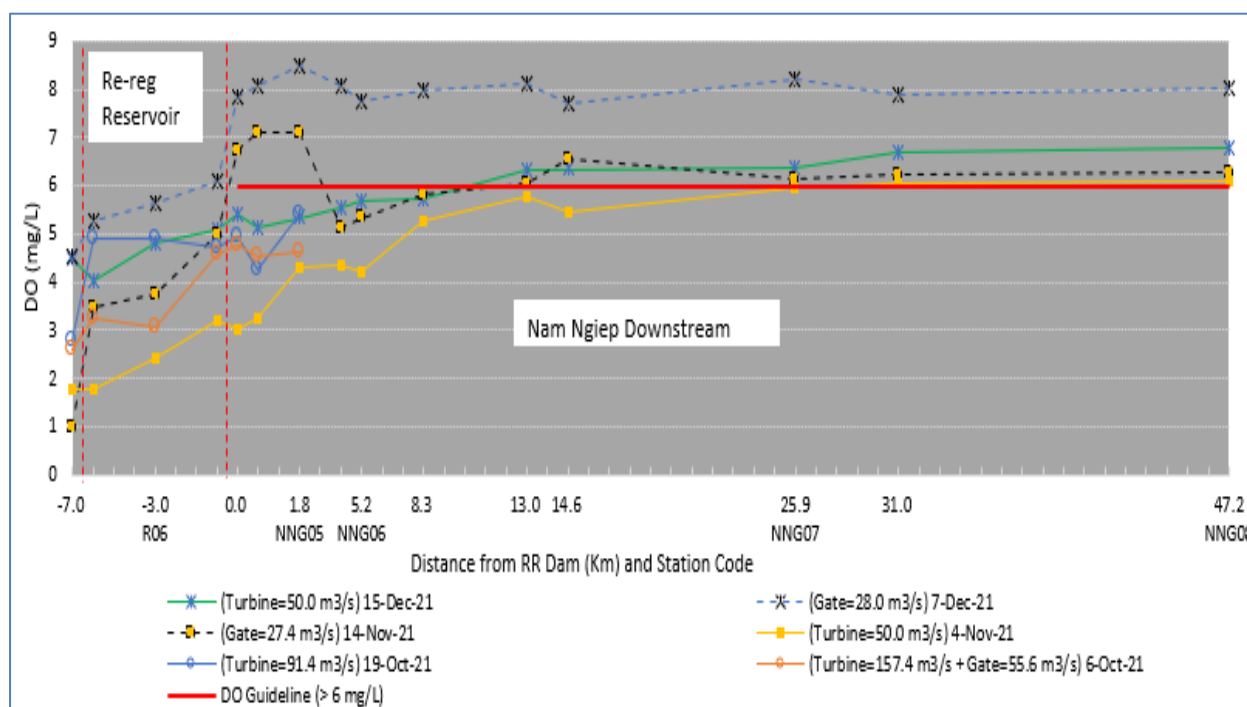
During Q4 2021, the discharge from the Re-regulation Dam mainly went through the turbine and occasionally through the gate (on 14 November and 07 December 2021) or a combination of gate and turbine (06 October 2021).

Selected timeseries of DO long profile measurements in Q4 2021 are presented in **Figure 3-11**. The graphs indicate that during gate discharge, the downstream DO levels were above 6 mg/L (the National Surface Water Quality Standard) due to the aeration generated by the turbulence at the gate. During periods only with turbine discharge, the DO concentrations at NNG05, about 1.8 km from the re-regulation dam, varied between 4.1 mg/L and 5.9 mg/L with an increasing tendency over the period. During periods with combined turbine and gate discharge, the DO concentration was 4.6 mg/L.

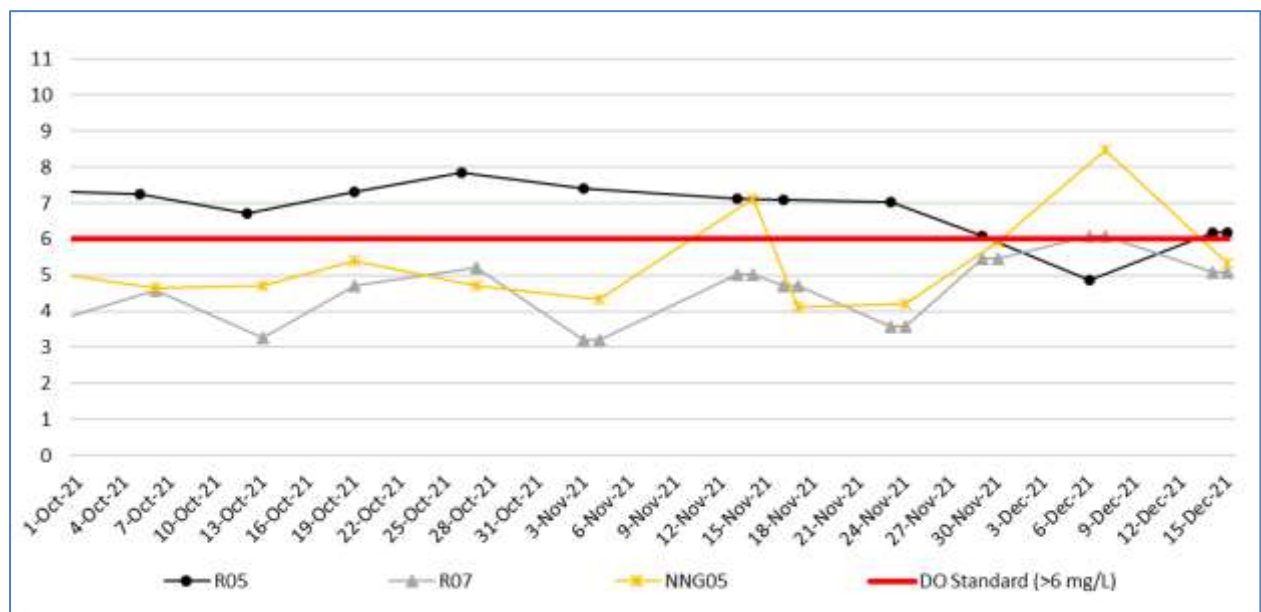
Further downstream from the dam, the DO concentrations generally increased reaching about 6.8 mg/L at NNG07 located 25 km from the dam (not considering measurements during periods only with gate discharge).

No dead fish was observed in Nam Ngiep downstream during Q4 2021.

FIGURE 3-11: DISSOLVED OXYGEN LONG PROFILE MEASUREMENT FROM THE RE-REGULATION RESERVOIR TO THE CONFLUENCE WITH THE MEKONG RIVER



The results of DO measurements for station R05, R07 and NNG05 are compared in **Figure 3-12**. For R05 (located in the main reservoir approximately 500 m upstream of the main dam) the DO measurements are shown for the surface level and for the level of the intake (276 m asl.). For R07 (in the re-regulation reservoir), the DO measurements represent the surface level.

FIGURE 3-12: DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM

NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

FIGURE 3-13: MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q4 2021

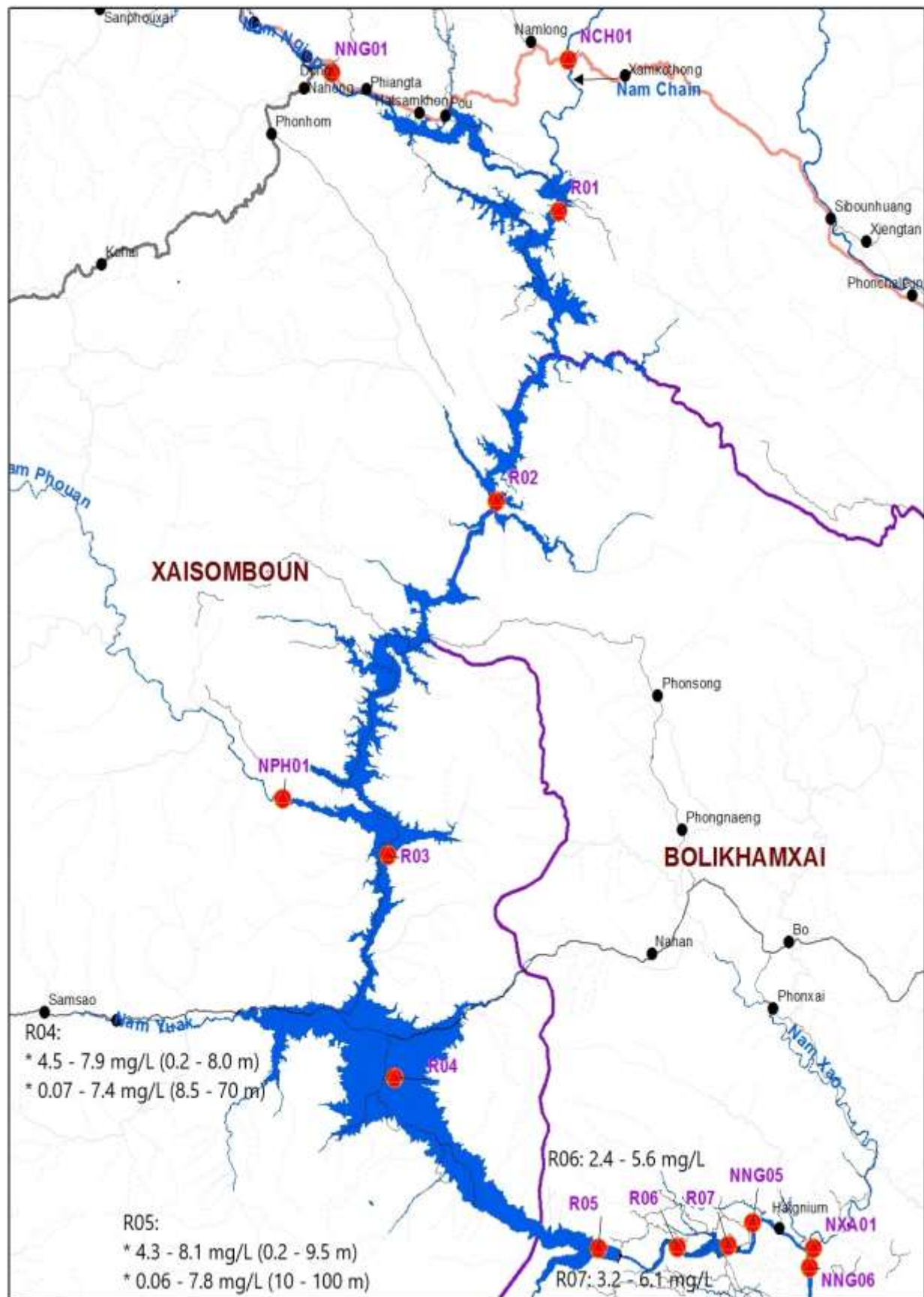


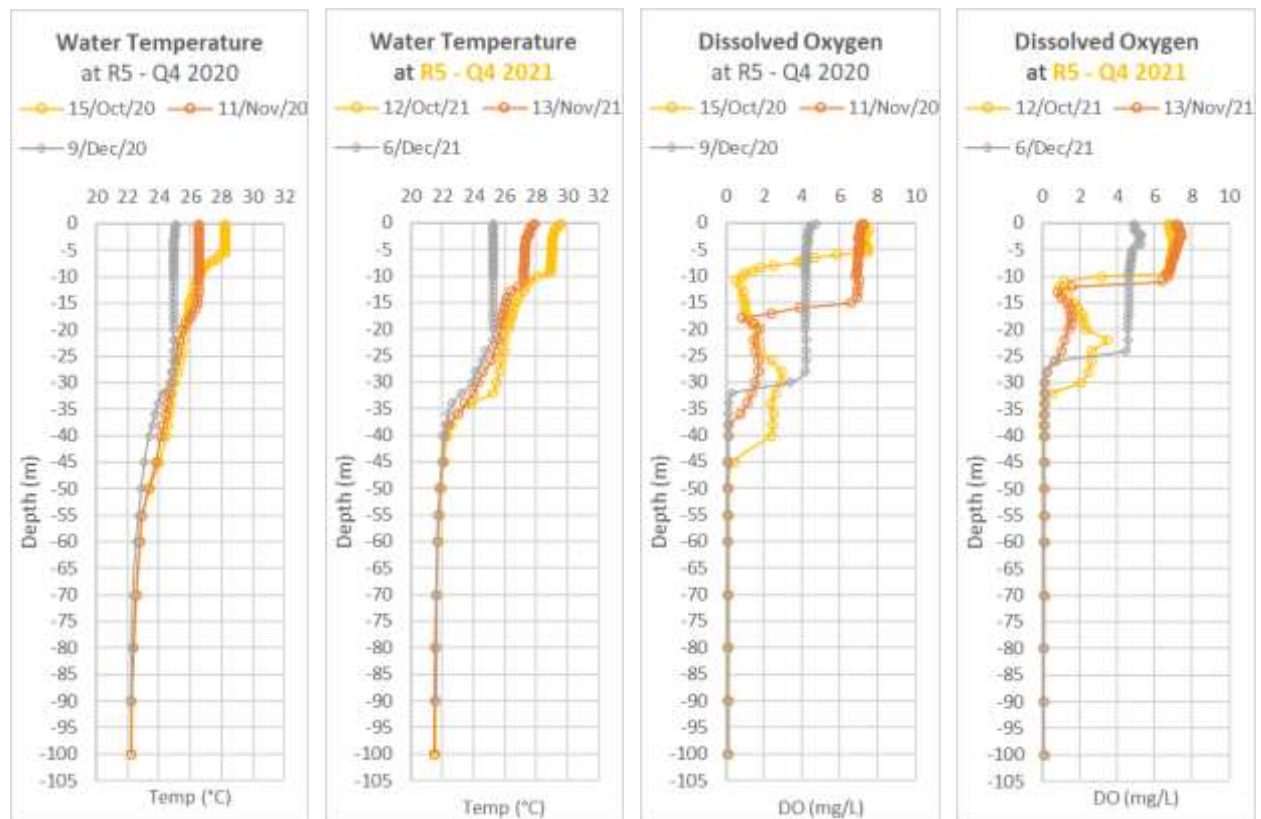
FIGURE 3-14: WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)

FIGURE 3-15: WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – DECEMBER 2021

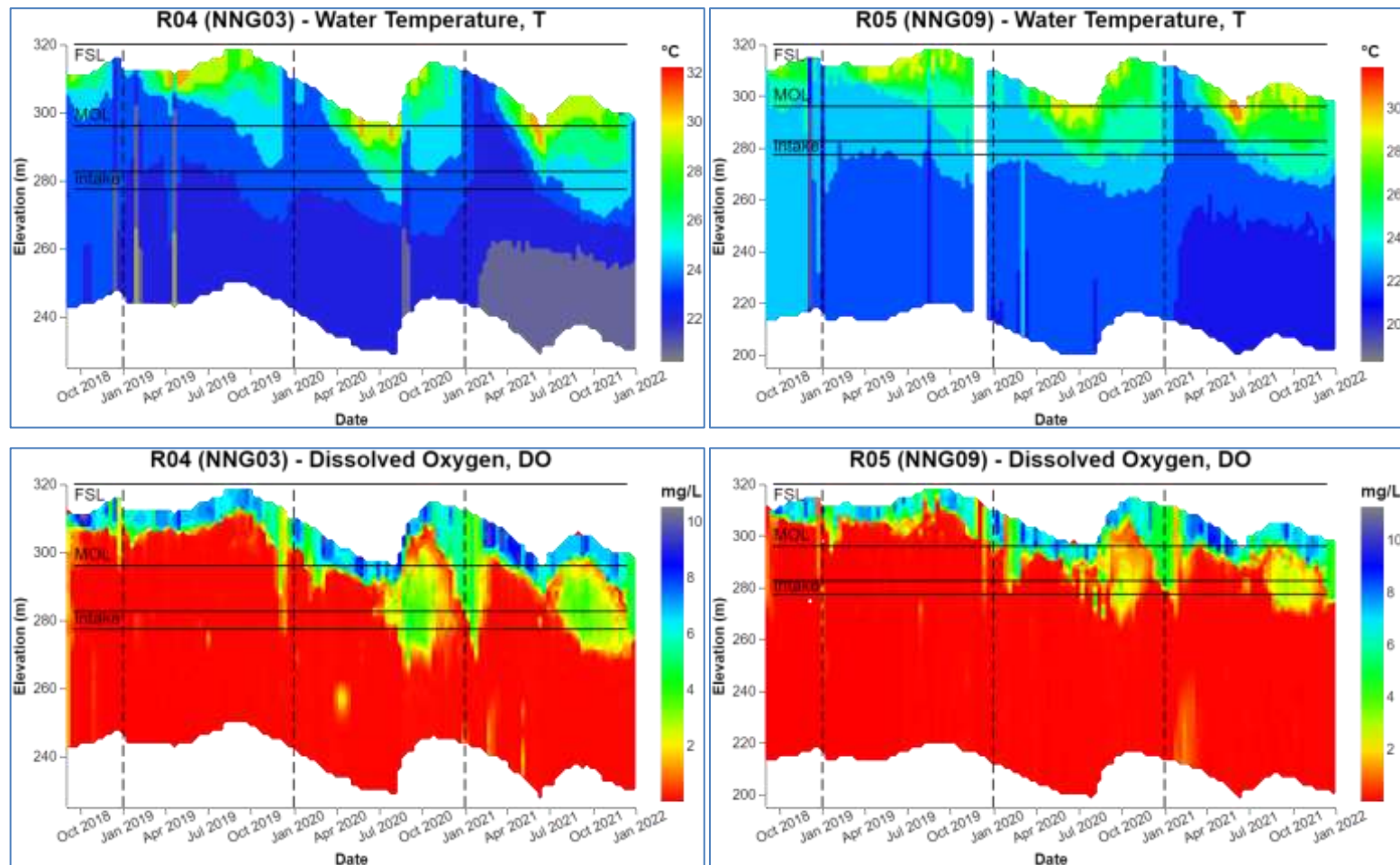


TABLE 3-10: DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q4 2021**(NATIONAL SURFACE WATER QUALITY STANDARD FOR DISSOLVED OXYGEN: ≥ 6 MG/L)**

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
5-Oct-21					6.75	7.26										
6-Oct-21							3.07	4.58	4.63							
12-Oct-21					6.73	6.71										
13-Oct-21							3.87	3.27	4.71							
19-Oct-21					6.69	7.32	4.92	4.7	5.41							
26-Oct-21					7.19	7.84										
27-Oct-21							4.88	5.2	4.72							
3-Nov-21					7.35	7.4	2.41	3.21								
4-Nov-21									4.32	4.21	5.98	6.1			6.12	6.65
13-Nov-21					6.82	7.14	3.77	5.01								
14-Nov-21									7.13	5.34	6.15	6.26			6.48	7.2
16-Nov-21					6.32	7.1	3.69	4.71								
17-Nov-21									4.11	4.98	5.68	6.25			6.1	6.03
23-Nov-21					6.67	7.04	3.12	3.57								
24-Nov-21									4.21	4.77	5.75	6.13			6.28	6.64
29-Nov-21					6.4	6.1	5.54	5.47								
30-Nov-21									5.94	5.96	6.82	6.86			6.99	7.49
6-Dec-21					4.79	4.85	5.66	6.1								
7-Dec-21									8.47	7.77	8.22	8.02			8.72	8.16
14-Dec-21					5.57	6.17	4.8	5.1								
15-Dec-21									5.34	5.7	6.37	6.8			7.19	6.87

Ammonia Nitrogen

In Q4 2021, at the surface level in R04 and R05, ammonia nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L), except for samples taken in November 2021. The concentrations of ammonia nitrogen at the bottom of the reservoir in R04 and R05 were higher at about 0.5 mg/L thus exceeding the standard. The source of ammonia nitrogen is likely breakdown of organic matter. Under anoxic conditions in the bottom of the reservoir, nitrification (the oxidation of ammonia) is inhibited which may explain the presence of ammonia nitrogen in the bottom samples.

Ammonia nitrogen includes both the ionized form (ammonium, NH_4^+) and the unionized form (ammonia, NH_3). An increase in pH favours formation of the more toxic unionized form (NH_3), while a decrease favours the ionized (NH_4^+) form. An increase in temperature also favours the more toxic form³. The Lao standard for ammonia nitrogen does not differentiate between different levels of pH and temperature, however, when comparing with the Canadian water quality guidelines, which provide a range of guideline values over various pHs and temperatures, and considering a pH of about 7 (decreasing with depth) and temperatures between 25 and 29 °C at the stations during the period, a guideline value of 2.39 mg/L total ammonia nitrogen would be applicable⁴.

TABLE 3-11: AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q4 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR AMMONIA NITROGEN: <0.2 MG/L)

Station Code	NNG 01	R0 1	R0 2	R0 3	R04	R05	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
19-Oct-21					<0.2	<0.2										
19-Oct-21 Bottom					0.56	0.21										
13-Nov-21					0.4	0.3										
13-Nov-21 Bottom					0.52	<0.2										
6-Dec-21					<0.2	<0.2										
6-Dec-21 Bottom					0.4	<0.2										

Biochemical Oxygen Demand (BOD₅)

Since 2014, the Biochemical Oxygen Demand (BOD₅) values in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L) with some measurements exceeding the National Surface Water Quality Standard (< 1.5 mg/L). The results for Q4 2021 indicate that the BOD₅ levels are in compliance with the standard. In addition, NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration

³ <https://www.epa.gov/caddis-vol2/ammonia>, accessed on 26 March 2022

⁴ Canadian Council of Ministers of the Environment. 2010. Canadian water quality guidelines for the protection of aquatic life: Ammonia. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg

measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

TABLE 3-12: *BOD₅* (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q4 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR *BOD₅*: <1.5 MG/L)

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
19-Oct-21					<1	<1	<1	<1	<1							
19-Oct-21 Bottom					<1	2.5										
13-Nov-21					<1	<1	<1	<1								
13-Nov-21 Bottom					<1	<1										
14-Nov-21									<1	<1	<1	<1			<1	<1
6-Dec-21					<1	<1	<1	<1								
6-Dec-21 Bottom					<1	<1										
7-Dec-21									<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)

The COD measurements in Q4 2021 are presented in **Table 3-13**.

TABLE 3-13: *COD* (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q4 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR *COD*: < 5 MG/L)

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
19-Oct-21							<5	6.4	<5							
13-Nov-21							6.4	12.9								
14-Nov-21									<5	<5	12.4	6.4			9.6	16.1
6-Dec-21							<5	<5								
7-Dec-21									<5	<5	<5	<5			<5	<5

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q4 2021 are presented in **Table 3-14**.

Faecal coliform complied with the standard in all stations during the Q4 2021.

TABLE 3-14: *FAECAL COLIFORMS* (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q4 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <1,000 MPN/100 ML)

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
19-Oct-21					0	0	5	14	14							
19-Oct-21 Bottom					0	0										
13-Nov-21					0	0	0	0								
13-Nov-21 Bottom					0	0										
14-Nov-21									8	17	79	110			31	170
6-Dec-21					0	0	0	0								
6-Dec-21 Bottom					0	0										
7-Dec-21									0	9	8	33			130	33

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 3-15**. The results indicate a similar pattern and same tendency as for faecal coliform bacteria. There were no exceedances of the National Surface Water Quality Standard (<5,000 MPN/100 mL) for total coliform bacteria.

TABLE 3-15: TOTAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q4 2021
(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <5,000 MPN/100 ML)

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
19-Oct-21					0	5	220	140	110							
19-Oct-21 Bottom					0	7.8										
13-Nov-21					0	0	2	2								
13-Nov-21 Bottom					0	0										
14-Nov-21									130	350	350	540			1,600	1,600
6-Dec-21					0	0	2	2								
6-Dec-21 Bottom					0	0										
7-Dec-21									7	17	79	220			240	350

3.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q4 2021, including 02 camps (OSOV1 and OSOV2) and at the Wastewater Treatment System of the Main Powerhouse. The effluent monitoring location sites are indicated in **Figure 3-16**.

The results are described in **Table 3-16** and the full data set is in **Appendix 5.2**.

The status of compliance as of 31 December 2021 can be summarized as follows:

- Non-compliance with Ammonia-Nitrogen, Total Nitrogen, Total Phosphorus for Wastewater Treatment Systems in Main Powerhouse (EF19) and OSOV2 Camp (EF13);
- Non-compliance with Faecal Coliform and Total Coliform at OSOV1 (EF01).

FIGURE 3-16: LOCATION OF EFFLUENT MONITORING POINTS

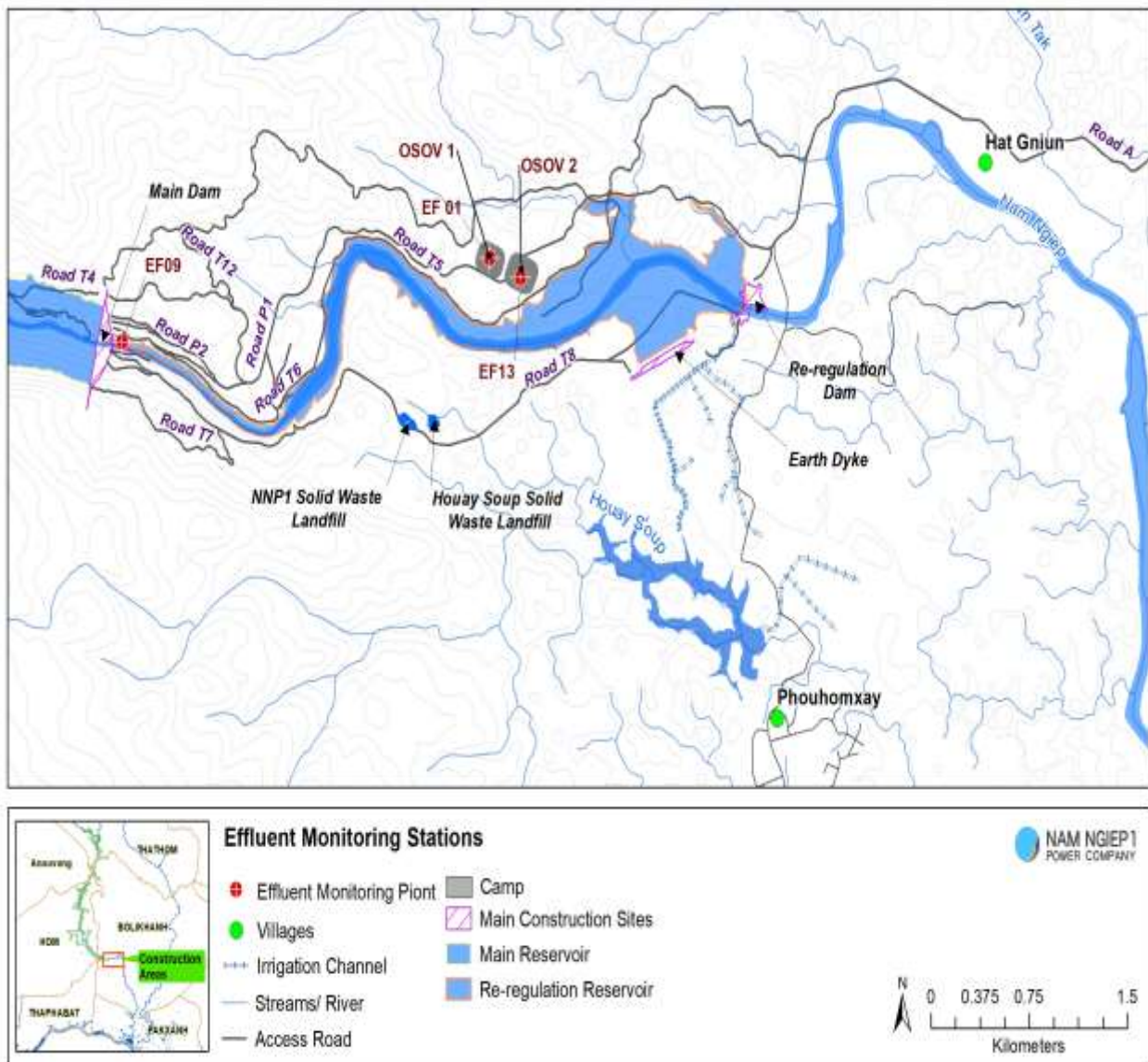


TABLE 3-16: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q4 2021 (NON-COMPLIANCE PARAMETERS ONLY)

		Site Name	OSO V1	OSO V 2 (ESD Camp)	Main Powerhouse
Date	Parameter (Unit)	Guideline in the CA	EF01	EF13	EF19
15/Oct/21	NH ₃ -N (mg/L)	<10.0	4.3	20.3	8.3
25/Oct/21	NH ₃ -N (mg/L)	<10.0	4.8	17.2	6.1
05/Nov/21	NH ₃ -N (mg/L)	<10.0	5.7	23.1	<2
11/Nov/21	NH ₃ -N (mg/L)	<10.0	<2	26.1	14.7
18/Nov/21	NH ₃ -N (mg/L)	<10.0	5.4	24.6	<2
22/Nov/21	NH ₃ -N (mg/L)	<10.0	6.3	27.4	5.2
03/Dec/21	NH ₃ -N (mg/L)	<10.0	6.2	19.5	11.4
09/Dec/21	NH ₃ -N (mg/L)	<10.0	6.3	20.5	<2
13/Dec/21	NH ₃ -N (mg/L)	<10.0	3.8	21.1	<2
15/Oct/21	Total Nitrogen (mg/L)	<10.0	5.13	22.1	9.72
25/Oct/21	Total Nitrogen (mg/L)	<10.0	5.37	18.1	6.32
05/Nov/21	Total Nitrogen (mg/L)	<10.0	6.22	24.3	4.67
11/Nov/21	Total Nitrogen (mg/L)	<10.0	4.12	30.5	17.3
18/Nov/21	Total Nitrogen (mg/L)	<10.0	12.9	25.1	5.9
22/Nov/21	Total Nitrogen (mg/L)	<10.0	9.41	28.7	10.8
03/Dec/21	Total Nitrogen (mg/L)	<10.0	13.5	29.6	12.2
09/Dec/21	Total Nitrogen (mg/L)	<10.0	7.84	22.9	1.59
13/Dec/21	Total Nitrogen (mg/L)	<10.0	4.34	23.8	1.69
15/Oct/21	Total Phosphorus (mg/L)	<2	0.82	1.51	4.46
25/Oct/21	Total Phosphorus (mg/L)	<2	0.47	1.5	4.49
05/Nov/21	Total Phosphorus (mg/L)	<2	0.64	2.03	2.72
11/Nov/21	Total Phosphorus (mg/L)	<2	1.03	1.89	6.79
18/Nov/21	Total Phosphorus (mg/L)	<2	0.84	1.72	1.9
22/Nov/21	Total Phosphorus (mg/L)	<2	0.87	2.87	8
03/Dec/21	Total Phosphorus (mg/L)	<2	0.87	1.7	4.11
09/Dec/21	Total Phosphorus (mg/L)	<2	1.04	1.15	7.26
13/Dec/21	Total Phosphorus (mg/L)	<2	1.14	1.68	7.29
15/Oct/21	Faecal Coliform (MPN/100 mL)	<400	220	4.5	0
25/Oct/21	Faecal Coliform (MPN/100 mL)	<400	1,600	220	0
05/Nov/21	Faecal Coliform (MPN/100 mL)	<400	540	79	0
11/Nov/21	Faecal Coliform (MPN/100 mL)	<400	5,400	1,600	17
18/Nov/21	Faecal Coliform (MPN/100 mL)	<400	1,600	0	0
22/Nov/21	Faecal Coliform (MPN/100 mL)	<400	540	0	0
03/Dec/21	Faecal Coliform (MPN/100 mL)	<400	540	79	0
09/Dec/21	Faecal Coliform (MPN/100 mL)	<400	3,500	9	0
13/Dec/21	Faecal Coliform (MPN/100 mL)	<400	49	23	0
15/Oct/21	Total coliform (MPN/100 mL)	<400	280	9	0
25/Oct/21	Total coliform (MPN/100 mL)	<400	1,600	220	0
05/Nov/21	Total coliform (MPN/100 mL)	<400	540	110	0
11/Nov/21	Total coliform (MPN/100 mL)	<400	5,400	1,600	17
18/Nov/21	Total coliform (MPN/100 mL)	<400	3,500	7	0
22/Nov/21	Total coliform (MPN/100 mL)	<400	1,600	0	0
03/Dec/21	Total coliform (MPN/100 mL)	<400	1,600	130	0
09/Dec/21	Total coliform (MPN/100 mL)	<400	3,500	49	0
13/Dec/21	Total coliform (MPN/100 mL)	<400	540	240	0

TABLE 3-17: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q4-2021

Site	ID	WWTS	Key Non-Compliance Issues ⁵ in Q4-2021	Corrective Actions
OSOV 1 (Owner's Site Office and Village)	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m ³ /day	<ul style="list-style-type: none"> - Total Nitrogen (<10 mg/L): Non-compliance in 2 out of 9 samplings. Q4 mean 7.6 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 7 out of 9 samplings. Q4 mean 1,554 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 8 out of 9 samplings. Q4 mean 2,062 MPN/100 mL. 	The Wastewater Treatment System Renovation was completed at the end of August 2021 and is now being tested and adjusted
OSOV 2 (ESD Camp)	EF13	Septic tanks (kitchen and black water) and SBR with chlorination system.	<ul style="list-style-type: none"> - Ammonia-nitrogen (<10 mg/L): Non-compliance in all 9 samplings. Q4 mean 22 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 9 samplings. Q4 mean 25 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 2 out of 9 samplings. Q4 mean 1.7 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 9 samplings. Q4 mean 223 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 9 samplings. Q4 mean 263 MPN/100 mL. 	As above.
Main Powerhouse	EF19	Septic tanks (grey and black water), biofilm tank and chlorination tank.	<ul style="list-style-type: none"> - Ammonia-nitrogen (<10 mg/L): Non-compliance in 2 out of 9 samplings. Q4 mean 5.7 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 3 out of 9 samplings. Q4 mean 7.8 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 8 out of 9 samplings. Q4 mean 5.2 mg/L. 	As above

⁵ The values in brackets indicate the applicable standard

3.7.3 Groundwater Quality Monitoring

During Q4 2021, there was no water quality monitoring carried out at Somseun, Nam Pa, Thong Noy, Pou Villages (one borehole in each village) and Phouhomxay Village (two new boreholes) due to the COVID-19 lockdown measures by GOL.

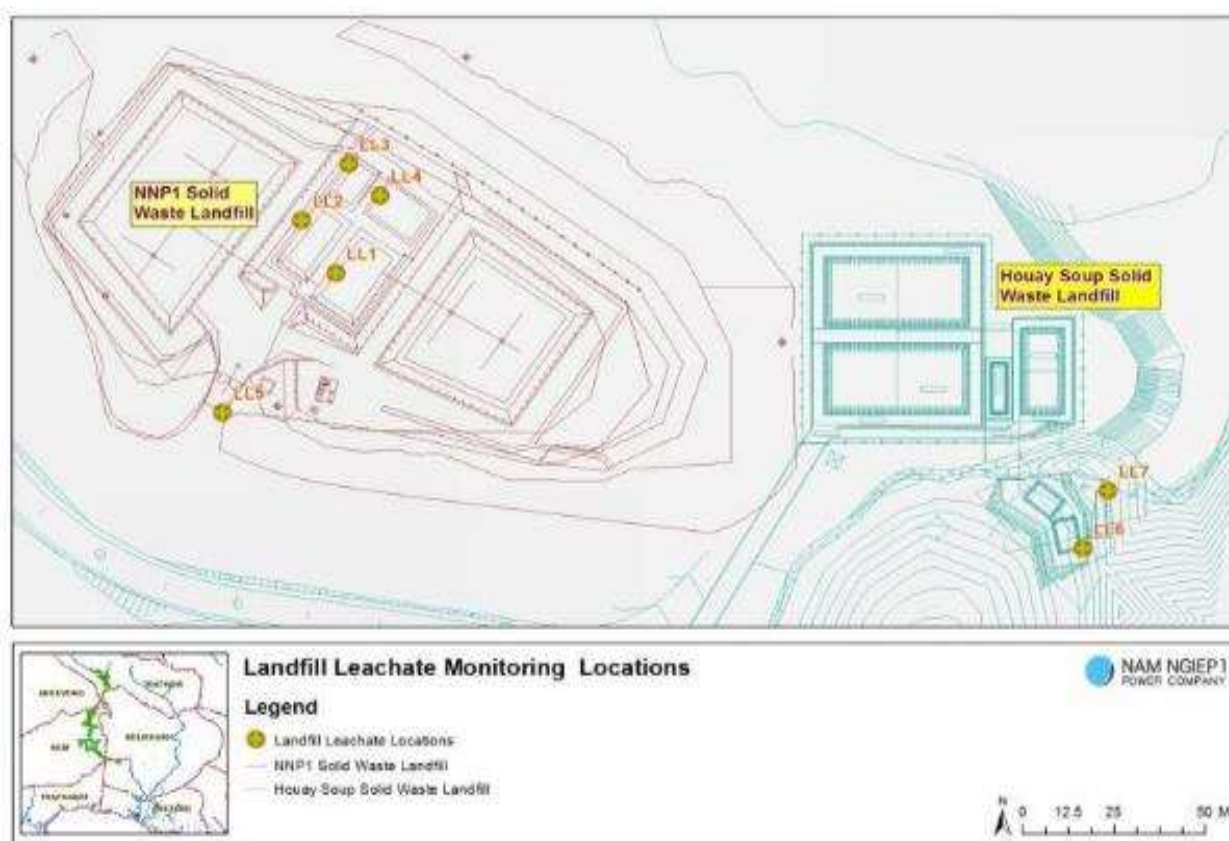
3.7.4 Gravity Fed Water Supply (GFWS) Monitoring

Due to COVID-19 lockdown measures by GOL, the regular water quality monitoring of the gravity-fed water supply systems at Hat Gniun, Thahuea and Phouhomxay Villages was suspended.

3.7.5 Landfill Leachate Monitoring

The landfill leachate treatment systems at NNP1 Project landfill and Houay Soup landfill are monitored to control the functioning of the treatment process and ensure compliance with effluent standards. The monitoring locations are presented in the **Figure 3-17**.

FIGURE 3-17: LANDFILL LEACHATE MONITORING LOCATION



The monitoring results in Q4 2021 indicate compliance with the applicable standards for the monitored parameters, except total coliform (December 2021) for NNP1 Project Landfill and faecal coliform (October 2021) and total coliform (October 2021) for Houay Soup Landfill. The monitoring data can be found in **Appendix 5.3**.

3.7.6 Summary of water quality compliance issues

The non-compliance issues related to water quality during Q4 2021 are summarized in **Table 3-18**.

TABLE 3-18: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q4 2021

No	Non-compliance Issues	Corrective Actions	Status
1	Dissolved Oxygen (DO) in the Nam Ngiep River downstream the Re-regulation Dam was lower than the National Surface Water Quality Standard (6 mg/L)	<ul style="list-style-type: none"> - NNP1PC is still in the process of compiling and analysing the water quality data, and evaluating if additional aeration to improve the DO level at downstream would be warranted. - Preliminary studies have been conducted on the feasibility and costs (including implications for electricity generation) of various aeration systems. 	<ul style="list-style-type: none"> - NNP1PC has proposed to ADB and LTA to keep monitoring the water quality in the Reservoir, Re-regulation Reservoir, and the Nam Ngiep downstream the Re-regulation Dam to study the changes and take actions where necessary. - A trial to operate the labyrinth spillway at the Re-regulation Dam was implemented in November 2021 to see the improvement of DO values downstream and the report was prepared by TD and shared to LTA and ADB during the mission in Q4 2021. - It is also worth noting that over the course of the last three years, no fish kill has been observed or reported
2	Effluents discharged from the Wastewater Treatment Systems (WWTS) at OSOV1, OSOV2 and the Main Dam exceeded the National Effluent Standard Guideline in some parameters	<p>The systems were studied and NNP1PC management agreed on improvement and modification as follows:</p> <ul style="list-style-type: none"> - OSOV1 – new construction of the 2nd wetland pond to be a concrete type for a longer-term service and full maintenance by replacing the filtering system of 2 wetland ponds and their piping; - OSOV2 – new construction of the Sequencing Batch Reactor (SBR) 	<ul style="list-style-type: none"> - The WWTS improvement work was completed by the end of August 2021 and the treatment system is under adjustment to ensure compliance with the effluent standards. - In Q4 2021, the monitoring frequency was increased from fortnightly to weekly to obtain more data

No	Non-compliance Issues	Corrective Actions	Status
		system to replace the under-designed wetland pond; - The Main Dam – modifying the piping system to extend the treatment time of wastewater including installation of an automatic chlorine dosing system.	supporting the system adjustments. - Expect to complete the adjustments in Q2 2022.
3	Landfill Leachate Monitoring for NNP1 Project and Houay Soup Landfills were not complied with the Standard on total coliform parameters for Q4 2021 in occasionally.	- Site observations were conducted during the routine water sampling. Faeces of livestock inside the landfill areas were observed and this may contribute to the presence of bacterial contamination due to faeces being washed into the leachate ponds during rain events. - Regular maintenance of the fence to prevent livestock entering to the landfills.	- Continue regular maintenance of perimeter fence to prevent livestock from entering

4. WATERSHED AND BIODIVERSITY MANAGEMENT

4.1 WATERSHED MANAGEMENT

4.1.1 Implementation of Watershed Management Plan

There were no activities implemented by Xaysomboun Watershed and Reservoir Protection Office (WRPO) during October to November 2021 due to the extended implementation of COVID-19 measures in Xaysomboun Province. It is noted that the pending activities under the approved Xaysomboun Annual Implementation Plan of 2019 and 2020 include Participatory Land Use Plan (PLUP) training, PLUP improvement for Phonhom Village, relocation of staff and equipment to the newly built Xaysomboun WRPO sub-office in Hom District, construction of reservoir access checkpoint at newly built WRPO sub-office, construction of two ranger stations and two reservoir Totally Protected Zone (TPZ) checkpoints, producing TPZs protection handbook, installation of signs and poles for TPZs, reservoir patrols, organization of meeting on the role and responsibilities of the reservoir fishery management, boat registration, and organization of annual meeting. The Environmental Management Office (EMO) discussed these pending activities with Xaysomboun WRPO during the online meeting on 5 November 2021 and recommended to focus on these activities until the end of the year. Xaysomboun WRPO conducted reservoir patrolling between

17 and 26 December 2021 but no progress on other pending activities as of end of December 2021.

Bolikhamxay WRPO conducted forest and reservoir patrolling between 27 October and 5 November 2021 and between 14 to 23 December 2021. They conducted internal monthly meeting on 13 December 2021 that particularly discussed the results of the patrolling under AIP2019-2021 as well as the patrolling plan for December 2021.

A meeting between NNP1PC Environment and Social Division (ESD) management and the Xaysomboun Provincial Governor and Bolikhamxay Vice Provincial Governor who is also the Chairman of Bolikhamxay Watershed and Reservoir Protection Committee (WRPC) related to the annual implementation activities will be organized in January 2022.

EMO presented the action plan to deal with pending issues for watershed and biodiversity program scheduled between December 2021 to January 2022 at a joint Asian Development Bank (ADB)-Independent Advisory Panel (IAP)-Lender Technical Advisor (LTA) virtual mission on 25 November 2021. The progress of actions to deal with the pending issues could be summarized in **Table 4-1**.

NNP1PC concluded the procurement of consultancy service for conducting Lao Newt and Bent-toed gecko survey in the NNP1 watershed at the end of November 2021. The plan for Lao Newt and Gecko, Camera Trap, and Gibbon survey in the NNP1 watershed was discussed among EMO and the Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) on 08 December 2021 and finalized on 24 December 2021. The plan was communicated with Xaysomboun WRPO on 27 December 2021. Xaysomboun WRPO confirmed that they agree with the survey scheduled for 10 January to 02 March 2022 and the proposed arrangements for the GOL team. However, they still insist for the extra accommodation allowance to be provided. This issue is expected to be resolved at the upcoming meeting with Xaysomboun Provincial Governor in January 2022. The biological surveys will have to wait until then.

TABLE 4-1: THE APPROACHES TO SOLVE THE PENDING ISSUES WITH THE GOL PARTIES ON THE NNP1 WATERSHED AND BIODIVERSITY PROGRAM

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 December 2021
1	Drafting the Financial Management Manual (FMM) for NNP1 Project to share with the GOL parties (DOF-MAF, WRPOs and BOMU) for their review and comments	22 November 2021	The draft was circulated to DOF-MAF, WRPOs, and BOMU on 22 November 2021	Completed
2	The comments from GOL on the draft FMM to be provided to NNP1PC	30 November 2021		Completed: NNP1 received the comments from DOF-MAF and Bolikhamxay Nam Chouan-Nam Xang (NC-NX) Biodiversity Offset Management Unit (BOMU), as well as from Bolikhamxay WRPO on 30 November and 21 December 2021 respectively. The comments from Xaysomboun WRPO were discussed during the workshop on 27 December 2021.
3	Organize a meeting with the central level and provincial level (DOF-MAF, WRPOs, BOMU) to clarify comments from GOL and finalize the FMM for approval.	During 13-17 November 2021	It is expected that the pending issues of allowance for the field work and the sub-office operation will be agreed and finalized.	Completed: <ul style="list-style-type: none"> The meeting was held online on 27 December 2021 with representatives from all relevant parties. The two issues of the allowances for the field work and the sub-office operation are still pending and could not be finalized, but the meeting agreed that the FMM will be finalized and approved by DOF with the technical support from NNP1PC with its consultant. The final approved FMM will be circulated to Xaysomboun and Bolikhamxay Province in January 2022 for the implementation of GOL AIP2022. If there is still disagreement, then the implementing unit could discuss internally with their respective provincial management or chairman of the committee. It is expected that the final draft FMM will be ready by 31 Jan 2022.
4	Organize meetings with implementing units (BOMU and WPROs) and BSP-WCS to discuss the way forward to put efforts into implementing the planned activities if the GOL COVID19 lockdown	7 December 2021		Completed: <ul style="list-style-type: none"> The meeting was held on 8 Dec 2021 between NNP1PC and BSP-WCS. Xaysomboun Province issued an official notification on 3 Dec 2021 to allow vaccinated persons to travel to the province (except to the red villages).

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 December 2021
	measures are still extended in December 2021.			<ul style="list-style-type: none"> Xaysomboun WRPO provided confirmation to BSP-WCS team on 20 Dec 2021 that they accepted to participate in the biological surveys that are scheduled for Jan 2022 with the existing allowance rate. However, the head of Xaysomboun WRPO re-confirmed again on 30 December 2021 after further internal discussion with Xaysomboun WRPO/PAFO team that they cannot accept the proposed activity without additional accommodation allowance and so the survey in NNP1 watershed will be postponed until the meeting with Xaysomboun provincial governor on 25 January 2022.
5	Organize a meeting with the Bolikhamxay Vice Provincial Governor (Chairman of Bolikhamxay Watershed and Reservoir Protection Committee (WRPC) and NC-NX Biodiversity Offset Management Committee (BOMC)) for his guidance on the pending allowance issues.	Within 14 January 2022	May not be necessary if the FMM can be agreed and finalized within action 3.	The meeting will be organized after the meeting with Xaysomboun Provincial Governor that is scheduled on 25 January 2022.
6	Organize a meeting with the Xaysomboun Provincial Governor (PG) for his guidance on the pending allowance issues, Fishery Management Plan (FMP), the threats in the watershed TPZs related with>NNL objectives, and the AIP2022 preparation.	Within 14 January 2022	<p>This would be the follow up on the recommendation by the provincial governor at the meeting in March 2021.</p> <p>The discussion on the allowance might not be necessary if the FMM can be agreed and finalized within action 3.</p>	Scheduled to be held on 25 January 2022 (face-to-face meeting)
7	Organize a meeting with the DOF-MAF and the Ministry level for their guidance on the pending allowance issues.	Within end of January 2022	May not be necessary if the issues can be agreed and finalized within action 5 and 6.	
8	Organize the Annual Meeting relating to AIP2020 and 2022 including the way forward with Xaysomboun WRPO to be chaired by Xaysomboun PG.	Within end of January 2022	After the approval of AIP2022	Related with step 6
9	Organize the Annual Meeting relating to AIP2021	Within end of January 2022	After the approval of AIP2022	Related with step 5

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 December 2021
	and 2022 including the way forward with Bolikhamxay WRPO to be chaired by Bolikhamxay Vice Governor.			
10	Organize the annual meeting relating to AIP2021 and 2022 including the way forward with Bolikhamxay NC-NX BOMU to be chaired by Bolikhamxay Vice Governor.	Within end of January 2022	After the approval of AIP2022 Note: Action 8 and 9 could be organized at the same day for time efficiency because the Bolikhamxay Vice Governor is the chairman for both Bolikhamxay WRPC and NC-NX BOMC	Related with step 5

4.1.2 Preparation of Annual Implementation Plan (AIP) 2021

DOF-MAF completed the fund transfer under the approved Bolikhamxay Watershed Management (WM) AIP2021 for the period of July-September 2021 to Bolikhamxay Watershed and Reservoir Protection Office (WRPO) Account on 14 October 2021. The Department of Forestry (DoF) of the Ministry of Agriculture and Forestry (MAF) submitted the fund disbursement request for Bolikhamxay WRPO AIP2021 covering Q4 2021 on 25 November 2021. Considering Bolikhamxay WRPO internal document process as well as the remaining budget from the third quarter, EMO decided not to proceed further with the fourth quarter fund disbursement. NNP1 has sent an official confirmation to DOF-MAF on 08 December 2021 about the situation for their reference.

Xaysomboun WRPO provided comments on the revised final plan of AIP2021 to EMO on 28 October 2021 and organized an online discussion with EMO on 05 November 2021 with the following results:

1. EMO provided clarification and confirmation on the comments and revisions to the AIP2021.
2. EMO recommended WRPO to start preparing AIP 2022.
3. EMO recommended WRPO to focus on the pending activities and complete them before the end of 2021.
4. WRPO will consult with their Management on the preparation of the AIP 2022 especially about no accommodation allowance for patrolling work.
5. WRPO will consult with their management and DoF about official establishment of teams at each station.

However, after several follow-ups by EMO, then Xaysomboun WRPO confirmed in the second week of December 2021 that they will not submit the AIP2021 and will focus on the preparation of AIP2022 instead.

4.1.3 Preparation of Annual Implementation Plan (AIP) 2022

EMO and BSP-WCS organized an online discussion about the AIP2022 preparation process on 08 October 2021. Further discussions with DOF-MAF were also organized on 18 October 2021. It was agreed that the BSP will closely work with WRPOs and NC-NX BOMU for the AIP2022 preparation. DOF-MAF also issued an official notification letter to WRPOs and NC-NX BOMU on 21 October 2021 for the cooperation from the WRPOs and NC-NX BOMU on the AIP2022 preparation with the deadlines for the plan preparation and approval. The letter also requested Xaysomboun WRPO to provide official confirmation on the establishment of full patrolling teams to undertake the land-based and reservoir patrolling in 2022.

Bolikhamxay submitted the draft AIP2022 to EMO on 09 November 2021 after their discussion with BSP-WCS. EMO provided comments on the draft plan on 23 November 2021. There was no update from the Xaysomboun WRPO on their AIP2022 preparation until end of November 2021. DoF-MAF submitted the budget plan for their AIP2022 on 24 November 2021. EMO team revised the budget plan and communicated it with DoF-MAF on 29 November 2021.

EMO submitted the draft AIP2022 of DOF-MAF and Bolikhamxay WRPO to ADB, IAP, and LTA on 21 December 2021 for their review and approval. Xaysomboun WRPO confirmed on 30 December 2021 that they will submit the draft AIP2022 to EMO in January 2022.

4.2 BIODIVERSITY OFFSET MANAGEMENT

4.2.1 Implementation of Biodiversity Offset Management Plan

Progresses on the implementation of activities by Component are described below:

a. Component 1 - Spatial Planning and Regulation

Nam Chouan-Nam Xang (NC-NX) Biodiversity Offset Management Unit (BOMU) shared the report and official minutes of meeting (MOM) with Vangphieng Village from the site visit to settle the issue on the Total Protection Zone (TPZ) boundary demarcation on 30 September 2021. It is noted that Vangphieng Village has no objection on the agreed TPZ boundary that was discussed, consulted, and agreed in September 2019. The demarcation and the placement of NC-NX Total Protection Zone (TPZ) boundary signs in Vangphieng village was completed on 12 December 2021. A total of six NC-NX boundary posts and 29 TPZ signs have been installed in the village according to the plan. NC-NX BOMU is preparing the field report and will further proceed with the recognition by the district authority of Viengthong and Xaychamphone that is scheduled to be completed in the Q1 of 2022.

The plan for reviewing and updating the land use plans of three NC-NX villages (Natan, Na Gnang, Vangphieng Villages) in Viengthong District under the AIP2021 was under review by NC-NX BOMU as of the end of December 2021. The activities will be carried out in the Q1 of 2022.

b. Component 2 – Enforcement

The four patrol teams scheduled to continue the patrolling in December 2021 between 24 December and 12 January 2022 focussing on TPZ highest priority area including Nam Xi, Houay Pong, Houay Xay Gnai and its mountain ridges, Nam San and Nam Pang Mountain ridges, Houay Phai and Houay Hee, the upstream of Nam Sone and Nam Chang as well as TPZ high priority area including Nam Ma, Nam Pang, Nam Sa Nga and mountain ridges. However, one of the patrol team members tested positive for COVID-19 on 24 December 2021 at NC-NX BOMU office in Viengthong District through the rapid testing (Antigen Test) prior to their departure. The district special task force for COVID-19 performed a Polymerase Chain Reaction (PCR) Test on the concerned person which was negative. However, the task force recommended all patrol and snare removal team members at NC-NX BOMU office to perform strict quarantine for at least two-weeks and being tested again prior to resuming their work.

The results of patrolling in October and November of 2021 are as follow:

Team	Patrolling Area/distance	Observations/Actions Taken
1	<p>25 October – 10 November 2021 TPZ highest priority area including upstream of Houay Payang and southern part of Nam San Mountain ridges. (15 days covering 86 km distance of forest)</p> <p>25 November – 14 December 2021 TPZ highest priority area including Nam Chang, Nam Chouan, Houay</p>	<p>25 October – 10 November 2021 The team did not encounter any threats during patrolling.</p> <p>25 November – 14 December 2021</p>

Team	Patrolling Area/distance	Observations/Actions Taken
	<p>Poung, Houay Payang and downstream of Nam Sone.</p> <p>(15 days covering 66.13 km distance of forest)</p>	<p>The team heard gunshots (2 times) in a location at Houay Payang. The team also noticed a man in the same area but they lost him in pursuit. The team observed a sign of Non-Timber Forest Product (NTFP) collection at Nam Chouan.</p>
2	<p>25 October – 10 November 2021 Nam Houng TPZ high priority area including Nam Houng, Nam Kapa, Nam Somfad and Nam Lak.</p> <p>(16 days covering 84 km distance of forest)</p> <p>25 November – 14 December 2021 Nam Houng TPZ highest priority area including Houay Xay Noi, Nam Chang and upstream of Nam Sone.</p> <p>(15 days covering 78.91 km distance of forest)</p>	<p>25 October – 10 November 2021 The team encountered and destroyed two fresh fishing camps located at 2 different locations in Nam Houng.</p> <p>25 November – 14 December 2021 The team did not encounter any threats during patrolling.</p>
3	<p>25 October – 10 November 2021 TPZ highest priority area including Nam Chouan, downstream of Sam Sone and mountain ridges.</p> <p>(16 days covering 88 km distance of forest)</p> <p>25 November – 14 December 2021 TPZ highest priority area including Houay Payang, Nam San and mountain ridges.</p> <p>(15 days covering 57 km of forest)</p>	<p>25 October – 10 November 2021 The team did not encounter any threats during patrolling.</p> <p>25 November – 14 December 2021 The team did not encounter any threats during patrolling.</p>
4	<p>25 October – 10 November 2021 TPZ highest priority area including Nam Sone, Nam Chouan, Houay Xay Gnai and Houay Xay Noi.</p> <p>(16 days covering 66.5 km of forest)</p> <p>25 November – 14 December 2021 TPZ high priority area including Nam Pang, Nam Ma and mountain ridges.</p> <p>(15 days covering 65.26 km of forest patrol)</p>	<p>25 October – 10 November 2021 The team encountered and destroyed one fishing camp and seized one fishing net found within the fishing camp.</p> <p>25 November – 14 December 2021 The team encountered and destroyed one fishing camp and seized one fishing net found within the fishing camp.</p>

FIGURE 4-1: MAP OF PATROLLING TRACK FROM OCTOBER TO NOVEMBER 2021

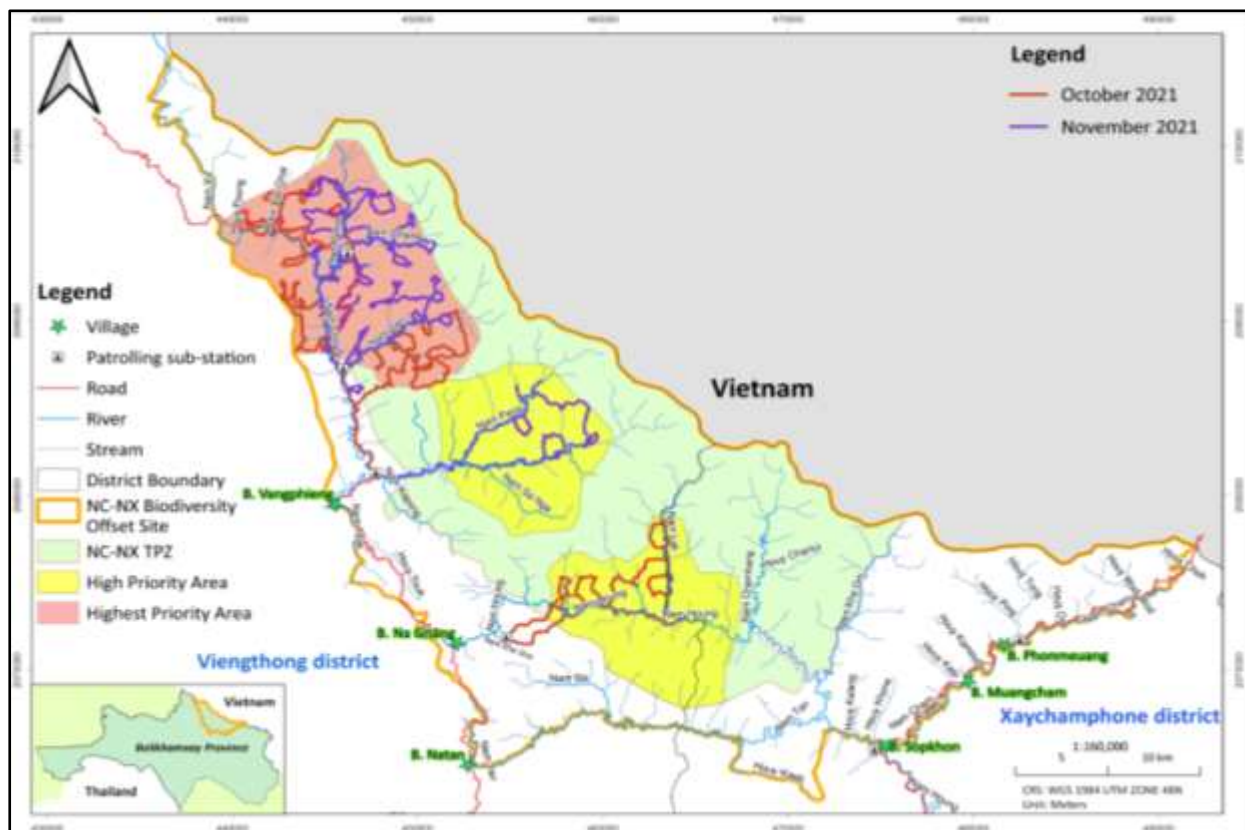


FIGURE 4-2: MAP OF THREATS FROM OCTOBER TO NOVEMBER 2021

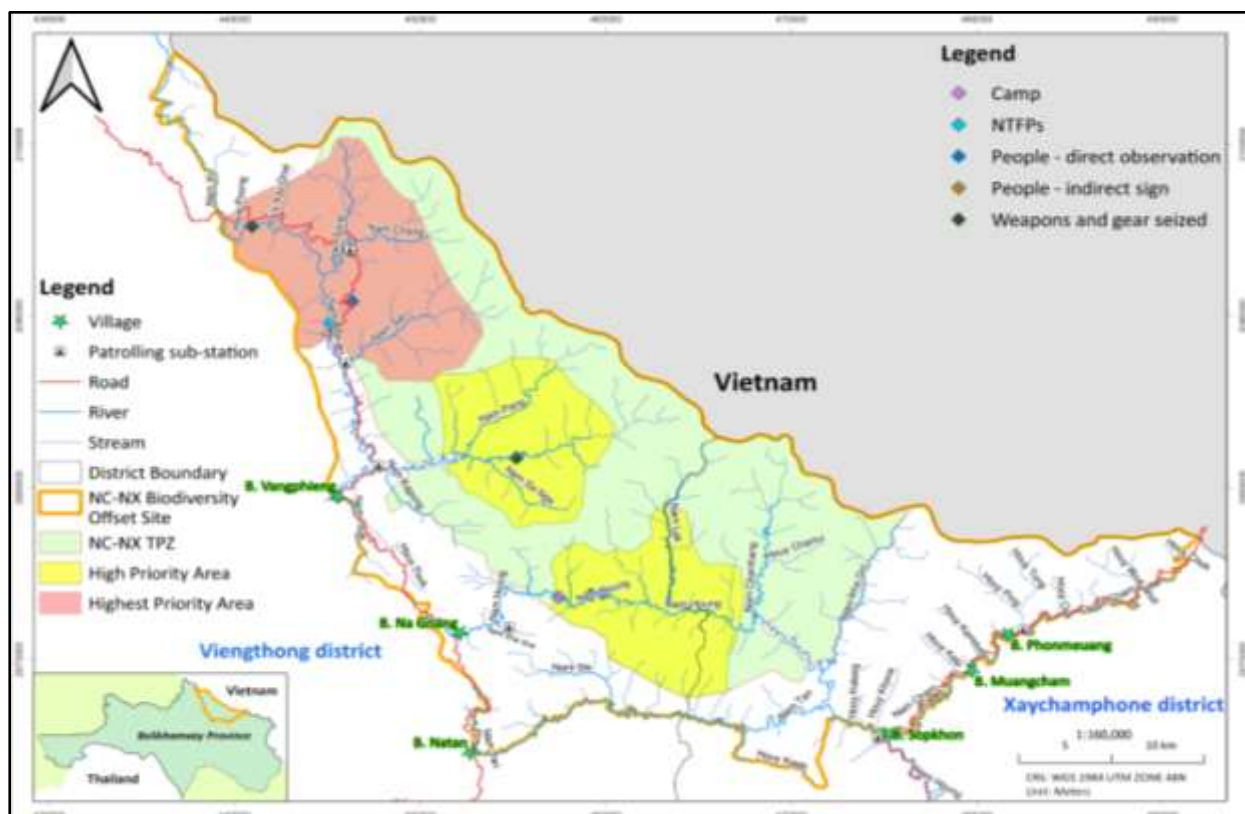


FIGURE 4-3: THE PEOPLE WHO ILLEGALLY FISHED FOUND BY TEAM 2 AT NAM HOUNG IN OCTOBER 2021**FIGURE 4-4: A FRESH FISHING CAMP FOUND AND DESTROYED BY TEAM 2 AT NAM HOUNG IN OCTOBER 2021****FIGURE 4-5: FISHING NET FOUND AND COLLECTED BY TEAM 4 AT NAM MA IN NOVEMBER 2021****FIGURE 4-6: DRYING RACK AND FIRE PLACE FOUND BY TEAM 4 AT NAM MA IN NOVEMBER 2021**

c. Component 3 – Conservation Outreach

BSP-WCS shared the draft outreach strategy document to NNP1 EMO on 11 October 2021 and the comments were provided back on 12 October 2021 for further revision. They continued finalizing the draft outreach strategy in November and December 2021. They shared the revised version to EMO on 28 December 2021 and it is expected to be discussed together with NC-NX BOMU in January 2022.

NNP1 EMO, NC-NX BOMU, and BSP-WCS organized an online discussion on 19 October 2021 to discuss about the outreach activity in the remaining quarter of 2021. BSP-WCS briefed the alternative plan related with the continued enforcement of lockdown as part of the COVID-19 measures in Bolikhamxay Province. It was agreed that the outreach activity will be conducted as per the original plan if the COVID-19 measures are eased otherwise most of the activities will be postponed to 2022 and only the radio-based outreach campaign and school program will be implemented in 2021. NC-NX BOMU and BSP-WCS were working with provincial and district Information, Culture and Tourism offices for preparing the scripts for the radio-based campaign. Three different scripts for the radio-based outreach to be broadcasted at district and village level

in two languages (Lao and Hmong) were finalized in the last week of November 2021 in collaboration with the district Information, Culture and Tourism Office. These scripts are about conservation, importance of biodiversity, and prohibitions in NC-NX regulation. The broadcast at district and village level was expected to start in December 2021 but due to the COVID-19 cases in Viengthong District, the activity was re-scheduled to the second week of January 2022.

d. Component 4 – Conservation linked livelihood

The NC-NX Community Development Plan (CDP) was officially signed by Bolikhamxay Province Agriculture and Forestry Office (PAFO) on 26 October 2021. The activity under the approved Community Development Plan (CDP) within the NC-NX BOM AIP2021 focussing on pig and poultry raising could not be commenced in the fourth quarter because of the continued implementation of COVID-19 measures that restricted the mobilization of BSP-WCS team from Vientiane Capital.

BSP-WCS shared the Draft Community Conservation Agreement (CCA) and related documents to EMO on 03 November 2021. EMO provided review and comments to BSP on 09 November 2021. BSP-WCS finalized the draft CCA on 19 November 2021 and in communication with NC-NX BOMU for review until end of November 2021. BSP-WCS finalized the draft CCA and its related documents in the last week of December 2021. The final draft will be shared to NC-NX BOMU for their further review in early January 2022.

After consulting with the District Task Force Committee for the COVID-19 preventive measures, the snare removal activity was implemented during 15-27 October 2021. NC-NX BOMU shared the snare removal of October 2021 SMART data and reported to EMO on 09 November 2021. It was noted that there was no threat/snare recorded by the team. The snare removal of November 2021 started on 22 November 2021 and focused on the TPZ highest priority area including upstream of Nam Sone, Houay Xay Gnai and its mountain ridges. NC-NX BOMU shared the snare removal of November 2021 SMART data and reported to EMO on 24 December 2021. The snare removal of December 2021 was scheduled to start on 24 December 2021 focuses on the TPZ highest priority area TPZ highest priority area including upstream of Nam San and its mountain ridges. However, due to the COVID-19 case then the field work was rescheduled to January 2022.

e. Component 6 – Biological Monitoring

BSP-WCS shared the NC-NX camera trap report to NNP1 EMO on 12 October 2021, and it was discussed during ADB-IAP-LTA virtual mission on 25 November 2021 for improvement.

4.2.2 Preparation of Annual Implementation Plan (AIP) 2022

NNP1 EMO, NC-NX BOMU, and BSP-WCS organized an online discussion on 19 October 2021 on the implementation of AIP2021 in the remaining quarter of 2021 as well as the preparation of AIP2022. NC-NX BOMU agreed to start the plan preparation with BSP-WCS support after receiving the official notification from DOF-MAF. NC-NX BOMU submitted the draft Biodiversity Offset Management (BOM) AIP2022 to EMO on 24 December 2021. EMO provided the comments back to NC-NX BOMU on 29 December 2021. The draft is expected to be submitted to ADB, IAP, and LTA for their review and approval in January 2022.

5. FISHERY MONITORING

The fishery monitoring survey in the Q4 of 2021 could not be completed according to the schedule because of the continuous implementation of lockdown as part as the COVID-19 measures in Xaysomboun and Bolikhamxay Province between September to December 2021. The results of this quarter will be reported in the Q1 of 2022.

6. HEALTH AND SAFETY

6.1 RELATED TO NNP1PC HEALTH AND SAFETY

A summary of the safety incidents reported during the Construction Phase (up to the end of August 2019) are provided in the *Q4 2020 Environmental Monitoring Report (October to December 2020)*.

A summary of the safety incidents reported during the Operation Phase (September 2019 to December 2021) are provided in **Table 6-1**.

TABLE 6-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO DECEMBER 2021)

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q4 2021	2	0	0	0	0	1	3
Cumulative Total Incidents to 31 December 2021	22	19	22	23	9	63	158

LEGEND:	LTI	-	Lost Time Incident
	RI	-	Recordable Injury ⁶
	NM	-	Near Miss
	PD	-	Property Damage
	FI	-	Fire Incident
	MVI	-	Motor Vehicle Incident

Three incidents occurred in November 2021. The detail of incident is provided below:

⁶ An **injury** or illness is **recordable** if it involves restricted work or transfer to another job. An employee is said to be on "restricted work" when he or she is unable to perform one or more routine functions of the job, beginning on the day after the **injury** or illness occurs

A Kenber contractor truck crane collided with a parked NNP1 pickup truck while trying to reverse causing some damage the parked vehicle. The incidence took place around 2:00 am on 18 November 2021 at the main dam top right bank (Near Zone E for grouting works).

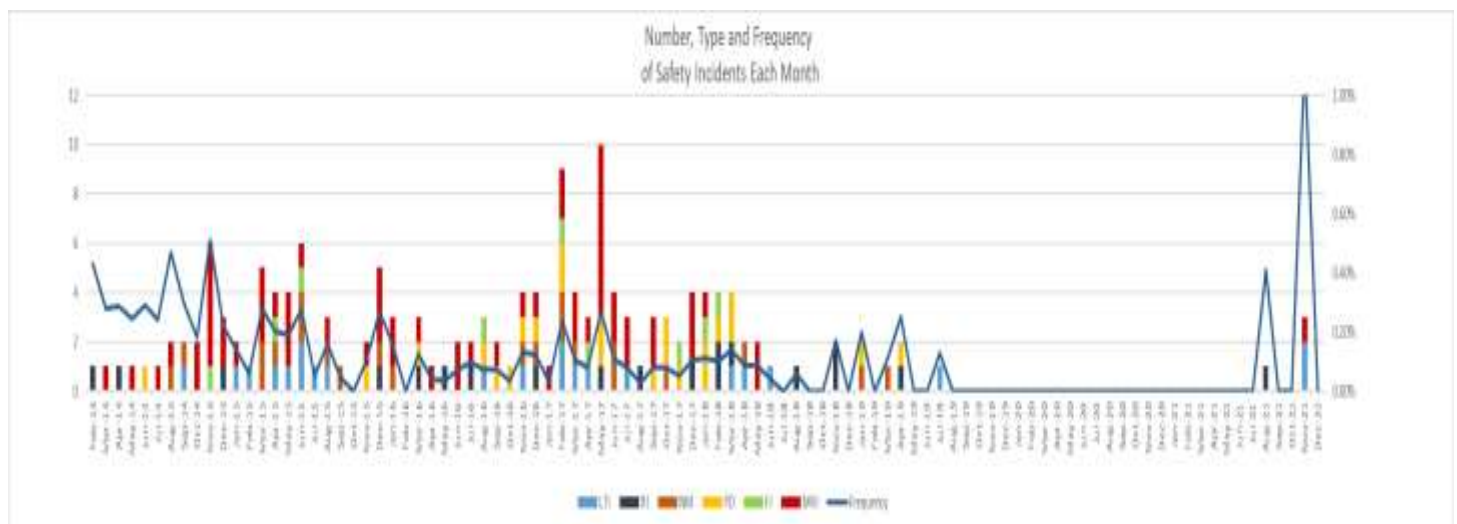
A Kenber contractor worker suffered hand injuries from ball valve explosion when he tried to turn off a ball valve of a hydraulic hose. The incidence took place at 10:00 am on 28 November 2021 at the main dam right bank, inside the gallery (Zone E for grouting works).

An NNP1PC staff suffered injury to his left thigh when he fell in an open pit. The incidence took place at 14:30 on 28 November 2021. After measurement of the lower bracket for unit 01 at the Main Power Station, he climbed up the ladder to the generator floor and walked around the generator room checking new LAN cable route for monitoring the lower reservoir oil level of the bearing, and then fell into the open pit causing injury to his left thigh.

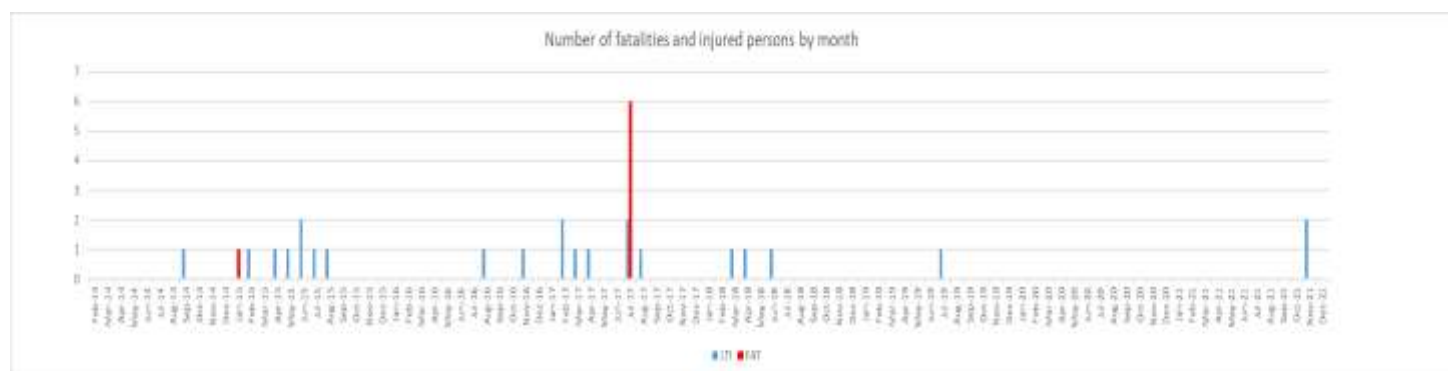
The histogram below in **Figure 6-1** shows the number of reported incidents in each month since the start of the Civil Works Contract with the colour indicating the type of incident including near misses. Up to the end of December 2015, all incidents related to the Civil Contractor and from 01 January 2016, those of the other three principal Contractors have been included. The graph superimposed on the histogram shows the frequency of incidents, including reported near misses, with the number of incidents occurring each month expressed as a percentage of the total number of Project workers employed in each month being the total man-months.

All reported incidents that have involved the Owner and its Contractors and Subcontractors are included in the histogram and shown graphically below. At the end of December 2021, the total number of people employed on Site was 244.

Figure 6-1: Number, Type and Frequency of Safety Incidents to 31 December 2021



The second histogram in **Figure 6-2** shows the number of persons who were injured, or lost their lives in the reported Lost Time Incidents.

Figure 6-2: Number of Fatalities and Injured Persons to 31 December 2021

Approximately: [Incidents = Accidents (with injury) + Near Misses + Other Incidents (with damage, no injury)]

6.2 RELATED TO COVID-19

According to the WHO COVID-19 situation report for Lao PDR dated 28 April 2021, Lao PDR was experiencing an increase in COVID-19 cases, with 453 cases reported from 20-27 April, of which 435 were locally acquired (but most of which were epidemiologically linked to importation).

The Prime Minister (PM) Order No. 15/PM dated 21 April 2021 was issued for the Prevention, Control and Preparedness for the COVID-19 and the implementation and enforcement have been extended through the PM Order No. 462/PM dated 5 May 2021, PM Order No. 528/PM dated 20 May 2021, PM Order No. 595/PM dated 4 June 2021, PM Order No. 671/PM dated 19 June 2021, PM Order No. 1036/PMO dated 19 August 2021, PM Order No. 1094/PMO dated 31 August 2021, PM Order No. 1177/PMO dated 15 September 2021, PM Order No. 1330/PMO dated 15 October 2021, and PM Order No. 1494/PMO dated 14 November 2021.

6.2.1 NNP1PC COVID-19 Measures

NNP1PC has implemented COVID-19 preventive measures since 2020 in line with the guidelines within the country, WHO, and the International Labour Organization (ILO). The general protocol being implemented includes:

1. Paramedics stationed at the site clinic at OSOV have started screening and checking body temperature of all staff, consultants and contractors at OSOV1 and OSOV2 once per day and twice a day for those on self-quarantine, The details about when, where and how often the screening will take place will be announced separately;
2. A mask will be provided to each staff per week and more as appropriate for high-risk staff who need to be working with local communities/contact with external stakeholders;
3. If a member of staff family comes back from a trip overseas of those listed as COVID-19 infected country, the staff must be self-quarantined for 14 days to monitor symptoms and by working from home or taking annual leave (and stay at home for self-isolation);
4. If a staff have any of the COVID-19 symptoms (i.e., dry cough, high fever, difficult breathing, sweats, chills, headaches) or have high temperature or flulike symptoms, they must contact their immediate supervisor and seek medical help immediately (clinic at OSOV or nearest medical centre) or by calling the hotline no. 166 or +85620 54066777;
5. If their medical case is found to be of the definition of COVID-19, they will be immediately removed from the site (site-based staff) and referred to the medical treatment facility in Vientiane Capital that is equipped to treat COVID-19;

6. If staff have any other sickness with a qualified medical certificate that it is not COVID-19, they can take sick leave or work in the office with proper protection (face mask and practice personal hygiene);
7. Refrain from meeting with staff and external stakeholders of more than 20 people. If such a meeting is necessary, alternative ways of communications e.g., telephone conference, Skype or other online platforms is recommended;
8. When visiting community members or contractors, wear a mask and keep your distance from another person at least one 1.5 meter apart;
9. Alcohol-based hand gel will be continued to be provided in all NNP1PC offices;
10. Common areas e.g., offices, canteens, bathrooms and kitchens will be thoroughly cleaned with alcohol (disinfectant liquid);
11. All staff must practice personal hygiene and take preventive measures as per above strictly;
12. All staff are asked to follow and implement NNP1PC and GOL preventive measures that have and to be issued periodically; and
13. These measures are also applicable for NNP1PC contractors and subcontractors and they shall take these as if they are their own measures.

Following the latest PM Order No. 1494/PMO dated 14 November 2021 and its extensions, NNP1PC has implemented a lockdown for site-based operations (OSOV1 and OSOV2) with the following protocol:

General Instructions:

- All staff are requested to strictly follow preventative measures against COVID-19 such as:
 - getting vaccinated as soon as possible following governmental guidance on vaccination;
 - keeping physical distance of at least 1 meter from others, even if they don't appear to be sick;
 - avoiding the 3Cs, spaces that are closed, crowded or involve close contact;
 - wearing a properly fitted mask when physical distancing is not possible and in poorly ventilated settings;
 - cleaning hands frequently with alcohol-based hand rub or soap and water;
 - covering mouth and nose with a bent elbow or tissue when cough or sneeze. Dispose of used tissues immediately and clean hands regularly; and
 - self-isolating until recovery in case of any symptoms or test positive for COVID-19.
- A disposable medical face mask will be provided for each staff every day and more as appropriate upon agreement by the supervisor for high-risk staff who need to be working with local communities/contact with external stakeholders;
- NNP1PC Site Access Form needs to be filled by all staff who are going out/coming into the camp for approval by each relevant DMD or his/her delegation and to attach it as part of a Vehicle Request each time;
- NNP1PC's essential activities such as operation and maintenance of power facilities, social and environmental activities and others can be conducted where permissible by GOL and communities by following GOL's preventative measures strictly;
- Subject to respective DMD's approval, staff and camp residents are allowed to travel to Pakxan or Bolikhan Districts for a day trip for personal and business-related matters and they are not required to be in self-quarantine when they return. However, they need to comply with COVID-19 measures strictly and avoid crowded areas;

- Staff have to be kept in self-quarantine for seven days who come from a District and/or Province which has local community infected cases declared by GOL. But it may change subject to pandemic situation and further announcements from governments;
- If a staff is found to have any symptoms of COVID-19 (i.e., dry cough, high fever, difficult breathing, sweats, chills, headaches, high temperature or flulike symptoms), the staff must contact its immediate supervisor for immediately placed in an isolation room provided (site-based staff) and referred to instruction by a relevant authority;
- Staff have to continuously check their body temperature and record it in the sheet provided at the entrance of OSOV1 and OSOV2 at least once a day; and
- Paramedics stationed at the site clinic have to continuously screen and check body temperature of self-quarantined and/or self-isolated personnel twice a day.

Specific Instructions:**1. Red Village**

- Staff who travel from a Red Village have to self-quarantine for seven days. But it may change subject to pandemic situation and further announcements from governments.

2. Neighboring communities e.g., Hat Gniun, Thaheua and Phouhomxay villages

- Staff can buy food and consumables in Hat Gniun village once a week but with strict implementation of GOL measures as well as the minimal number of staff going there;
- Staff from these communities will be allowed to return home and commute daily to their work at OSOV1 and OSOV2 but they will not be allowed to socialize when they are in their community as per government announcements;
- ESD staff living in Phouhomxay Village can commute to the Project site office with following strict COVID-19 measures; and
- ESD-Livelihood Development staff working for Phouhomxay Village can commute from OSOV2 to work in Phouhomxay Village following COVID-19 measures strictly.

3. Travel from Overseas

- Staff who complete self-quarantine with negative PCR test result for COVID-19 during the self-quarantine from overseas and travel straight from a self-quarantine place to their accommodation in OSOV1 or OSOV2 do not require self-quarantine unless instructed by governments in writing. However, if they visit somewhere prior to and/or during travel to their accommodation in OSOV1 or OSOV2, they have to be kept in self-quarantine for seven days if they are fully vaccinated more than two weeks ago, or otherwise for fourteen days.

4. Community safety

- Staff who reside in Phouhomxay, Hat Gniun and Thaheua villages must not participate in and organize social functions or parties with villagers;
- Work coordination with local authorities in the three villages has to be conducted in line preventive measures against COVID-19 as described above; and
- New arrival to the three villages or the NNP1 Project site has to be notified promptly to the local authorities or the security of NNP1PC.

5. Guests or visitors

- Except emergency cases by Government Agencies, all external visit will not be allowed until further notice.

6. Others

- Subject to prior approval by a respective Deputy Managing Director (DMD), staff will be considered to return home for annual leave or to work from home;
- Food and essential items to be delivered to the site for camp residents using LPS truck or NNP1PC vehicles must be loaded at the Main Entrance to OSOV and these will be collected and sterilized by the respective team before distribution. Materials for construction activities can be transported into site directly as long as there is no direct contact with any camp residents;
- Alcohol consumption is prohibited at all times in the main and re-regulation powerhouses as well as by general staff and contractors during or outside working hours. Consumption of alcohol outside these areas after work is allowed;
- The residents of OSOV1 and OSOV2 can interact with one another and dining in the canteen are allowed but precautionary measures such as social distance at least one meter and personal hygiene have to be practiced. Different dining time between OSOV1, OSOV2 and contractors such as EGAT O&M and Kenber will be organized to reduce congestion in the canteen;
- Selling beer and other alcoholic beverages inside the camp is allowed;
- Drinking beer and other alcoholic beverages in the residence area is allowed subject to: (1) within four people; (2) within one hour; and (3) with social distance; and
- Sport events onsite are allowed but all players need to wear masks and the number of players is limit to two (2) people only. Gathering and discussing in groups or more than two in sport areas is not allowed.

Contractors inside and outside the Project areas are required to implement the followings at all times:

1. All contractors' personnel are required to strictly follow preventative measures against COVID-19 such as:
 - getting vaccinated as soon as possible with following governmental guidance on vaccination;
 - keeping physical distance of at least 1 meter from others, even if they don't appear to be sick;
 - avoiding the 3Cs, spaces that are closed, crowded or involve close contact;
 - wearing a properly fitted mask when physical distancing is not possible and in poorly ventilated settings;
 - cleaning your hands frequently with alcohol-based hand rub or soap and water;
 - covering your mouth and nose with a bent elbow or tissue when you cough or sneeze. Dispose of used tissues immediately and clean hands regularly; and
 - self-isolating until recovery in case of any symptoms or test positive for COVID-19.
2. Contractors' personnel living outside the camps can commute from the host villages directly to their work areas without contacting with NNP1PC staff. These include Kenber, Soulignet, Lao Security Service Enterprise, CV General Construction and Nilun.
3. Contractors' personnel have to be kept in self-quarantine for seven days who come from a District and/or Province which has local community infected cases declared by governments. But it may change subject to pandemic situation and further announcements from governments.

4. Contractors' personnel have to be kept in self-quarantine for seven days who travel from a Red Village. But it may change subject to pandemic situation and further announcements from governments.
5. Contractors' personnel who complete self-quarantine with PCR test negative for COVID-19 during the self-quarantine from overseas and travel straight from a self-quarantine place to their accommodation in OSOV1 or OSOV2 do not require self-quarantine unless instructed by governments in writing. However, if they visit somewhere prior to and/or during travelling to their accommodation in OSOV1 or OSOV2, they have to be kept in self-quarantine for seven days if they are fully vaccinated more than two weeks ago, or otherwise for fourteen days.
6. A relevant Division shall ensure that all contractors' personnel working for the NNP1 Project are regularly checked for body temperatures and use of face masks/hand gel in their camps and working places. No new workers from infected areas are allowed to enter. If any contractors' personnel travel to and from the community-based infected Provinces to purchase materials/goods, they have to implement the same measures as NNP1PC staff.
7. Contractors' personnel in OSOV1 or OSOV2 have to continuously check their body temperature and record it in the sheet provided at the entrance of OSOV1 and OSOV2 at least once a day.
8. If contractors' personnel are found to have any symptoms of COVID-19 (i.e., dry cough, high fever, difficult breathing, sweats, chills, headaches), high temperature or flulike symptoms, the contractor shall inform NNP1PC of relevant information immediately.

6.2.2 COVID-19 actual situations in NNP1PC as of 31 December 2021

Total number of NNP1PC staff at the end of December 2021 was 142 and the vaccination rate is 100%. The ATK tests were conducted for three staffs (one onsite and two at Vientiane Office) and two PCR tests were conducted on two staffs (one onsite and two at Vientiane Office) to confirm their positive results.

Total number of the Contractors at the end of December 2021 was 82 and the vaccination rate is 100%. One ATK and one PCR test were conducted on the Contractor staff (Rathlao) to confirm his positive result.

Three cases (two NNP1PC staffs and one Contractor staff) were confirmed the contract COVID19 and NNP1PC followed the GOL guideline in case of these positive tests.

6.2.3 Overview of NNP1PC COVID-19 Measures related to NNP1PC project implementation and monitoring program

Workplace risk assessment	
<ul style="list-style-type: none"> The exposure risk for NNP1PC entities (employee, consultant, contractor, sub-contractor) during the increased COVID-19 cases which was started in April 2021 is defined based on the WHO Guideline (2020)⁷ that is “medium exposure risk”. The medium exposure risk means that jobs or work tasks with close, frequent contact with the general public, or other co-workers, visitors, clients or customers, or contractors, but that do not require contact with people known to be or suspected of being infected with COVID-19. In areas where COVID-19 cases continue to be reported, this risk level may be applicable to workers who have work-related frequent and close contact with the general public, visitors, or customers in high-population-density work environments (e.g., food markets, bus stations, public transport, and other work activities where physical distancing of at least 1 m may be difficult to observe), or work tasks that require close and frequent contact between co-workers. In areas without community transmission of COVID-19, this scenario may include frequent contact with persons returning from areas with community transmission. 	
Risk	Preventive measures
Job or work tasks with close or frequent contact in the area where COVID-19 continue to be reported or contact with persons returning from area with community transmission	<ul style="list-style-type: none"> Implement the lockdown for site-based operation (OSOV1 and OSOV2) with specific protocol as mentioned in the section of “NNP1PC COVID-19 Measures”. The lockdown started from 23 April 2021 with possible extension following the country guideline on COVID-19 measures (PM Order No. 1494/PMO dated 14 November 2021) During the lockdown, the staffs were also encouraged to be well updated on the situation within their work-related places and hometown to reduce non-essential travel as much as possible; to implement the self-quarantine for at least 14 days after returning from their work-related places and home town with the COVID-19 low-risk of community transmission; and to be part of country COVID-19 vaccination program that rolled out in the nearby medical facilities, and.

⁷ Annex to Considerations for public health and social measures in the workplace in the context of COVID-19. WHO (10 May 2020)

	<ul style="list-style-type: none"> In the case of infection as mentioned within “NNP1PC COVID-19 measures then the staff will be immediately removed from the site and referred to the medical treatment facility in Vientiane Capital that is equipped to treat COVID-19.
Impact on NNP1 project and OHS	Mitigation
<ul style="list-style-type: none"> The country wide lockdown measures following PM Order No. 15/PM dated 21 April 2021 is being implemented since 21 April 2021 impacting the continuation some project implementation activities. 	<ul style="list-style-type: none"> The project activities within the project area with COVID-19 low-risk of community transmission continues to progress such as Dam operation and maintenance work; EMO environmental monitoring work within the NNP1 reservoir; or SMO livelihood centre operation. Any implementation and monitoring activities that does not require field work will be performed through an online platform such as the discussion on the preparation of Annual Implementation Plan (AIP) 2021 under watershed and biodiversity management or monthly meeting with NC-NX BOMU. Close coordination with relevant GOL committees in case that some restrictions are lifted by local authorities that will allow the continuation of some field activities. For example: Bolikhamxay and Xaysomboun Provincial authority eased the travelling restriction from or to the respective provincial administrative area in December 2021 and some of NNP1 ESD program could be resumed such as livelihood development activity, social monitoring, fishery monitoring, etc.; Bolikhamxay PAFO and NC-NX BOMU agreed with the proposal from EMO Team to allow NC-NX patrolling work to continue during the country wide lockdown because the NC-NX offset site is within the COVID-19 low-risk community transmission. Any continuation of project implementation and monitoring activities especially for the field work must comply NNP1PC COVID-19 measures and any with applicable guidelines.
<ul style="list-style-type: none"> The site lockdown between April to December 2021 might impact psychological state of site residents 	<ul style="list-style-type: none"> NNP1PC COVID-19 measures during this lockdown allow the site residents to leave their respective site in case of emergency such as accidents, health and family related

	<p>issues and other requests as found reasonable by respective management.</p> <ul style="list-style-type: none"> • NNP1PC COVID-19 measures during this lockdown period allow for social events/gathering but for less than 20 people with mask-wearing and social distancing of at least one meter must be ensured.
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Lockdown schedule	Impact on NNP1PC project implementation and monitoring activities		
	TD	SMO	EMO
01 October – until further notice (Ref: PM Order No.1036/PMO dated 19 August 2021, PM Order No. 1094/PMO dated 31 August 2021, and PM Order No. 1177/PMO dated 15 September 2021; PM Order No. 1330/PMO dated 15 October 2021, and PM Order No. 1494/PMO dated 14 November 2021)	No impact on the overall power generation and maintenance work.	To be reported in the SMO Quarterly Progress Report (Q4 2021).	<ul style="list-style-type: none"> • No monthly and quarterly visit by EMU. • No impact on EMO environmental monitoring program except for some water quality testing parameters that needs to be performed the analysis in Thailand. • EMO fishery monitoring program was postponed during this lockdown period. • Relevant GOL committees in Xaysomboun and Bolikhamxay confirmed that the implementation activities under watershed and biodiversity monitoring could resume during this lockdown period. • The training needs assessment on the capacity of WRPO and GOL staff related to land-use and forest management under component 1 of the approved WMP was postponed.

7. External missions and visits

A joint ADB, IAP, and LTA virtual mission was conducted during 22 to 26 November 2021 and the work progress of NNP1PC Environmental Management Office (EMO) was shared during the mission with BSP-WCS and NNP1PC TD supports.

The discussion topics on work progress during the virtual mission included:

- Environmental monitoring results
- Implementation of the environmental sub-plans
- Environmental flows and discharges downstream
- Operation Manual
- Dam safety
- Emergency Action Plan (EAP) and Emergency Preparedness and Response Plan (EPRP)
- Health and Safety
- Watershed and Biodiversity Offset Management Programs
- NC-NX Community Development Plan (CDP) and Fishery Management Plan (FMP)
- EMO work progress with BSP support
 - Results of patrolling effort in NC-NX offset site and NNP1 reservoir from SMART analysis
 - Results of Camera Trap Survey
 - Biological monitoring vs NNL progress

The queries raised by ADB, IAP, and LTA were addressed during discussion and some pending issues were responded/explained later through email exchanges. LTA submitted the draft LTA Virtual Site Visit Environmental Monitoring Report No.02 to NNP1PC on 13 December 2021, IAP submitted their mission report to NNP1PC on 16 December 2021. As of the end of December 2021, ADB has not yet shared the Back to the Office Report (BTOR) with NNP1PC.

The action priorities recommended by ADB, IAP, and LTA during the mission in November 2021 are listed for further follow-up as shown in the Table 7-1.

TABLE 7-1: NNP1 CORRECTIVE ACTION PLAN (CAP)

No	Requested/Recommended Actions	Status as of early January 2022
1	E&S Capacity i) NNP1PC to provide Job Descriptions of Key EMO and SMO staff. ii) NNP1PC to provide job descriptions of H&S staff. iii) NNP1PC to include the updated chart in the ESMS and next Q monitoring report iv) The Job Descriptions of key SMO staff will be assessed by ADB to ensure that their deliverables are aligned with the deliverables in the REDP, SDP, CDP and Masterplan for Livelihood Development	i) Three TORs of EMO key positions and H&S staff were already provided since the November 2021 mission. The remaining job descriptions of EMO & SMO key staff positions was completed by Q4, 2021. iii) The organization chart of E&S is added in the Env Q4 2021 Report.
2	Emergency Preparedness <ul style="list-style-type: none"> The revised EAP and EEP have to be completed and tested Revise and consider response times Integration of the EAP and EEP into the internal documents The plans need to consider the comments from the mission of December 2020. Plans should be developed in consultation with relevant emergency authorities. <ul style="list-style-type: none"> Drills to be performed prior to the wet season, and a concrete timebound plan for field testing, and evidence of consultants hired and their CVs are required to achieve project completion. The LTA and ADB needs to review the revised EAP and EEP version for clearance. 	<ul style="list-style-type: none"> Stage1: NNP1PC is addressing comments of ADB from the Dec 2020 mission and this was shared by 31 December 2021. The timeline for EEP drills conducted by ESD in September-October 2021 was already shared with the mission in November 2021 and will be updated by mid-January 2022. Stage 2: The national consultant hired by NNP1PC is revising the EEP for GOL review by Q1, 2022 and drills will be done before the wet season from May-June 2022. The format for EEP will follow example of GOL format provided and adjusted to include key practical information. The CV of the national consultant who works on the EEP will be shared with ADB in Q1 2022. Draft EEP and drills report will be provided by 30 June 2022.
3	Impacts caused by water level variations <ul style="list-style-type: none"> EAP & EAP Socialisation: Prior to the onset of the wet season each year, annual emergency evacuation drills are to be undertaken with each downstream village Compensation Upstream: Confirm whether there have been any flooding impacts upstream above 320 m asl. due to backwater effects or wet season/abnormal flooding. Also confirm if compensation has been provided for the new suspension bridge at 323.2 m asl. Provide evidence that National Road 1D (which is to be raised to 322 m asl.) used to get flooded prior to filling the reservoir the level of the road. Clarify NNP1PC funding contribution to Road 1D. CDF funds should not be used. 	<ul style="list-style-type: none"> NNP1PC already responded during the mission and provided photos to proof the floodings were occurred in the area since before the reservoir impoundment and source of budget for improvement related with the upstream flooding and road 1 D improvement. The relevant info and materials (including the compensation maps both upstream and downstream area) were shared with ADB during and after the latest virtual mission. The EEP schedule is being updated and will share with ADB by mid-January 2022.

No	Requested/Recommended Actions	Status as of early January 2022
4	Operation manual <ul style="list-style-type: none"> NNPC1 to address comments by the LTA, and update manuals as necessary LTA to indicate whether the operational manual requires updating with the finalization of the EAP and EEP. LTA to review and endorse the Operational Manual (updated in July 2021 as indicated by NNPC1) to verify that previous comments on maximum operating levels considering PMF, backwater effects and water availability for the irrigation system have been incorporated. LTA to verify that the operations manual complies with CA requirements on e-flows and water level fluctuation. 	<ul style="list-style-type: none"> The comments made by LTA were addressed in the Operation Manual (OM) by TD team in December 2021. NNP1PC provided an OM management plan and document list and its coverage by 31 December 2021.
5	E-flows NN1PC to continue monitoring compliance with the e-flows and fluctuation thresholds set in the ESIA and CA.	Noted. No further response is required.
6	Water Quality (Reservoir) <ul style="list-style-type: none"> i) NN1PC to provide the results of the trial to operate the labyrinth Spillway at the Re-regulation Dam (scheduled in September 2021) to see the improvement of DO values downstream and possibility to operate the spillway routinely. ii) LTA to review the information provided and the ESMMP-OP. iii) Share results of the 3-D simulation of predicting DO will be done in Q4 2021 to understand the changes. Share results with ADB and LTA 	i) the results were shared during the latest virtual mission; iii) NNP1PC already confirmed during the mission that there will be no 3D simulation in Q4-2021.
7	Water Quality (Reservoir) LTA/ADB to confirm whether monitoring can stop. Continue monitoring in the meantime.	A report to request stopping monitoring the sulphur hydroxide (H ₂ S) and Phytoplankton Biomass will be shared with ADB and LTA by mid of January 2022.
8	Water Quality (communities) The Plan of action will be followed up	The potential root cause and the plan of action will be reported in the Env Q1 2022 Report.
9	Wastewater Treatment <ul style="list-style-type: none"> Review the design and as built plans of all WWTPs to be retained during the operations phase to ensure adequate volume and discharge quality. Find root cause of contamination and possible solutions. 	i) The discharge routing maps with the requested details were provided by the end of December 2021. ii) The root cause of contamination and the updated results of system adjustment will be reported in the Env Q1 2022 Report. iii) The SOPs for waste management were provided to ADB and LTA on 3 December 2021.
10	Watershed Management Plan - Budget	i) The approach was provided and discussed during the mission on 25 November 2021 and updates were provided on 07 December 2021.

No	Requested/Recommended Actions	Status as of early January 2022
	<ul style="list-style-type: none"> Finalise AIP while ensuring that allocated resources are not diverted from conservation NN1PC to provide evidence of the following: <ol style="list-style-type: none"> Resolution of the allowance issue with WRPOs considering how this has been addressed in other similar programs in the provinces and Lao; Provide an efficient and rapid way of generating the AIP or suggest improvements to the current process; Budget (AIP) for 2021 agreed asap. AIP for 2022 agreed by December 2021 with GoL. 	<p>ADB confirmed its acceptance on 07 December 2021.</p> <p>ii) Draft WMP AIP2022 from DOF-MAF and Bolikhamxay WRPO were shared with ADB and IAP and expected to be finalized and approved within January 2022.</p> <p>iii) Draft WMP AIP2022 from Xaysomboun WRPO is expected to be submitted to EMO in January 2022 and expected to be shared with ADB and IAP afterward.</p>
11	<p>Watershed Management Plan - Law Enforcement</p> <ol style="list-style-type: none"> A law enforcement strategy approved by all relevant bodies for the sub-catchment (BSP is taking the lead role on this). The Strategy should clarify what that entails, and who should lead on it (at least, a final draft submitted for review to the relevant bodies). Details of finalization and operation of Xaysomboun (Hom District) sub office and 2 reservoir checkpoints rubber plantation clearing issues to be resolved 	<ul style="list-style-type: none"> The Law Enforcement Strategy for the NNP1 sub-catchment will be ready by the end of Q2 2022. 'Hom sub-office' - the construction was completed in September and the evidence was shared on 31 December 2021. The other actions (operation of Hom District sub-office and rubber plantation clearance) cannot be achieved by the end of December 2021. These are GOL responsibilities outside the WMP/REDP and Project Completion Date (PCD) conditions of NNP1PC. NNP1PC will indicate a timeline which GOL commits after discussing with the Xaysomboun PRLRC at the end of January 2022.
12	<p>Watershed Management Plan - Health and Safety</p> <ol style="list-style-type: none"> update EPRP accordingly Implement updated H&S and EPRP - to be verified by ADB/LTA 	<p>The Emergency Preparedness and Response Plan (EPRP) will be updated and shared with ADB/LTA by the end of February 2022.</p>
13	<p>Downstream Impacts</p> <ul style="list-style-type: none"> Follow up on the plan of action Update relevant plans Provide warnings to PAP and Consultations - see Social CAP 	<p>The compensation downstream was confirmed by pegging line for a discharge of 160 m³/s plus 1 m up from this discharge level in the dry season (therefore an equivalent of 230 m³/s max. discharge can be obtained). The map of compensated riverbank gardens was provided. The Action Plan for downstream water discharge warning is part of the OM for the re-regulation dam.</p>
14	<p>Reservoir & Watershed Management - Fisheries and Livelihood Development</p> <ul style="list-style-type: none"> Confirm that Final Fisheries Co-Management Plan was approved by the GoL and disclosed 	<p>The final draft of the Fisheries Co-Management Plan is still on hold by the Xaysomboun PAFO due to pending workshop to decide on the roles and responsibilities including budget division between the Provincial and District levels.</p>

No	Requested/Recommended Actions	Status as of early January 2022
	<p>to communities and is being successfully implemented</p> <ul style="list-style-type: none"> • PAPs are still returning to lands and fishing concession is being extended in the absence of dissemination of WMP regulations. • In addition to the AIP finalisation, NN1PC should: <ul style="list-style-type: none"> v) provide a final FMP addressing comments vi) Submit Livelihood Program for 12 Reservoir Villages vii) Provide details of plans and the process to address the issue of people returning to the sub-catchment TPZ for agriculture, both at the reservoir and in other areas. 	<p>Xaysomboun Provincial Governor already advised in March 2021 for them to organise workshops and discuss but this was not done. NN1PC already reported to the Provincial Governor and requested for a meeting with PRLRC to resolve the pending issues of watershed management, encroachment by PAP to the watershed area and compensated land, etc. at the end of January 2022.</p> <p>GOL directions to resolve these pending issues can be shared after the planned meeting.</p>
15	<p>Implementation of the biodiversity mitigation and offset framework</p> <ul style="list-style-type: none"> i) finalize the AIP for 2021 asap ii) Resolve the allowance issue with WRPOs considering how this has been addressed for other similar NNL programs in the provinces and Lao; iii) Provide an efficient and rapid way of generating the AIP or suggest improvements to the current process; iv) provide an agreement on the TPZ demarcation and checkpoints by all relevant parties; v) Budget (AIP) for 2022 agreed by December 2021 with GoL. vi) Commence biological monitoring survey as planned for 2021 vii) procurement and engagement of the NNL audit consultant in 2021 	<ul style="list-style-type: none"> i) The AIP2022 is under preparation and expected to be shared with ADB and IAP for review by the end of January 2022. ii) The field work for the biological monitoring survey as planned for 2022 will be started after the meeting with Xaysomboun Provincial Governor at the end of January 2022. <p>The other actions also could not be achieved by the end of December 2021. A clear timeline will be provided later after the meeting with Xaysomboun PRLRC at the end of January 2022.</p>
16	<p>BOMP – Law enforcement</p> <p>Provide a strategy agreed with GoL and monitor compliance</p> <ul style="list-style-type: none"> i) Continue TPZ patrolling according to the BOMP and Law Enforcement Strategy ii) Provide an update and demonstrate that law enforcement targets for 2021 are on track as indicated in table 5 of the NC-NX LE strategy v6 (August 2021). 	<p>The results of patrolling were reported by BSP-WCS and discussed during the latest virtual mission in November 2021.</p>
17	<p>BOMP – Community Development Plan</p> <p>CDP monitoring and implementation</p>	<p>The approved CDP was shared with ADB and IAP, the CDP implementation activities are included in the AIP2021 and will also be included in the AIP2022.</p>

No	Requested/Recommended Actions	Status as of early January 2022
18	Occupational Health and Safety Update ERP with the navigation/emergency situations near water	EPRP led by NNP1PC-ADM will be updated and shared with ADB/LTA by the end of February 2022.
19	Dam safety NNP1PC to provide evidence of completion of grouting and slope stabilization works of the main dam and an update on the dam safety recommendations. LTA to review and clear	<ul style="list-style-type: none"> The work plans were provided to ADB and LTA on 3 December 2021. The updated dam safety recommendation (DSRP meeting 20 Report) was provided on 8 December 2021. The evidence of work completion will be provided later when the works are done.
20	Site disposal areas/ Site rehabilitation/ quarry site <ul style="list-style-type: none"> Submit a handover plan for ADB/LTA review that includes responsibilities and how the GoL will check the conditions of the site or KPIs, and agreed future uses Agree on the handover plan with GoL. 	<ul style="list-style-type: none"> The rehabilitation work has been completed by the Contractor for each site and checked/inspected by GOL (EMU). Only two areas are pending to be monitored and confirmed by EMU including the former LILAMA10 camp and the spoil disposal area of the irrigation canal contractor. If additional work is required by GOL due to no vegetation can be grown, additional counter measures suggested by GOL will be discussed and considered by NNP1PC using operational budget. A handover plan will be shared with ADB and LTA in Q1 2022.
21	Paragraph (b) of the definition of Project Completion Date All Project Costs have been paid in full or provided for other than: (i) any amounts which the Company is disputing in good faith and in respect of which a reserve (to an amount satisfactory to the Intercreditor Agent) has been established in a segregated account or sub-account of the Project Accounts and has been fully funded; (ii) the withholding of retention amounts pursuant to the Construction Contracts; and (iii) any other amounts in respect of which, in the opinion of the Intercreditor Agent (acting on the instructions of the Required Lenders who shall consult with the Technical Adviser in providing such instructions), an adequate reserve has been established in a segregated account or sub-account in the Accounts and has been fully funded.	This will be done by Q1 2022. The main budget source will be from the operation budget only.

No	Requested/Recommended Actions	Status as of early January 2022
22	Paragraph (k) of the definition of Project Completion Date The Shareholders have complied with their obligations under clauses 2 (Base Equity Commitment) and 3 (Contingent Equity Commitment) of the Shareholder Support and Subordination Deed to make Contributions to the Company in the amount of the Remaining Construction Period Safeguard Costs for credit to the Safeguards Costs Reserve Account	NNP1PC already submitted the items and amount of the Remaining Construction Period Safeguard Costs in 2019. The list of remaining items and budget were also presented in the joint ADB-IAP-LTA mission's meeting on 26 November 2021.
23	Section 29,a,ii of Annex C of CA, and clauses related to permits Compliance with the CA	This will be determined and provided by January 2021 according to the CA requirements.
24	Clauses 51-82 in Annex C of the CA Compliance with the CA	This will be determined and provided by January 2021 according to the CA requirements.

The status of the requested/recommended actions will be followed up and updated in the next quarterly report.

APPENDICE

APPENDIX 1: STATUS OF DOCUMENTS REVIEW AND APPROVAL DURING Q4 2021

No	Site name	Document Name	Contractor / Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 31 December 2021
1	Phouhomxay village's Irrigation Canal	DWP & SS-ESMMP for improvement of damaged irrigation canal and leveling access roads	CV General Construction Sole Co., Ltd.	1 st submission on 30 November 2021. No objection with no comment on 17 December 2021	Repairing of damaged irrigation canal	Waiting for Notice to Proceed
2	OSO2	PLC Standard operating Procedure	Soulignet Choumanitham Construction Co., Ltd.	2 nd submission 29 December 2021 - under Review	Setting and adjustment of program logic controller for the WWTS (SBR) at OSO2	In progress

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q4 2021

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
1	ONC_KENBER-0001	29.07.2021	KENBER's Temporary Camp (Rental houses)	<p>Lack of proper waste segregation implementation on site:</p> <ul style="list-style-type: none"> - General waste, recycle waste (scrap metal, aluminium, plastic, glasses and cardboard) and hazardous waste (DE NEEF HA Cut AF, known as “PU”) are mixed. - Three waste labels (Recycle, general and hazardous) displayed in same waste bin. - There was an insufficient number of waste bins/bags provided for the camp (rental houses). This might cause of no waste segregation practices on site. 	<ol style="list-style-type: none"> 1) Segregate the waste according to below waste sorting for further proper disposal and eliminations: <ul style="list-style-type: none"> - General waste (dispose of at NNP1 landfill); - Chemical waste – PU waste (shall be disposed and buried at spoil disposal No. 6); - Hazardous waste (disposed by an approved local firm); - Recycle waste (sell to local recycle waste buyer/firm); - Scrap metal; - Glass; - Plastic bottle; - Aluminium can; - Cardboard. 2) Setting up a temporary recycle waste storage. 3) Provide waste management awareness training for all workers. 4) Provide a sufficient waste bins/bags for the rental 	10.08.2021	29.10.2021	Resolved

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
					houses for waste segregation and disposal. Note: No hazardous waste and recycle waste is allowed to dispose of at NNP1 landfill.			
2	ONC_KENBER-0002	29.07.2021	KENBER's Temporary Camp (Rental houses)	No proper hazardous material storage area set up on site. A 200 L fuel drum is stored on the porch of rental house whilst a dining table and smoking area are beside that has a highly potential risk of falling/collapse and/or spills on to the ground from the handling and refilling activities as well as the fire.	1) A proper temporary hazardous material storage area with hardstand floor, bunding and roofing which keeps a distance from the accommodation and assembly area need to be provided. 2) A manual pump is recommended to be used for the refilling activities to avoid/prevent spillage.	10.08.2021	29.10.2021	Resolved
3	ONC_KENBER-0003	29.07.2021	KENBER's Temporary Camp (Rental houses)	There were no control devices installed for the cooking, washing and bathing areas of each rental houses. The grey water is released to the natural land and stream directly. Without an appropriate counter measure, this has highly	The contractor was instructed to: - Excavate/provide a grey water retaining pond(s) with sufficient capacity to collect the grey water from the facilities. - The grey water shall be drained by a proper PVC piping	10.08.2021	29.10.2021	Resolved

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				potential risks of: - Generating a pollution to the natural land and streams; - The operation sites became an un-pleasance hygienic and health amenity (smelling and attracting the flies).	system from the source to a retaining pond(s) to avoid animals' swallows and disturbances.			
4	ONC_KENBER-0005	29.07.2021	Main Dam	There was evidence of highly turbid water drained from the grouting works of gallery to outlet and discharged to the Nam Ngiep River (downstream of dam) without proper and efficiency sedimentation control devices/facilities. Two series of sand bag dikes were installed. However, its effectiveness is low.	The contractor was instructing to: - Provide/install with more sedimentation traps along the open ditch where applicable; - Dry alum (Aluminium Sulphate), shall be apply, if necessary; - A regular clean-up of sediment from the sedimentation traps shall be provided to maintain the capacity and effectiveness of sedimentation trap.	05.08.2021	29.10.2021	Resolved
5	NC01/2021	20.08.2021	Downstream of the Re-regulation Dam	Low DO concentration at downstream the Re-regulation Dam during the turbine discharge which is not complied with the national standard guideline (≥ 6 mg/L).	1) Trial on Labyrinth Spillwater/ Combination of Labyrinth Spillway and Turbine Operation; 2) DO water quality monitoring at the Re-regulation Dam	05.10.2021	07.10.2021	Closed with a concrete plan was issued to be followed up according to the timeframe

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				<ul style="list-style-type: none"> • There is an issue of low DO concentration downstream the Re-regulation Dam which is always lower than the national standard guideline during the turbine discharge commencing mid November 2019. • The feasibilities studies are in progress but no clear action plan to be implemented. 	downstream stations in Nam Ngiep River; 3) Assessment of the past monitoring records and trail in action no.1; 4) Desktop studies for the alternative solutions to improve the DO level at the downstream stations; 5) Establishment of a reasonably concrete action plan considering the above information for review and decision on the sustainable solutions for NNP1 management; 6) Taking actions according to the agreed solutions on the action no.5. Note: Timeframes of each corrective action are subjected to change upon the results of trial and desktop studies.			identified in the Environmental Management Plan (EMP) No. 03/2021.
6	NC02/2021	09.11.2021	KENBER's Temporary	Lack of spill control at the KENBER's temporary camp and	- The Contractor's Site Manager/Project Manager	19.11.2021	28.12.2021	Closed with a new NCR

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			Camp (Rental houses)	<p>workshop (rental house) at Hat Gnuin Village.</p> <ul style="list-style-type: none"> - A lot of fuel spilt inside the bunding area without provision a countermeasure; - Machinery maintenance on the bare ground without spillage protection facilities; - Evidence of hydrocarbon spilt of the ground as surrounding of workshop and fuel station without cleaning up; - Lack of collection and proper storing of hazardous material. Fuel drums, used oil drums are scattered on the camp yard. 	<p>needs to undertake his role and responsibility to ensure the site operation and management are followed the proposed and approved SS-ESMMP.</p> <ul style="list-style-type: none"> - Seek ways to resolve the issue of fuel spills in the bunding area of fuel station. - Proper housekeeping and move the scattered fuel drums and used oil drums including oily dirt hose, equipment and machinery to the designated hazardous material storage areas. - Clean-up of spillage and contaminated soil/sand and store properly for further disposal and elimination when the works completed. - Provide a hazardous material management and spill response training to relevant workers. - Precaution signages and work instruction need to be displayed at hazardous material storage areas. 			enforcement was issued to be followed up together with the new findings (Ref: NC04/2021 in item no.12)

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
7	NC03/2021	09.11.2021	KENBER's Temporary Camp (Rental houses)	Poor waste management at the KENBER Contractor's temporary camp (rental houses) in Hat Gnuin Village: - No waste segregation on site. General waste and recycle waste are mixed in the same bag; - No waste collection at the surrounding areas of the three rental houses.	- Collect/clean-up the scattered waste and segregate properly for disposal according to NNP1PC's waste management plan and hierarchy. - Provide a camp man daily waste clean-up and waste segregation. - Regularly provide a waste management awareness training toolbox for workers. - The Contractor's Site Manager needs to undertake his role and responsible for their onsite environmental management corresponding to the approved SS-ESMMP.	19.11.2021	28.12.2021	Resolved
8	ONC_KENBER-0007	28.12.2021	Main Dam	The contractor has a lack of spill response and control on site: - Black oil and hydrocarbon spills from the generator and water pump to the ground and open ditch without provision of appropriate countermeasures; - No cleaning up of absorbent	- Move the water pump for 2-3 meters far away from the open ditch and provide spillage control measures to stop the oil leakage to the water. - Collect the oil on the water and store properly for further elimination and disposal environmentally.	05.01.2022	Newly open (it was not followed up during the Q4 2021)	Unresolved

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				sand/contaminated sand for a proper disposal/elimination.	<p>- Regular clean-up of contaminated soil/sand under the generators and store properly for further disposal/elimination.</p> <p>Note: The Contractor needs to pay more attention for spillage response on site. Otherwise, NCR will be issued immediately.</p>			
9	ONC_KENBER-0008	28.12.2021	KENBER's Temporary Camp (Rental houses)	Refer to the previous NCR (NC No.03/2021) pursuant the poor waste management at the temporary camp (rental houses). The scattered waste was collected and burnt at the surrounding areas of the rental houses. Whilst NNP1PC-EMO has regular instructed that no burning of solid waste is allowed.	<p>- Stop burning of solid waste on site. The solid waste shall be sorting/separated:</p> <p>(i) General waste to be disposed of at NNP1 landfill;</p> <p>(ii) Recycle waste to be sold to the local trader.</p> <p>- Collect the burnt waste/ash to bag and deliver to dispose of at the Spoil Disposal no.6, where currently uses for disposing of chemical waste and cement bags.</p>	05.01.2022	Newly open (it was not followed up during the Q4 2021)	Unresolved
10	NC04/2021	28.12.2021	KENBER's Temporary	With reference to the NC No. 02/2021 (in item no. 8), pursuant the lack of spill control	- The Contractor's Site Manager/Project Manager needs to undertake his role and	07.01.2022	Newly open (it was not	Unresolved

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			Camp (Rental houses)	<p>at the KENBER's temporary camp and workshop (rental house) at Hat Gnuin Village. NNP1PC-EMO had issued the NC No. 02/2021 with six (06) instructions to the Contractor's Site Manager for taking the corrective actions. During a joint site inspection and following up on 28 December 2021, only one of six instructions has been undertaken. No corrective actions have been taken for the rest of five instructions, in addition, new addition spillages were also observed. This indicates that the Contractor lacks of attention to follow up and resolve the non-compliance issue.</p> <p>During this joint site inspection, it was found that:</p> <ul style="list-style-type: none"> - No cleaning up of contaminated soil/sand on the ground that NNP1PC-EMO previously instructed on NC No. 	<p>responsibility to ensure the site operation and management are followed the proposed and approved SS-ESMMP.</p> <ul style="list-style-type: none"> - Proper housekeeping and move the scattered fuel drums and used oil drums including oily dirt hose, equipment and machinery to designated hazardous material storage areas. - Clean-up of spillage and contaminated soil/sand and store properly for proper disposal and elimination when the work completed. - Provide a hazardous material management and spill response training to relevant workers. - Precaution signages and work instruction need to be displayed at hazardous material storage areas. - The evidences of the hazardous material management and spill response (photos, training 		followed up during the Q4 2021)	

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				02/2021. - Contaminated sand and spilt oil inside of the bunding area of fuel station was cleaned up and disposed/dumped to the ground outside of bunding area directly without contain and store properly. - New additional spillages on the ground is observed.	material/topics and list of trainees record) shall be presented during the next joint site inspection and verification.			

APPENDIX 3: SITE CODES, LOCATIONS, MONITORING PARAMETERS AND ITS MAP OF THE SURFACE WATER QUALITY MONITORING

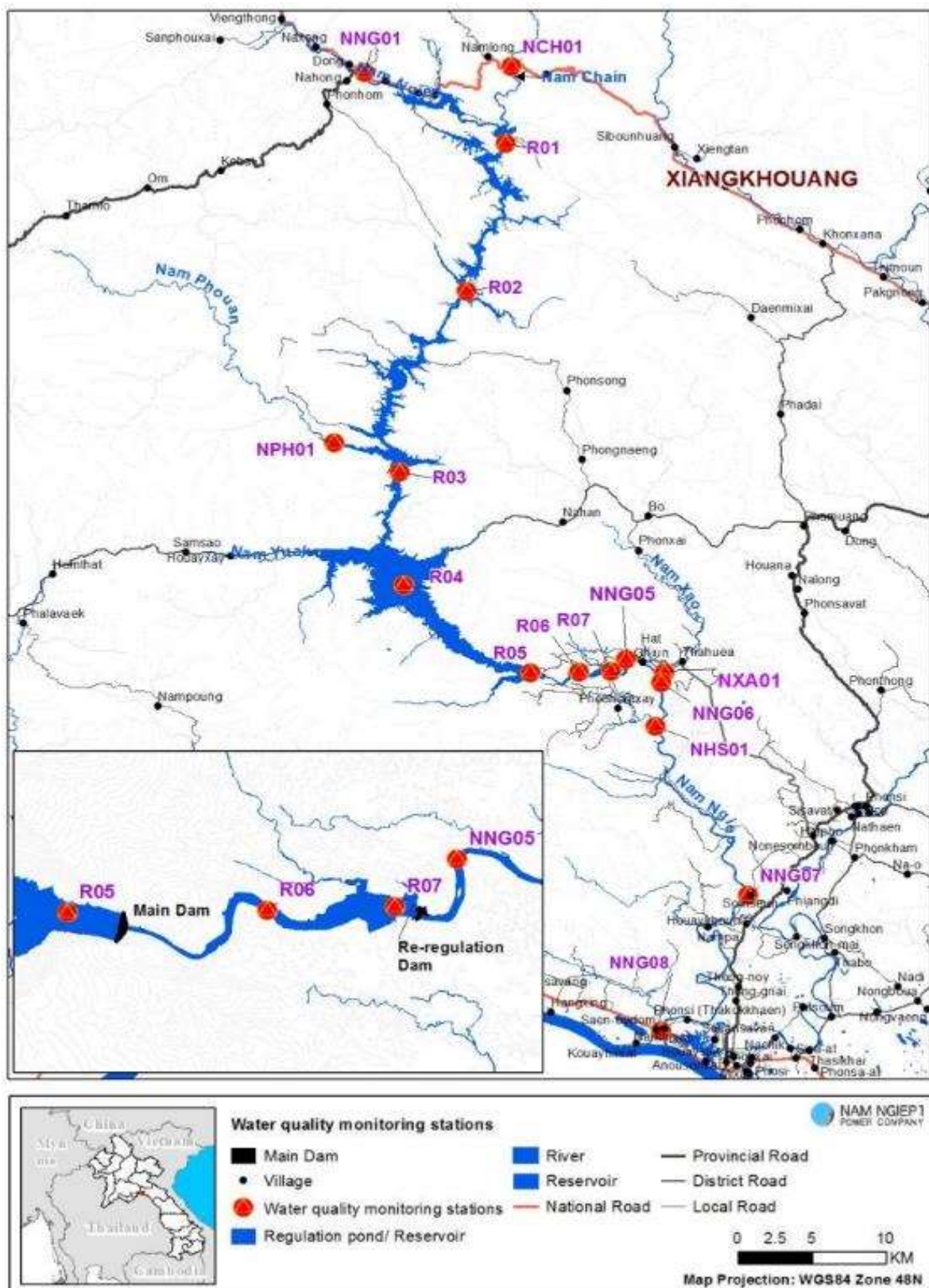
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

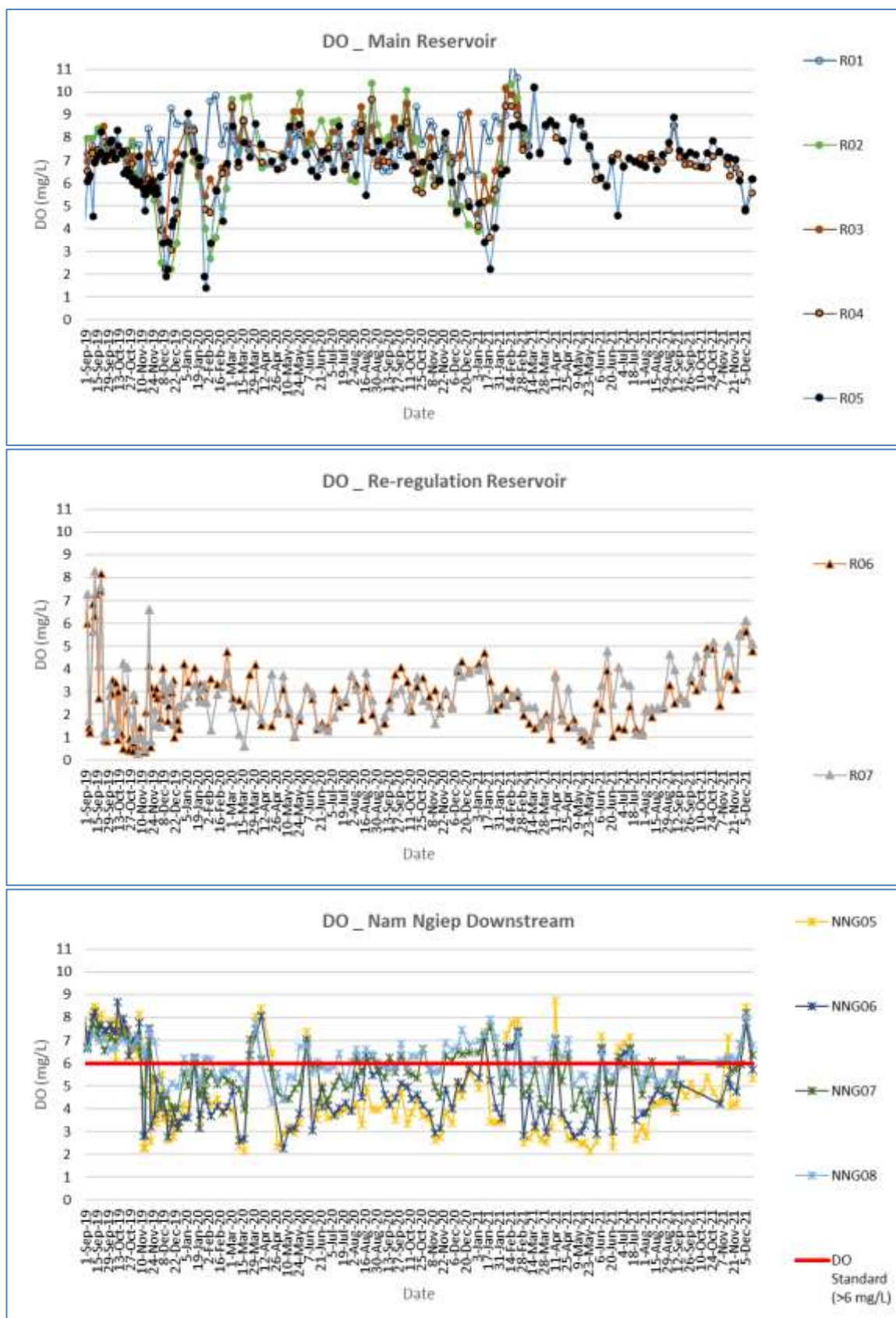
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Phiengta Village	Upstream Project Construction Site
R01	Main reservoir upstream main dam approx. 50 Km.	
R02	Main reservoir upstream main dam approx. 35 Km.	
NNG02/R03	Nam Ngiep Upstream of Nam Phouan Confluence / Main reservoir upstream main dam approx. 21 Km.	
NNG03/R04	Nam Ngiep Downstream of Sopyouak Village/ Main reservoir upstream main dam approx. 13 Km.	
NNG09/R05	Nam Ngiep Upstream Main Dam / Main reservoir upstream main dam approx. 0.5 Km	
NNG04 / R06	Nam Ngiep Downstream RT Camp (Middle Re-regulation Reservoir)	Within Project Construction Site
R07	Reservoir Upstream Re-Regulation Dam	
NNG05	Nam Ngiep Upstream of Hat Gniun Village	Downstream Project Construction Site
NNG06	Nam Ngiep Downstream of Nam Xao Confluence	
NNG07	Nam Ngiep at Somsuen Village	
NNG08	Nam Ngiep at the Bridge of Road 13	
NCH01	Nam Chiane at the Bridge of Road 1D	Tributaries Upstream of Project Construction Site
NPH01	Nam Phouan Upstream of Nam Ngiep Confluence	
NXA01	Nam Xao Upstream of Nam Ngiep Confluence	Tributaries Downstream of Project Construction Site
NSH01	Nam Houay Soup Upstream Nam Ngiep Confluence	

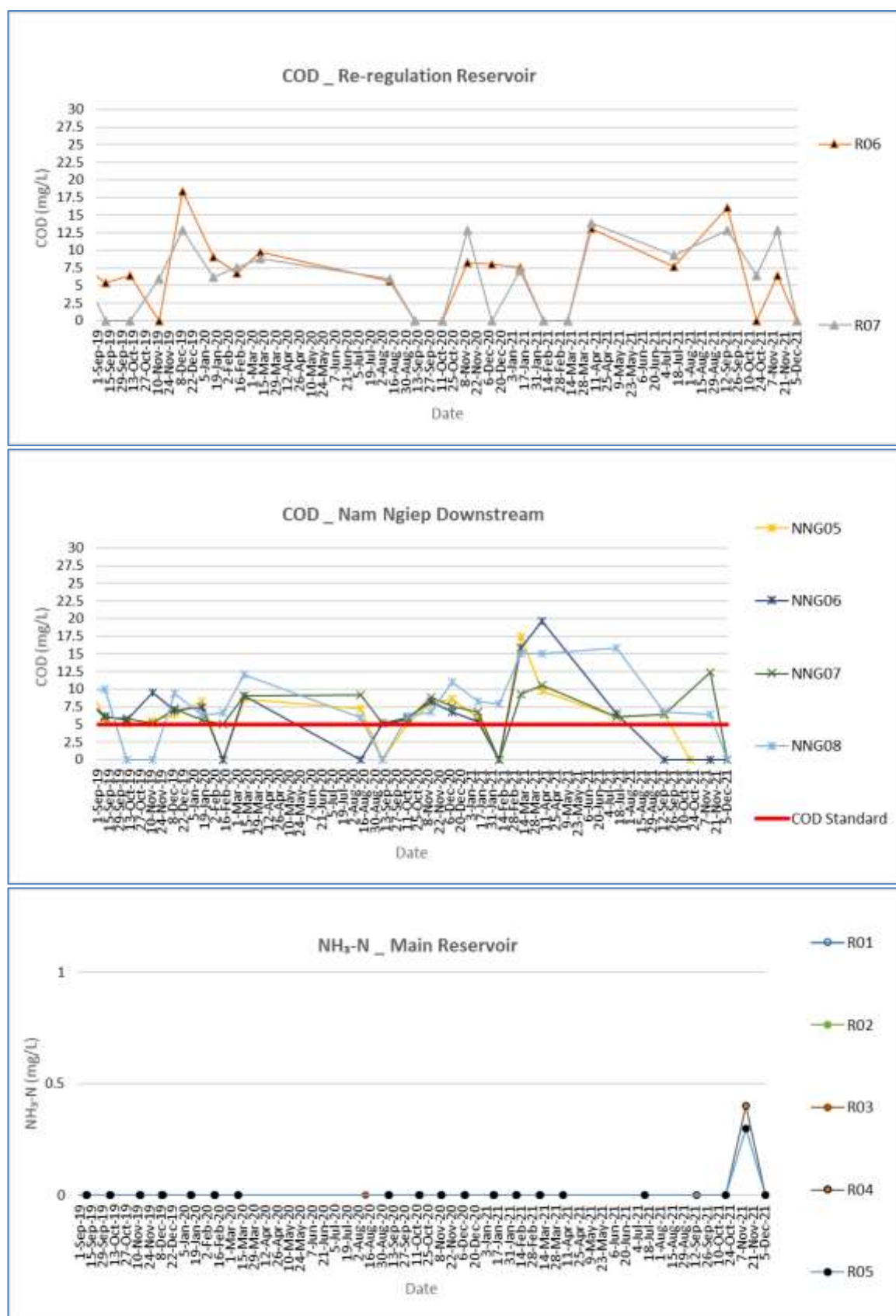
MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), Turbidity (NTU).	<ul style="list-style-type: none"> - Main Reservoir: R01, R02, R03, R04, R05; - Nam Ngiep downstream: NNG05, NNG06, NNG07 and NNG08; - Tributaries: Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01].
Fortnightly	pH, DO (%), DO (mg/L), Conductivity ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), Turbidity (NTU)	All stations
Monthly	TSS (mg/L), BOD ₅ (mg/L), COD (mg/L), NH ₃ -N (mg/L), NO ₃ -N (mg/L), total coliform (MPN/100 mL), faecal coliform (MPN/100 mL), Hydrogen sulphide (mg/L), Phytoplankton biomass, TOC and TKN.	As per ESMMP-OP.

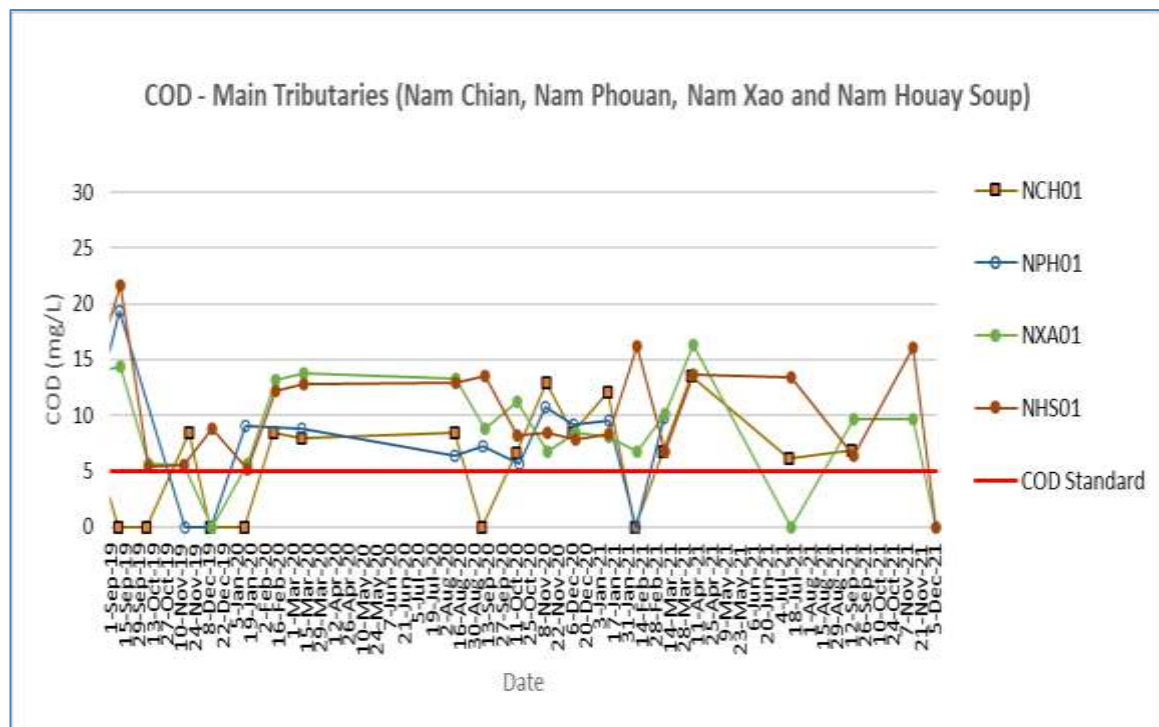
SURFACE WATER QUALITY MONITORING LOCATIONS



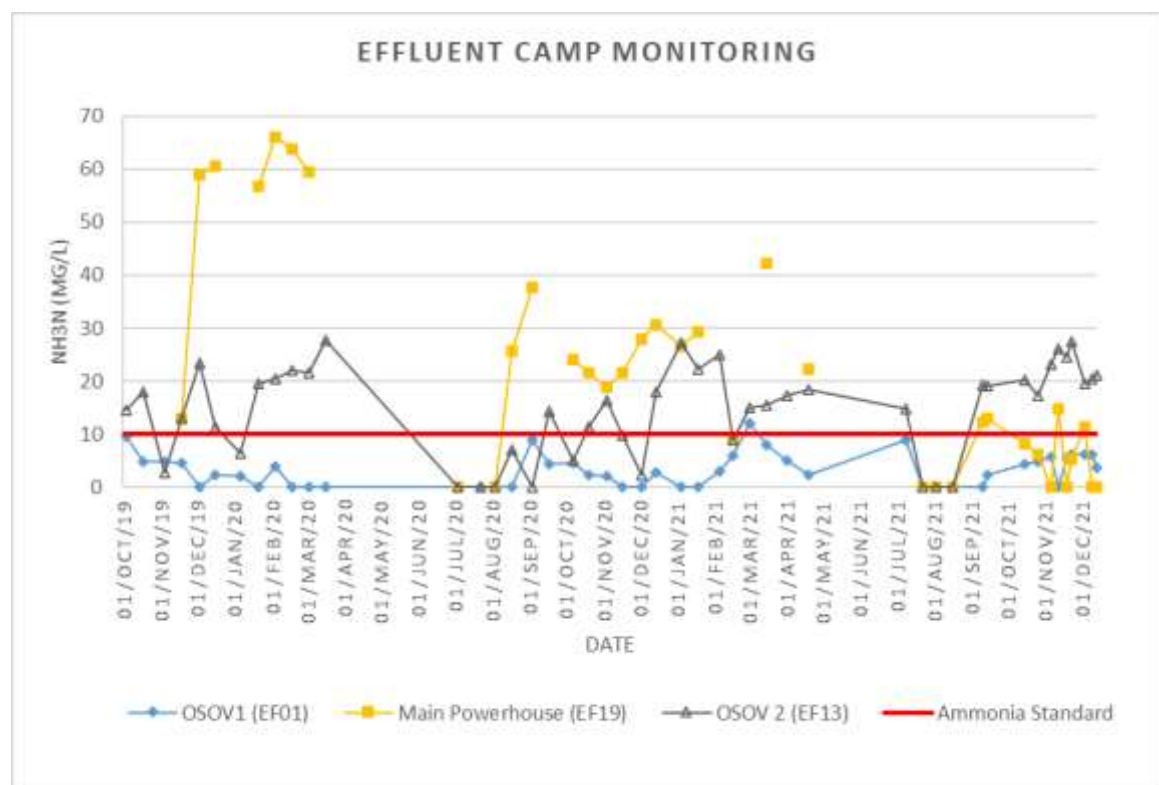
**APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF DECEMBER 2021
(ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)
NAM NGIEP SURFACE WATER**

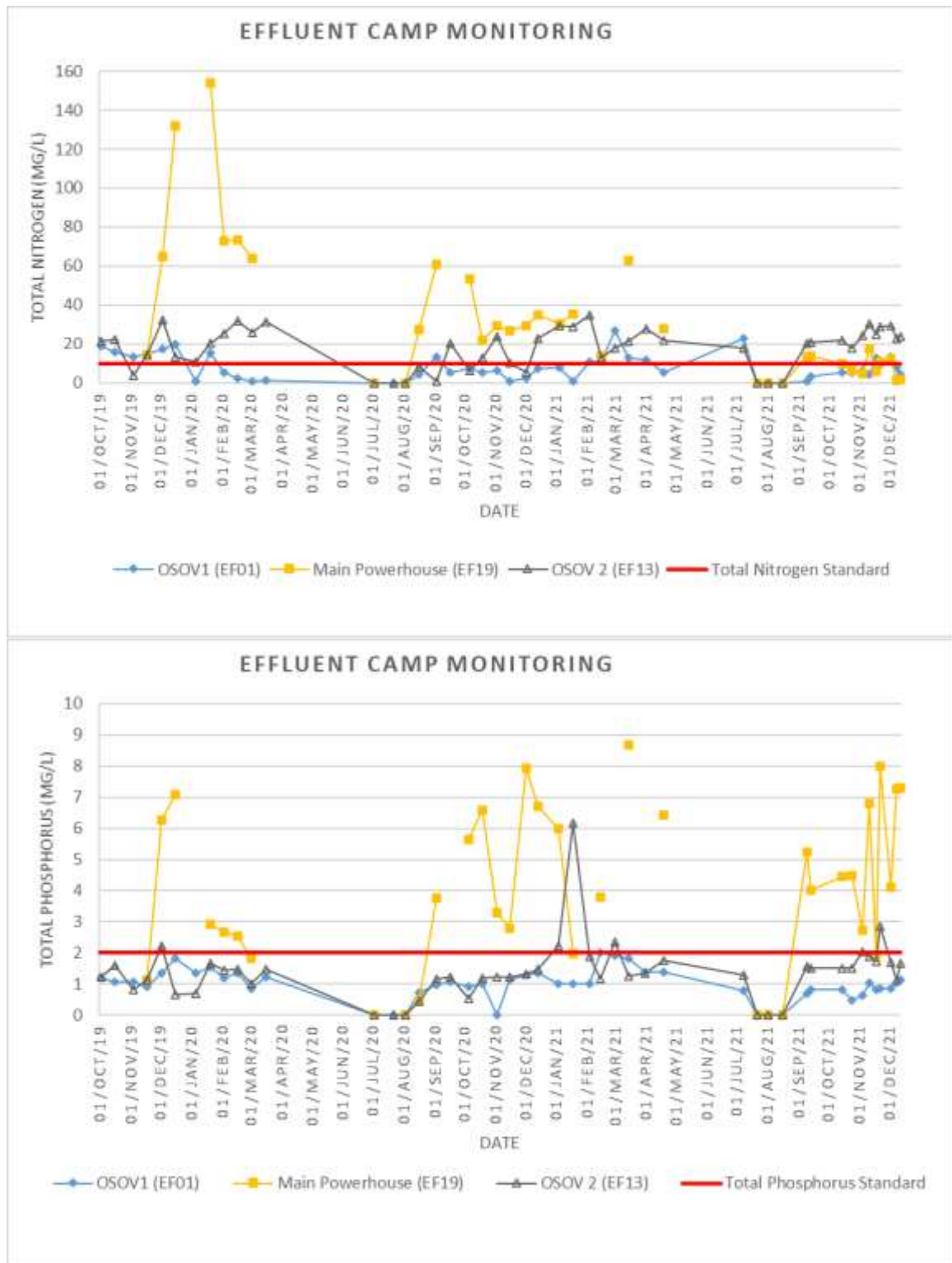


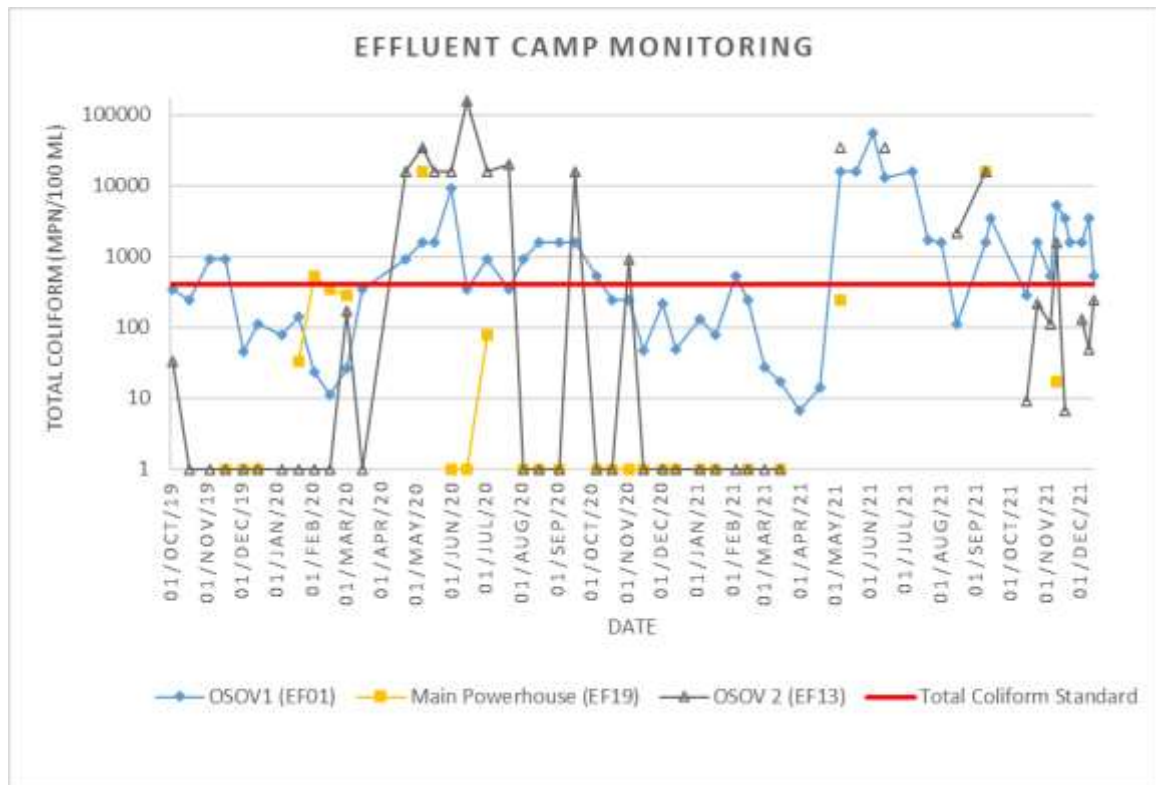
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chiane, Nam Phouan, Nam Xao, Nam Houay Soup



Camps' Effluent Water Quality Trends (Since October 2019 – December 2021)







APPENDIX 5: WATER QUALITY MONITORING DATA**APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q4 2021**

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
5/Oct/21	pH	5.0 - 9.0					7.02	6.89										
6/Oct/21	pH	5.0 - 9.0							6.8	6.87	6.87							
12/Oct/21	pH	5.0 - 9.0					6.69	6.9										
13/Oct/21	pH	5.0 - 9.0							6.64	6.75	6.69							
19/Oct/21	pH	5.0 - 9.0					7.35	7.1	6.98	6.99	6.75							
26/Oct/21	pH	5.0 - 9.0					6.53	6.67										
27/Oct/21	pH	5.0 - 9.0							6.16	6.11	6.2							
3/Nov/21	pH	5.0 - 9.0					7.22	7.06	6.56	6.63								
4/Nov/21	pH	5.0 - 9.0									6.65	6.86	6.77	6.83		6.78	6.7	
13/Nov/21	pH	5.0 - 9.0					7.86	7.23	7.51	7.35								
14/Nov/21	pH	5.0 - 9.0									6.86	6.89	6.98	7.06		6.96	6.92	
16/Nov/21	pH	5.0 - 9.0					6.58	6.87	6.63	6.75								
17/Nov/21	pH	5.0 - 9.0									6.65	6.99	6.91	6.95		6.96	7.12	
23/Nov/21	pH	5.0 - 9.0					7.74	7.57	7.07	7.06								
24/Nov/21	pH	5.0 - 9.0									7.13	7.1	7.14	7.17		7.22	6.99	

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
29/Nov/21	pH	5.0 - 9.0					7.21	7.04	7.01	6.89								
30/Nov/21	pH	5.0 - 9.0									6.85	6.92	6.92	7.07			6.85	6.85
6/Dec/21	pH	5.0 - 9.0					7.11	6.76	6.72	6.82								
7/Dec/21	pH	5.0 - 9.0									6.72	6.9	7.04	7			6.93	6.88
14/Dec/21	pH	5.0 - 9.0					7.74	6.94	6.66	6.64								
15/Dec/21	pH	5.0 - 9.0									6.83	6.92	6.95	6.97			6.85	6.69
5/Oct/21	Sat. DO (%)						88.9	95.6										
6/Oct/21	Sat. DO (%)								37.8	57.3	56.9							
12/Oct/21	Sat. DO (%)						88.5	88.3										
13/Oct/21	Sat. DO (%)								47.9	40.9	58.2							
19/Oct/21	Sat. DO (%)						85.9	93.5	62.2	60.9	68.1							
26/Oct/21	Sat. DO (%)						92.3	100.6										
27/Oct/21	Sat. DO (%)								59.8	64.1	58.2							
3/Nov/21	Sat. DO (%)						95.7	95.2	29.9	39.6								
4/Nov/21	Sat. DO (%)										53.5	51.9	79.1	76.4			77.5	81.4
13/Nov/21	Sat. DO (%)						86.4	90.9	46.3	62.3								
14/Nov/21	Sat. DO (%)										87.7	65.2	75.6	77			77.8	83.7
16/Nov/21	Sat. DO (%)						80.5	89.3	45.6	59								

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
			Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01
Date	Parameters (Unit)	Guideline																
17/Nov/21	Sat. DO (%)									50.6	61.5	70.2	77.8			76	71.9	
23/Nov/21	Sat. DO (%)					85.3	88.9	38.1	44.1									
24/Nov/21	Sat. DO (%)									51.6	57.7	69.7	74.3			76.8	76.5	
29/Nov/21	Sat. DO (%)					79.8	75.6	68.4	67.7									
30/Nov/21	Sat. DO (%)									72.5	72.8	82.2	82.7			82	85.2	
6/Dec/21	Sat. DO (%)					58.2	58.9	69.7	74.9									
7/Dec/21	Sat. DO (%)									100.8	90.9	95.3	92.6			94.9	93.9	
14/Dec/21	Sat. DO (%)					67.1	75	57.7	62									
15/Dec/21	Sat. DO (%)									64.2	67.2	65.3	83.7			81.5	73.2	
5/Oct/21	DO (mg/L)	>6.0				6.75	7.26											
6/Oct/21	DO (mg/L)	>6.0						3.07	4.58	4.63								
12/Oct/21	DO (mg/L)	>6.0				6.73	6.71											
13/Oct/21	DO (mg/L)	>6.0						3.87	3.27	4.71								
19/Oct/21	DO (mg/L)	>6.0				6.69	7.32	4.92	4.7	5.41								
26/Oct/21	DO (mg/L)	>6.0				7.19	7.84											
27/Oct/21	DO (mg/L)	>6.0						4.88	5.2	4.72								
3/Nov/21	DO (mg/L)	>6.0				7.35	7.4	2.41	3.21									
4/Nov/21	DO (mg/L)	>6.0						2.41	3.21	4.32	4.21	5.98	6.1			6.12	6.65	

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup	
		Zone	Location Refer to Construction Sites											Location Refer to Construction Sites				
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream		
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
13/Nov/21	DO (mg/L)	>6.0					6.82	7.14	3.77	5.01								
14/Nov/21	DO (mg/L)	>6.0							3.77	5.01	7.13	5.34	6.15	6.26			6.48	7.2
16/Nov/21	DO (mg/L)	>6.0					6.32	7.1	3.69	4.71								
17/Nov/21	DO (mg/L)	>6.0							3.69	4.71	4.11	4.98	5.68	6.25			6.1	6.03
23/Nov/21	DO (mg/L)	>6.0					6.67	7.04	3.12	3.57								
24/Nov/21	DO (mg/L)	>6.0							3.12	3.57	4.21	4.77	5.75	6.13			6.28	6.64
29/Nov/21	DO (mg/L)	>6.0					6.4	6.1	5.54	5.47								
30/Nov/21	DO (mg/L)	>6.0							5.54	5.47	5.94	5.96	6.82	6.86			6.99	7.49
6/Dec/21	DO (mg/L)	>6.0					4.79	4.85	5.66	6.1								
7/Dec/21	DO (mg/L)	>6.0							5.66	6.1	8.47	7.77	8.22	8.02			8.72	8.16
14/Dec/21	DO (mg/L)	>6.0					5.57	6.17	4.8	5.1								
15/Dec/21	DO (mg/L)	>6.0						6.17	4.8	5.1	5.34	5.7	6.37	6.8			7.19	6.87
5/Oct/21	Conductivity (µs/cm)						67	65										
6/Oct/21	Conductivity (µs/cm)								72	73	73							
12/Oct/21	Conductivity (µs/cm)						67	64										
13/Oct/21	Conductivity (µs/cm)								73	73	73							
19/Oct/21	Conductivity (µs/cm)						67	64	72	73	72							
26/Oct/21	Conductivity (µs/cm)						60	59										
27/Oct/21	Conductivity (µs/cm)								66	65	65							
3/Nov/21	Conductivity (µs/cm)						60	60	68	69								

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
4/Nov/21	Conductivity (µs/cm)									67	69	70	69			121	34	
13/Nov/21	Conductivity (µs/cm)					58	57	65	65									
14/Nov/21	Conductivity (µs/cm)									66	72	66	67			121	43	
16/Nov/21	Conductivity (µs/cm)					58	57	65	64									
17/Nov/21	Conductivity (µs/cm)									65	65	66	66			122	41	
23/Nov/21	Conductivity (µs/cm)					58	57	67	66									
24/Nov/21	Conductivity (µs/cm)									66	67	67	66			123	53	
29/Nov/21	Conductivity (µs/cm)					59	59	64	63									
30/Nov/21	Conductivity (µs/cm)									64	66	66	67			124	60	
6/Dec/21	Conductivity (µs/cm)					63	62	65	65									
7/Dec/21	Conductivity (µs/cm)									65	69	70	70			125	60	
14/Dec/21	Conductivity (µs/cm)					64	63	66	66									
15/Dec/21	Conductivity (µs/cm)									65	67	67	66			131	61	
5/Oct/21	Temperature (°C)					29.75	29.57											
6/Oct/21	Temperature (°C)							26.67	27.02	26.24								
12/Oct/21	Temperature (°C)					29.64	29.6											
13/Oct/21	Temperature (°C)							26.36	26.96	26.31								
19/Oct/21	Temperature (°C)					28.13	28.15	26.4	27.81	27.11								
26/Oct/21	Temperature (°C)					28.24	28.13											
27/Oct/21	Temperature (°C)							25.81	26.1	26.04								
3/Nov/21	Temperature (°C)					28.71	28.44	26.77	26.25									
4/Nov/21	Temperature (°C)									26.35	26.25	26.94	27.24			27.39	25.78	

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream					Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
13/Nov/21	Temperature (°C)						27.67	27.9	26.06	27.02								
14/Nov/21	Temperature (°C)										25.86	25.52	25.91	25.93			24.47	22.89
16/Nov/21	Temperature (°C)						27.56	27.36	26.15	26.98								
17/Nov/21	Temperature (°C)										25.95	25.93	26.28	26.68			26.42	25.91
23/Nov/21	Temperature (°C)						27.86	27.45	25.57	26.02								
24/Nov/21	Temperature (°C)										25.5	25.18	25.07	25.23			25.68	22.4
29/Nov/21	Temperature (°C)						26.57	26.29	26.08	26.34								
30/Nov/21	Temperature (°C)										25.4	25.02	24.92	24.94			23.18	21.71
6/Dec/21	Temperature (°C)						25.25	25.24	26.23	25.8								
7/Dec/21	Temperature (°C)										24.19	23.31	22.91	22.31			19.42	16.49
14/Dec/21	Temperature (°C)						24.83	25.31	24.68	25.12								
15/Dec/21	Temperature (°C)										24.24	23.86	23.73	24.15			21.59	18.42
19/Oct/21	TSS (mg/L)						<5	<5	<5	<5	<5							
13/Nov/21	TSS (mg/L)						<5	<5	<5	<5								
14/Nov/21	TSS (mg/L)										<5	<5	<5	5.73			<5	<5
6/Dec/21	TSS (mg/L)						<5	<5	<5	<5								
7/Dec/21	TSS (mg/L)										<5	<5	<5	<5			<5	<5
19/Oct/21	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1	<1							

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream					Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
13/Nov/21	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
14/Nov/21	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
6/Dec/21	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
7/Dec/21	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
19/Oct/21	COD (mg/L)	<5.0							<5	6.4	<5							
13/Nov/21	COD (mg/L)	<5.0							6.4	12.9								
14/Nov/21	COD (mg/L)	<5.0									<5	<5	12.4	6.4			9.6	16.1
6/Dec/21	COD (mg/L)	<5.0							<5	<5								
7/Dec/21	COD (mg/L)	<5.0									<5	<5	<5	<5			<5	<5
19/Oct/21	NH ₃ -N (mg/L)	<0.2					<0.2	<2										
13/Nov/21	NH ₃ -N (mg/L)	<0.2					0.4	0.3										
6/Dec/21	NH ₃ -N (mg/L)	<0.2					<0.2	<0.2										
19/Oct/21	NO ₃ -N (mg/L)	<5.0					0.05	<0.02										
13/Nov/21	NO ₃ -N (mg/L)	<5.0					<0.02	<0.02										
6/Dec/21	NO ₃ -N (mg/L)	<5.0					<0.02	0.09										
19/Oct/21	Faecal coliform (MPN/100 mL)	<1,000					0	0	5	14	14							
13/Nov/21	Faecal coliform (MPN/100 mL)	<1,000					0	0	0	0								
14/Nov/21	Faecal coliform (MPN/100 mL)	<1,000									8	17	79	110			31	170
6/Dec/21	Faecal coliform (MPN/100 mL)	<1,000					0	0	0	0								
7/Dec/21	Faecal coliform (MPN/100 mL)	<1,000									0	9	8	33			130	33
19/Oct/21	Total Coliform (MPN/100 mL)	<5,000					0	5	220	140	110							
13/Nov/21	Total Coliform (MPN/100 mL)	<5,000					0	0	2	2								
14/Nov/21	Total Coliform (MPN/100 mL)	<5,000									130	350	350	540			1,600	1,600
6/Dec/21	Total Coliform (MPN/100 mL)	<5,000					0	0	2	2								
7/Dec/21	Total Coliform (MPN/100 mL)	<5,000									7	17	79	220			240	350

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
19/Oct/21	TKN (mg/L)						<1.5	<1.5										
13/Nov/21	TKN (mg/L)						<1.5	<1.5										
6/Dec/21	TKN (mg/L)						<1.5	<1.5										
5/Oct/21	Secchi Disk (m)						3	2.7										
12/Oct/21	Secchi Disk (m)						3.4	3.5										
19/Oct/21	Secchi Disk (m)						3	2.9										
26/Oct/21	Secchi Disk (m)						4	4.2										
3/Nov/21	Secchi Disk (m)						3.2	3.7										
13/Nov/21	Secchi Disk (m)						3.75	3.6	4.7	4								
16/Nov/21	Secchi Disk (m)						4	4.3	4.3	4								
23/Nov/21	Secchi Disk (m)						4	4.2	3.8	3.5								
19/Oct/21	TOC (mg/L)								2.11	1.38	1.6							
13/Nov/21	TOC (mg/L)								1.26	1.2								
14/Nov/21	TOC (mg/L)										1.21	1.26	1.23	1.33			1.44	2.29
6/Dec/21	TOC (mg/L)								1.54	1.24								
7/Dec/21	TOC (mg/L)										1.2	1.21	1.26	1.55			1.38	1.3
19/Oct/21	Phytoplankton Biomass (g dry wt/m³)						8	1										
13/Nov/21	Phytoplankton Biomass (g dry wt/m³)						1.6	1.6										
6/Dec/21	Phytoplankton Biomass (g dry wt/m³)						0.6	1										
19/Oct/21	Total Phosphorus (mg/L)						<0.01	<0.01										
13/Nov/21	Total Phosphorus (mg/L)						0.02	<0.01										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
6/Dec/21	Total Phosphorus (mg/L)					<0.01	0.02											
19/Oct/21	Total Dissolved Phosphorus (mg/L)					<0.01	<0.01											
13/Nov/21	Total Dissolved Phosphorus (mg/L)					<0.01	<0.01											
6/Dec/21	Total Dissolved Phosphorus (mg/L)					0.01	<0.01											
19/Oct/21	Hydrogen Sulfide (mg/L)					<0.02	<0.02											
13/Nov/21	Hydrogen Sulfide (mg/L)					<0.02	<0.02											
6/Dec/21	Hydrogen Sulfide (mg/L)					<0.02	<0.02											
19/Oct/21	TSS (mg/L)-bottom					16.53	<5											
13/Nov/21	TSS (mg/L)-bottom					14.8	<5											
6/Dec/21	TSS (mg/L)-bottom					11.97	<5											
19/Oct/21	BOD ₅ (mg/L)-bottom					<1	2.5											
13/Nov/21	BOD ₅ (mg/L)-bottom					<1	<1											
6/Dec/21	BOD ₅ (mg/L)-bottom					<1	<1											
19/Oct/21	Total Coliform (MPN/100 mL)-bottom					0	7.8											
13/Nov/21	Total Coliform (MPN/100 mL)-bottom					0	0											
6/Dec/21	Total Coliform (MPN/100 mL)-bottom					0	0											
19/Oct/21	Faecal coliform (MPN/100 mL)-bottom					0	0											

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
13/Nov/21	Faecal coliform (MPN/100 mL)-bottom						0	0										
6/Dec/21	Faecal coliform (MPN/100 mL)-bottom						0	0										
19/Oct/21	NH ₃ -N (mg/L)-bottom						0.56	0.21										
13/Nov/21	NH ₃ -N (mg/L)-bottom						0.52	<0.2										
6/Dec/21	NH ₃ -N (mg/L)-bottom						0.4	<0.2										
19/Oct/21	NO ₃ -N (mg/L)-bottom																	
13/Nov/21	NO ₃ -N (mg/L)-bottom						<0.02	<0.02										
6/Dec/21	NO ₃ -N (mg/L)-bottom						0.08	<0.02										
19/Oct/21	TKN-bottom						6.2	5.3										
13/Nov/21	TKN-bottom						<1.5	<1.5										
6/Dec/21	TKN-bottom						<1.5	<1.5										
19/Oct/21	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	<0.01										
13/Nov/21	Total Dissolved Phosphorus (mg/L)-bottom						0.05	0.03										
6/Dec/21	Total Dissolved Phosphorus (mg/L)-bottom						0.08	0.01										
19/Oct/21	Total Phosphorus (mg/L)-bottom						<0.01	0.01										
13/Nov/21	Total Phosphorus (mg/L)-bottom						0.05	0.04										
6/Dec/21	Total Phosphorus (mg/L)-bottom						0.11	0.03										
19/Oct/21	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NN G 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
13/Nov/21	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
6/Dec/21	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
19/Oct/21	Phytoplankton Biomass (g dry wt/m³)-bottom						8	2.4										
13/Nov/21	Phytoplankton Biomass (g dry wt/m³)-bottom						15.6	1.6										
6/Dec/21	Phytoplankton Biomass (g dry wt/m³)-bottom						15	2										

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q4 2021

		Site Name	OSOV1	OSOV 2 (ESD Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
15/Oct/21	pH	6.0 - 9.0	6.78	7.53	7.84
25/Oct/21	pH	6.0 - 9.0	6.37	7.28	7.04
05/Nov/21	pH	6.0 - 9.0	6.73	7.45	7.97
11/Nov/21	pH	6.0 - 9.0	6.77	7.77	7.92
18/Nov/21	pH	6.0 - 9.0	6.94	7.49	7.29
22/Nov/21	pH	6.0 - 9.0	7.34	7.62	7.8
03/Dec/21	pH	6.0 - 9.0	6.73	7.37	7.56
09/Dec/21	pH	6.0 - 9.0	6.46	7.3	8.14
13/Dec/21	pH	6.0 - 9.0	6.86	7.48	7.04
15/Oct/21	Sat. DO (%)		58.4	90.2	95
25/Oct/21	Sat. DO (%)		70.8	87.7	80.2
05/Nov/21	Sat. DO (%)		37.2	80.4	81.9
11/Nov/21	Sat. DO (%)		65.1	78.8	69
18/Nov/21	Sat. DO (%)		52.7	79.9	65.9
22/Nov/21	Sat. DO (%)		74.2	85.7	73.9
03/Dec/21	Sat. DO (%)		43.2	76.8	84.6
09/Dec/21	Sat. DO (%)		68	80.6	84.5
13/Dec/21	Sat. DO (%)		54.6	76.7	74.5
15/Oct/21	DO (mg/L)		4.65	7.15	7.27
25/Oct/21	DO (mg/L)		5.53	6.83	6.14
05/Nov/21	DO (mg/L)		5.68	6.28	6.1
11/Nov/21	DO (mg/L)		5.19	6.31	5.18
18/Nov/21	DO (mg/L)		4.17	6.33	5.02
22/Nov/21	DO (mg/L)		5.85	6.76	5.82
03/Dec/21	DO (mg/L)		3.66	6.47	6.53
09/Dec/21	DO (mg/L)		5.82	6.73	6.58
13/Dec/21	DO (mg/L)		4.66	6.53	5.92
15/Oct/21	Conductivity (µs/cm)		365	463	764
25/Oct/21	Conductivity (µs/cm)		358	400	1126
05/Nov/21	Conductivity (µs/cm)		3.7	453	1059
11/Nov/21	Conductivity (µs/cm)		343	454	768
18/Nov/21	Conductivity (µs/cm)		372	424	1500
22/Nov/21	Conductivity (µs/cm)		375	464	1402
03/Dec/21	Conductivity (µs/cm)		378	411	937
09/Dec/21	Conductivity (µs/cm)		364	431	1700
13/Dec/21	Conductivity (µs/cm)		303	436	1630
15/Oct/21	Temperature (°C)		27.13	27.22	29.14
25/Oct/21	Temperature (°C)		27.78	28.14	29.01
05/Nov/21	Temperature (°C)		27.99	27.97	30.53
11/Nov/21	Temperature (°C)		27	26.62	30.27
18/Nov/21	Temperature (°C)		27.52	27.19	29.43
22/Nov/21	Temperature (°C)		27.61	27.59	29.61
03/Dec/21	Temperature (°C)		23.53	23.95	28.68
09/Dec/21	Temperature (°C)		23.57	24.4	28.12
13/Dec/21	Temperature (°C)		23.48	23.32	26.85
15/Oct/21	TSS (mg/L)	<50	<5	9.85	6.19

		Site Name	OSOV1	OSOV 2 (ESD Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
25/Oct/21	TSS (mg/L)	<50	<5	7.93	<5
11/Nov/21	TSS (mg/L)	<50	<5	<5	16.8
18/Nov/21	TSS (mg/L)	<50	<5	<5	5.02
22/Nov/21	TSS (mg/L)	<50	<5	7.46	<5
03/Dec/21	TSS (mg/L)	<50	<5	9.68	33.11
09/Dec/21	TSS (mg/L)	<50	<5	8.4	29.52
13/Dec/21	TSS (mg/L)	<50	<5	10.4	33.4
15/Oct/21	BOD ₅ (mg/L)	<30	<6	<6	<6
25/Oct/21	BOD ₅ (mg/L)	<30	<6	<6	<6
05/Nov/21	BOD ₅ (mg/L)	<30	<6	<6	<6
11/Nov/21	BOD ₅ (mg/L)	<30	<6	<6	<6
18/Nov/21	BOD ₅ (mg/L)	<30	<6	<6	
22/Nov/21	BOD ₅ (mg/L)	<30	<6	<6	<6
03/Dec/21	BOD ₅ (mg/L)	<30	6.57	<6	<6
09/Dec/21	BOD ₅ (mg/L)	<30	<6	<6	<6
13/Dec/21	BOD ₅ (mg/L)	<30	<6	<6	<5
15/Oct/21	COD (mg/L)	<125	<25	26.4	28.5
25/Oct/21	COD (mg/L)	<125	<25	38.8	<25
05/Nov/21	COD (mg/L)	<125	<25	29.2	<25
11/Nov/21	COD (mg/L)	<125	<25	36.4	53.3
18/Nov/21	COD (mg/L)	<125	<25	32	<25
22/Nov/21	COD (mg/L)	<125	<25	34.4	<25
03/Dec/21	COD (mg/L)	<125	<25	36.2	68
09/Dec/21	COD (mg/L)	<125	<25	38.2	29.4
13/Dec/21	COD (mg/L)	<125	<25	43.8	36.4
15/Oct/21	NH ₃ -N (mg/L)	<10.0	4.3	20.3	8.3
25/Oct/21	NH ₃ -N (mg/L)	<10.0	4.8	17.2	6.1
05/Nov/21	NH ₃ -N (mg/L)	<10.0	5.7	23.1	<2
11/Nov/21	NH ₃ -N (mg/L)	<10.0	<2	26.1	14.7
18/Nov/21	NH ₃ -N (mg/L)	<10.0	5.4	24.6	<2
22/Nov/21	NH ₃ -N (mg/L)	<10.0	6.3	27.4	5.2
03/Dec/21	NH ₃ -N (mg/L)	<10.0	6.2	19.5	11.4
09/Dec/21	NH ₃ -N (mg/L)	<10.0	6.3	20.5	<2
13/Dec/21	NH ₃ -N (mg/L)	<10.0	3.8	21.1	<2
15/Oct/21	Total Nitrogen (mg/L)	<10.0	5.13	22.1	9.72
25/Oct/21	Total Nitrogen (mg/L)	<10.0	5.37	18.1	6.32
05/Nov/21	Total Nitrogen (mg/L)	<10.0	6.22	24.3	4.67
11/Nov/21	Total Nitrogen (mg/L)	<10.0	4.12	30.5	17.3
18/Nov/21	Total Nitrogen (mg/L)	<10.0	12.9	25.1	5.9
22/Nov/21	Total Nitrogen (mg/L)	<10.0	9.41	28.7	10.8
03/Dec/21	Total Nitrogen (mg/L)	<10.0	13.5	29.6	12.2
09/Dec/21	Total Nitrogen (mg/L)	<10.0	7.84	22.9	1.59
13/Dec/21	Total Nitrogen (mg/L)	<10.0	4.34	23.8	1.69
15/Oct/21	Total Phosphorus (mg/L)	<2	0.82	1.51	4.46
25/Oct/21	Total Phosphorus (mg/L)	<2	0.47	1.5	4.49
05/Nov/21	Total Phosphorus (mg/L)	<2	0.64	2.03	2.72
11/Nov/21	Total Phosphorus (mg/L)	<2	1.03	1.89	6.79

		Site Name	OSOV1	OSOV 2 (ESD Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
18/Nov/21	Total Phosphorus (mg/L)	<2	0.84	1.72	1.9
22/Nov/21	Total Phosphorus (mg/L)	<2	0.87	2.87	8
03/Dec/21	Total Phosphorus (mg/L)	<2	0.87	1.7	4.11
09/Dec/21	Total Phosphorus (mg/L)	<2	1.04	1.15	7.26
13/Dec/21	Total Phosphorus (mg/L)	<2	1.14	1.68	7.29
15/Oct/21	Faecal Coliform (MPN/100 mL)	<400	220	4.5	0
25/Oct/21	Faecal Coliform (MPN/100 mL)	<400	1600	220	0
05/Nov/21	Faecal Coliform (MPN/100 mL)	<400	540	79	0
11/Nov/21	Faecal Coliform (MPN/100 mL)	<400	5400	1600	17
18/Nov/21	Faecal Coliform (MPN/100 mL)	<400	1600	0	0
22/Nov/21	Faecal Coliform (MPN/100 mL)	<400	540	0	0
03/Dec/21	Faecal Coliform (MPN/100 mL)	<400	540	79	0
09/Dec/21	Faecal Coliform (MPN/100 mL)	<400	3500	9.3	0
13/Dec/21	Faecal Coliform (MPN/100 mL)	<400	49	23	0
15/Oct/21	Total coliform (MPN/100 mL)	<400	280	9.3	0
25/Oct/21	Total coliform (MPN/100 mL)	<400	1600	220	0
05/Nov/21	Total coliform (MPN/100 mL)	<400	540	110	0
11/Nov/21	Total coliform (MPN/100 mL)	<400	5400	1600	17
18/Nov/21	Total coliform (MPN/100 mL)	<400	3500	6.8	0
22/Nov/21	Total coliform (MPN/100 mL)	<400	1600	0	0
03/Dec/21	Total coliform (MPN/100 mL)	<400	1600	130	0
09/Dec/21	Total coliform (MPN/100 mL)	<400	3500	49	0
13/Dec/21	Total coliform (MPN/100 mL)	<400	540	240	0
15/Oct/21	Oil & Grease (mg/L)	<10.0	<1	2	<1
05/Nov/21	Oil & Grease (mg/L)	<10.0	1.6	<1	1.2
03/Dec/21	Oil & Grease (mg/L)	<10.0	<1	<1	1

APPENDIX 5-3: LANDFILL LEACHATE MONITORING RESULTS – Q4 2021

			Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
			Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
			Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline								
4/Oct/21	pH	6.0-9.0					8.25		8.91	
15/Oct/21	pH	6.0-9.0					8.32		8.27	
5/Nov/21	pH	6.0-9.0					7.93		7.73	
3/Dec/21	pH	6.0-9.0					7.34		7.26	
4/Oct/21	Sat. DO (%)						107.4		144.1	
15/Oct/21	Sat. DO (%)						116.6		116	
5/Nov/21	Sat. DO (%)						93.8		89.1	
3/Dec/21	Sat. DO (%)						76.1		91.1	
4/Oct/21	DO (mg/L)						7.92		10.68	
15/Oct/21	DO (mg/L)						9.3		9.23	
5/Nov/21	DO (mg/L)						7.34		7.04	
3/Dec/21	DO (mg/L)						6.68		7.82	
4/Oct/21	Conductivity (µS/cm)						83		147	
15/Oct/21	Conductivity (µS/cm)						76		150	
5/Nov/21	Conductivity (µS/cm)						73		139	
3/Dec/21	Conductivity (µS/cm)						81		154	
4/Oct/21	Temperature (°C)						31.42		31.06	
15/Oct/21	Temperature (°C)						26.82		26.96	
5/Nov/21	Temperature (°C)						28.03		27.59	
3/Dec/21	Temperature (°C)						21.74		22.9	
4/Oct/21	BOD5 (mg/L)	<30					6.9		9.96	
15/Oct/21	BOD5 (mg/L)	<30					7.77		6.63	
5/Nov/21	BOD5 (mg/L)	<30					7.71		9.27	
3/Dec/21	BOD5 (mg/L)	<30					10.86		<6	
15/Oct/21	COD (mg/L)	<125					48.4		54.4	
5/Nov/21	COD (mg/L)	<125					68.7		59	
3/Dec/21	COD (mg/L)	<125					80.8		47.7	
4/Oct/21	Faecal Coliform (MPN/100 mL)	<400					6.8		4.5	
15/Oct/21	Faecal Coliform (MPN/100 mL)	<400					70		540	
5/Nov/21	Faecal Coliform (MPN/100 mL)	<400					49		33	
3/Dec/21	Faecal Coliform (MPN/100 mL)	<400					49		23	
4/Oct/21	Total Coliform (MPN/100 mL)	<400					220		170	

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
15/Oct/21	Total Coliform (MPN/100 mL)	<400				70		920	
5/Nov/21	Total Coliform (MPN/100 mL)	<400				110		33	
3/Dec/21	Total Coliform (MPN/100 mL)	<400				540		79	
15/Oct/21	Total Nitrogen (mg/L)	<10				1.83		1.78	
5/Nov/21	Total Nitrogen (mg/L)	<10				1.67		1.61	
3/Dec/21	Total Nitrogen (mg/L)	<10				18.6		15.4	
5/Nov/21	Copper (mg/L)					<0.006		<0.006	
5/Nov/21	Iron (mg/L)					0.41		1.33	
15/Oct/21	Ammonia nitrogen (mg/L)	<10				<2		<2	
5/Nov/21	Ammonia nitrogen (mg/L)	<10				<2		<2	
3/Dec/21	Ammonia nitrogen (mg/L)	<10				<2		<2	
15/Oct/21	Oil & Grease (mg/L)	<10				<1		1.3	
5/Nov/21	Oil & Grease (mg/L)	<10				<1		1.3	
3/Dec/21	Oil & Grease (mg/L)	<10				1		<1	