

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

November 2021




					
A	15 December 2021	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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EXECUTIVE SUMMARY

A joint ADB, LTA and IAP 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 support from the Biodiversity Service Provider – Wildlife Conservation Society (BSP-WCS) and NNP1PC TD. The results of mission will be updated in Monthly Report of December 2021.

During November 2021, EMO received one document for review and approval. EMO issued two Non-Compliance Reports (NCR) to a Contractor.

Due to the COVID-19 pandemic and the measures announced by the GOL, the regular joint site inspections were completely suspended at all restricted areas such as nearby villages and in Zone 2UR as well as at NNP1PC's operation sites during the reporting period. However, the EMO undertook their own site inspections of the Dam sites, NNP1PC's operation sites and the 230 kV transmission line as normal.

The operation and adjustment of the newly constructed wastewater treatment systems are in progress. EMO has conducted six fortnightly samplings after the completion of the improvements. EMO requires more time to confirm the results and the sampling schedule is now adjusted from fortnightly to weekly basis to optimize the wastewater treatment conditions.

In November 2021, water quality depth profile measurements at R01, R02 and R03 (main reservoir) and NPH01 were suspended due to security concerns.

At R05, the average DO concentration was 6.9 mg/L in the upper 8.5 m varying between 5.7 mg/L and 7.9 mg/L, and the oxycline was generally found at a depth of 9.0 to 19.0 m with DO concentrations abruptly decreasing from about 6 mg/L to below 2 mg/L– similar to October 2021. In the Re-regulation Reservoir, the mean DO concentration at water column were 3.8 mg/L and 4.2 mg/L in R06 and R07 respectively.

The discharge from the Re-regulation Dam was mainly turbine discharge and occasionally gate discharge during reported period. At the stations in Nam Ngiep immediately downstream of the Re-regulation Dam, the DO concentrations were between 4.1 mg/L and 5.9 mg/L (mean 4.6 mg/L) for turbine discharge periods. No dead fish was observed in Nam Ngiep downstream in this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream. In addition, the trial operations to study the DO level improvement by conducting the combination of labyrinth and turbine discharges, labyrinth discharge and turbine discharge were conducted during 01-02 November and 08-11 November 2021. The results are reported separately by TD team and shared with ADB and LTA during the latest virtual mission.

In November 2021, the local waste collection contractors continued collecting waste from the NNP1PC's operation sites and the nearby villages, and operating the NNP1 Project Landfill and Houay Soup Landfill. The work included waste segregation and disposal, waste cover, grass cutting and repairing perimeter fences.

A total of 20.9 m³ of solid waste was disposed of at the NNP1 Project Landfill, an increase of 4.9 m³ compared with October 2021. A total of 25.9 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, a decrease of 1.3 m³ compared with October 2021. During this period, the local recycle waste vendors have collected recyclable waste and

hazardous waste on site for further recycling and disposal. There was no trading of recyclable waste at the community recycle waste bank during the period of reporting.

There were no field activities carried out by Xaysomboun Reservoir Protection Office (WRPO) in November 2021. Bolikhamxay WRPO carried out the forest and reservoir patrol under the approved Annual Implementation Plan (AIP) 2021. Bolikhamxay Nam Chouane-Nam Xang Biodiversity Offset Management Unit (NC-NX BOMU) carried out NC-NX patrolling and snare removal activity in November 2021.

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

Some pending documents relating to ISO14001:2015 are under preparation and review by the relevant parties. The work plan for EMO remains unchanged from the October 2021 Report.

TABLE 1-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN-REVISED IN NOVEMBER 2021

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

1.2 COMPLIANCE MANAGEMENT

In October 2021, EMO received one document for review and approval. The status of document review is shown on **Table 1-2** below.

TABLE 1-2: SUMMARY STATUS OF DOCUMENT REVIEW IN NOVEMBER 2021

Title	Date Received	Status
DWP & SS-ESMMP for Irrigation Repairing	30 November 2021 (1 st submission)	Under review

Due to the Corvid-19 situation, the GOL's lockdown measures continue to be in place in the area surrounding the project and its activities, and the suspension of the regular joint site inspections has continued at all areas such as at nearby villages, in Zone 2UR and at NNP1PC's operation sites during the reporting period. However, the Compliance team conducted their normal independent site inspections at the construction sites and contractor camps including at OSOV1, OSOV2, and at the Main Dam grouting work.

The operation and adjustment of the newly constructed wastewater treatment systems (WWTS) are in progress. EMO has conducted six fortnightly samplings since the completion of the improvements. EMO requires more time to confirm the results and the sampling schedule is now adjusted from fortnightly to weekly basis to optimize the wastewater treatment conditions. In addition, the WWTS operation manual is under drafting with support of the Contractor (SCC). It is expected that the manual will be finalized in December 2021.

EMO issued two Non-Compliance Reports (NCR) during November 2021. The status of compliance reports (Observation of Non-Compliance or ONC; and Non-Compliance Report or NCR) issued by NNP1PC is summarized in **Table 1-3** and **Table 1-4** below.

TABLE 1-3: SUMMARY OF ONCs AND NCRs

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from October 2021	0	0	0	0
Newly Opened in November 2021	0	2	0	0
Total in November 2021	0	2	0	0
Resolved in November 2021	0	0	0	0
Carried over to December 2021	0	2	0	0
Unsolved Exceeding Deadlines	0	0	0	0

TABLE 1-4: SUMMARY OF THE NCRs ISSUED TO THE CONTRACTOR

Document Number / Date of Issue	Subject Description	Current Status at the end of November 2021
NC02/21 09-11-21 (NCR Level 1)	Lack of spill control at the KENBER's temporary camp and workshop (rental house) at Hat Gniun Village. <ul style="list-style-type: none"> - A lot of fuel spilt inside the bunding area without provision of any countermeasure; - Machinery maintenance on the bare ground without spill protection facilities; - Evidence of hydrocarbon spilt on the ground surrounding the workshop and fuel station without cleaning up; and - Lack of collection and proper storing of hazardous material. Fuel drums and used oil drums are scattered on the camp yard. 	The corrective action on site was done by the Contractor but has not yet been verified by the EMO Compliance Team. The NCR will be closed after the verification on site in December 2021.
NC03/21 09-11-21 (NCR Level 1)	Poor waste management at the KENBER Contractor's temporary camp (rental houses) in Hat Gniun Village: <ul style="list-style-type: none"> - No waste segregation on site. General waste and recycle waste are mixed in the same bags; - No waste collection at surrounding of three rental houses. 	The corrective action on site was done by the Contractor but has not yet been verified by the EMO Compliance Team. The NCR will be closed after the verification on site in December 2021.

1.2.1 Site Inspection by Environment Management Unit (EMU)

The monthly site visit by the EMU of Bolikhan District and the quarterly site visit by the EMU of Xaysomboun Province were not carried out in November 2021 due to the COVID-19 lockdown measures.

1.2.2 Site Decommissioning and Rehabilitation

During the reporting period of November 2021, EMO has continued to monitor the status and progress of site rehabilitation for the Phouhomxay Village's Irrigation canal rock and spoil disposal area and the former LILAMA10 camp. A joint site inspection between EMO and TD O&M at the former LILAMA10 camp evaluated the percentage of vegetation cover since TD completed additional counter measures in early September 2021 and found that the vegetation cover is 65%, which is similar to October 2021.

1.3 WATER QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD₅), Faecal Coliform Bacteria, Total Coliform Bacteria and *E. coli* have been carried out by NNP1PC's environmental laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) monthly, and quarterly to the ADB. The reports are also published on the Company's website at <https://namngiep1.com/resources/monitoring-reports/>

Due to the rapid increase in COVID-19 infection cases in the project related communities during November 2021, the GOL imposed additional COVID-19 preventative measures, which meant that the community water supply (groundwater and gravity fed) monitoring had to be suspended.

In addition, there is still no turbidity measurement data reported in November 2021 due to the Turbidity Meter was broken.

1.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the **Annex B** of this Report. The effluent camp monitoring results in November 2021 indicated non-compliances for some parameters in OSOV1 (EF01), OSOV2 (EF13) and the Main Powerhouse (EF19).

The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in **Table 1-5**.

TABLE 1-5: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN NOVEMBER 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total nitrogen in one out of four samplings, and faecal coliform and total coliform in all four samplings.	The wastewater treatment systems modification and improvements were completed. The efficacy of the treatment systems will be closely monitored until the end of December 2021 to ensure that there is sufficient data to draw conclusions and make appropriate adjustments to the operation.
OSOV2	EF13	Non-compliance for ammonia-nitrogen and total nitrogen in all four samplings, and faecal coliform and total coliform in one out of four samplings.	
Main Powerhouse	EF19	Non-compliance for total phosphorus in three out of four samplings, total nitrogen in two out of four samplings, ammonia nitrogen in one out of four samplings.	

1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

The ambient surface water and reservoir water quality monitoring programme comprises five monitoring stations in the main reservoir (R01-R05), two stations in the Re-regulation Reservoir (R06 and R07), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]). However, water quality monitoring at three stations in the main reservoir (R01-R03) and Nam Phouan (NPH01) were suspended due to the security concerns.

Weekly depth profile monitoring (pH, DO, conductivity and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation reservoir and the main reservoir. The locations of the monitoring stations are shown in **Figure 1-2**.

The monitoring results for key parameters (DO, TSS and BOD₅) during November 2021 are presented in **Table 1-6, Table 1-7 and Table 1-8**. The full set of data for November 2021 is attached in **Annex A**. In addition, the results for DO are presented as line graphs in **Figure 1-3**.

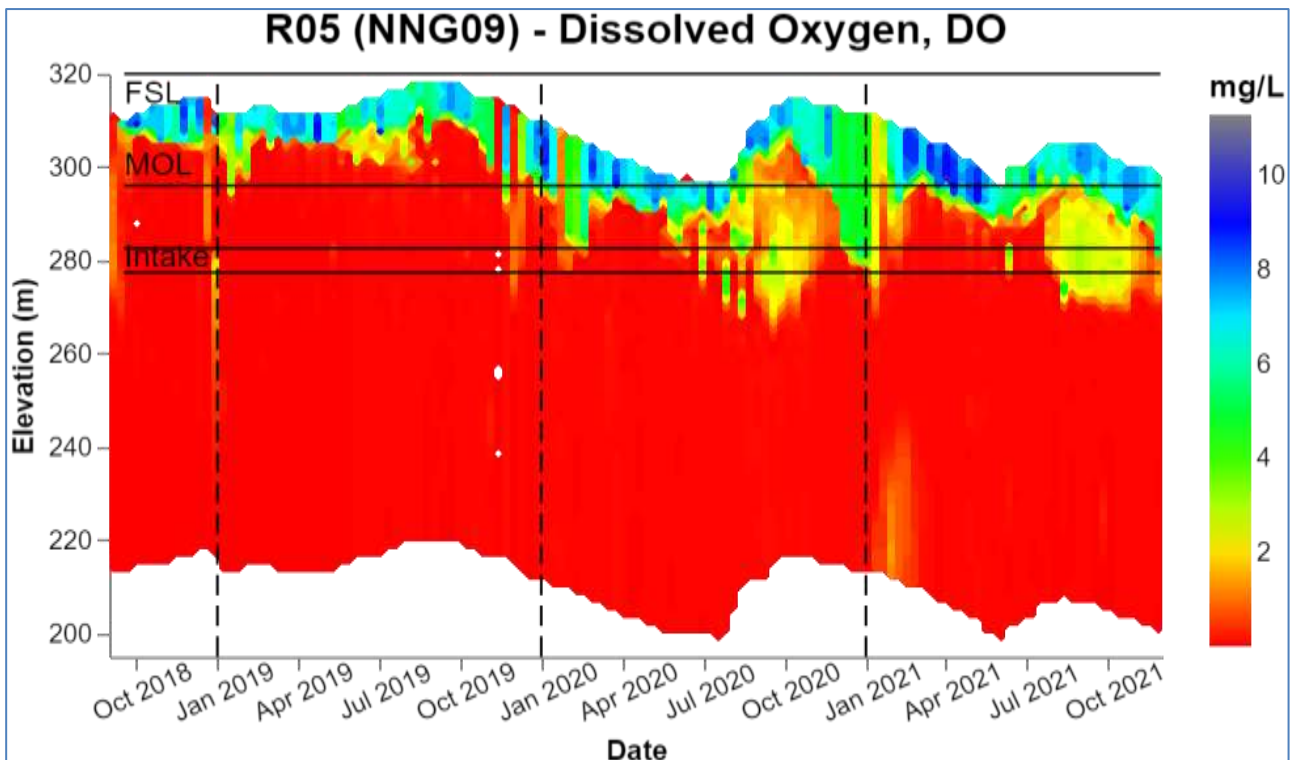
Main Reservoir

From 01 to 30 November 2021, the main reservoir water level decreased with 1.28 m from El. 300.99 m asl to El. 299.71 m.

Depth profile measurements and sampling at R01, R02 and R03 continue to be suspended due to security concerns during November 2021.

At R05, the average DO concentration was 6.9 mg/L in the upper 8.5 m varying between 5.7 mg/L and 7.9 mg/L, and the oxycline was generally found at a depth of 9.0 – 19.0 m with DO concentrations abruptly decreasing from about 6 mg/L to below 2 mg/L – similar to October 2021. As shown in Figure 1-1, at the intake level (centreline approximately 20 m below surface), the mean DO concentration was about 1 mg/L until towards the end of November 2021 where the DO concentration at the top of the intake hovered around 6 mg/L dropping to less than 2 mg/L at the level of the intake centreline. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depths below 28 m corresponding to 3 m below the Intake in early November 2021 to 6 m below the Intake by the end of the month, taking into consideration the decreased water level in the reservoir over the period.

FIGURE 1-1: DO DEPTH PROFILES TIME SERIES IN R5 (SINCE SEPTEMBER 2018 TO NOVEMBER 2021)



At R04, the DO levels in the upper 9.0 m varied between 5.1 mg/L and 7.5 mg/L with oxycline at depths between 10 m and 15 m below surface where the DO concentrations decreased from about 6 mg/L to below 2 mg/L.

As expected, the TSS concentrations in the main reservoir have been consistently low since the start of impounding with a mean of 5 mg/L compared with the high flow season means of about 100 – 250 mg/L and low flow season means of 20 mg/L - 50 mg/L.

The BOD₅ measurements at R04 and R05 in both epilimnion and hypolimnion were less than 1.0 mg/L.

Re-regulation Reservoir

In November 2021, the turbine discharges from the main powerhouse varied between 13 and 233 m³/s usually interrupted by night-time periods with no discharge.

The mean DO concentration in the entire water column were 3.8 mg/L and 4.2 mg/L in R06 and R07 respectively during November 2021.

The BOD₅ concentrations in both R06 and R07 were less than 1.0 mg/L.

Nam Ngiep Downstream

During November 2021, the discharge from the Re-regulation Dam was mainly turbine discharge and occasionally gate discharge.

During periods with turbine discharge, the DO concentrations at NNG05 about 1.8 km downstream of the Re-regulation Dam varied between 4.1 mg/L and 5.9 mg/L with an average of 4.6 mg/L.

However, a DO concentration during gate discharge was 7.1 mg/L, complied with the surface water quality standard.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

The BOD₅ in the downstream station (NNG05) was less than 1 mg/L and complied with the national surface water quality standard.

In addition, the trial operations to study the DO level improvement by conducting a combination of labyrinth and turbine discharges were conducted during 01-02 November and 08-11 November 2021. The results have been reported separately by TD team and shared with ADB and LTA during the latest virtual mission.

Main Tributaries to Nam Ngiep

No water quality monitoring for Nam Phouan (NPH01) and Nam Chiane (NCH01) during November 2021.

All monitored parameters in the Nam Xao (NXA01) and Nam Houaysoup (NHS01) complied with the standards, except COD.

FIGURE 1-2: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

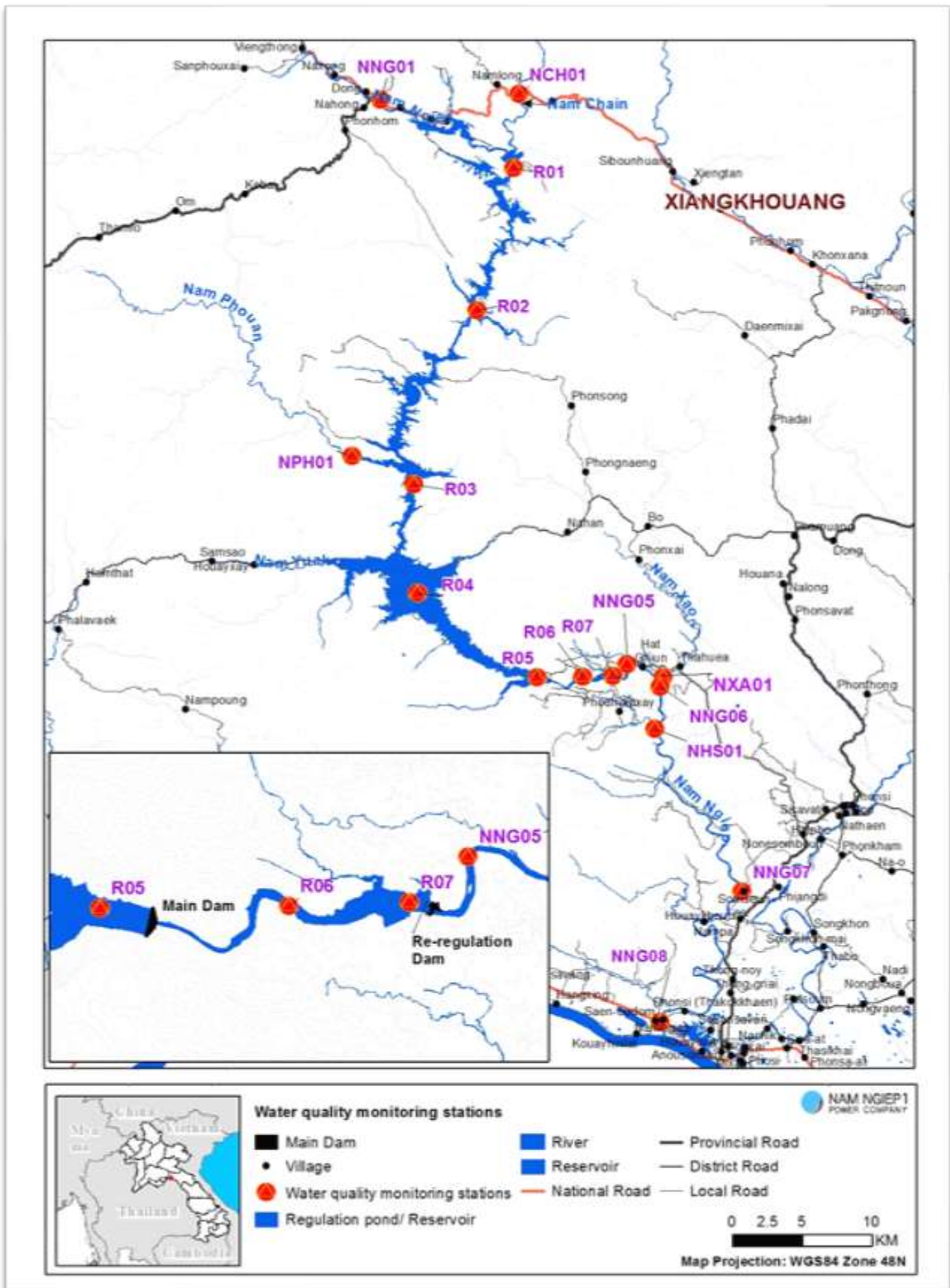


FIGURE 1-3: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO NOVEMBER 2021

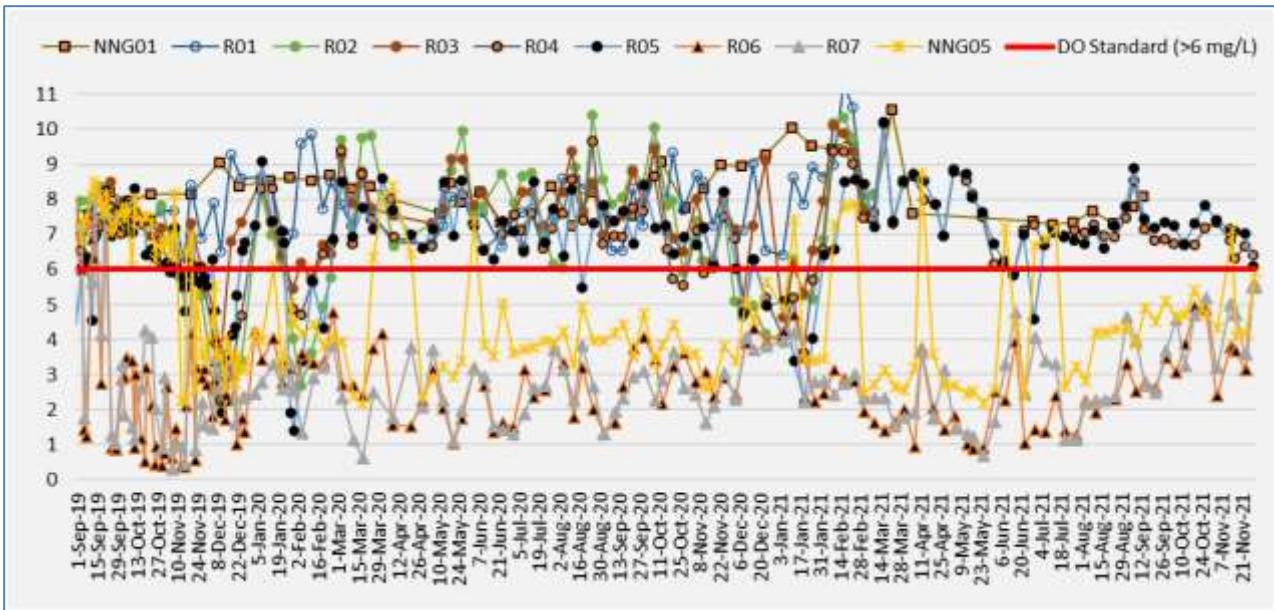


TABLE 1-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
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

TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR TOTAL SUSPENDED SOLIDS (MG/L)

Total Suspended Solids (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
13-Nov-21					<5	<5	<5	<5								
13-Nov-21 Bottom					14.8	<5										
14-Nov-21									<5	<5	<5	5.73			<5	<5

TABLE 1-8: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD₅ (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

BOD ₅ (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
13-Nov-21					<1	<1	<1	<1								
13-Nov-21 Bottom					<1	<1										
14-Nov-21									<1	<1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During November 2021, the groundwater quality monitoring in the communities was suspended due to a rapid increase in COVID-19 infection cases in the communities which meant that NNP1PC could not access the villages, and therefore there are no water quality monitoring results for the six wells located in Phouhomxay Village, Somseun Village, Nam Pa Village, Thong Noy Village and Pou Village to be reported in this month.

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Due to the rapid increase in COVID-19 infection cases in the communities, NNP1PC suspended the water quality monitoring of the community gravity fed water supply systems in Phouhomxay, Hat Gniun and Thahuea Villages in November 2021.

1.3.5 Landfill Leachate Monitoring

During November 2021, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that NNP1 Project and HouaySoup Landfills leachate fully complied with the standards. The leachate was still contained in the leachate ponds without discharging to the environment. EMO will continue to monitor the leachate and report the results in the next monthly progress report.

The landfill leachate monitoring results for November 2021 can be found in **Table 1-9**.

TABLE 1-9: RESULTS OF THE LANDFILL LEACHATE MONITORING

		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							
5-Nov-21	pH	6.0-9.0				7.93		7.73	
5-Nov-21	Sat. DO (%)					93.8		89.1	
5-Nov-21	DO (mg/L)					7.34		7.04	
5-Nov-21	Conductivity (µS/cm)					73		139	
5-Nov-21	Temperature (°C)					28.03		27.59	
5-Nov-21	BOD5 (mg/L)	<30				7.71		9.27	
5-Nov-21	COD (mg/L)	<125				68.7		59	
5-Nov-21	Faecal Coliform (MPN/100mL)	<400				49		33	
5-Nov-21	Total Coliform (MPN/100mL)	<400				110		33	
5-Nov-21	Total Nitrogen (mg/L)	<10				1.67		1.61	
5-Nov-21	Copper (mg/L)					<0.006		<0.006	
5-Nov-21	Iron (mg/L)					0.41		1.33	
5-Nov-21	Ammonia nitrogen (mg/L)	<10				<2		<2	
5-Nov-21	Oil & Grease (mg/L)	<10				<1		1.3	

1.4 DISCHARGE MONITORING

1.4.1 Main Reservoir – Water Level, Inflow and Discharge

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in **Figure 1-4 and Figure 1-5** presents the values recorded since May 2018.

During November 2021, the mean inflow to the main reservoir was 72 m³/s. The minimum and maximum inflows were 49 m³/s (on 29 November 2021) and 90 m³/s (on 01 November 2021) respectively.

From 01 to 30 November 2021, the water level in the main reservoir decreased from El. 300.99 m asl to El. 299.71 m.

In November 2021, the hourly turbine discharges from the Main Powerhouse varied between 13 and 233 m³/s usually interrupted by night-time periods with no discharge.

FIGURE 1-4: INFLOW TO THE MAIN RESERVOIR

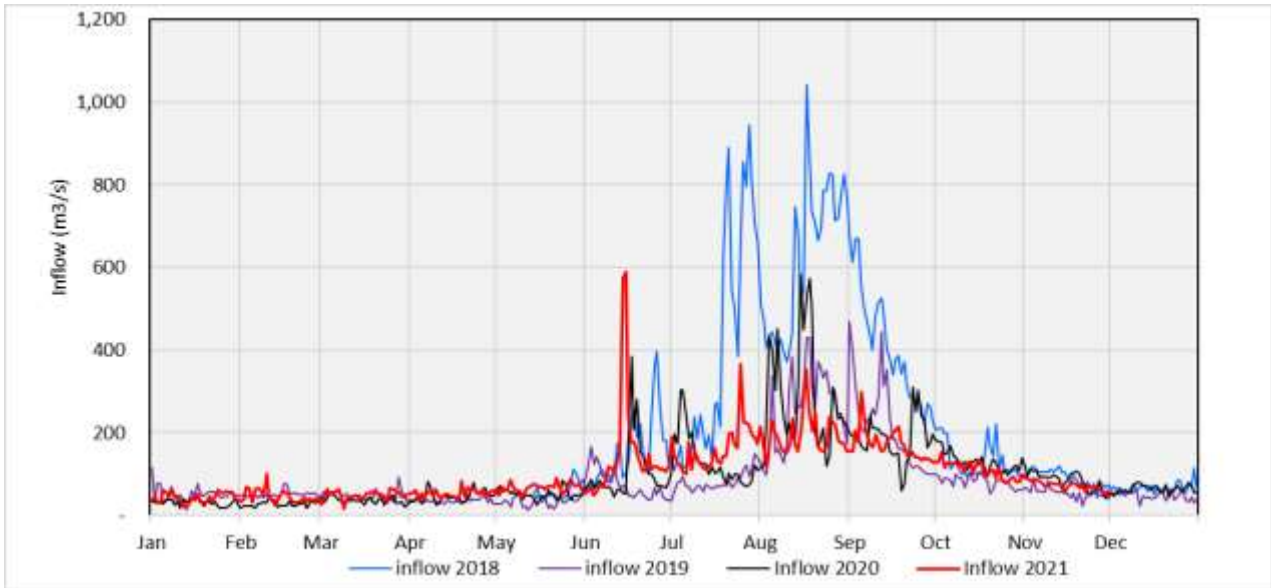
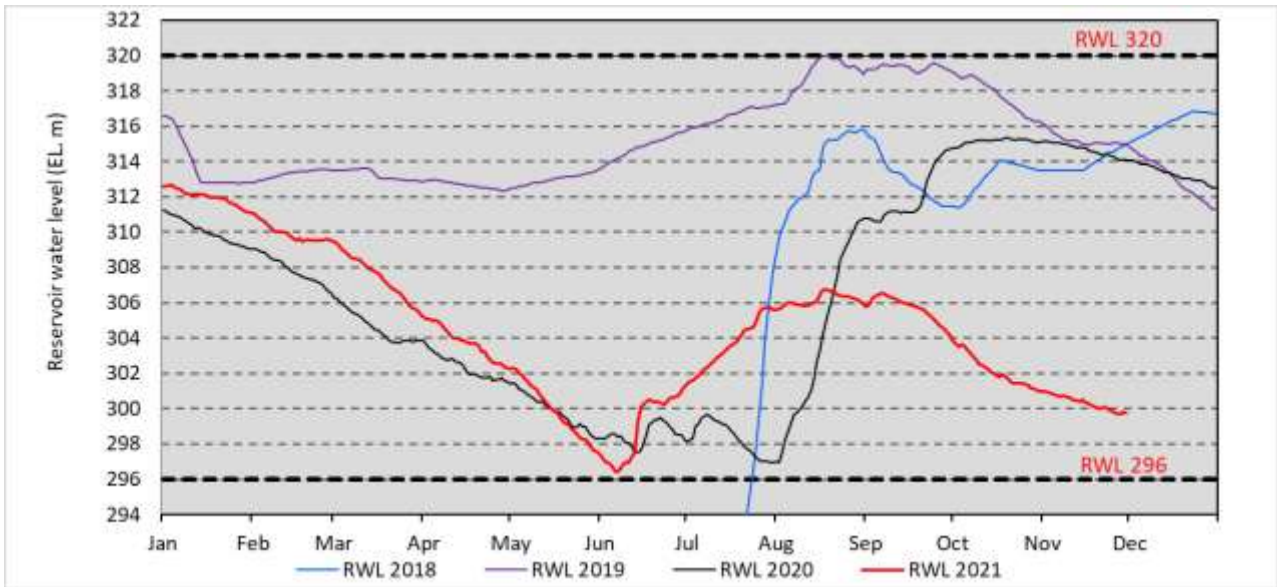


FIGURE 1-5: WATER LEVEL FOR THE MAIN RESERVOIR



Note: The 2018 and 2019 Reservoir Water Level represent the reservoir before the COD (05 September 2019)

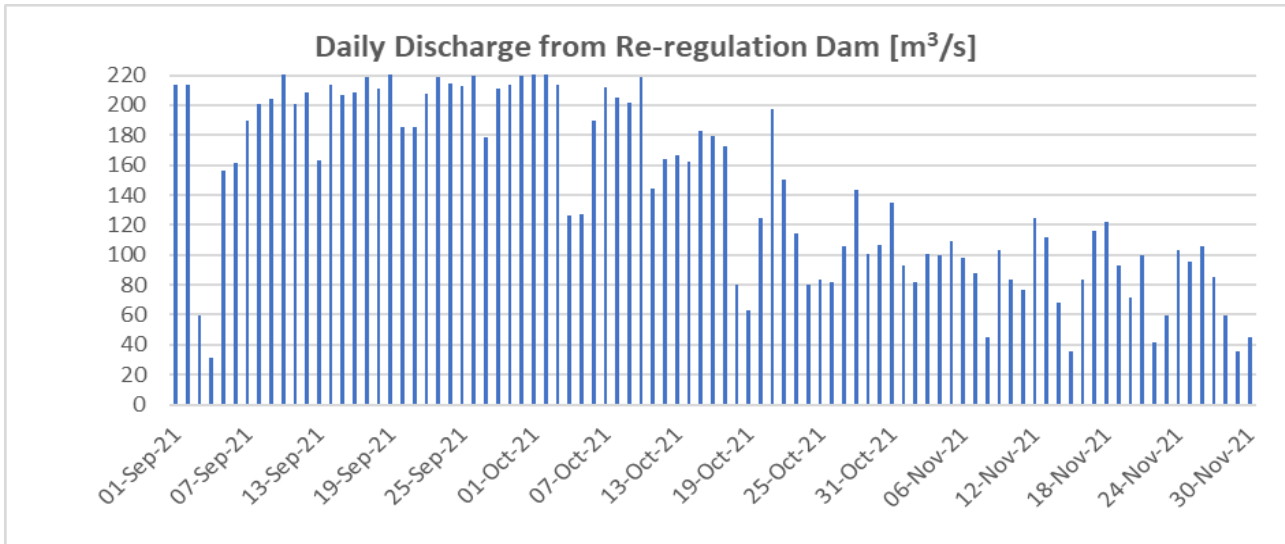
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during September to November 2021 is presented in **Figure 1-6**.

During November 2021, the mean daily discharge from the Re-regulation Dam was about 84 m³/s with hourly turbine discharges varying between 48 m³/s and 177 m³/s, hourly gate discharge varied between 27 m³/s and 180 m³/s, and hourly total discharge varying between 27 m³/s and 218 m³/s. The hourly discharge was kept above the minimum flow requirement of 27 m³/s at all times.

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.

FIGURE 1-6: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN SEPTEMBER TO NOVEMBER 2021



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In November 2021, EMO carried out five boat missions to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam. A total of 19 sites have been identified with potential shallow water depths and in one of the five boat missions, the talweg water depth was less than 0.5 m at four of the sites (distance between 1.5 and 5.6 km from the Re-regulation Dam) during the discharge of 27.4 m³/s on 14 November 2021.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In November 2021, a total of 20.9 m³ of solid waste was disposed of at the NNP1 Project Landfill, an increase of 4.5 m³ compared with October 2021.

During this reporting period, the contractor continued the regular waste collection from the NNP1PC’s operation sites and operated the project landfill for three days per week. The work included waste segregation and disposal, waste cover and compaction, grass cutting and repairing of perimeter fences.

FIGURE 1-7: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING NOVEMBER 2021



The total amount of recyclable waste selling and collection this month is summarized in **Table 1-10**.

TABLE 1-10: AMOUNTS OF RECYCLABLE WASTE SOLD AND COLLECTION

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by November 2021
1	Plastic bottles	kg	25	5
2	Aluminium	kg	0	27
3	Paper/Cardboard	kg	28	0
4	Glass	kg	15	0
5	Scrap Metal	Kg	0	0
Total		kg	68	32

In November 2021, while observing the required COVID-19 precautions, the villagers from Phouhomxay Village and host villages collected 1,157 kg of food waste from the OSOV1 canteen for feeding their animals.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in November 2021 are shown in **Table 1-11** and **Table 1-12**.

TABLE 1-11: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in November 2021 (A)	Used (B)	Remaining at the end of November 2021 (A – B)
1	Diesel	Litre	5,474	2,381	3,093
2	Gasoline	Litre	910	300	610
3	Lubricant (Turbine oil)	Litre	15,527	1,405	14,122
4	Colour Paint	Litre	242	0	242
5	Thinner	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		7

TABLE 1-12: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in November 2021 (A)	Disposed (B)	Remaining at the end of November 2021 (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	320	0	320
2	Used oil mixed with water	Litre	6,100	3,800	2,300
3	Empty 200L drum of used oil	Unit	15	1.2	14
4	Contaminated soil, sawdust and textile material	m ³	1	0	1
5	Empty 20L chemical drum	Drum	18	0	18
6	Lead battery	Unit	7	0	7
7	Halogen/fluorescent bulbs	Unit	390	112	278
8	Empty cartridge (Ink)	Unit	21	0	21
9	Clinic Waste	kg	5	0	5

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community 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. No recycle waste trade activities in the community recycle waste bank in November 2021.

1.6.2 Community Solid Waste Management

In November 2021, a total of 25.9 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, a decrease of 1.3 m³ compared with October 2021.

During this reporting period, the local waste collection contractor conducted regular waste collection from the three villages and operated the Houay Soup landfill for two days per week. The work included waste collection, segregation and disposal, waste cover and compaction, grass cutting and repairing the perimeter fences. The contractor also assisted on the big cleaning in the three villages.

In additional, EMO conducted waste management awareness and health & safety toolbox training for the local workers of waste management contractor.

FIGURE 1-8: WASTE MANAGEMENT ACTIVITIES DURING NOVEMBER 2021

QUARTELY WASTE COMPACTION AND COVERING	
	
WASTE MANAGEMENT TOOLBOX	
	
SUPPORT BIG CLEANING IN THE VILLAGES	
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

There were no activities implemented by Xaysomboun Watershed and Reservoir Protection Office (WRPO) during the reporting period. It is noted that the pending activities under the approved Xaysomboun Annual Implementation Plan of 2019 and 2020 comprise Participatory Land Use Plan (PLUP) training, PLUP improvement for Phonhom Village, relocation of staff and equipment to the newly built Xaysomboun WRPO sub-office, construction of reservoir access checkpoint at WRPO sub-office, construction of 2 ranger stations and 2 reservoir TPZ checkpoints, producing TPZs protection handbook, installation of signs and poles for TPZs, 3 times of reservoir patrols, organization of meeting on role and responsibilities on the reservoir fishery management, boat registration, and organization of annual meeting. 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.

The meeting between NNP1 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 after the ease of the COVID-19 lockdown in Xaysomboun and Bolikhamxay Province. EMO also presented the action plan to deal with pending issues for watershed and biodiversity program scheduled between December 2021 to January 2022 at a joint ADB-IAP-LTA virtual mission on 25 November 2021.

2.1.2 Preparation and implementation of Annual Implementation Plan (AIP) 2021

Bolikhamxay WRPO conducted reservoir and forest patrol between 27 October to 5 November 2021. Department of Forestry (DoF) of the Ministry of Agriculture and Forestry (MAF) submitted the fund disbursement request for Bolikhamxay WRPO budget plan covering the period of October to December 2021 on 25 November 2021. EMO Team is communicating with Bolikhamxay WRPO to provide more detailed information on the request for consideration and further processing.

EMO and Xaysomboun WRPO organized an online discussion on 5 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 for sub-office at each station.

However, there were no responses or updates from Xaysomboun WRPO until the end of November 2021 despite the agreement during the meeting on 05 November 2021 and several follow-ups by EMO team.

2.1.3 Preparation of the Annual Implementation Plan (AIP) 2022

Bolikhamsay 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.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP) 2021

The progress on the implementation of key activities by Component in November 2021 are described below:

a. Component 1 - Spatial Planning and Regulation

The boundary demarcation and sign installation in Vangphieng Village as well as the reviewing and updating of the land use plans of three NC-NX villages (Natan, Na Gngang, Vangphieng Villages) in Viengthong District under the AIP2021 is subject to the approval from Bolikhamsay PAFO and District Task Force Committee for COVID-19 measures due to increased COVID-19 cases in Viengthong District recorded within the third week of November 2021.

b. Component 2 – Law Enforcement

The four patrol teams continued the patrolling in November 2021 between 25 November to 14 December 2021 focussing on TPZ highest priority area including Nam Sone, Houay Leuk, upstream of Nam San, Houay Pong and its mountain ridges, Nam Chouan, Nam Chang and its mountain ridges as well as TPZ high priority area including Nam Ma, Nam Pang and its mountain ridges.

The results of patrolling activity in October 2021 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	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)	The team did not encounter any threats during patrolling.
2	Nam Houg TPZ high priority area including Nam Houg, Nam Kapa, Nam Somfad and Nam Lak. (16 days covering 84 km distance of forest patrol)	The team encountered and destroyed two fresh fishing camps located at two different locations in Nam Houg.
3	TPZ highest priority area including Nam Chouan, downstream of Sam Sone and mountain ridges. (16 days covering 88 km distance of forest patrol)	The team did not encounter any threats during patrolling.
4	TPZ highest priority area including Nam Sone, Nam Chouan, Houay Xay Gnai and Houay Xay Noi. (16 days covering 66.5 km of forest patrol)	The team encountered and destroyed one fishing camp and seized one fishing net found within the fishing camp.

FIGURE 2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN OCTOBER 2021

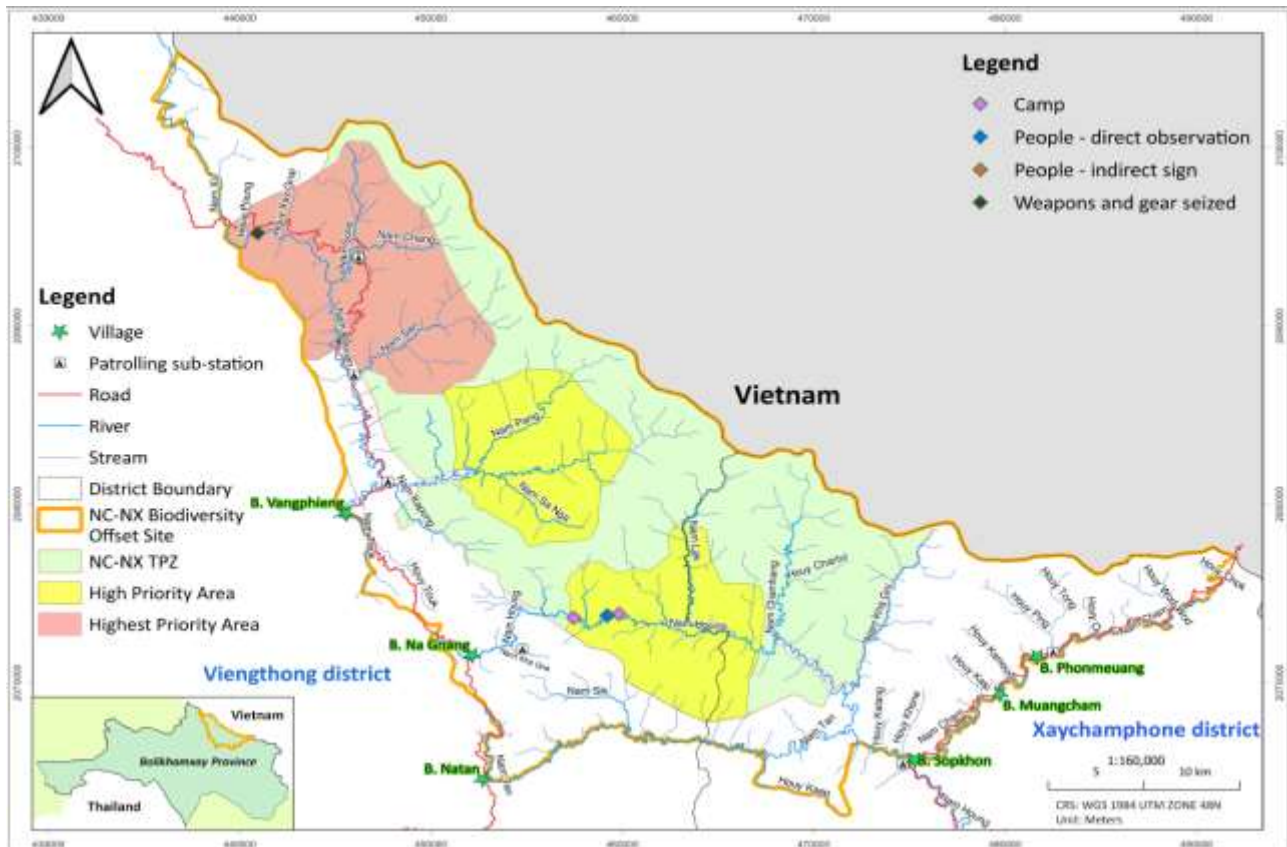


FIGURE 2-2: THE PEOPLE WHO ILLEGALLY FISHED FOUND BY TEAM 2 AT NAM HOUNG



FIGURE 2-3: A FRESH FISHING CAMP FOUND AND DESTROYED BY TEAM 2 AT NAM HOUNG



c. Component 3 – Conservation Outreach

Biodiversity Service Provider-Wildlife Conservation Society (BSP-WCS) continued working on the finalizing the draft outreach strategy in November 2021.

Three different scripts for the radio base outreach for the broadcasting 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 is expected to start in December 2021.

d. Component 4 – Conservation linked livelihood development

The activity under the approved Community Development Plan (CDP) focussing on pig and poultry raising could not be commenced yet because of the continuous implementation of COVID-19 measure that restricted the mobilization of BSP-WCS team from Vientiane Capital.

BSP-WCS shared the Draft Community Conservation Agreement (CCA) and its relevant documents to EMO on 3 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.

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 was started on 22 November 2021 and focuses on the TPZ highest priority area including upstream of Nam Sone, Houay Xay Gnai and its mountain ridges.

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. NNP1PC concluded procurement of consultancy service for conducting Lao Newt and Bent-toed gecko survey in the NNP1 watershed at the end of November 2021. The field work is expected to be carried out in December 2021 subject to the COVID-19 situation and enforcement of lockdown in Xaysomboun Province.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2022

NC-NX BOMU and BSP-WCS are preparing the Biodiversity Offset Management (BOM) AIP2022. The first draft of the plan is expected to be ready in the first week of December 2021.

3. FISHERY MONITORING

The fishery monitoring survey could not be completed according to the schedule because of the extended enforcement of lockdown as part as the COVID-19 measures in Xaysomboun and Bolikhamxay Province until end of November 2021. The results will be presented in the next monthly report.

4. EXTERNAL MISSIONS AND VISITS

A joint ADB, LTA and IAP virtual mission were 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 were:

- 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, LTA and IAP were addressed during discussion and some pending issues were responded/explained later through the email exchanges.

The results of mission will be updated in Monthly Report of December 2021.

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

TABLE A-1: RESULTS OF MAIN RESERVOIR, RE-REGULATION RESERVOIR AND SURFACE WATER (NAM NGIEP RIVER, NAM PHOUAN, NAM CHIANE AND NAM XAO) QUALITY MONITORING

Date	Parameters (Unit)	River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup				
			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	NNG 08	NCH01	NPH01	NXA01	NHS01					
	Guideline																				
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				
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				
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												
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				
3-Nov-21	DO (mg/L)	>6.0				7.35	7.4	2.41	3.21												

		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	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
4-Nov-21	DO (mg/L)	>6.0									4.32	4.21	5.98	6.1			6.12	6.65
13-Nov-21	DO (mg/L)	>6.0				6.82	7.14	3.77	5.01									
14-Nov-21	DO (mg/L)	>6.0								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								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								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								5.94	5.96	6.82	6.86			6.99	7.49	
3-Nov-21	Conductivity (µs/cm)					60	60	68	69									
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)																	
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	
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	

		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	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
29-Nov-21	Temperature (°C)					26.57	26.29	26.08	26.34									
30-Nov-21	Temperature (°C)																	
13-Nov-21	TSS (mg/L)					<5	<5	<5	<5									
14-Nov-21	TSS (mg/L)									<5	<5	<5	5.73			<5	<5	
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	
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	
13-Nov-21	NH ₃ -N (mg/L)	<0.2				0.4	0.3											
13-Nov-21	NO ₃ -N (mg/L)	<5.0				<0.02	<0.02											
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	
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	
13-Nov-21	TKN					<1.5	<1.5											
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	
13-Nov-21	Phytoplankton Biomass (g dry wt/m ³)					1.6	1.6											
13-Nov-21	Total Phosphorus (mg/L)					0.02	<0.01											
13-Nov-21	Total Dissolved Phosphorus (mg/L)					<0.01	<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	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Nov-21	Hydrogen Sulfide (mg/L)					<0.02	<0.02											
13-Nov-21	TSS (mg/L)-bottom					14.8	<5											
13-Nov-21	BOD ₅ (mg/L)-bottom					<1	<1											
13-Nov-21	Total Coliform (MPN/100 mL)-bottom					0	0											
13-Nov-21	Faecal coliform (MPN/100 mL)-bottom					0	0											
13-Nov-21	NH ₃ -N (mg/L)-bottom					0.52	<0.2											
13-Nov-21	NO ₃ -N (mg/L)-bottom					<0.02	<0.02											
13-Nov-21	TKN-bottom					<1.5	<1.5											
13-Nov-21	Total Dissolved Phosphorus (mg/L)-bottom					0.05	0.03											
13-Nov-21	Total Phosphorus (mg/L)-bottom					0.05	0.04											
13-Nov-21	Hydrogen Sulfide (mg/L)-bottom					<0.02	<0.02											
13-Nov-21	Phytoplankton Biomass (g dry wt/m ³)-bottom					15.6	1.6											

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN NOVEMBER 2021

	Site Name	OSO V1 (Owner's Site Office and Village)				OSO V2 (ESD Camp)				Main Powerhouse			
	Station Code	EF01				EF13				EF19			
	Date	05-Nov-21	11-Nov-21	18-Nov-21	22-Nov-21	05-Nov-21	12-Nov-21	18-Nov-21	22-Nov-21	05-Nov-21	11-Nov-21	18-Nov-21	22-Nov-21
Parameters (Unit)	Guideline												
pH	6.0 - 9.0	6.73	6.77	6.94	7.34	7.45	7.77	7.49	7.62	7.97	7.92	7.29	7.8
Sat. DO (%)		37.2	65.1	52.7	74.2	80.4	78.8	79.9	85.7	81.9	69	65.9	73.9
DO (mg/L)		5.68	5.19	4.17	5.85	6.28	6.31	6.33	6.76	6.1	5.18	5.02	5.82
Conductivity (µs/cm)		373	343	372	375	453	454	424	464	1,059	768	1,500	1,402
TDS (mg/L)		186.5	171.5	186	187.5	226.5	227	212	232	529.5	384	750	701
Temperature (°C)		27.99	27	27.52	27.61	27.97	26.62	27.19	27.59	30.53	30.27	29.43	29.61
Turbidity (NTU)													
TSS (mg/L)	<50		<5	<5	<5		<5	<5	7.46		17	5	<5
BOD ₅ (mg/L)	<30	<6	<6	<6	<6	<6	<6	<6	<6	<6	<6		<6
COD (mg/L)	<125	<25	<25	<25	<25	29.20	36.40	32.00	34.40	<25	53	<25	<25
NH ₃ -N (mg/L)	<10.0	5.7	<2	5.4	6.3	23.10	26.10	24.60	27.40	<2	14.70	<2	5.20
Total Nitrogen (mg/L)	<10.0	6.22	4.12	12.9	9.41	24.30	30.50	25.10	28.70	4.67	17.30	5.90	10.80
Total Phosphorus (mg/L)	<2	0.64	1.03	0.84	0.87	2.03	1.89	1.72	2.87	2.72	6.79	1.90	8.00
Oil & Grease (mg/L)	<10.0	1.6				<1				1			
Total coliform (MPN/100 mL)	<400	540	5,400	3,500	1,600	110.0	1,600	6.8	0	0	17	0	0
Faecal Coliform (MPN/100 mL)	<400	540	5,400	1,600	540	79.0	1,600	0	0	0	17	0	0