NAM NGIEP1 POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

July 2021

					
A	15 August 2021	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

EXECUTIVE SUMMARY

The preparation and review of the ISO14001:2015 documentation is progressing. Most of the mandatory documents have been drafted and are under review. A Kick-off meeting for ISO14001:2015 Internal Audit was held on 28 July 2021 with establishment of 10 Internal Audit Teams comprised of 22 Internal Auditors who were assigned by the top management. The internal audit is scheduled between 10 and 20 August 2021 to cover 06 main operation sites out of a total of 38 work sections. The 1st Management Review is scheduled to be held by the end of August 2021 and the 1st stage of ISO14001:2015 Certification Audit by the external auditor (SGS, Thailand) is planned to be conducted remotely via the Microsoft Team on 07 September 2021.

During July 2021, EMO received two documents (DWP and SS-ESMMPs) for review and approval. EMO issued a Site Inspection Report (SIR) of Observation Non-Compliance to the Contractor during July 2021.

Due to the COVID-19 pandemic and the measures announced by the GOL, the regular joint site inspections were suspended at some restricted areas such as villages and Zone 2UR during the reporting period. However, the joint site inspections around the Dam sites and NNP1PC's operation sites were resumed as normal.

The construction of the wastewater treatment system modification and improvement at OSOV1 and OSOV2 were still on going by the Soulignet Choummanitham Construction Sole Co., Ltd. (SCC). The status of construction progress is about 70% and is expected to be completed by mid-August 2021. This half-month delay is due to the Corvid-19 outbreak and Country lockdown which has resulted in a slowdown of water pumps and accessories purchasing and importing processes.

In July 2021, water quality depth profile measurements at R01, R02 and R03 (main reservoir) and NPH01 were suspended due to security concerns. At R05, close to the dam, the Dissolved Oxygen (DO) levels at the surface were generally between 6 mg/L and 7 mg/L and the oxycline was generally found at a depth of 4.0 to 10.0 m - similar to June 2021. In the re-regulation reservoir, the mean DO levels over the entire water column was 1.4 mg/L in both R06 and R07.

The discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate or a combination of gate and turbine discharge. At the stations in Nam Ngiep immediately downstream of the Re-regulation Dam, the DO concentrations were only greater than 6 mg/L during gate 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 July 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 Houy Soup Landfill. The works included waste segregation and disposal, waste cover, grass cutting and repairing perimeter fences.

A total of 44 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 11.3 m^3 compared with June 2021 due to a temporary increase in workers for construction and maintenance activities related to the NNP1 project. A total of 43.9 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, an increase of 18.1 m^3 compared with June 2021. The recyclable waste in the Community Waste Bank was segregated in poor

condition recyclable waste which was disposed of at the Houay Soup Landfill and recyclable waste in acceptable condition which has been sold to the local waste trading company.

The field activity such as reservoir patrolling by Xaysomboun WRPO and forest patrolling by Bolikhamxay WRPO resumed in July 2021. The construction of Xaysomboun WRPO sub-office at Ban Huayxay as well as the patrolling and snare removal in the NC-NX offset site continued to progress in July 2021.

The fish catch monitoring for June 2021 in Nam Ngiep Watershed was dominated by *Oreochromis niloticus* and the species groups of *Barbonymus gonionotus* and Hypsibarbus, Hampala, *Sikukia gudgeri* and *Amblyrhynchichthys truncates*, and Mastacembelus. They are classified as Least Concern (LC) according to the IUCN Red List, except *Sikukia gudgeri* is classified as Data Deficient species (DD).

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The preparation and review of the ISO14001:2015 documentation is progressing. Most of the mandatory documents have been drafted and are under review. A Kick-off meeting for ISO14001:2015 Internal Audit was held on 28 July 2021 with establishment of 10 Internal Audit Teams comprises of 22 Internal Auditors who were assigned by the top management. The internal audit is scheduled between 10 and 20 August 2021 to cover 06 main operation sites out of a total of 38 work sections. The 1st Management Review is scheduled to be held by the end of August 2021 and the 1st stage of ISO14001:2015 Certification Audit by the external auditor (SGS, Thailand) is planned to be conducted remotely via the Microsoft Team on 07 September 2021.

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

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021			
		Q3	Q4	Q1	Q2	Q3	Q4
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: - 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 – **1st Stage** (***remote audit*** on the documentation review)						
10	Implement the corrective actions and preventive actions according to the 1st Stage Audit						
11	ISO 14001:2015 Assessment and Certification Audit – **2nd Stage** (***on-site audit***)						
12	Implement the corrective actions and preventive actions according to the 2nd Stage Audit						
13	**Certify of ISO14001:2015 upon successful completion of the audit**						

	Completed activities
	Delayed activities and re-scheduled
	Original plan activities

1.2 COMPLIANCE MANAGEMENT

In July 2021, EMO received 02 Detail Work Programs (DWPs) and Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) for review and approval. The status of the document reviews is presented in ***Table 1-2***.

TABLE 1-2: SS-ESMMP AND DOCUMENT REVIEW STATUS IN JULY 2021

Title	Date Received	Status
DWP & SS-ESMMP for Remedial Grouting work at Main Dam	1 June 2021 (2nd submission)	No objection with comments on 13 July 2021
DWP & SS-ESMMP for Improvement of Irrigation System and Tractor Roads at PHX Village	17 June 2021 (1st submission)	No objection with no comment on 17 July 2021

Due to the Corvid-19 situation and the GOL's lockdown measures, the suspension of the regular joint site inspections has continued at some areas such as at villages and in Zone 2UR during the reporting period. However, the Compliance team conducted joint site inspections at the construction sites for the wastewater treatment system improvement and modification at OSOV1 and OSOV2, the Main Dam's grouting work and the Powerhouses maintenance. EMO issued a Site Inspection Report (SIR) based on observation non-compliance issues to the contractor and instructed the contractor to take corrective actions.

On 05 July 2021, a joint site inspection was conducted for the 50% work completion of the WWTS improvement and modification works. The status and quality of construction was accepted by the inspection committees.

The COVID-19 outbreak and the country lockdown has resulted in a slowdown in purchasing and importing water pumps and accessories which have caused a delay in the construction (the contractual timeframe is 31 July 2021). In this regard, on 31 July 2021, EMO organized a meeting with the contractor (Soulignet Choummanitham Company) and summarized the work status as well as discuss the delays and related contract conditions. The meeting agreed to extend the period of work completion for two weeks until 15 August. The overall status can be seen in ***Figure 1-1*** below:

FIGURE 1-1: PHOTOS OF SITE INSPECTION ON THE PROGRESS OF WASTEWATER TREATMENT SYSTEM IMPROVEMENT AND MODIFICATION AT OSOV1, OSOV2 AND THE MAIN POWERHOUSE

WWTS MODIFICATION AT OSOV2

During 50% completion inspection 05/07/21

As of 30 July 2021 (estimated 58%)

WWTS IMPROVEMENT AT OSOV1

WWTS IMPROVEMENT AT MAIN POWERHOUSE

EMO has issued 06 Observations of Non-Compliance (ONC) during July 2021. The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC is summarized in ***Table 1-3***.

TABLE 1-3: SUMMARY OF ONCS AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from June 2021	0	0	0	0
Newly Opened in July 2021	6	0	0	0
Total in July 2021	**6**	**0**	**0**	**0**
Resolved in July 2021	0	0	0	0
Carried over to August 2021	6	**0**	0	0
Unsolved Exceeding Deadlines	**1**	**0**	**0**	**0**

1.2.1 Site Inspection by Environment Management Unit (EMU)

The monthly site visits by the EMU of Bolikhan District and the quarterly site visit by the EMU of Xaysomboun Province were not carried out in July 2021.

1.2.2 Site Decommissioning and Rehabilitation

During the reporting period of July 2021, EMO continued to monitor the progress of rehabilitation for two sites (Phouhomxay Village's Irrigation canal rock and spoil disposal area and the former LILAMA10 camp). The status of the two sites at the end of July 2021 are shown below:

FIGURE 1-2: PHOTOS STATUS OF FORMER LILAMA10 CAMP AND PHOUHOMXAY VILLAGE'S IRRIGATION CANAL'S ROCK AND SPOIL DISPOSAL AREA AT THE END OF JULY 2021.

STATUS OF FORMER LILAMA10 CAMP REHABILITATED AT THE END OF JULY 2021

STATUS OF IRRIGATION CANAL ROCK/SPOIL DISPOSAL AREA AT THE END OF JULY 2021


1.3 WATER QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD_5), 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 COVID-19 preventative measures imposed by the Thai Governments since middle of July 2021, some water samples were analysed at the NNP1 Project Environmental Laboratory only for TSS, BOD_5, *E.coli* bacteria, faecal coliform and total coliform and no water samples were shipped to the UAE Laboratory in Thailand. Therefore, there are no results for COD, ammonia-nitrogen, total nitrogen, TKN, TOC, phytoplankton biomass, total phosphorus, and oil and grease in the second half of July 2021.

In addition, there is also no turbidity measurement data reported in July 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 July 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 1-4.***

TABLE 1-4: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN JULY 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total nitrogen (first fortnightly sample), faecal coliform and total coliform.	Soulignet Choummanitham Construction Sole Company Limited Co., Ltd. (SCC) commenced the wastewater treatment systems improvement work on 26 April 2021. It was expected that the works will be completed by the end of July 2021, but due to the delayed delivery of water pumps and accessories for the system improving work, the work completion date is extended to mid-August 2021.
OSOV2	EF13	Non-compliance for Ammonia-nitrogen and total nitrogen in the first fortnightly sampling. Full compliance in the second fortnightly sampling for the monitored parameters.	
Main Powerhouse	EF19	Non-compliance for TSS and BOD_5 in the second fortnightly sampling. No discharge during the first fortnightly sampling.	

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]).

In addition, weekly depth profile monitoring (pH, DO, conductivity and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation and main reservoirs. The locations of the monitoring stations are shown in **Figure 1-3.**

The monitoring results for key parameters (DO, TSS and BOD_5) during July 2021 are presented in ***Table 1-5, Table 1-6*** *and* ***Table 1-7.*** The full set of data for July 2021 is attached in ***Annex A***. In addition, the results for DO are presented as line graphs in ***Figure 1-4***.

Main Reservoir

From 01 to 31 July 2021, the water level in the main reservoir increased from El. 301.35 m asl to El. 305.64 m asl.

Depth profile measurements and sampling at R01, R02 and R03 were suspended due to security concerns during July 2021.

At R05, the average DO concentration was 6.0 mg/L in the upper 9.0 m varying between 3.1 mg/L and 7.7 mg/L, and the oxycline was generally found at a depth of 4.0 – 10.0 m with DO concentrations between about 4 mg/L and 5 mg/L – slightly higher than June 2021. The depth at which the DO concentration was at or below 2 mg/L varied from 12 m to 14 m. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depths below 15 m corresponding to 10.9 m above the centre line of the Intake in early July 2021 to 3.5 m above the centre line by the end of the month, taking into consideration the rising water level in the reservoir over the period.

At R04, the DO levels in the upper 6.5 m varied between 5.8 mg/L and 7.4 mg/L. The DO concentrations dropped to below 0.5 mg/L at a depth of about 30 m.

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 BOD_5 measurements at R04 and R05 in both epilimnion and hypolimnion were less than 1.0 mg/L.

Re-regulation Reservoir

In July 2021, the turbine discharges from the main powerhouse varied between 11 and 230 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO levels over the entire water column were 1.4 mg/L in both R06 and R07 during July 2021.

The BOD_5 concentrations in both R06 and R07 were less than 1.0 mg/L.

Nam Ngiep Downstream

During July 2021, the discharge from the Re-regulation Dam mainly went through the turbine and occasionally through the gate or as a combination of gate and turbine discharge.

During periods with turbine discharge, the DO concentrations at NNG05 about 1.8 km downstream of the Re-regulation Dam varied between 2.6 mg/L and 3.2 mg/L and gradually increased to 5.7 mg/L at a distance of 14 km from the dam and to about 5.6 mg/L at NNG07 (25.9 km distance from the dam). At NNG08 close to the confluence with the Mekong River (47.2 km from the dam), the DO levels varied between 5.0 mg/L and 6.2 mg/L.

During periods with gate discharge, the DO concentrations were above 6 mg/L for the entire reach below the dam – with a few exceptions with slightly lower concentrations likely because the measurements represent a mixture of gate and turbine discharge.

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 BOD_5 in the downstream station (NNG05) was less than 1 mg/L and complied with the national surface water quality standard.

Main Tributaries to Nam Ngiep

No water quality monitoring for Nam Phouan during July 2021.

All monitored parameters in the Nam Chian (NCH01), Nam Xao (NXA01) and Nam Houaysoup (NHS01) complied with the standards, except DO (29 July 2021) at NHS01 and NXA01 and COD (14 July 2021) at NCH01 and NHS01.

FIGURE 1-3: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

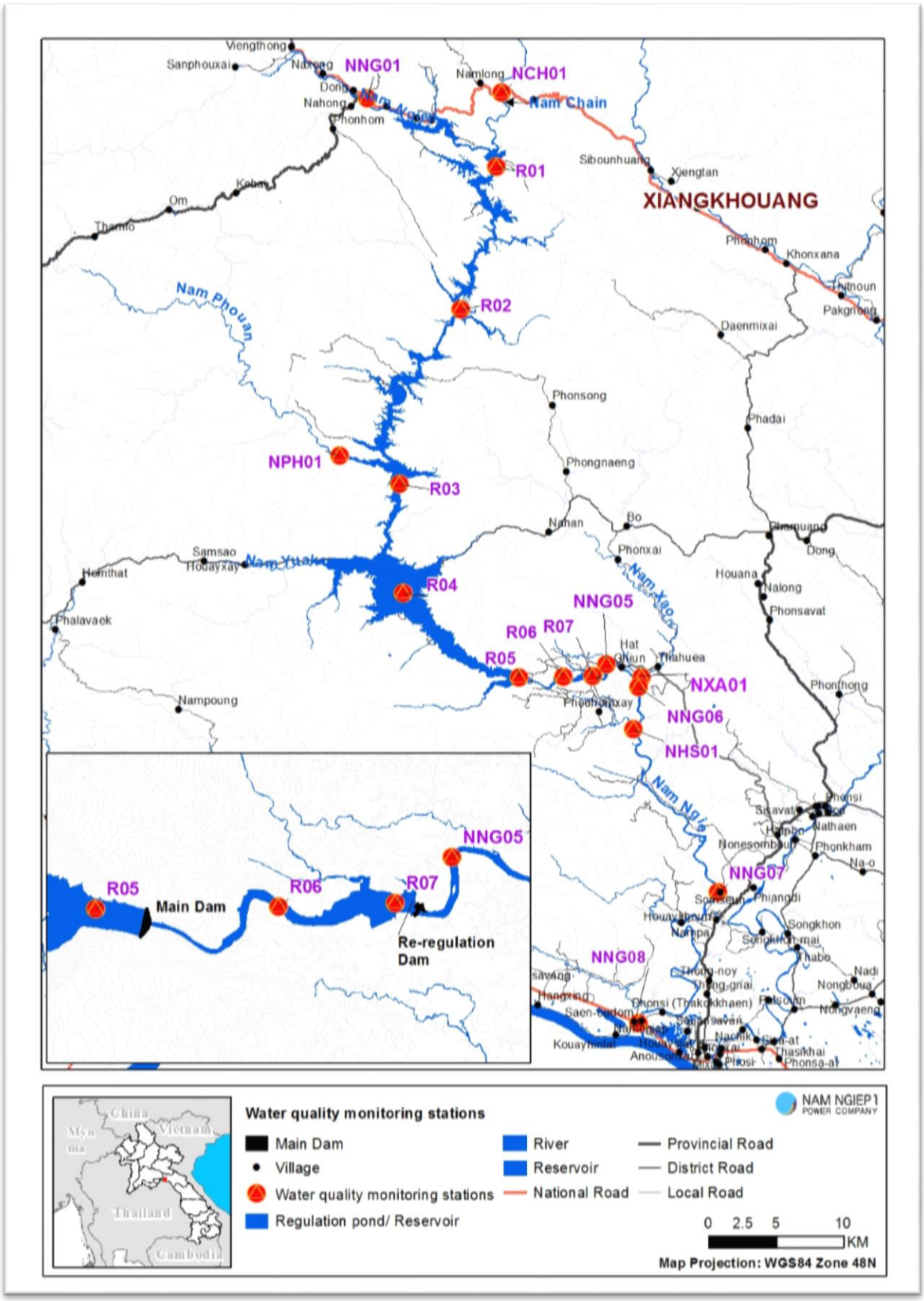


FIGURE 1-4: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO JULY 2021

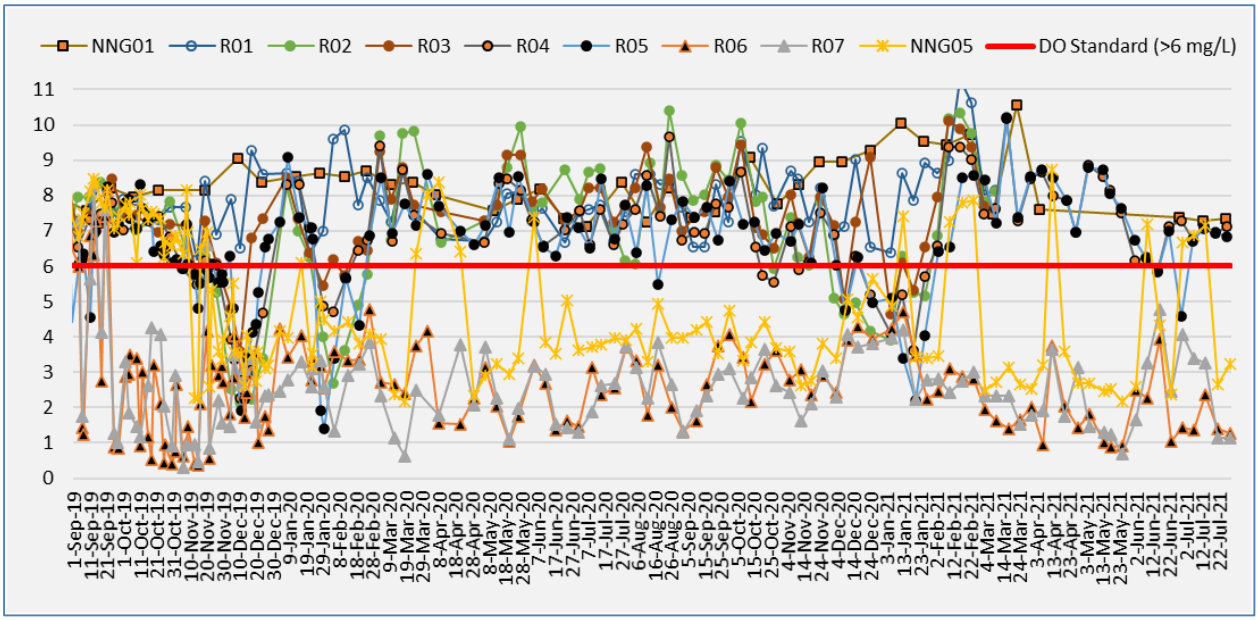


TABLE 1-5: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
6-Jul-21					6.76	6.7										
7-Jul-21							1.37	3.4	6.86	6.48	5.94	6.06			6.06	6.57
12-Jul-21	7.27												7.4			
13-Jul-21					7.07	7.11										
14-Jul-21							2.38	3.28	7.14	6.62	6.68	6.45			6.21	6.69
20-Jul-21					6.94	6.96										
21-Jul-21							1.41	1.15	2.66	3.52	5.6	6.24			6.11	6.39
26-Jul-21	7.34												7.9			
27-Jul-21					7.12	6.82										
29-Jul-21							1.27	1.13	3.22	3.8	4.61	5.08			5.64	5.74

TABLE 1-6: 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
12-Jul-21	21.8												10.3			
13-Jul-21					<5	<5										
13-Jul-21 Bottom					<5	<5										
14-Jul-21							<5	5.4	<5	<5	6.0	6.1			12.4	29.4

TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD_5 (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
12-Jul-21	<1												<1			
13-Jul-21					<1	<1										
13-Jul-21 Bottom					<1	<1										
14-Jul-21							<1	<1	<1	1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During July 2021, community groundwater quality analyses were carried out for five wells located in Phouhomxay Village, Somseun Village, Nam Pa Village, Thong Noy Village and Pou Village. The community groundwater samples were taken from household water taps, except in Phouhomxay Village where the groundwater samples were taken at sampling points before entering into the water storage tank.

The results indicate that:

- Two wells in Phouhomxay Village (GPHX01 and GPHX02) did not comply with the groundwater quality standards for *E.coli* bacteria.
- The well in Thong Noy Village and one well in Nam Pa Village did not comply with the standard for *E.coli* bacteria.
- The well in Pou Village did not comply with the standard pH and *E.coli* bacteria.
- The well in Somsuen Village complies with the standard.

The community groundwater quality monitoring results are presented in ***Table 1-8.***

The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and

recommended to carry out the operation and maintenance improvement as well as were encouraged to boil water before drinking.

TABLE 1-8: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONG NOY AND PHOUHOMXAY VILLAGES

Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline*						
pH	6.5 - 9.2	6.58	7.09	7.1	7.26	7.21	6.1
Sat. DO (%)		58.2	36.8	53	77.7	42.1	79
DO (mg/L)		4.73	3.01	4.28	6.25	3.27	5.87
Conductivity (µS/cm)		416	438	339	402	399	18
Temperature (°C)		26.11	25.78	26.22	26.4	28.32	31.08
Faecal coliform (MPN/100mL)		33	2	0	2	79	2
E.coli Bacteria (MPN/100mL)	0	33	2	0	2	27	2

*These are groundwater quality standards for drinking purposes attached in the concession agreement.

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the Gravity Fed Water Supply water quality analyses are presented in ***Table 1-9***.

Faecal Coliform and *E.coli* exceeded the drinking water quality standards in the water supply of Thaheua Village (WTHH02), Hat Gniun Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). Note here that during sampling of tap water in Phouhomxay Village, surface water from Houay Soup Stream was still supplied into the system and the samples likely represent a mixture of surface water and groundwater from the boreholes, where, as mentioned in ***Section 1.3.3*** and as shown in **Table 1-8**, *E.coli* bacteria were also detected in the two wells.

As observed in the field during water sampling, livestock are roaming around the water intake areas and feces from birds may also contribute to the presence of Faecal Coliform Bacteria and *E.coli* in GFWS samples. The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No. 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and were encouraged to boil water before drinking.

TABLE 1-9: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

	Site Name	Thaheua Village	Hat Gniun Village	Phouhomxay Village	
	Station	WTHH02	WHGN02	WPHX02	WPHX03
Parameter (Unit)	Guideline*				
pH	6.5 - 8.6	6.94	6.84	5.55	5.48
Sat. DO (%)		108.9	108.3	103	111.1
DO (mg/L)		8.63	8.5	8.12	8.7
Conductivity (µS/cm)	<1,000	73	98	11	9
Temperature (°C)	<35	27.16	27.83	27.96	28.1
Faecal Coliform (MPN/100 mL)	0	17	26	70	79
E.coli Bacteria (MPN/100 mL)	0	17	26	70	79

*These are drinking water quality standards attached in the concession agreement.

1.3.5 Landfill Leachate Monitoring

During July 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 Landfill leachate did not comply with the total coliform standard and Houay Soup Landfill leachate did not comply with the standard for faecal coliform and total coliform. However, the leachate is 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 July 2021 can be found in ***Table 1-10***.

TABLE 1-10: RESULTS OF THE LANDFILL LEACHATE MONITORING

		Site Name	NNP1 Landfill Leachate Monitoring					Houay Soup Landfill Leachate Monitoring	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
8-Jul-21	pH	6.0-9.0				7.82		7.93	
8-Jul-21	Sat. DO (%)					88.2		79.1	
8-Jul-21	DO (mg/L)					6.84		6.2	
8-Jul-21	Conductivity (µS/cm)					112		181	
8-Jul-21	Temperature (°C)					28.44		28.05	
8-Jul-21	BOD_5 (mg/L)	<30				16.5		13.8	
8-Jul-21	COD (mg/L)	<125				78		48.7	
8-Jul-21	Faecal Coliform (MPN/100 mL)	<400				170		1,600	

		Site Name	NNP1 Landfill Leachate Monitoring					Houay Soup Landfill Leachate Monitoring	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
8-Jul-21	Total Coliform (MPN/100 mL)	<400				1,600		1,600	

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 1-5*** *and* ***Figure 1-6*** presents the values recorded since May 2018.

During July 2021, the mean inflow to the main reservoir was 160 m^3/s. The minimum and maximum inflows were 99 m^3/s (on 06 July 2021) and 367 m^3/s (on 27 July 2021) respectively.

From 01 to 31 July 2021, the water level of the main reservoir increased by 4.29 m from El. 301.35 m asl to El. 305.64 m asl.

In July 2021, the hourly turbine discharges from the Main Powerhouse varied between 11 and 230 m^3/s usually interrupted by night-time periods with no discharge.

FIGURE 1-5: INFLOW TO THE MAIN RESERVOIR

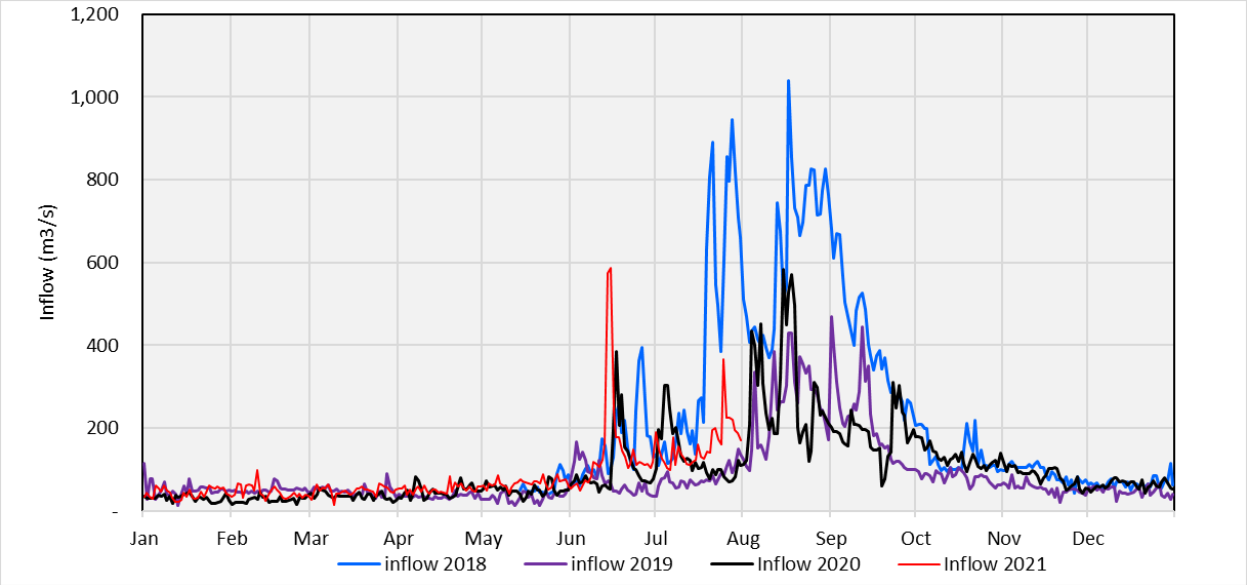
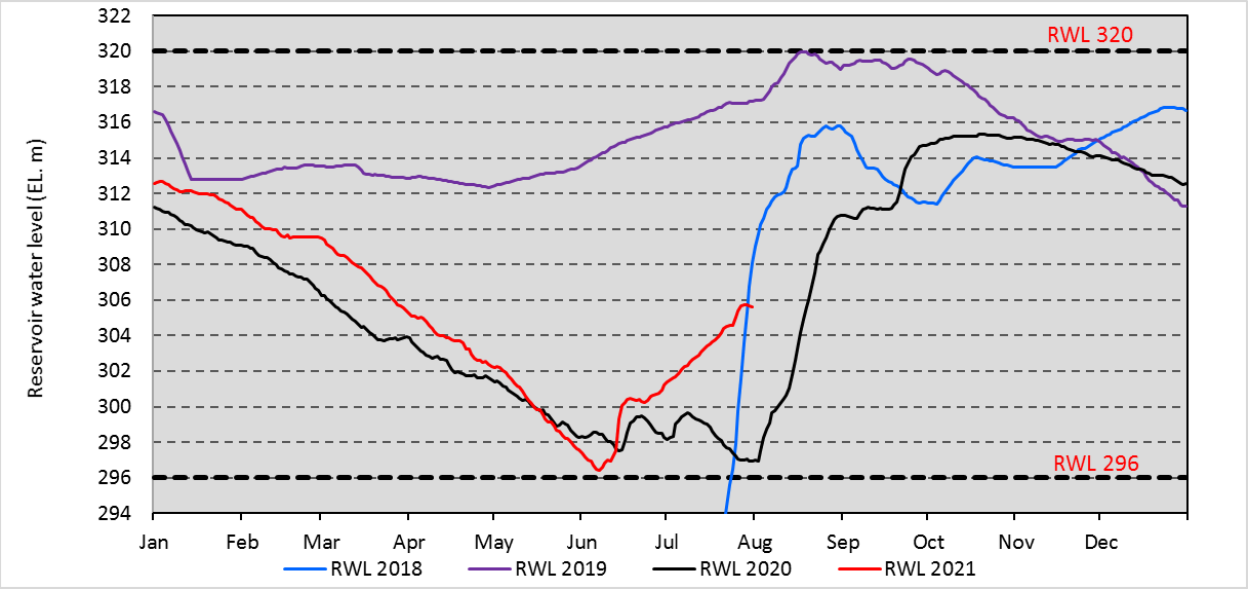


FIGURE 1-6: WATER LEVEL FOR THE MAIN RESERVOIR



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

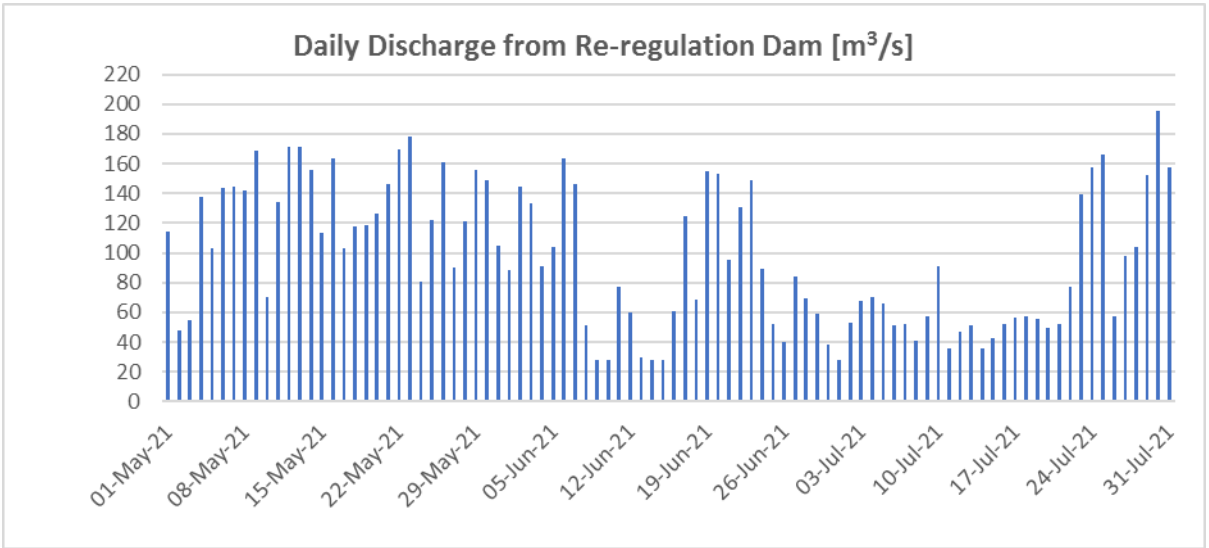
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during May to July 2021 is presented in ***Figure 1-7***.

During July 2021, the mean hourly discharge from the Re-regulation Dam was about 84 m^3/s with hourly turbine discharges varying between 47 m^3/s and 162 m^3/s, hourly gate discharge varied between 27 m^3/s and 149 m^3/s, and hourly total discharge varying between 27 m^3/s and 207 m^3/s. The hourly discharge was kept above the minimum flow requirement of 27 m^3/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 1-7: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN MAY TO JULY 2021



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In July 2021, EMO carried out four 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 the thalweg water depth monitoring results are:

- On 07 July 2021 during a discharge of 27.8 m3/s - three of the 19 sites (distance between 1.5 and 5.6 km from the Re-regulation Dam) had a talweg water depth less than 0.5 m;
- On 14 July 2021 during the discharge of 27.8 m^3/s - two of the 19 sites (distance between 2.4 and 5.6 km from the Re-regulation Dam) had a talweg water depth less than 0.5 m.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In July 2021, a total of 44 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 11.3 m^3 compared with June 2021 due to a temporary increase in workers for construction and maintenance activities related to the NNP1 project.

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, grass cutting and repairing of perimeter fence. In addition, the contractor completed the first quarterly waste cover in the landfill and compaction by excavator.

FIGURE 1-8: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING JULY 2021

WEEKLY WASTE COVER	*WEEKLY LANDFILL MAINTENANCE (GRASS CUTTING)*
	
QUARTERLY WASTE COVER AND COMPACTION BY EXCAVATOR	
	

The total amount of recyclable waste selling and collection this month is summarized in **Table 1-11.**

TABLE 1-11: AMOUNTS OF RECYCLABLE WASTE SOLD AND COLLECTION

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by July 2021
1	Plastic bottles	kg	79	16
2	Aluminium	kg	56	8
3	Paper/Cardboard	kg	169	1
4	Glass	kg	205	12
5	Scrap Metal	Kg	156	0
Total		**kg**	**665**	**37**

Due to the extension of OSOV1 Lockdown until August 2021 which restricts access to the site, collection of food waste from the OSOV1 canteen by the villagers from Phouhomxay Village continued to be suspended in July 2021. NNP1PC is considering introducing safety measures that would allow villagers to collect food waste without compromising the lockdown of OSOV1.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in July 2021 are shown in ***Table 1-12*** and ***Table 1-13.***

TABLE 1-12: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in July 2021 (A)	Used (B)	Remaining at the end of July 2021 (A – B)
1	Diesel	Litre	1,724	4,676	**3,048**
2	Gasoline	Litre	370	225	**845**
3	Lubricant (Turbine oil)	Litre	7,826	501	**7,325**
4	Colour Paint	Litre	242	4	**241**
5	Thinner	Litre	8	2	**9**
6	Grease Oil	Litre	160	0	**220**
7	Gear Oil	Litre	470	2	**468**
8	Chlorine Liquid	Litre	3	80	**83**
9	Chlorine Powder	kg	65	0	**65**
10	SIKA	Litre	7	0	**7**

TABLE 1-13: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in July 2021 (A)	Disposed (B)	Remaining at the end of July 2021 (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	4587.7	4467.7	**120**
2	Used oil mixed with water	Litre	150	150	**0**
3	Empty 200L drum of used oil	Unit	21	0	**21**
4	Contaminated soil, sawdust and textile material	M^3	2.53	2.51	**0.02**
5	Used tires	Piece	18	18	**0**
6	Empty 20L chemical drum	Drum	10	0	**10**
7	Lead battery	Unit	5	0	**5**
8	Empty paint and spray cans	Can	139	139	**0**
9	Halogen/fluorescent bulbs	Unit	294	0	**294**
10	Empty cartridge (Ink)	Unit	198	195	**3**
11	Clinic Waste	kg	3.5	0	**3.5**

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. EMO contacted a local recycling company to come and collect the recyclable waste that have been stored for a long time.

Recyclable waste (126 kgs of cardboard) in poor condition was segregated and disposed of at the Houay Soup Landfill and the good quality recyclables (2,393 kgs of glass and plastic bottles) were sold to the local waste trading company.

TABLE 1-14: TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY RECYCLE WASTE BANK

Types of Waste	Unit	Remaining in June 2021	Additional in July 2021	Sold/ dispose	Remaining in July 2021
Glass bottles	kg	2,358	0	2,358	0
Paper/ cardboard	kg	126	0	126	0
Plastic bottles	kg	35	0	35	0
Aluminium cans	kg	0	0	0	**0**
Scrap metal	kg	0	0	0	**0**
Total	**kg**	**2,519**	**0**	**2,519**	**0**

1.6.2 Community Solid Waste Management

In July 2021, a total of 43.9 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, an increase of 18.1 m^3 compared with June 2021 due to the disposal of 126 kg of recyclable wastes (poor condition of cardboard) from the community waste bank at the landfill.

During this reporting period, the local waste collection contractor conducted regular waste collection from the three villages and operated the Houy Soup landfill for two days per week. The work included waste collection, segregation and disposal, waste cover, grass cutting and repairing the perimeter fence. In addition, the local contractor also conducted a quarterly site inspection and provided training on health, safety and environmental as well as waste covering and segregation for the local workers. In additional, the contractor completed the first quarterly waste cover in the landfill and compaction by excavator.

FIGURE 1-9: WASTE MANAGEMENT ACTIVITIES DURING JULY 2021

WASTE DUMP AT HSL	***WASTE COVER AT HSL***
	
QUARTELY WASTE COVER AND COMPACTION	
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

The construction of the sub-office for Xaysomboun WRPO at Houay Xay Village, Hom District under the approved AIP2020 continued to progress in July 2021.

Xaysomboun WRPO resumed the reservoir patrolling from 21 – 30 July 2021 and the report will be shared to EMO in August 2021. Bolikhamxay WRPO resumed forest patrolling from 23 June – 02 July 2021 and the report was shared in the second week of July 2021. According to the report there is a forest encroachment for farming around 56 ha at Phouhomxay Village. A warning letter was issued to a villager for illegally clearing and occupying an area of around 50 ha out of 56 ha encroached forest area.

Bolikhamxay WRPO organized a back-to-back consultation meeting on law enforcement (under NNP1 WMP Act 3.2) and reservoir fishery management (under NNP1 WMP Act 5.2) on 15 July 2021 at District Administration Office in Bolikhan District Bolikhamxay Province. The meeting was chaired by Mr. Phatthachone Keophoutthavong, Head of BLX PAFO and attended by 32 representatives from DoF, PAFO, BLK DAFO, relevant district agencies, WCS-BSP, NNP1PC (EMO) and village authorities from three respective downstream villages. The discussion from law enforcement meeting more focused on the patrolling rather than on initiating ideas and development of a joint action plan among relevant GOL agencies in accordance with their roles and responsibilities to reduce illegal activities such as illegal logging, hunting and the sale of wildlife within the district. More engagement from WCS-BSP in organizing such meetings in the coming years is needed. EMO team provided clarification and recommended that Bolikhamxay and Xaysomboun WRPO should have agreed coordination mechanism on the fishery co-management.

The local consultant to support implementing the Action Plan of Sustainable Livelihood Opportunities started the work on 01 July 2021. After completing the review of relevant documents, agreeing with further detail working plan, as well as in compliance with GOL measures on COVID-19, the Consultant and EMO team organized community meetings with production groups in the seven watershed villages in Anouvong, Thathom, and Hom Districts in Xaysomboun Province during 23-30 July 2021. The objectives of the community meetings are: i) to understand the production capacity of each production group; ii) to understand the needs and plan of each production group; and iii) to understand the production practice and product distribution.

EMO Team also noted from the discussion with Xaysomboun WRPO/PAFO, DAFO of Hom and Thathom about the GOL's plan and work arrangement for agricultural extension service as follows:

a) Thathom DAFO does not have plan for agricultural extension service in 2021. Thathom DAFO has a team who can organize training on good agricultural practice, organic farming and rice seed selection. The DAFO can share the training manual that they have with EMO Team. A further discussion with Thathom DAFO is needed to understand the need for agricultural extension service for the two watershed villages of Nahong and Phonhom.
b) One of the agriculture strategies of Hom DAFO is to promote organic farming focusing on coffee, pineapple, orange and vegetables. In addition, Hom DAFO also has a plan to promote organic vegetable farming among farmers within Hom district to supply to the organic market in Vientiane. The DAFO has a team who can deliver training on good agricultural practice and organic vegetable farming. They have prepared an annual agricultural extension service plan and will share the plan with EMO Team. However, the budget for implementing this annual agricultural extension service plan is still subject to fund availability and allocation from PAFO. It is noted that in 2021, the DAFO has not received funds from PAFO similar to previous years.
c) Xaysomboun PAFO has experience in organizing training on soil fertility improvement and vegetable farming where most of the training was organized only in Anouvong District. The PAFO has a plan to provide extension services to pineapple and coffee farmers in Hom and cassava farmers in Thathom. The PAFO will draft an agricultural extension service plan for watershed communities and share the plan with EMO Team for review and consideration.

EMO Team will organize further discussions with DAFO of Thathom and Hom on the plan for agricultural extension in the first week of August 2021.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2021

The Minutes of Meeting (MOM) of the online meeting on the WMP's 5-year budget plan 2021-2025 that was organized on 09 June 2021 was finalized in the second week of July 2021 and in the process of obtaining the official signature from relevant offices.

Bolikhamxay WRPO submitted the revised plan to EMO on 14 June 2021 and EMO reviewed the plan and provided comments at the end of June 2021. ADB and IAP Team Leader provided confirmation of no objection on 15 July 2021. Additional clarifications were provided to IAP Biodiversity Specialist on 21 July 2021 and the final version of the plan was forwarded to Bolikhamxay WRPO on the same date for fund disbursement process.

After a series of follow-up and offers of support from EMO and BSP-WCS, Xaysomboun WRPO provided confirmation to EMO on 21 July 2021 that their plan will be submitted in the last week of July 2021 or early August 2021.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP) 2019 and 2020

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

a. Component 1 - Spatial Planning and Regulation

The site visits to settle the issue on the TPZ boundary demarcation in the remaining village, Vangphieng Village of Viengthong district was still postponed until further confirmation of the availability of representatives of NC-NX BOMC and BOMU.

During the preparation of AIP2021, it was agreed with NC-NX BOMU, EMO, and BSP-WCS that the land use plans of three NC-NX villages (Natan, Na Gnang, Vangphieng Villages) in Viengthong district will be updated first under the AIP2021. The plan to update these village land use plans was drafted and shared by BSP-WCS to EMO on 21 July 2021. The plan is being reviewed by EMO Team and is expected to be further discussed with NC-NX BOMU in August 2021. The activity is expected to be implemented in September 2021.

b. Component 2 – Law Enforcement

The four patrol teams continue the patrolling work that was scheduled between 14 July to 13 August 2021. After discussions among NC-NX BOMU, EMO, and BSP-WCS considering the safety issue and difficult access during rainy season, BSP-WCS and EMO recommended that the patrol teams should avoid the potential risky activities especially in the TPZ highest priority area such as crossing main rivers with high water level and strong current, tracking in the deep forest with potential landslide area etc. Therefore, it was agreed among NC-NX BOMU, EMO, and BSP-WCS that the patrolling in July 2021 should have two teams to continue in the TPZ highest priority area while the other two teams will patrol in Nam Ma and Nam Houng TPZ higher priority areas.

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

Team	Patrolling Area/distance	Observations/Actions Taken
1	Nam Ma TPZ high priority area including Nam Ma, Nam Pang, Nam Mong and mountain ridges. (15 days covering 75.78 km distance of forest and 12.17 km distance of road patrol)	The team found and destroyed a fresh hunting camp located at Nam Sone.
2	Nam Houng TPZ high priority area including Nam Houng, Na Somfad, Nam Lak, Houy Bon and Houy Kanang. (15 days covering 88.26 km distance of forest patrol)	The team encountered and destroyed three fresh fishing camps at Nam Houng and found a wooden place for hunting close to Nam Houng.
3	TPZ highest priority area including Nam Sone, Nam Chuan, Houy Xai Gnai, Houy Xai Noi and Houy Poung. (16 days covering 58.52 km distance of forest patrol and 18.96 km of road patrol)	The team encountered and destroyed a small fresh hunting camp located at the upstream of Houy Xay Gnai and found 10 large spring snares located close to Nam Xi.
4	TPZ highest priority area including Nam San and Nam Chang. (16 days covering 54.12 km of forest patrol and 12.32 km of road patrol)	The team did not encounter any threats during patrolling.

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

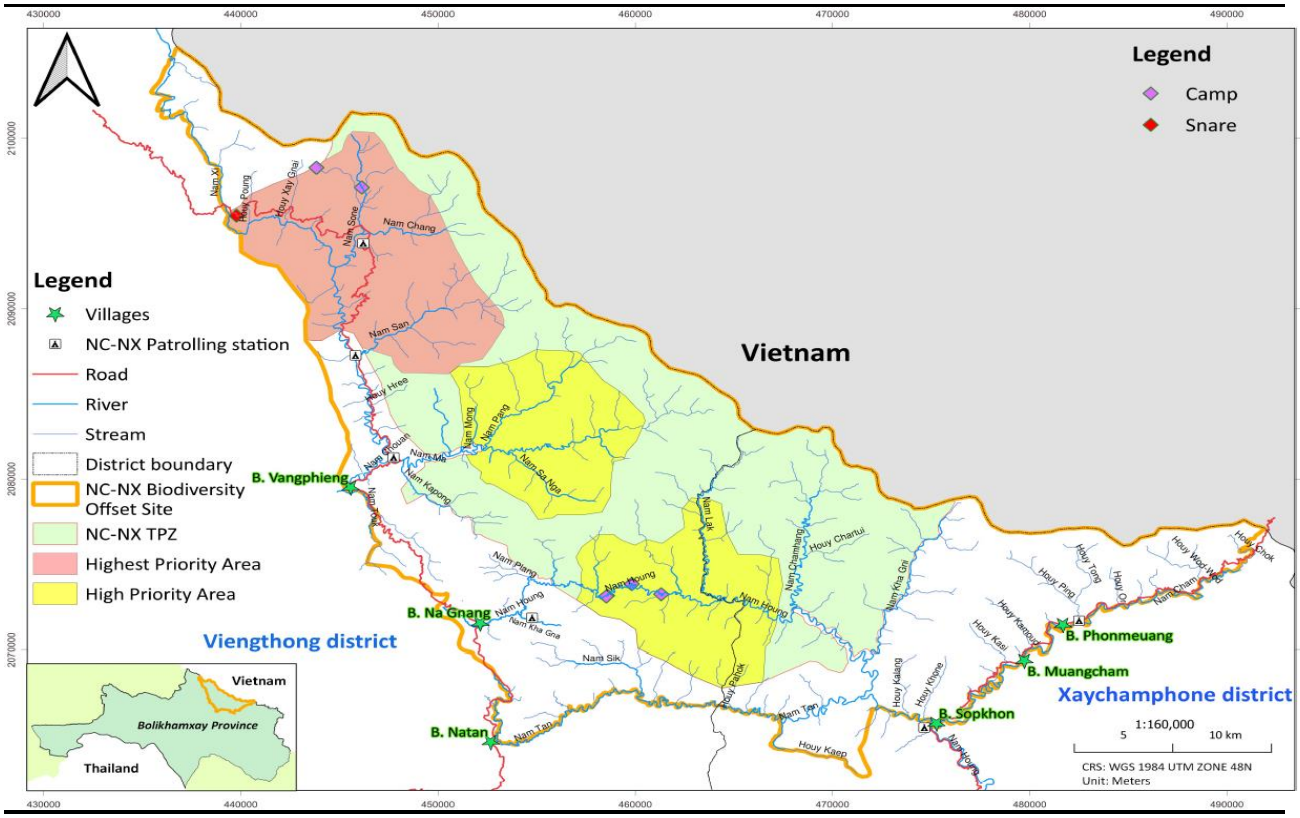


FIGURE 2-2: FRESH FISHING CAMP FOUND BY TEAM 2 AT NAM HOUNG	*FIGURE 2-3: WOODEN PLACE FOR HUNTING FOUND BY TEAM 2 AT NAM HOUNG*
	
FIGURE 2-4: LARGE SPRING SNARE ENCOUNTERED BY TEAM 3 LOCATED CLOSE TO NAM XI	
	

c. Component 3 – Conservation Outreach

The outreach activity will be further postponed to after the rainy season.

d. Component 4 – Conservation linked livelihood development

The finalization of the Lao version of the CDP is subject to further discussions with Bolikhamxay PAFO but some of the CDP activities have already been incorporated into the NC-NX BOM AIP2021.

The second snare removal for June 2021 was commenced between 20 June and 3 July 2021. The reports of May and June 2021 were shared by NC-NX BOMU in the third week of July 2021. The reports note that there were no snares detected in the target area. The snare removal of July 2021 started from 23 July 2021 with the focus on TPZ highest priority area including Nam San and south of Nam San Mountain ridges.

e. Component 6 – Biological Monitoring

EMO and BSP developed the TOR for specific surveys between February and March 2021. The TORs were discussed and reviewed by ADB and IAP between April and May 2021. The TOR is being reviewed by NNP1 ESD management.

The draft TOR of NNL auditor was shared by ADB on 17 May 2021 noting that it has been reviewed by IAP Biodiversity Expert. EMO provided comments and notes for ESD management consideration on 24 May 2021. The draft TOR is being reviewed by NNP1 ESD management.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2021

Per further internal discussion with ESD management, the NC-NX BOM AIP2021 was advised to be separated into agreeable and non-agreeable activity/budget plans in which the agreeable activity/budget plan can be processed for fund disbursement. The updated plan was shared to BOMU on 8 July 2021 for their confirmation and agreement. After NC-NX BOMU confirmation then the revised plan was submitted to ADB on 14 July 2021. After some clarification and revision then ADB confirmed no objection on 23 July 2021. EMO is currently waiting for the confirmation from IAP biodiversity specialist before proceeding further with fund disbursement.

3. FISHERY MONITORING

Four species groups and one species dominated the fish catch by weight in June 2021 as listed in **Table 3-1.** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species[1], except *Sikukia gudgeri* is classified as Data Deficient species (DD).

Table 3-1*: *Fish Species dominating the Fish Catch in June 2021

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Barbonymus gonionotus, Hypsibarbus malcomi, Hypsibarbus vernayi, Hypsibarbus wetmorei	ปาปา	201.1	LC
Hampala dispar, Hampala macrolepidota	ปาสูด	164.3	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาขาวຊาย	123	DD, LC
Mastacembelus armatus, Mastacembelus favus	ปาหาด	122.3	LC
Oreochromis niloticus	ปานิน	62.5	LC

The recorded catch of Threatened species (IUCN Red List classification) in June 2021 are presented in **Table 3-2.** The list includes three species that are classified as Vulnerable species (VU).

[1] The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not Evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

Table 3-2: Threatened Species of June 2021 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cyprinus carpio	ปาไม	19.5	VU
Scaphognathops bandanensis	ปาอวมไฝ/ปาป่วม	13.4	VU
Tor sinensis	ปาแดง	22	VU

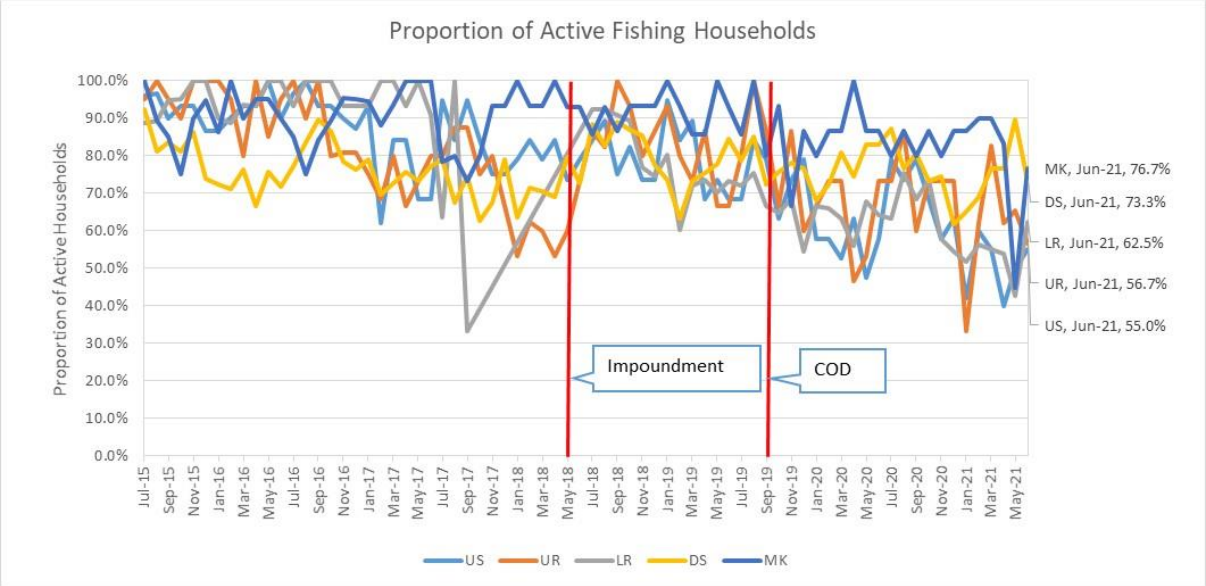
Species abundance and occurrence is based on the 7-day reported catch from the DCL survey in June 2021. The catch is divided in three areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in June 2021 for above dam, below dam and Mekong area are presented in **Table 3-3.**

Table 3-3: Main Biodiversity Indicators for June 2021

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	39	36	39
Single species	30	22	25
Species groups	9	14	14
Top 15 species (% total catch weight)	83.92%	88.35%	89.75%
Proportion for species groups	25.57%	75.76%	59.07%
Diversity index (Shannon)	2.8163	2.6247	2.7707

Figure 3-1 shows the proportion of total number of households actively fishing by fishing zone including upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK). It ranges between 55% and 76% of active fishing households for all fishing zones in June 2021.

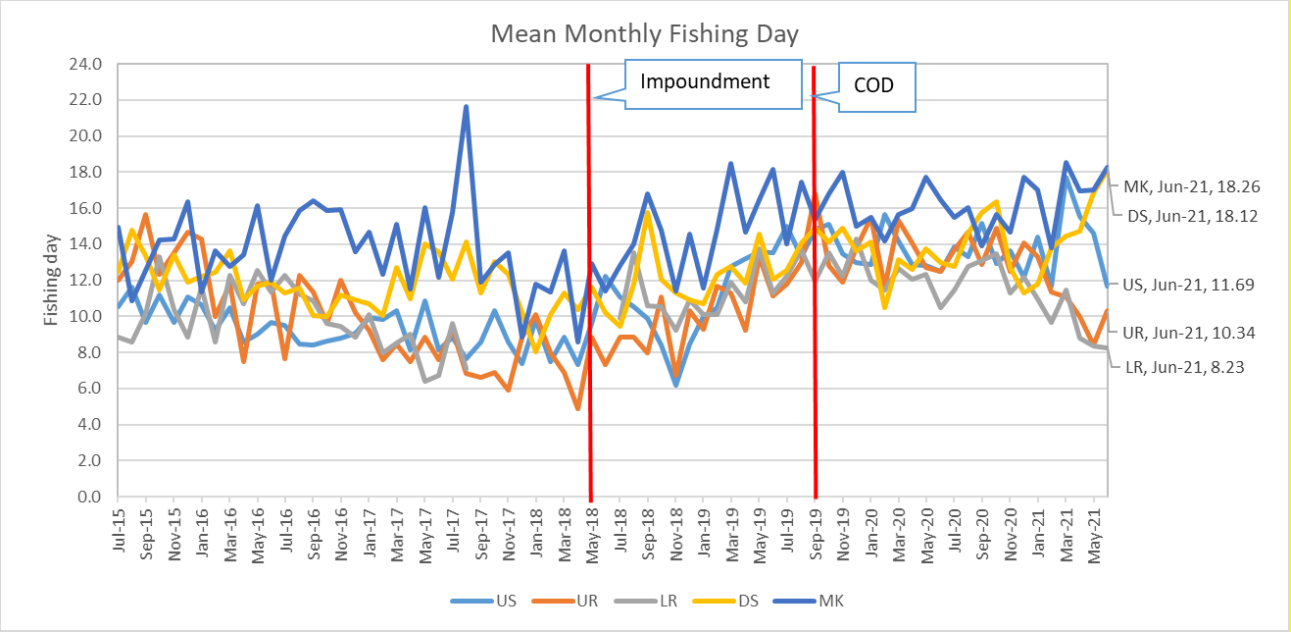
FIGURE 3-1: Proportion of total number of households actively fishing by fishing zone from July 2015 to June 2021



Note: Proportion of Active Fishing Households = (Active Fishing Households/Total Interviewed Households) x 100%

Figure 3-2 shows the average (mean) of monthly fishing day from July 2015 to June 2021 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

FIGURE 3-2: Mean of monthly fishing day from July 2015 to June 2021



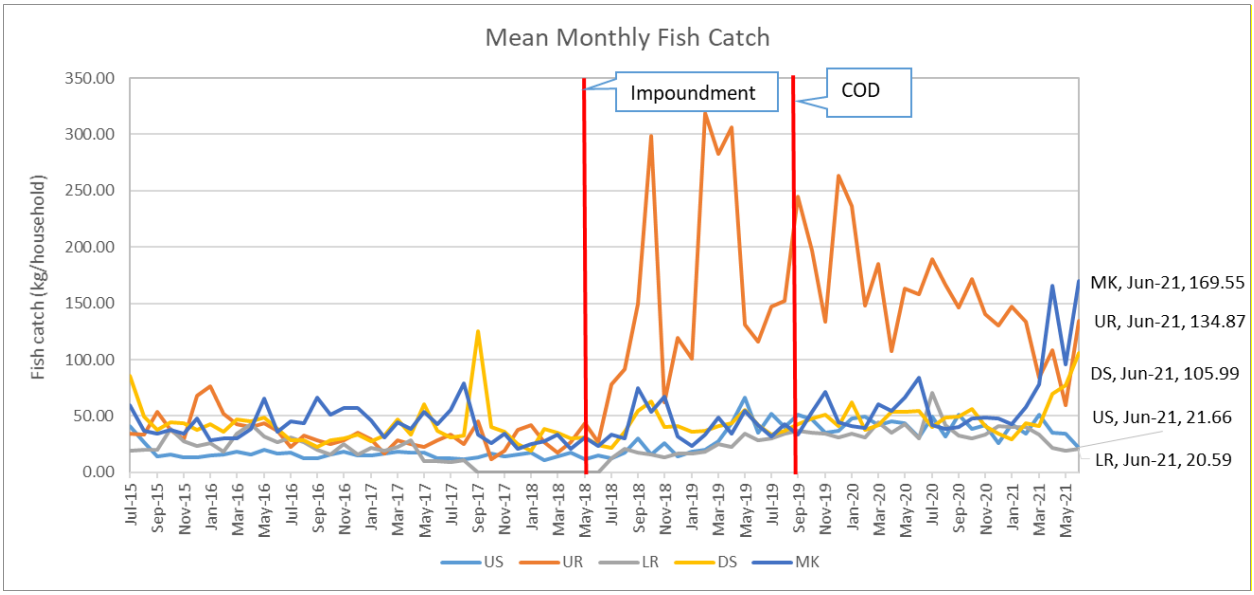
The mean monthly number of fishing day in June from 2016 to 2021 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in **Table 3-4.**

Table 3-4: Mean reported number of fishing days by fishing zone in June from 2016 to 2021

Fishing Zone	June 2016 (day)	June 2017 (day)	June 2018 (day)	June 2019 (day)	June 2020 (day)	June 2021 (day)
Upstream	9.64	8.14	12.24	13.52	12.47	11.69
Upper reservoir	11.90	7.62	7.35	11.14	12.47	10.34
Lower reservoir	11.33	6.73	0.00	11.29	10.48	8.23
Downstream	11.87	13.60	10.22	12.07	12.97	18.12
Mekong	12.00	12.14	11.43	18.13	16.48	18.26

The mean monthly household fish catch from July 2015 to June 2021 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 3-3.***

FIGURE 3-3: Mean Monthly Household Fish Catch from July 2015 to June 2021



The mean household fish catch for the month of June from 2016 to 2021 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in **Table 3-5.**

Table 3-5: Mean Monthly Household Fish Catch for the month of June from 2016 to 2021

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)	June 2020 (kg)	June 2021 (kg)
Upstream	16.53	12.34	14.57	35.47	30.62	21.66
Upper reservoir	36.57	28.43	26.51	116.40	158.49	134.87
Lower reservoir	26.66	10.16	NA	28.39	30.44	20.59
Downstream	38.16	36.61	24.45	41.97	54.11	105.99
Mekong	36.29	42.50	23.43	41.60	83.64	169.55

The mean daily fish catch per household from July 2015 to June 2021 are displayed in **Figure 3-4** and the mean fish catch per household per fishing day for the month of June from 2016 to 2021 are shown in **Table 3-6.**

FIGURE 3-4: Mean Daily Fish Catch per Household from July 2015 to June 2021

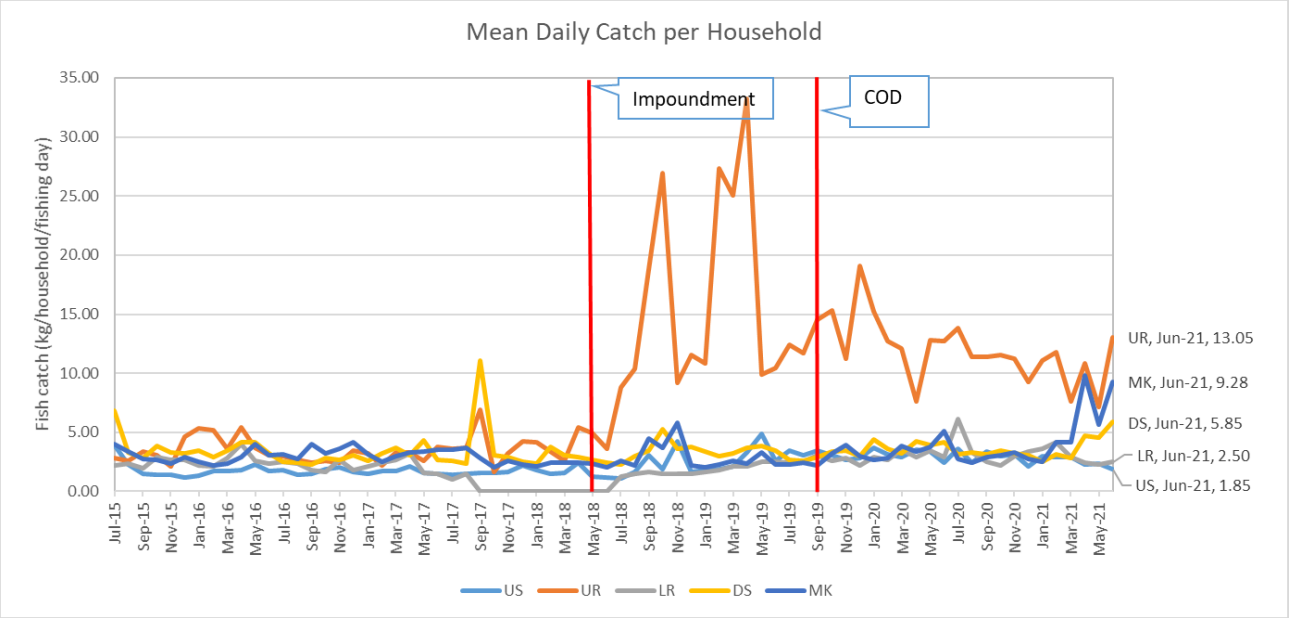


Table 3-6: Mean Daily Fish Catch per Household for the month of June from 2016 to 2021

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)	June 2020 (kg)	June 2021 (kg)
Upstream	1.71	1.52	1.19	2.62	2.46	1.85
Upper reservoir	3.07	3.73	3.61	10.45	12.71	13.05
Lower reservoir	2.35	1.51	NA	2.51	2.91	2.50
Downstream	3.22	2.69	2.39	3.48	4.17	5.85
Mekong	3.02	3.50	2.05	2.29	5.07	9.28

The survey results in June 2021 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams, and Mekong respectively. The proportion of fishing habitats in June 2021 are displayed in ***Table 3-7.***

Table 3-7: Proportion of the catch reported by main habitats (%) in June 2021

Habitats	US	UR	LR	DS	MK
Mekong	0%	0%	0%	13.05%	86.39%
Nam Ngiep	60.25%	1.76%	0%	54.73%	0.88%
Nam Xan	0%	0%	0%	0%	0%
Reservoir	0%	90.36%	10.41%	0%	0%
Tributary and stream	29.68%	7.33%	66.94%	21.56%	3.08%
Wetland	10.07%	0.56%	22.65%	1.84%	9.65%
Others	0.00%	0.00%	0.00%	8.82%	0.00%

Total reported fish and OAA catch (proportion of OAA) for the same 7-day period from July 2015 to June 2021 are presented in **Figure 3-5** and the proportion of OAA catch for the month of June from 2016 to 2021 are shown in **Table 3-8.**

FIGURE 3-5: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone from July 2015 to June 2021

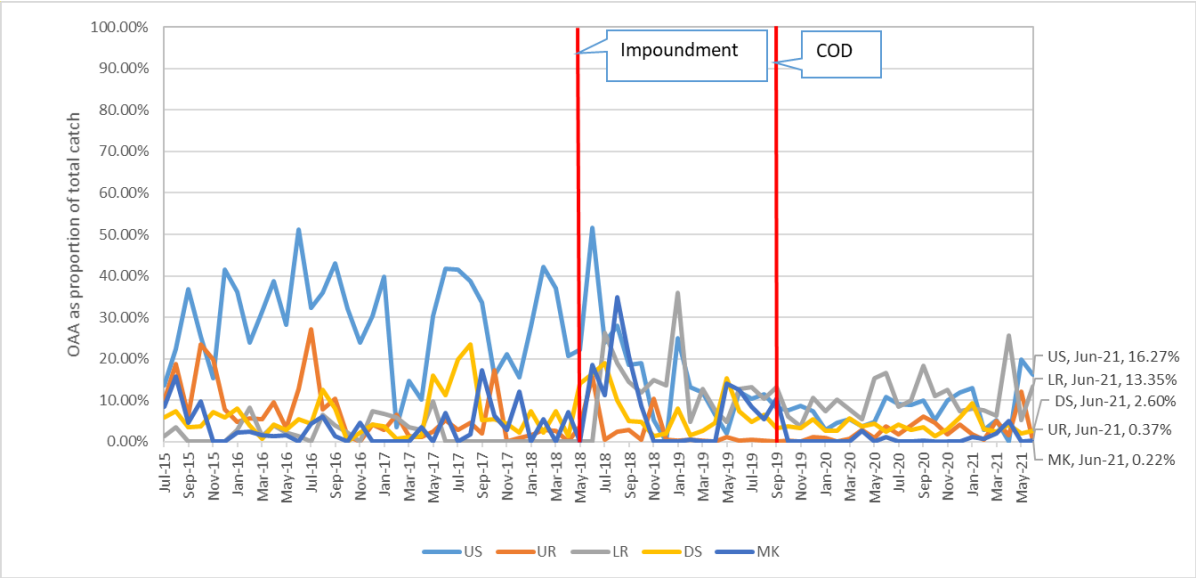


Table 3-8: Proportion of OAA to the total reported number of fish and OAA for the month of June from 2016 to 2021

Fishing Zone	June 2016	June 2017	June 2018	June 2019	June 2020	June 2021
Upstream	51.23%	41.70%	51.63%	12.09%	10.78%	16.27%
Upper reservoir	12.73%	5.24%	15.76%	0.37%	3.74%	0.37%
Lower reservoir	1.47%	0.00%	0.00%	12.70%	16.52%	13.35%
Downstream	5.52%	11.31%	16.40%	7.30%	2.40%	2.60%
Mekong	0.00%	7.03%	18.51%	12.48%	1.17%	0.22%

4. EXTERNAL MISSONS AND VISITS

A joint virtual meeting between ADB, LTA and NNP1PC was conducted on 19 July 2021 and the progress on the Correction Action Plans (CAP) for the ADB Environmental Safeguard non-compliance issues were reported as well as the progress on ISO14001:2015 certification preparation. There are two pending issues to be followed up after the meeting:

1) Emergency Action Plan (EAP) and Emergency Evacuation Plan (EEP)

- **EAP** was updated on 01 April 2021 in accordance with a new Guideline of GoL and submitted to the Department of Energy Management (DEM) on 21 April 2021. The desktop testing was conducted in April 2021 and the field testing is scheduled to be conducted within October 2021 led by NNP1PC Technical Division.
- **EEP** (in Lao Language) for the 13 downstream villages is under preparation by an external consultant to be reviewed and approval by the GOL. The emergency evacuation drills in all high-risk areas identified in downstream villages are scheduled within October 2021 led by the Consultant in participation of relevant and local authorities. The EEP could be finalized within November 2021.

2) Water Quality – low Dissolved Oxygen (DO) levels at downstream

- DO levels downstream the Re-regulation Dam at lower Nam Ngiep River regularly observed non-compliance with the National Surface Water Quality Standard (<6 mg/L) during the turbine discharge.
- The timeline of next steps to resolve the issues was shared with ADB on 01 April 2021 with some information of the feasibility studies but the proper action to resolve the issue is not yet finalized.
- A trial to operate the labyrinth Spillway at the Re-regulation Dam is scheduled in September 2021 to see the improvement of DO values downstream and possibility to operate the spillway routinely.
- ADB requested for a concrete action plan to resolve the low DO issue for submission to ADB by Q4, 2021. TD is leading this work since it is related to the dam operation with support from ESD for monitoring the results.

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

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

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
6-Jul-21	pH	5.0 - 9.0					6.97	6.94						
7-Jul-21	pH	5.0 - 9.0							6.9	6.99	6.82	6.56	6.94	7.11
12-Jul-21	pH	5.0 - 9.0	6.56											
13-Jul-21	pH	5.0 - 9.0					7.39	7.71						
14-Jul-21	pH	5.0 - 9.0							6.44	6.44	6.59	6.78	6.91	6.9
20-Jul-21	pH	5.0 - 9.0					6.54	6.66						
21-Jul-21	pH	5.0 - 9.0							6.71	6.99	7.02	6.66	7.22	7.36
26-Jul-21	pH	5.0 - 9.0	6.86											
27-Jul-21	pH	5.0 - 9.0					7.03	7.22						
29-Jul-21	pH	5.0 - 9.0							7.07	7.01	7	7.15	7.17	7.21
6-Jul-21	Sat. DO (%)						92.3	90.8						
7-Jul-21	Sat. DO (%)								16.5	42.3	84.7	80.6	74.4	76.2
12-Jul-21	Sat. DO (%)		91.5											
13-Jul-21	Sat. DO (%)						95.1	95.4						
14-Jul-21	Sat. DO (%)								28	41.1	87.7	82.1	85.3	84.1
20-Jul-21	Sat. DO (%)						92.9	91.2						
21-Jul-21	Sat. DO (%)								17	13.9	32.1	42.7	68.6	76.4
26-Jul-21	Sat. DO (%)		89.4											
27-Jul-21	Sat. DO (%)						93.5	88.7						
29-Jul-21	Sat. DO (%)								15.4	13.8	39.5	47	57.3	63.3
6-Jul-21	DO (mg/L)	>6.0					6.76	6.7						
7-Jul-21	DO (mg/L)	>6.0							1.37	3.4	6.86	6.48	5.94	6.06
12-Jul-21	DO (mg/L)	>6.0	7.27											
13-Jul-21	DO (mg/L)	>6.0					7.07	7.11						
14-Jul-21	DO (mg/L)	>6.0							2.38	3.28	7.14	6.62	6.68	6.45
20-Jul-21	DO (mg/L)	>6.0					6.94	6.96						
21-Jul-21	DO (mg/L)	>6.0							1.41	1.15	2.66	3.52	5.6	6.24
26-Jul-21	DO (mg/L)	>6.0	7.34											
27-Jul-21	DO (mg/L)	>6.0					7.12	6.82						
29-Jul-21	DO (mg/L)	>6.0							1.27	1.13	3.22	3.8	4.61	5.08
6-Jul-21	Conductivity (µs/cm)						70	71						
7-Jul-21	Conductivity (µs/cm)								86	58	79	87	66	53
12-Jul-21	Conductivity (µs/cm)		81											
13-Jul-21	Conductivity (µs/cm)						71	71						
14-Jul-21	Conductivity (µs/cm)								82	85	82	88	64	66
20-Jul-21	Conductivity (µs/cm)						71	70						
21-Jul-21	Conductivity (µs/cm)								82	81	79	84	62	46
26-Jul-21	Conductivity (µs/cm)		86											
27-Jul-21	Conductivity (µs/cm)						70	68						
29-Jul-21	Conductivity (µs/cm)								76	76	75	77	73	66
6-Jul-21	Temperature (°C)						31.48	31.44						
7-Jul-21	Temperature (°C)								25.28	26.67	26.18	26.68	26.95	26.99

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
12-Jul-21	Temperature (°C)		31.02											
13-Jul-21	Temperature (°C)						31.02	30.79						
14-Jul-21	Temperature (°C)								25	27.12	25.8	26.33	27.96	28.94
20-Jul-21	Temperature (°C)						30.68	29.42						
21-Jul-21	Temperature (°C)								25.07	25.14	25.2	25.01	25.82	25.72
26-Jul-21	Temperature (°C)		25.27											
27-Jul-21	Temperature (°C)						29.78	28.98						
29-Jul-21	Temperature (°C)								25.49	25.92	25.59	26.05	26.17	25.56
12-Jul-21	TSS (mg/L)		21.8											
13-Jul-21	TSS (mg/L)						<5	<5						
14-Jul-21	TSS (mg/L)								<5	5.4	<5	<5	6.03	6.09
12-Jul-21	BOD_5 (mg/L)	<1.5	<1											
13-Jul-21	BOD_5 (mg/L)	<1.5					<1	<1						
14-Jul-21	BOD_5 (mg/L)	<1.5							<1	<1	<1	<1	<1	<1
12-Jul-21	COD (mg/L)	<5.0	6.9											
14-Jul-21	COD (mg/L)	<5.0							7.7	9.3	6.1	6.5	6.1	15.8
12-Jul-21	NH_3-N (mg/L)	<0.2	<0.2											
14-Jul-21	NH_3-N (mg/L)	<0.2					<0.2	<0.2						
12-Jul-21	NO_3-N (mg/L)	<5.0	0.11											
13-Jul-21	NO_3-N (mg/L)	<5.0					<0.02	<0.02						
12-Jul-21	Faecal coliform (MPN/100 mL)	<1,000	170											
13-Jul-21	Faecal coliform (MPN/100 mL)	<1,000					0	2						
14-Jul-21	Faecal coliform (MPN/100 mL)	<1,000							49	11	79	170	220	240
12-Jul-21	Total Coliform (MPN/100 mL)	<5,000	540											
13-Jul-21	Total Coliform (MPN/100 mL)	<5,000					2	2						
14-Jul-21	Total Coliform (MPN/100 mL)	<5,000							130	49	130	920	280	350
12-Jul-21	TKN		<1.5											
13-Jul-21	TKN						<1.5	<1.5						
12-Jul-21	TOC (mg/L)		1.85											
14-Jul-21	TOC (mg/L)								1.84	1.79	1.76	1.82	3.03	2.25
13-Jul-21	Phytoplankton Biomass (g dry wt/m^3)						1.2	0.4						
12-Jul-21	Total Phosphorus (mg/L)		<0.01											
13-Jul-21	Total Phosphorus (mg/L)						<0.01	<0.01						
12-Jul-21	Total Dissolved Phosphorus (mg/L)		<0.01											
13-Jul-21	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01						
13-Jul-21	TSS (mg/L)-bottom						<5	<5						
13-Jul-21	BOD_5 (mg/L)-bottom						<1	<1						
13-Jul-21	Total Coliform (MPN/100 mL)-bottom						0	2						
13-Jul-21	Faecal coliform (MPN/100 mL)-bottom						0	2						
13-Jul-21	NH_3-N (mg/L)-bottom						0.3	0.2						
13-Jul-21	NO_3-N (mg/L)-bottom						<0.02	<0.02						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
13-Jul-21	TKN-bottom						<1.5	<1.5						
13-Jul-21	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	<0.01						
13-Jul-21	Total Phosphorus (mg/L)-bottom						<0.01	<0.01						
13-Jul-21	Hydrogen Sulfide (mg/L)-bottom						0.14	0.27						
13-Jul-21	Phytoplankton Biomass (g dry wt/m^3)-bottom						1.8	2.4						

TABLE A-2: RESULTS OF SURFACE WATER QUALITY MONITORING IN NAM CHIAN, NAM PHOUAN, NAM XAO AND NAM HOUAY SOUP

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
7-Jul-21	pH	5.0 - 9.0			7.11	6.76
12-Jul-21	pH	5.0 - 9.0	6.92			
14-Jul-21	pH	5.0 - 9.0			6.66	6.91
21-Jul-21	pH	5.0 - 9.0			7.18	7.5
26-Jul-21	pH	5.0 - 9.0	7.08			
27-Jul-21	pH	5.0 - 9.0				
29-Jul-21	pH	5.0 - 9.0			7.22	7.23
7-Jul-21	Sat. DO (%)				78.3	81.1
12-Jul-21	Sat. DO (%)		90.8			
14-Jul-21	Sat. DO (%)				79.1	83.8
21-Jul-21	Sat. DO (%)				76.9	77.7
26-Jul-21	Sat. DO (%)		93.2			
27-Jul-21	Sat. DO (%)					
29-Jul-21	Sat. DO (%)				72.8	72.8
7-Jul-21	DO (mg/L)	>6.0			6.06	6.57
12-Jul-21	DO (mg/L)	>6.0	7.4			
14-Jul-21	DO (mg/L)	>6.0			6.21	6.69
21-Jul-21	DO (mg/L)	>6.0			6.11	6.39
26-Jul-21	DO (mg/L)	>6.0	7.9			
27-Jul-21	DO (mg/L)	>6.0				
29-Jul-21	DO (mg/L)	>6.0			5.64	5.74
7-Jul-21	Conductivity (µs/cm)				142	19
12-Jul-21	Conductivity (µs/cm)		33			
14-Jul-21	Conductivity (µs/cm)				125	25

15 August 2021

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
21-Jul-21	Conductivity (µs/cm)				145	18
26-Jul-21	Conductivity (µs/cm)		29			
27-Jul-21	Conductivity (µs/cm)					
29-Jul-21	Conductivity (µs/cm)				115	22
7-Jul-21	Temperature (°C)				29.84	26.06
12-Jul-21	Temperature (°C)		25.76			
14-Jul-21	Temperature (°C)				30.32	27.64
21-Jul-21	Temperature (°C)				27.49	25.32
26-Jul-21	Temperature (°C)		23.75			
27-Jul-21	Temperature (°C)					
29-Jul-21	Temperature (°C)				29.48	27.5
12-Jul-21	TSS (mg/L)		10.28			
14-Jul-21	TSS (mg/L)				12.4	29.43
12-Jul-21	BOD_5 (mg/L)	<1.5	<1			
14-Jul-21	BOD_5 (mg/L)	<1.5			<1	<1
12-Jul-21	COD (mg/L)	<5.0	6.1			
14-Jul-21	COD (mg/L)	<5.0			<5	13.4
12-Jul-21	NH_3-N (mg/L)	<0.2	<0.2			
14-Jul-21	NH_3-N (mg/L)	<0.2				
12-Jul-21	NO_3-N (mg/L)	<5.0	0.13			
12-Jul-21	Faecal coliform (MPN/100 mL)	<1,000	920			
14-Jul-21	Faecal coliform (MPN/100 mL)	<1,000			220	94
12-Jul-21	Total Coliform (MPN/100 mL)	<5,000	1,600			
14-Jul-21	Total Coliform (MPN/100 mL)	<5,000			920	140
12-Jul-21	TKN (mg/L)		<1.5			
12-Jul-21	TOC (mg/L)		1.63			
14-Jul-21	TOC (mg/L)				2.75	4.97
12-Jul-21	Total Phosphorus (mg/L)		<0.01			
12-Jul-21	Total Dissolved Phosphorus (mg/L)		<0.01			

TABLE A-3: RESULTS OF CAMP EFFLUENTS IN JULY 2021

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	08-Jul-21	22-Jul-21	08-Jul-21	22-Jul-21	08-Jul-21	22-Jul-21
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	7.08	6.99	7.16	7.13		8.63
Sat. DO (%)		29.6	44.1	24.7	13.2		55.2
DO (mg/L)		2.3	3.37	1.95	1.02		4.19
Conductivity (µs/cm)		338	495	528	997		978
TDS (mg/L)		169	247.5	264	498.5	No	489
Temperature (°C)		28.58	29.32	27.42	28.53	Discharge	29.39
Turbidity (NTU)		n/a	n/a	n/a	n/a		n/a
TSS (mg/L)	<50	8.88	<5	29.0	41.8		58.9
BOD_5 (mg/L)	<30	10.98	<6	<6	<6		34.92
COD (mg/L)	<125	29.2	n/a	81.4	n/a		n/a
NH_3-N (mg/L)	<10.0	9	n/a	14.9	n/a		n/a
Total Nitrogen (mg/L)	<10.0	22.9	n/a	18.1	n/a		n/a
Total Phosphorus (mg/L)	<2	0.8	n/a	1.28	n/a		n/a
Oil & Grease (mg/L)	<10.0	<0.1	n/a	1	n/a		n/a
Total coliform (MPN/100 mL)	<400	16,000	1,700	0	0		0
Faecal Coliform (MPN/100 mL)	<400	16,000	1,600	0	0		0
Effluent Discharge Volume (L/mn)		6	5	4	4		1250
Chlorination Dosing Rate (mL/mn)		n/a	n/a	25.00	0.26		310
Residual Chlorine (mg/L)	<1.0	n/a	n/a	0.29	0.77		0.67