NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management
Monthly Monitoring Report

March 2022

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EXECUTIVE SUMMARY

During March 2022, activities related to the corrective actions of ISO14001:2015 certification per the auditor's recommendations were in progress such as revising and updating the environmental aspects according to the external auditor's comments. The official ISO14001:2015 certification is still being processed by the audit company (SGS) and is expected to be submitted to NNP1PC within April 2022.

During March 2022, no documents were submitted to EMO for review and approval. EMO also did not issue any Site Inspection Report of Observation of Non-Compliance (ONC) and Non-Compliance Reports (NCR) to the Contractor.

Due to the COVID-19 pandemic and increase in infected cases in the project areas and communities surrounding the project, the regular joint site inspections continue to be suspended at some restricted areas such as in Zone 2UR. However, the regular joint site inspections of the Dam sites and NNP1PC's operation sites have been resumed.

The operation and adjustment of the newly constructed wastewater treatment systems continued in March 2022. EMO and ADM conducted routine inspection, monitoring and adjustment to identify the factors causing non-compliance with certain standards. EMO is reviewing the monitoring results and expects to implement relevant corrective actions in Q2 2022.

At R05 (in the Main Reservoir approx. 0.5 Km upstream the Main Dam), the average DO concentration was 7.9 mg/L in the upper 9.0 m varying between 5.0 mg/L and 9.6 mg/L, and the oxycline was generally found at the depth between 16.0 and 18.0 m with DO concentrations decreasing from about 3 mg/L to less than 1 mg/L. In the Re-regulation Reservoir, the mean DO concentrations over the entire water column were 4.8 mg/L and 4.0 mg/L in R06 (middle of the Re-regulation Reservoir) and R07 (in the Re-Regulation Reservoir approx. 0.3 Km upstream the Re-regulation Dam) respectively.

The DO measurements in R05 at the level of the intake to the main powerhouse dropped abruptly from about 4.5 mg/L to below 1 mg/L. The flow pattern at the intake is likely rather complex drawing in a mixture of water from different parts of the water column which has likely contributed to the relatively high DO concentrations in the Re-regulation Reservoir. The generally high DO levels immediately downstream of the Re-regulation Dam with concentrations between 6 mg/L and 8 mg/L are a result of the higher DO levels in the Re-regulation reservoir and reaeration during periods with gate discharge. Further downstream the DO levels were above 6 mg/L thus complying with the surface water quality standard.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

In March 2022, the local waste collection contractors provided training and awareness on waste management for villagers of the host villages and the resettlement village as well as 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 17.4 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 5.7 m^3 compared with February 2022. A total of 24.3 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at Houay Soup Landfill, an increase of 4.3 m^3 compared with February 2022. There was no trading of recyclable waste at the community recycle waste bank during the period of reporting.

The Watershed and Reservoir Protection Offices (WRPOs) carried out activities in March 2022 including reservoir patrolling by Xaysomboun WRPO and outreach campaign by Bolikhamxay WRPO. Bolikhamxay Nam Chouan-Nam Xang Biodiversity Offset Management Unit (NC-NX BOMU) carried out activities in March 2022 including the patrolling and community outreach through radio broadcast at NC-NX districts and villages.

The fish catch monitoring for February 2022 in Nam Ngiep Watershed was dominated by *Oreochromis niloticus* and *Scaphiodonichthys acanthopterus* and species groups of Hampala, Poropuntius and *Sikukia gudgeri* and *Amblyrhynchichthys truncates*. They are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Sikukia gudgeri* which is classified as Data Deficient species (DD).

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During March 2022, some activities related to the corrective action of the ISO14001:2015 certification audit per the external auditor's recommendations were in progress such as revising and updating of the environmental aspects. The official ISO14001:2015 certification is still being processed by the audit company (SGS) and is expected to be submitted to NNP1PC within April 2022.

TABLE 1-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN-REVISED IN MARCH 2022

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								
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 – **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 – No Corrective Action Request raised during the Stage 2 Audit								
13	**Certify of ISO14001:2015 with a successful completion of the audit**								
	Completed activities per the plan								
	Plan to achieve the activities								

1.2 COMPLIANCE MANAGEMENT

In March 2022, EMO did not receive any documents for review and approval. However, EMO followed up on the four pending revision and resubmissions from the contractors as summarised in ***Table 1-2***.

TABLE 1-2: SUMMARY OF DOCUMENT PENDING REVISION AND RESUBMISSION FOR REVIEW IN MARCH 2022

Title	Date Received	Latest Status of documents which are pending to be submitted after revising
DWP SS-ESMMP for Repairing of damaged irrigation canal and leveling the Access Roads in PHX Resettlement Village	10 February 2022 (2nd submission)	No objection with comments on 21 February 2022. ***Deadline for resubmission: 30 April 2022.***
DWP SS-ESMMP for Remedial Right Bank Abatement of Main Dam	07 January 2022 (1st submission)	No objection with comments on 10 January 2022. ***Deadline for resubmission: 30 April 2022.***
DWP SS-ESMMP for Maintenance Works 2022	20 January 2022 (1st submission)	No objection with comments on 20 January 2022. ***Deadline for resubmission: 30 April 2022.***
DWP SS-ESMMP for Construction of Water Supply and roads improvement for Pou Village in Zone 2UR	14 July 2021 (1st submission)	No objection with comments on 19 July 2021. ***Deadline for resubmission: 30 April 2022.***

Due to the COVID-19 pandemic and an increase in infections in the project aeras and the communities surrounding the project, the regular joint site inspections continued to be suspended at some restricted areas such as in Zone 2UR. However, the regular joint site inspections of the Dam sites and NNP1PC's operation were resumed.

The operation and adjustment of the newly constructed wastewater treatment systems continued in March 2022. EMO and ADM conducted routine inspection, monitoring and adjustment to identify the factors causing non-compliance with certain standards. EMO is finalizing its review of the monitoring results and expects to implement relevant corrective actions in Q2 2022.

EMO did not issue any Site Inspection Report of Observation of Non-Compliance (ONC) and Non-Compliance Reports (NCR) to the Contractor. 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 February 2022	2	2	0	0
Newly Opened in March 2022	0	0	0	0
Total in February 2022	**2**	**2**	**0**	**0**
Resolved in March 2022	2	1	0	0
Carried over to April 2022	0	**1**	0	0
Unsolved Exceeding Deadlines	**0**	**0**	**0**	**0**

TABLE 1-4: SUMMARY OF THE ONC AND NCR ISSUED TO THE CONTRACTOR

Document Number / Date of Issue	Subject Description	Current Status at the end of March 2022
NC No. 01/22 Issued Date: 13-02-22 (NCR Level 1)	Some effluent discharge parameters continue to exceed the standards for almost 5 months following the completion of the improvement and modification in September 2021	• Proper fencing installation to prevent the cattle's encroachment in the OSOV1 wetlands' ponds – **Completed.** • Additional planting of reeds in the OSOV1 wetlands' ponds – **Completed.** • Adding the proper sludges/seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System - **In progress.** • Replacing the detergents in the Main Powerhouse by lower Phosphate detergents - **The same products are used but the housekeepers advised to minimize the quantity.** • Closely monitor the Residual Chlorine content in the effluents of OSOV2 and the Main Powerhouse WWTS and adjust as necessary – **Completed.** • Closely monitor the Influent to compare with the Effluent for the specific parameters to check their treatment effectiveness - **In progress.**

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 March 2022.

1.2.2 Site Decommissioning and Rehabilitation

In March 2022, EMO conducted site inspections and monitoring on all rehabilitation sites. Due to some rain events during this month, germination of seedlings has started. No significant reduction in vegetation coverage and/or erosion were observed. The overall status of the two sites with the lowest percentage of vegetation cover are presented in ***Figure 1-1*** below.

FIGURE 1-1: STATUS OF TWO SITES LOWEST VEGETATION COVER BY THE END OF MARCH 2022

FORMER LILAMA10 CAMP	PHX'S IRRIGATION CANAL ROCK AND SPOIL DIPOSISAL
	

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/

1.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the ***Annex A*** of this Report. 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 MARCH 2022

Site	Sampling ID	Status	Corrective Actions (Expected Completion Date)
OSOV1	EF01	Non-compliance for total faecal coliform and total coliform in all four samplings.	1) Completed proper fencing installation to prevent the cattle's encroachment in the OSOV1 wetlands' ponds (31 March 2022). 2) Completed additional planting of reeds in the OSOV1 wetlands' ponds (31 March 2022). 3) Adding the proper sludges/seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System – Still under contract with the supplier (Q2 of 2022). 4) Replacing the detergent materials in the Main Powerhouse by using lower Phosphate detergent (30 April 2022). 5) Closely monitor the Residual Chlorine content in the effluents of OSOV2 and the Main Powerhouse WWTS and adjust as necessary (30 April 2022). 6) Closely monitor the Influent to compare with the Effluent for the specific parameters to check their treatment effectiveness (Q2 of 2022).
OSOV2	EF13	Non-compliance for ammonia-nitrogen and total nitrogen in all three samplings, total phosphorus in two out of three samplings, and total coliform and faecal coliform in two out of four samplings.	
Main Powerhouse	EF19	Non-compliance for total nitrogen and total phosphorus in all three samplings, ammonia nitrogen in two out of three samplings, and faecal coliform and total coliform in two out of three samplings.	

1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

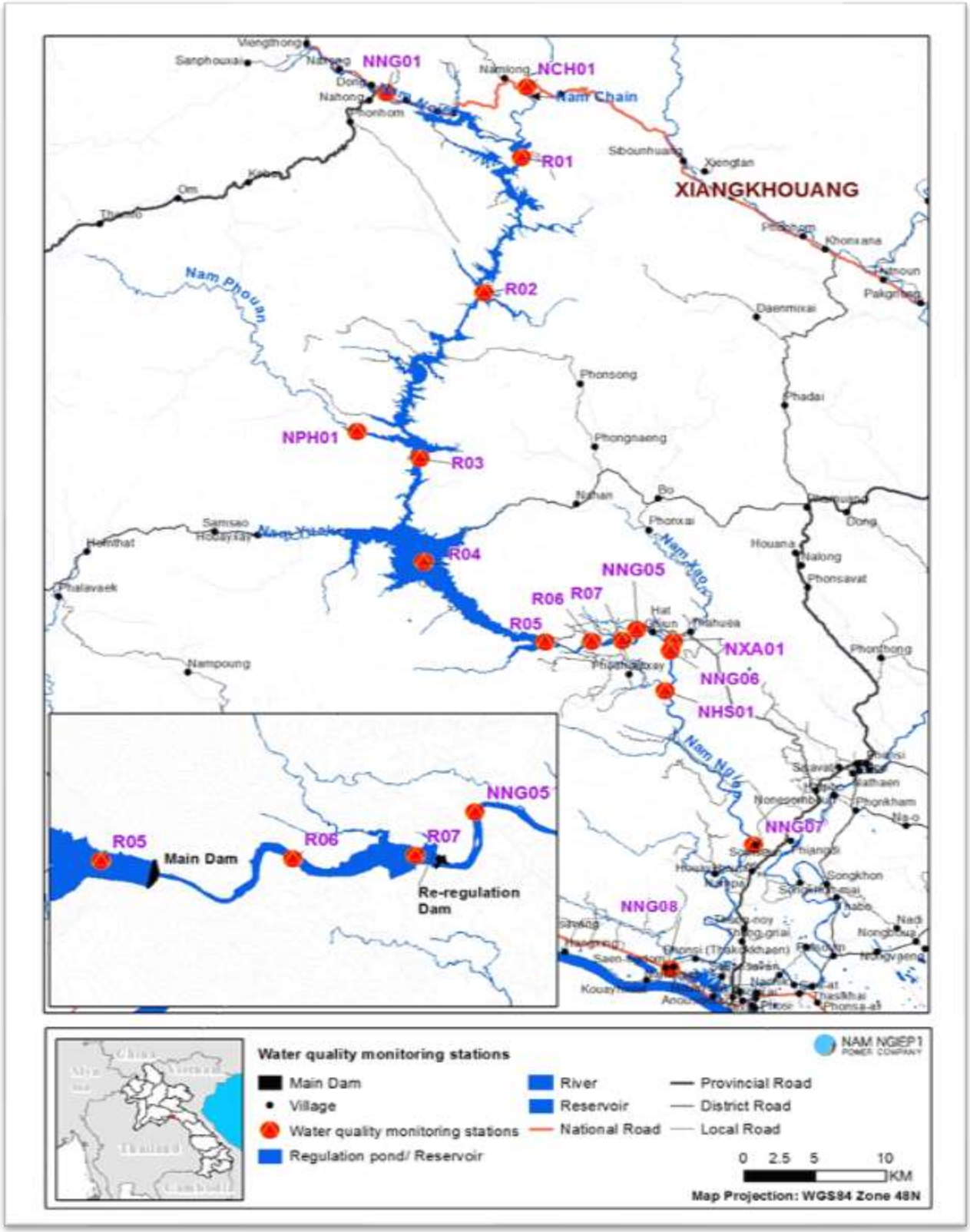
The ambient surface water and reservoir water quality monitoring programme comprises five monitoring stations in the main reservoir (R01-R05), two stations in the Re-regulation Reservoir (R06 and R07), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main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

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 BOD_5) during March 2022 are presented in ***Table 1-6***, ***Table 1-7*** *and* ***Table 1-8.*** The full set of data for March 2022 is attached in ***Annex A***. In addition, the trends of DO depth profile timeseries measurement graph for R05 station is shown in

Figure 1-3, the results for DO timeseries are presented as line graphs in ***Figure 1-4*** *and DO Long Profile graphs in* ***Figure 1-5***.

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

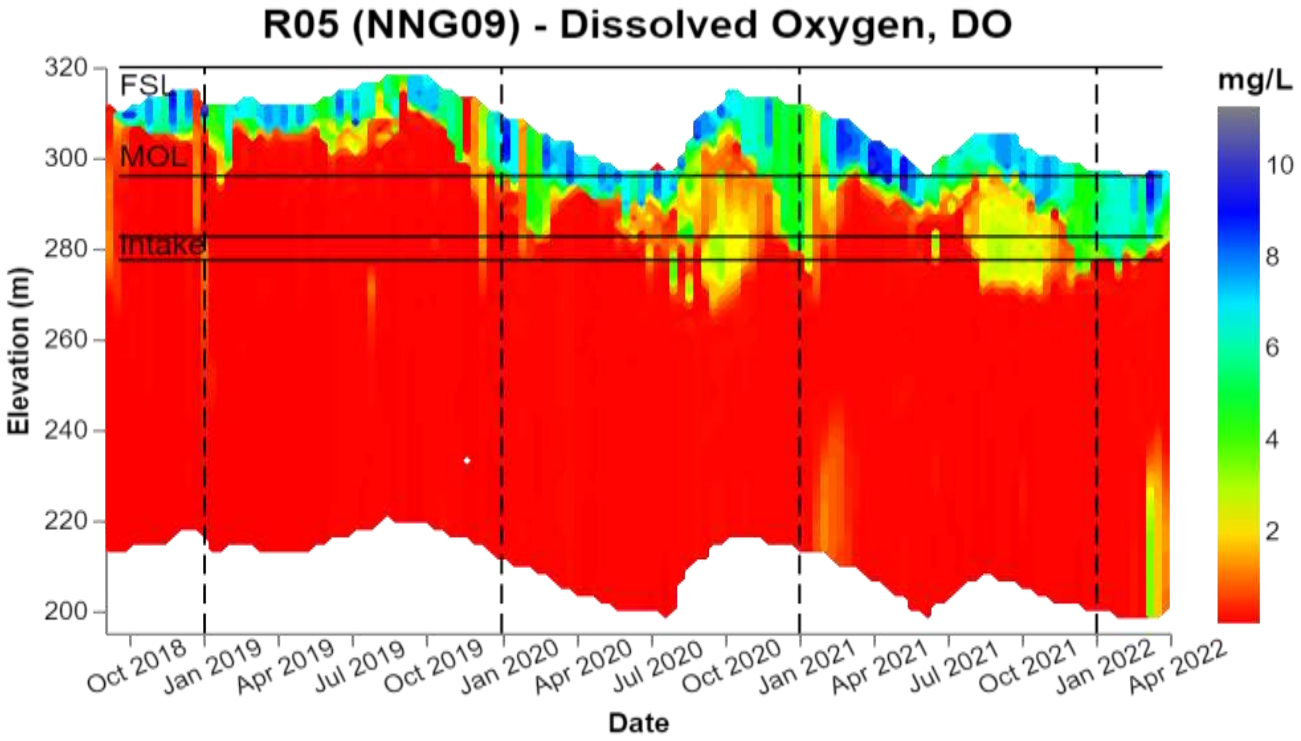


Main Reservoir

From 01 to 31 March 2022, the main reservoir water level increased with 1.66 m from El. 297.74 m asl to El. 299.40 m.

At R05, the average DO concentration was 7.9 mg/L in the upper 9.0 m varying between 5.0 mg/L and 9.6 mg/L, and the oxycline was generally found at the depth between 16.0 and 18.0 m with DO concentrations decreasing from about 3 mg/L to less than 1 mg/L. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depths of 18 - 20 m which is just after the intake. During this month, the DO measurements in R05 at the level of the intake to the main powerhouse dropped abruptly from about 4.5 mg/L to below 1 mg/L.

FIGURE 1-3: DO DEPTH PROFILES TIME SERIES IN R05 (SINCE SEPTEMBER 2018 TO MARCH 2022)



At R04, the DO levels in the upper 8.0 m varied between 5.4 mg/L and 9.6 mg/L with oxycline at depths of 6.5 m and 14 m below surface and DO concentrations generally less than 2 mg/L at depths below 18 m.

At R03, the DO levels in the upper 8 .0 m varied between 5.2 mg/L and 10.8 mg/L, and below 8.5 m to the bottom, the DO concentrations were generally between less than 1 mg/L to 6 mg/L with a mean of 2 mg/L.

At R02, the DO levels in the entire water column varied between 5.1 mg/L and 9.2 mg/L with a mean of 7.5 mg/L.

At R01, the DO level at the water surface was between 8.0 mg/L and 9.4 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 BOD_5 measurements at R01, R02, R03, R04 and R05 in both epilimnion and hypolimnion were less than 1.0 mg/L.

Re-regulation Reservoir

In March 2022, the turbine discharges from the Main Powerhouse varied between 13 and 230 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO concentration in the water column were 4.8 mg/L and 4.0 mg/L in R06 and R07 respectively.

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

Nam Ngiep Downstream

During March 2022, the discharge from the Re-regulation Dam was mainly gate discharge and occasionally turbine discharge.

The DO measurements in R05 at the level of the intake to the main powerhouse dropped abruptly from about 4.5 mg/L to below 1 mg/L. The flow pattern at the intake is likely rather complex drawing in a mixture of water from different parts of the water column which has likely contributed to the relatively high DO concentrations in the Re-regulation Reservoir. The generally high DO levels immediately downstream of the Re-regulation Dam with concentrations between 6 mg/L and 8 mg/L are a result of the higher DO levels in the Re-regulation reservoir and reaeration during periods with gate discharge. Further downstream the DO levels were above 6 mg/L thus complying with the surface water quality standard.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam.

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

All monitored parameters in the Nam Phouan (NPH01), Nam Xao (NXA01) and Nam Houaysoup (NHS01) complied with the standards, except COD at Nam Phouan and Nam Houaysoup.

FIGURE 1-4: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO MARCH 2022

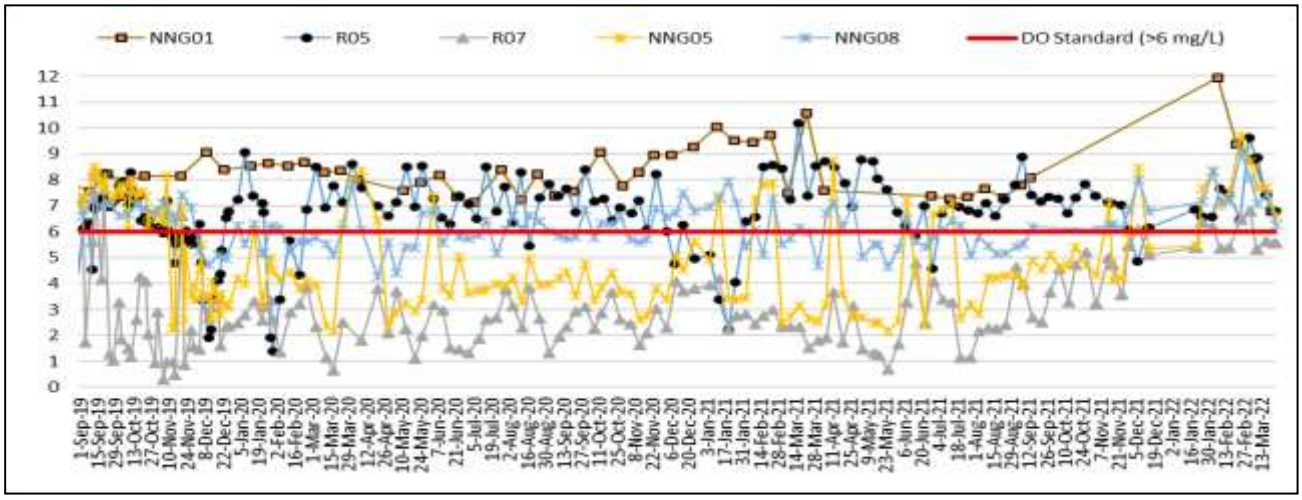


FIGURE 1-5: DISSOLVED OXYGEN (MG/L) LONG PROFILE IN MARCH 2022 (FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP RIVER)

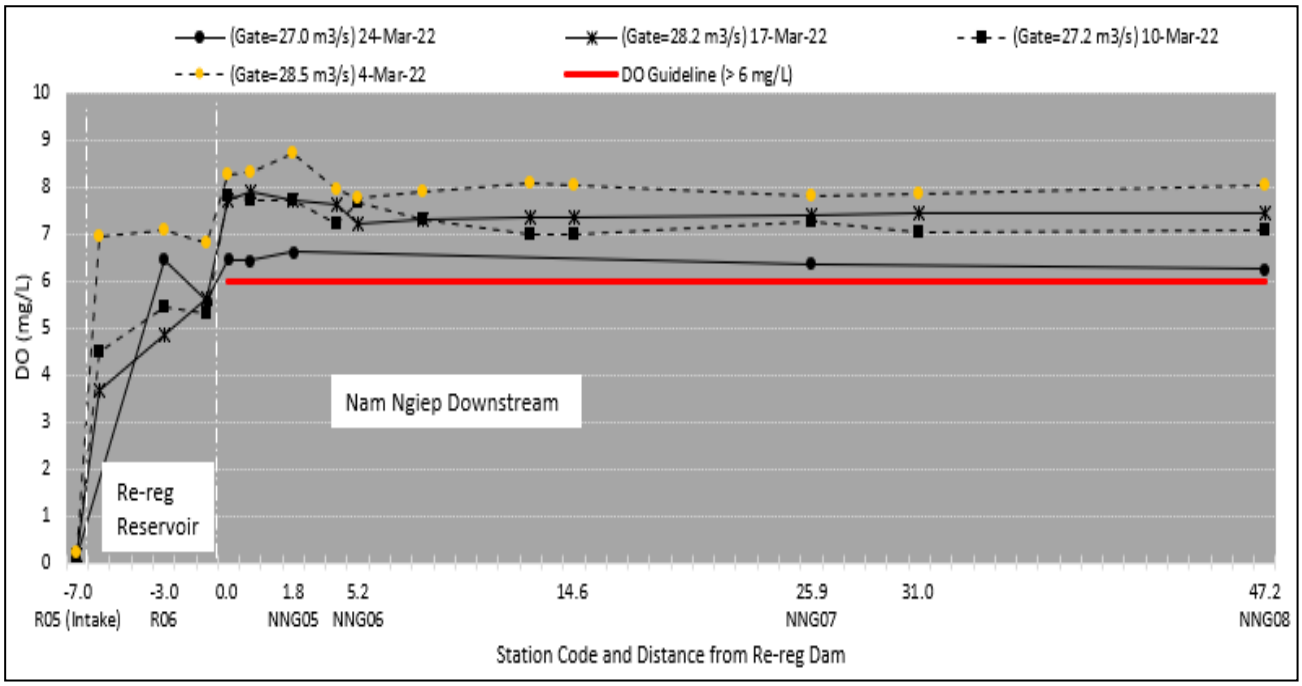


TABLE 1-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Mar-22		9.49	8.89	9.11												
3-Mar-22					9.48	9.61	7.06	6.8								
4-Mar-22							7.06	6.8	8.7	7.76	7.81	8.05			8.3	7.54
7-Mar-22	8.79												8.66			
8-Mar-22		8.05	7.92	8.33										8.62		
9-Mar-22					8.73	8.85	5.45	5.32								
10-Mar-22						8.85	5.45	5.32	7.71	7.66	7.28	7.07			6.63	6.5
15-Mar-22		8.24	8.32	8.35										8.68		
16-Mar-22					7.34	7.42	4.85	5.63								
17-Mar-22						7.42	4.85	5.63	7.71	7.24	7.41	7.46			7.27	7.23
21-Mar-22	6.78												8.54			
22-Mar-22		9.19	8.94	9.31										9.05		
23-Mar-22					6.8	6.8	6.45	5.57								
24-Mar-22						6.8	6.45	5.57	6.62		6.36	6.25			6.14	

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
7-Mar-22	<5												<5			
8-Mar-22		181.1		<5										118.75		
8-Mar-22 Bottom				<5												
9-Mar-22					<5	<5										
9-Mar-22 Bottom					<5	<5										
10-Mar-22							7.06	<5	5.46	5.36	<5	<5			<5	<5

TABLE 1-8: 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
7-Mar-22	<1												<1			
8-Mar-22		<1		<1										<1		
8-Mar-22 Bottom				<1												
9-Mar-22					<1	<1	1.84	1.36								
9-Mar-22 Bottom					<1	<1										
10-Mar-22									<1	<1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During March 2022, community groundwater quality analyses were carried out for seven wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village. The community groundwater samples were taken from household's water tap (except in Phouhomxay Village).

The results indicate that:

- Both wells in Phouhomxay Village (GPHX01 and GPHX02) complied with the National Standard.
- The well in Nam Pa Village fully complied with the Standard.
- The well in Somseun Village and the well in Thong Noy Village did not comply with the Standard for faecal coliform and *E. Coli* bacteria parameters.

- One out of two wells (GPOU02 – new wells) in Pou Village did not comply with the Standard for faecal coliform and *E. Coli* bacteria parameters.

The community groundwater quality monitoring results are presented in ***Table 1-9.***

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 1-9: GROUNDWATER QUALITY MONITORING RESULTS IN SOM SUEN, NAM PA, THONG NOY AND POU VILLAGES

	Site Name	Phouhomxay Village		Somseun Village	Nam Pa Village	Thong Noy Village	Pou Village	
Parameter (Unit)	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
	Guideline	14-Mar-22	14-Mar-22	14-Mar-22	14-Mar-22	14-Mar-22	07-Mar-22	21-Mar-22
pH	6.5 - 9.2	6.65	6.71	7.02	7.18	6.96	7.23	7.92
Sat. DO (%)		32	24.7	69.2	80.7	51.6	81.8	76.1
DO (mg/L)		2.59	2.04	5.23	6.36	4.05	6.48	6.15
Conductivity (µS/cm)		320	448	359	420	418	28	333
Temperature (°C)		26.07	25.73	28.21	27.61	28.39	27.66	26.15
Turbidity (NTU)	<20	0.43	0.27	0.47	0.51	0.54	1.28	0.35
Faecal coliform (MPN/100ml)	0	0	0	2	0	5	0	7.8
E.coli Bacteria (MPN/100ml)	0	0	0	0	0	2	0	4.5

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the water quality analyses are presented in ***Table 1-10***.

Faecal Coliform and *E.coli* exceeded the 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 all water taps were disinfected before sampling and 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 1-9**, the groundwater samples from the two wells in Phouhomxay Village both complied with the GOL Drinking Water Standards for *E.coli* and faecal coliform bacteria.

As observed in the field during water sampling, livestock are roaming around the water intake areas which may 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 1-10: 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	18-Mar-22	18-Mar-22	14-Mar-22	14-Mar-22
pH	6.5 - 8.5	6.86	6.91	6.97	6.96
Sat. DO (%)		19	94.2	83.6	70.2
DO (mg/L)		1.47	7.69	6.76	6.66
Conductivity (µS/cm)	<1,000	85	121	121	139
Temperature (°C)	<35	28.16	25.64	26.45	26.44
Turbidity (NTU)	<10	0.79	1.63	0.41	0.79
Faecal Coliform (MPN/100 mL)	0	70	33	70	49
E.coli Bacteria (MPN/100 mL)	0	49	17	70	22

1.3.5 Landfill Leachate Monitoring

During March 2022, there was no landfill leachate monitoring at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

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 1-6*** *and* ***Figure 1-7*** presents the values recorded since January 2020.

During March 2022, the mean inflow to the main reservoir was 65 m^3/s. The minimum and maximum inflows were 38 m^3/s (on 07 March 2022) and 215 m^3/s (on 25 March 2022) respectively.

From 01 to 31 March 2022, the water level in the main reservoir increased from El. 297.74 m asl to El. 299.40 m asl.

In March 2022, the hourly turbine discharges from the Main Powerhouse varied between 13 m^3/s and 230 m^3/s usually interrupted by night-time periods with no discharge.

FIGURE 1-6: INFLOW TO THE MAIN RESERVOIR DURING JANUARY 2020 TO MARCH 2022

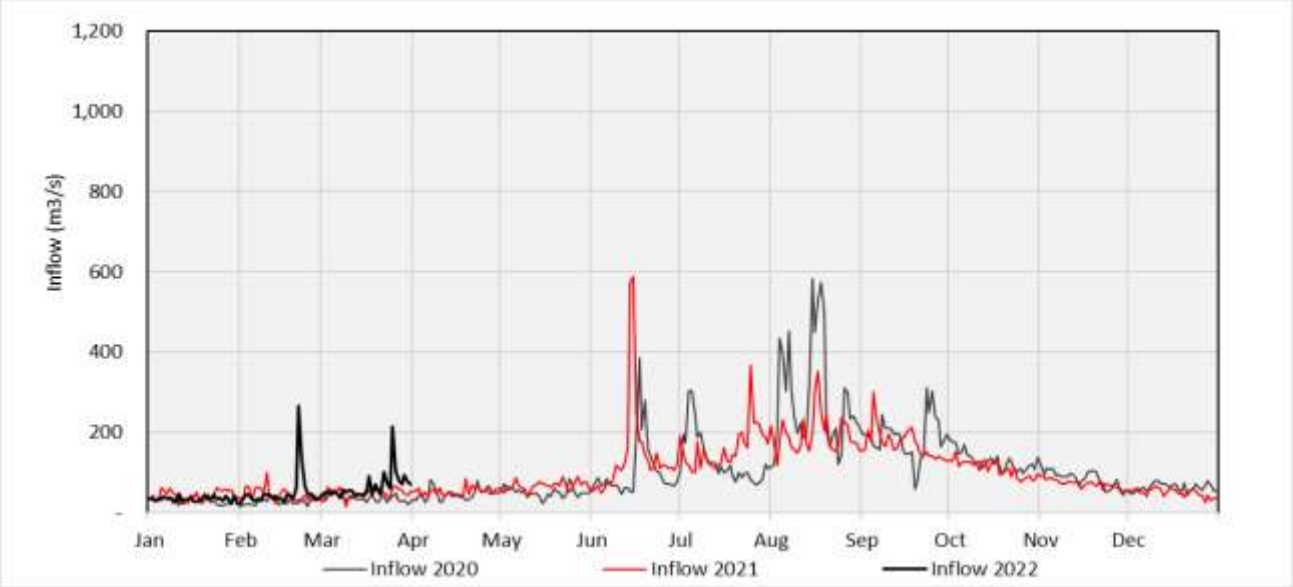
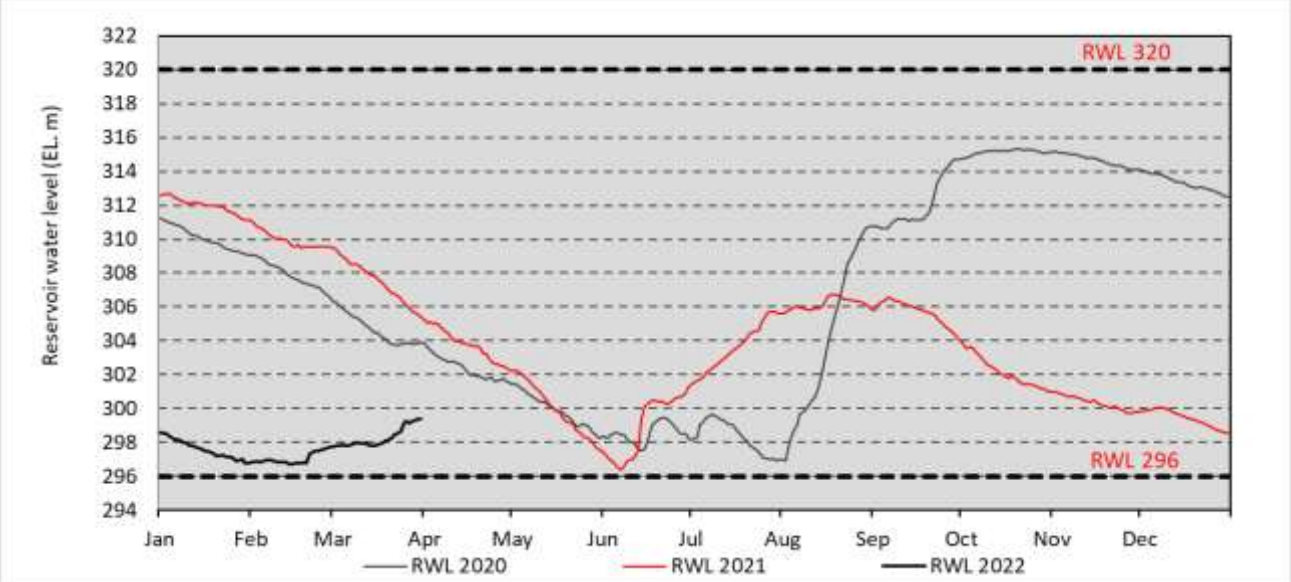


FIGURE 1-7: WATER LEVEL FOR THE MAIN RESERVOIR DURING JANUARY 2020 TO MARCH 2022



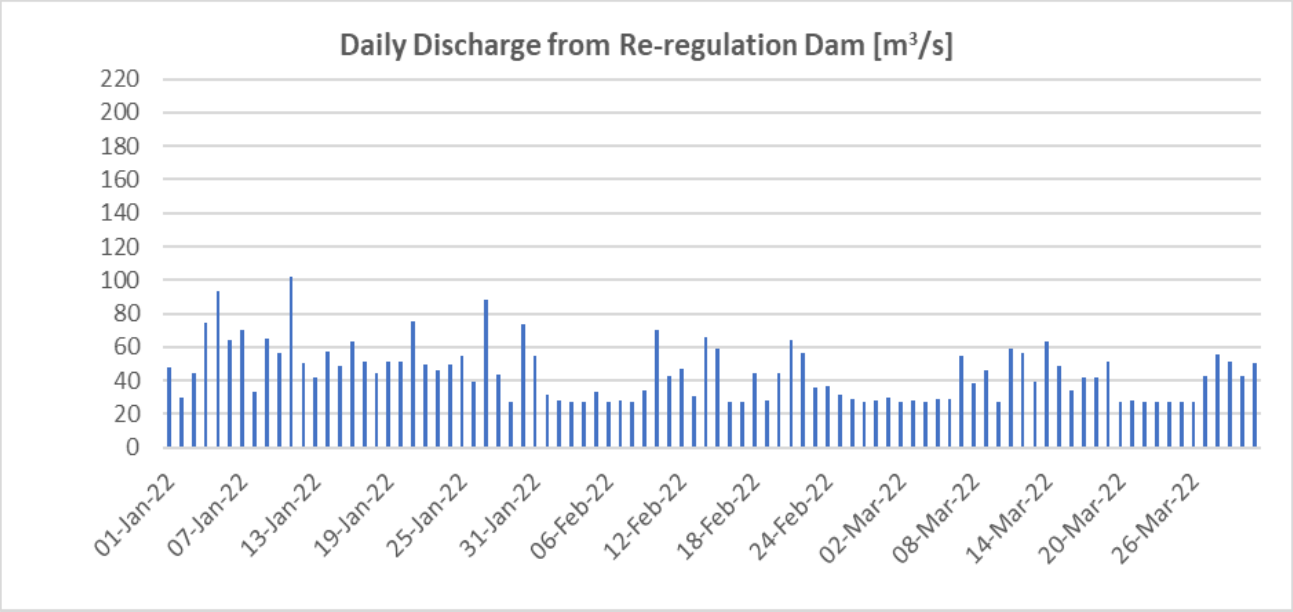
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during January to March 2022 is presented in ***Figure 1-8***.

During March 2022, the mean daily discharge from the Re-regulation Dam was about 39 m^3/s with hourly turbine discharges varying between 36 m^3/s and 156 m^3/s, hourly gate discharge varied between 26 m^3/s and 148 m^3/s, and hourly total discharge varying between 26 m^3/s and 176 m^3/s. The hourly discharge was kept above the minimum flow requirement of 27 m^3/s at most of the times, except one hour on 02, 25, 26 and 27 March 2022 with discharge about 26 m^3/s for a short period of time.

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 1-8: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN JANUARY TO MARCH 2022



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In March 2022, EMO carried out three boat mission 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 all four boat missions, the thalweg water depth was less than 0.5 m at four sites (distance between 1.5 and 5.6 km from the Re-regulation Dam) and the EMO experienced difficulties with boat navigation at 5.6 km during the discharge about 27 m^3/s on 04, 10 and 17 March 2022.

NNP1PC TD and EMO will conduct a joint survey during low discharge (about 27 m^3/s) in May 2022 to determine the need for minor excavations in the thalweg riverbed to ensure compliance with the water depth requirement of at least 0.5 m.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In March 2022, a total of 17.4 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 5.7 m^3 compared with February 2022.

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 including the fourth quarter (last quarter) waste compaction and waste cover by the existing contractor's service contract 2021-2022.

FIGURE 1-9: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING MARCH 2022

WASTE SPOT CHECK AND WASTES COLLECTION

WASTE DUMP AND WASTES COVER

QUARTERLY WASTE COMPACTION AND COVER BY HEAVY MACHINES

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 IN MARCH 2022

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by March 2022
1	Plastic bottles	kg	0	**52**
2	Aluminium can	kg	0	**3**
3	Paper/Cardboard	kg	0	**70**
4	Glass	kg	0	**42**
5	Scrap Metal	Kg	0	**5**
Total		**kg**	**0**	**172**

In March 2022, the access to OSOV1 continued to be restricted and the villagers collected 410 kg food wastes 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 March 2022 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 March 2022 (A)	Used (B)	Remaining at the end of March 2022 (A – B)
1	Diesel	Litre	9,914	4,327	**5,587**
2	Gasoline	Litre	2,036	646	**1,390**
3	Lubricant (Turbine oil)	Litre	12,108	0	**12,108**
4	Colour Paint	Litre	242	0	**242**
5	Thinner	Litre	7	0	**7**
6	Grease Oil	Litre	1,350	0	**1,350**
7	Gear Oil	Litre	84	0	**84**
8	Chlorine Liquid	Litre	93	12	**81**
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 March 2022 (A)	Disposed (B)	Remaining at the end of March 2022 (A - B)
1	Used Oil (Hydraulic + Engine)	Litre	272.3	0	**272.3**
2	Used oil mixed with water	Litre	920	0	**920**
3	Empty used oil drum/container (drum 200L)	Unit	3	0	**3**
4	Contaminated soil, sawdust and textile material	m^3	0.48	0	**0.48**
5	Used tyre	Drum	16	0	**16**
6	Empty used chemical drum/container (drum 20L)	Unit	8	2	**6**
7	Lead acid batteries	Unit	9	0	**9**
8	Empty paint and spray cans	Unit	138	8	**130**
9	Halogen/fluorescent bulbs	kg	263	0	**263**
10	Empty cartridge (Ink)	Unit	176	10	**166**
11	Clinic Waste	Kg	15.7	8.5	**7.2**

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 March 2022.

1.6.2 Community Solid Waste Management

In March 2022, a total of 24.3 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, an increase of 4.3 m^3 compared with February 2022.

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 as well as quarterly waste compaction and waste cover. The contractor also provided waste management awareness trainings to a Host Village (Hat Gniun) and the Resettlement Village (Phouhomxay) with a support by EMO team.

FIGURE 1-10: WASTE MANAGEMENT ACTIVITIES DURING MARCH 2022

DAILY WASTE COLLECTION FROM VILLAGE	***DAILY WASTE DUMP AT HOUAY SOUP LANDFILL***
	
WASTE MANAGEMENT AWARENESS RAISING	
Phouhomxay village	Hat Gnuin village
	
QUARTERLY W ASTE COMPACTION AND WASTE COVER	
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP)

2.1.1.1 Xaysomboun Watershed and Reservoir Protection Office (WRPO)

Xaysomboun WRPO conducted reservoir patrol between 22-31 March 2022 and the report will be communicated to the Biodiversity Service Provider (BSP) - Wildlife Conservation Society (WCS) for SMART data analysis and future planning. Xaysomboun WRPO will also schedule the Participatory Land Use Plan (PLUP) training and PLUP improvement for Phonhom Village in April 2022.

Xaysomboun WRPO informed that a new Head of Xaysomboun Provincial Agriculture and Forestry Office (PAFO) has been appointed and the internal meeting will be organized to discuss the AIP implementation including the pending progress of particular the appointment of staffs for WRPO sub-office operation and patrolling program, the establishment of two land-based ranger stations in the Totally Protected Zone (TPZ) and two reservoir checkpoints, as well as actions related with reservoir and fishery management. They also informed that a meeting on improvement of institutional arrangement of Watershed and Reservoir Protection Committee (WRPC) and WRPO is scheduled in April 2022.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO with the participation of BSP-WCS organized awareness raising on the importance of biodiversity for villagers and students in the nine villages adjacent to NNP1 watershed at Bolikhan District during 22 February - 6 March 2022.

2.1.1.3 NNP1PC EMO

EMO is coordinating with District Agriculture and Forestry Office (DAFO) of Thathom District for the implementation of agriculture extension service plan. DAFO of Hom District organized a consultation meeting on the establishment of a Production Group at Phou Ngou and Houayxai village on 22-23 March 2022.

EMO had a follow-up discussion with Dr. Viengsakoun, a Professor at Faculty of Agriculture, National University of Laos on the collaboration on providing capacity building for cattle fattening to the farmers at Phou Ngou, Houayxai, Phonhom and Nahong Villages. A field visit for trainers from Faculty of Agriculture to collect necessary information for planning and designing training course was scheduled in April 2022.

The camera trap installation was completed on 14 March 2022 and the Lao Newt and Gecko survey was completed on 25 March 2022.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

Xaysomboun WRPO submitted the budget plan of their AIP2022 to EMO on 30 March 2022. The plan is being reviewed by EMO team.

2.1.2.2 Bolikhamxay WRPO and DOF-MAF

The funds to cover the implementation of activities during Q1 and Q2 2022 under the approved Bolikhamxay WRPO and DOF-MAF AIP2022 were transferred by NNP1PC to DOF-MAF account at central level on 15 March 2022.

Bolikhamxay WRPO is preparing the document for further fund transfer from DOF-MAF account to Bolikhamxay WRPO account at provincial level.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP)

The progress on the implementation of key activities by Component in March 2022 are described below:

a. Component 1 - Spatial Planning and Regulation

The Biodiversity Offset Management Unit (BOMU) continued to process the recognition of NC-NX Totally Protected Zone (TPZ) boundary by District authorities of Viengthong and Xaychampone. The discussion among EMO, BOMU, and BSP-WCS for updating village land use plans still could not be organized because of the unavailability of BOMU team.

b. Component 2 – Law Enforcement

The patrolling in March 2022 was implemented between 10 March and 16 April 2022 focussing on TPZ highest priority area including Nam Xi, Houay Poung, Houayxai Gnai, Houayxai Noi and mountain ridges, Nam San and southern Nam San Mountain ridges as well as Nam Houng TPZ high priority area including Houay Kanang and Houay Pahok and Nam Ma TPZ high priority area including Nam Ma, Nam Sa Nga and mountain ridges. The results of the patrolling in March 2022 will be presented in April 2022 Monthly Report.

The results of patrolling activity in February 2022 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	TPZ highest priority area including Nam Sone, Nam Chouan, Houay Kokhai and Houay Payang. (16 days covering a distance of 102.2 km on forest patrolling)	The team encountered and destroyed a small and fresh hunting camp at Houay Payang.
2	TPZ highest priority area including Nam Sone, Nam Chang and Houay Poung. (16 days covering a distance of 85.7 km of forest patrolling)	The team did not encounter any threats during the patrolling.
3	TPZ highest priority area including Nam Chouan, Houay Hree, Houay Phai, Houay Poung, Nam San and northern Nam San tributaries. (17 days covering a distance of 82.29 km of forest patrolling)	The team did not encounter any threats during the patrolling.
4	Nam Ma TPZ high priority area including Nam Ma, Nam Mong, Nam Pang and mountain ridges. (16 days covering a distance of 61.39 km of forest patrolling)	The team encountered and destroyed a fresh hunting camp and collected a used cartridge located at the upstream of Nam Mong.

FIGURE 2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN FEBRUARY 2022

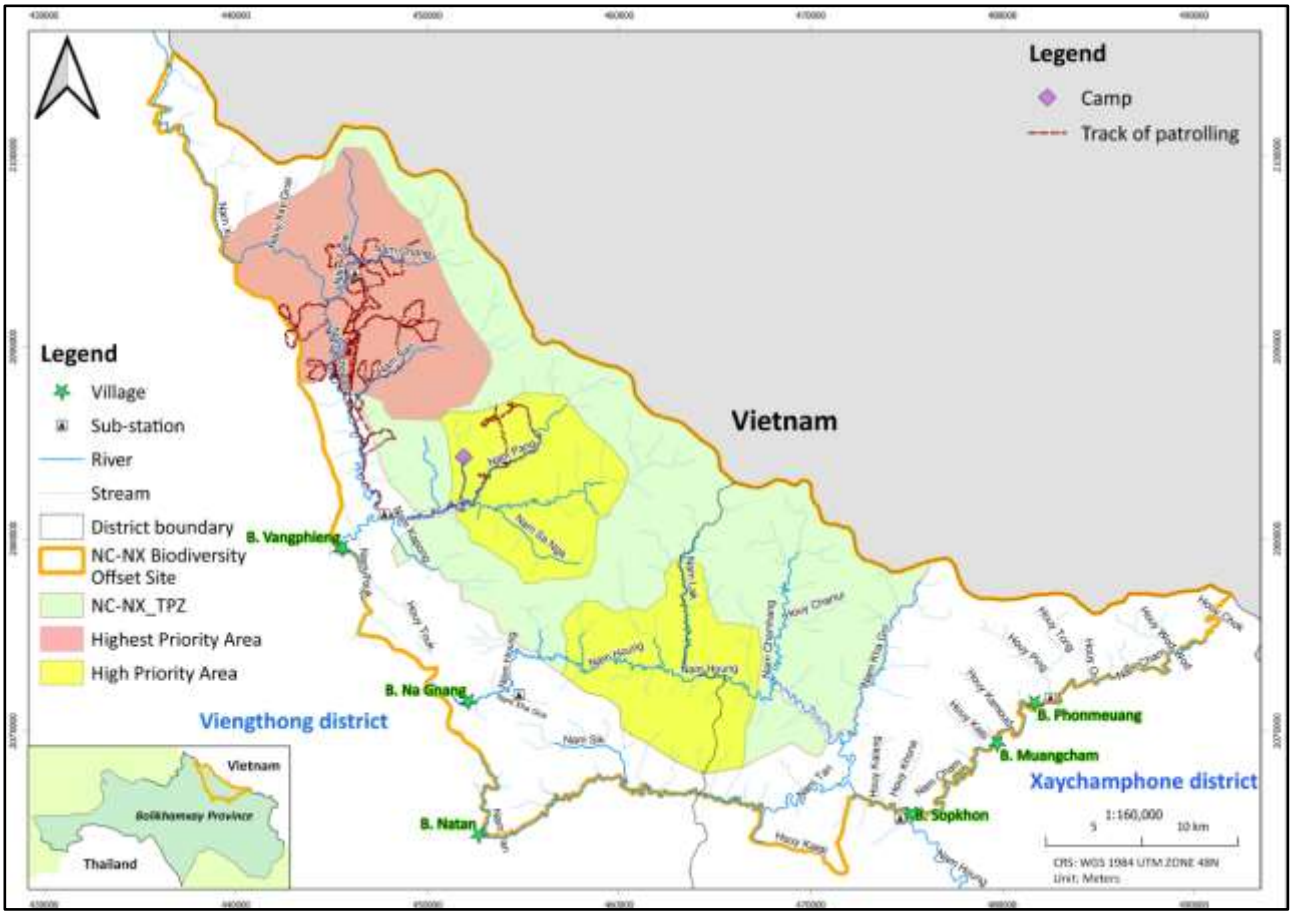


FIGURE 2-2: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN FEBRUARY 2022

	
A fresh hunting camp found and destroyed by Team 1 at Houay Payang	Used cartridge collected by Team 4 at the upstream of Nam Mong

c. Component 3 – Conservation Outreach

BSP-WCS continues to further improve the draft Nam Chouan-Nam Xang (NC-NX) outreach strategy. The radio-broadcast outreach will continue to be implemented until July 2022.

d. Component 4 – Conservation linked livelihood development

The activity under the approved Community Development Plan (CDP) still could not be commenced due to unavailability of BOMU and DAFO staff.

BSP-WCS continued improving the Lao version of the draft Community Conservation Agreement (CCA) for BOMU review and comments.

The results of February 2022 monthly snare removal were encoded into SMART database. The March 2022 snare removal was scheduled on 14 - 28 March 2022. However, EMO, BOMU, and BSP-agreed that snare removal assessment should be carried out before continuing the activity. BSP-WCS finalized the assessment forms elaborating the review and comments from BOMU and EMO on 17 March 2022. The budget plan for the assessment was prepared by BOMU.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2022

The draft AIP 2022 was submitted to ADB and IAP on 23 February 2022. IAP and ADB provided comments with no objection on 7 and 18 March 2022 respectively. However, BOMU confirmed that the Financial Management Manual (FMM) should be finalized first before concluding the AIP2022. The discussion on final draft FMM was scheduled in April 2022.

2.3 FISHERY MONITORING

The fishery monitoring is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey of the month by covering the upstream, upper reservoir, lower reservoir, downstream and Mekong areas.

Fish species dominated the fish catch by weight in February 2022 as listed in ***Table 2-1.*** 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 2-1: FISH SPECIES DOMINATING THE FISH CATCH IN FEBRUARY 2022

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Hampala dispar, Hampala macrolepidota	ปาสูด	217.4	LC
Oreochromis niloticus	ปานิน	96	LC
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	74.7	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาຂาวຊาย	65.9	DD, LC
Scaphiodonichthys acanthopterus	ปาม้อม	51.5	LC

[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.

The recorded catch of Threatened species (IUCN Red List classification) in February 2022 are presented in ***Table 2-2.*** The list includes two species that are classified as Vulnerable species (VU).

TABLE 2-2: THREATENED SPECIES OF FEBRUARY 2022 FISH CATCH

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Scaphognathops bandanensis	ปาเอ฽มไฝ/ปาป่฽ม	5	VU
Tor sinensis	ปาแดง	28.7	VU

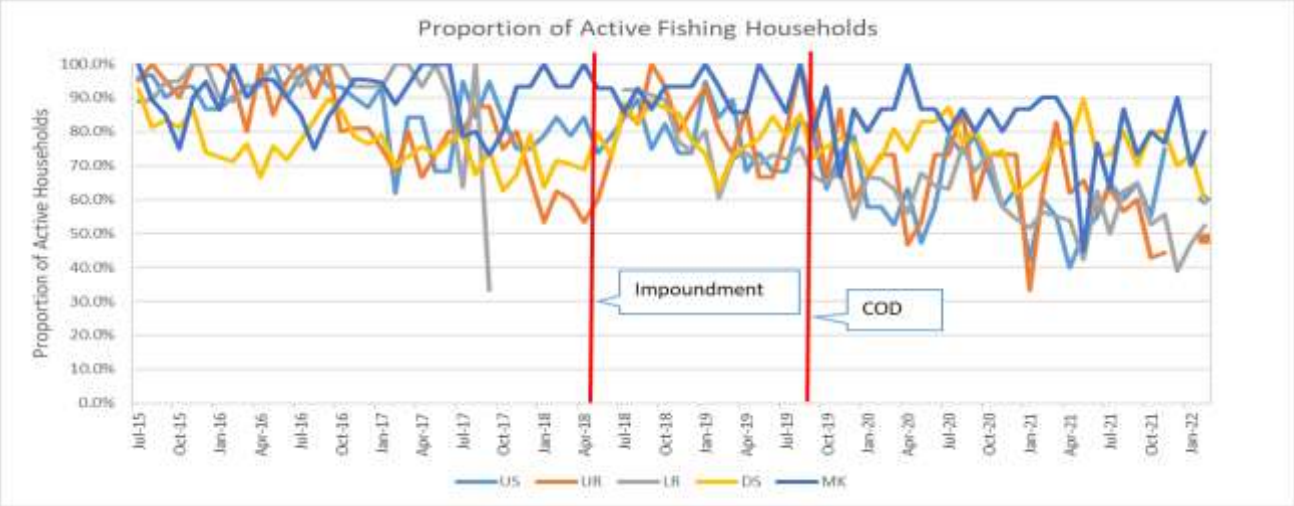
Species abundance and occurrence is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey in February 2022. The catch is divided in three areas including above the Main Dam, below the Main Dam and Mekong area. Main biodiversity indicators in February 2022 for above dam, below dam and Mekong area are presented in ***Table 2-3.***

TABLE 2-3: MAIN BIODIVERSITY INDICATORS FOR FEBRUARY 2022

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	26	35	29
Single species	21	22	18
Species groups	5	13	11
Top 15 species (% total catch weight)	93.24%	83.48%	95.55%
Proportion for species groups	16.36%	60.03%	53.39%
Diversity index (Shannon)	2.3794	2.8340	2.3651

Figure 2-3 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 48% and 80% of active fishing households for all fishing zones in February 2022.

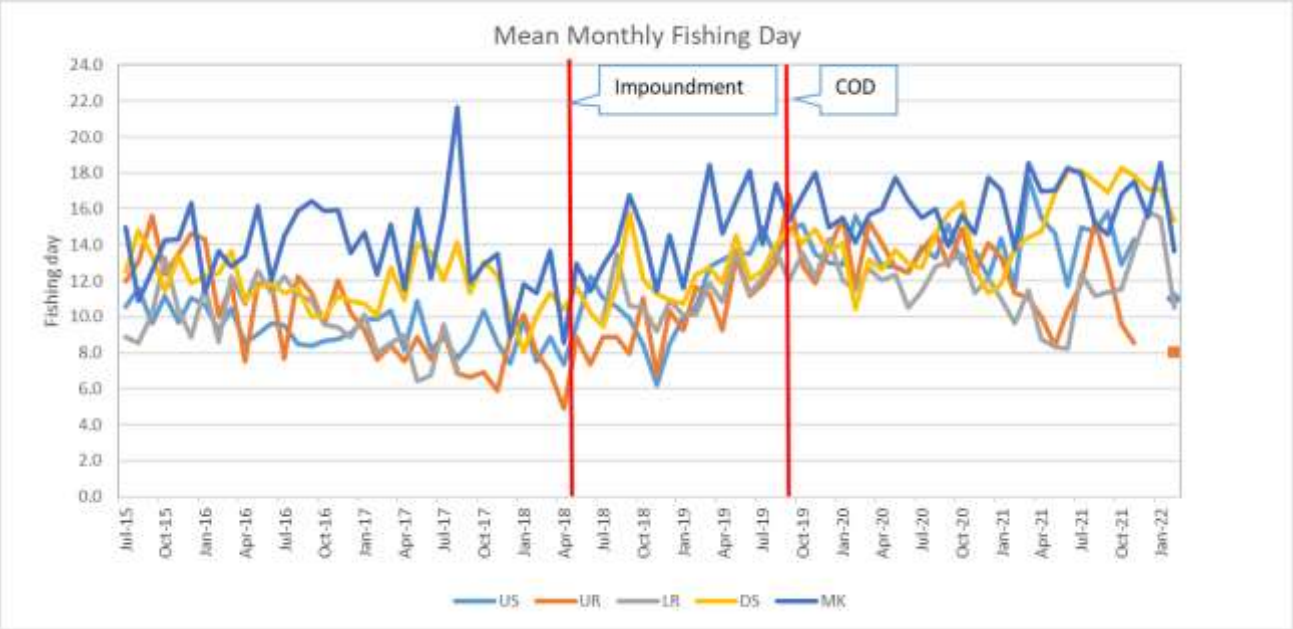
FIGURE 2-3: PROPORTION OF TOTAL NUMBER OF HOUSEHOLDS ACTIVELY FISHING BY FISHING ZONE FROM JULY 2015 TO FEBRUARY 2022



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

Figure 2-4 shows the average (mean) of monthly fishing day from July 2015 to February 2022 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

FIGURE 2-4: MEAN OF MONTHLY FISHING DAY FROM JULY 2015 TO FEBRUARY 2022



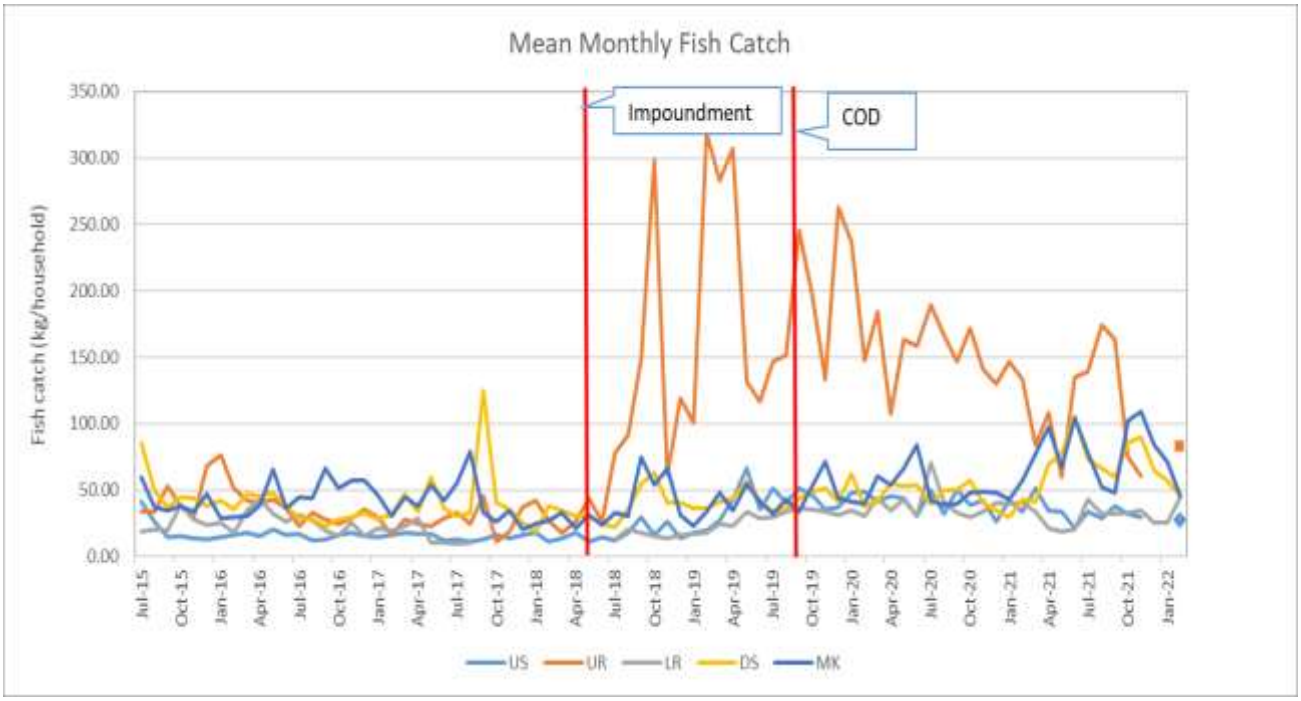
The mean monthly number of fishing day for the month of February from 2016 to 2022 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2-4***.

TABLE 2-4: MEAN REPORTED NUMBER OF FISHING DAYS BY FISHING ZONE FOR THE MONTH OF FEBRUARY FROM 2016 TO 2022

Fishing Zone	February 2016 (day)	February 2017 (day)	February 2018 (day)	February 2019 (day)	February 2020 (day)	February 2021 (day)	February 2022 (day)
Upstream	9.23	9.85	7.50	10.50	15.64	11.67	11.00
Upper reservoir	9.99	7.60	8.00	11.67	11.64	11.33	8.00
Lower reservoir	8.58	8.00	0.00	10.13	11.46	9.64	10.48
Downstream	12.43	10.06	10.09	12.33	10.47	13.80	15.33
Mekong	13.65	12.33	11.33	14.86	14.15	13.78	13.67

The mean monthly household fish catch from July 2015 to February 2022 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 2-5***.

FIGURE 2-5: MEAN MONTHLY HOUSEHOLD FISH CATCH FROM JULY 2015 TO FEBRUARY 2022



The mean household fish catch for the month of February from 2016 to 2022 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2-5.***

TABLE 2-5: MEAN MONTHLY HOUSEHOLD FISH CATCH FOR THE MONTH OF FEBRUARY FROM 2016 TO 2022

Fishing Zone	February 2016 (kg)	February 2017 (kg)	February 2018 (kg)	February 2019 (kg)	February 2020 (kg)	February 2021 (kg)	February 2022 (kg)
Upstream	16.06	16.62	10.95	19.90	49.05	34.00	27.33
Upper reservoir	51.66	16.60	26.80	318.73	147.85	133.64	82.86
Lower reservoir	17.93	19.35	0.00	18.13	30.61	40.20	44.80
Downstream	35.79	32.34	38.38	36.50	38.13	43.38	45.20
Mekong	29.90	30.73	27.33	33.83	39.57	57.57	45.83

The mean daily fish catch per household from July 2015 to February 2022 are displayed in ***Figure 2-6*** and the mean fish catch per household per fishing day for the month of February from 2016 to 2022 are shown in ***Table 2-6.***

FIGURE 2-6: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO FEBRUARY 2022

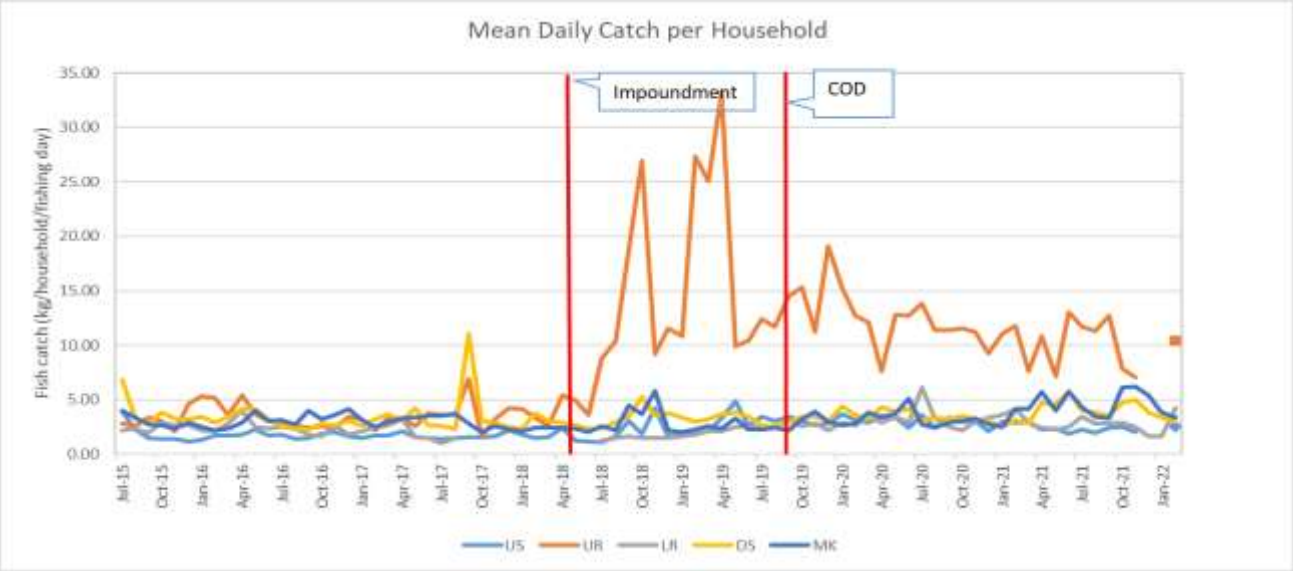


TABLE 2-6: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR THE MONTH OF FEBRUARY FROM 2016 TO 2022

Fishing Zone	February 2016 (kg)	February 2017 (kg)	February 2018 (kg)	February 2019 (kg)	February 2020 (kg)	February 2021 (kg)	February 2022 (kg)
Upstream	1.74	1.69	1.46	1.90	3.14	2.91	2.48
Upper reservoir	5.17	2.18	3.35	27.32	12.71	11.79	10.36
Lower reservoir	2.09	2.42	0.00	1.79	2.67	4.17	4.28
Downstream	2.88	3.21	3.81	2.96	3.64	3.14	2.95
Mekong	2.19	2.49	2.41	2.28	2.80	4.18	3.35

The survey results in February 2022 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 February 2022 are displayed in ***Table 2-7.***

TABLE 2-7: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN FEBRUARY 2022

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.00%	0.00%	16.72%	85.27%
Nam Ngiep	75.6%	10.52%	0.00%	43.26%	4.00%
Nam Xan	0.0%	0.00%	0.00%	0.00%	0.00%
Reservoir	0.0%	87.59%	40.39%	0.00%	0.00%
Tributary and stream	24.4%	1.90%	57.91%	35.94%	0.00%
Wetland	0.0%	0.00%	1.70%	4.08%	10.73%
Others	0.0%	0.00%	0.00%	0.00%	0.00%

Total reported fish and OAA (other aquatic animals) catch (proportion of OAA) for the same 7-day period from July 2015 to February 2022 are presented in ***Figure 2-7*** and the proportion of OAA catch for the month of February from 2016 to 2022 are shown in ***Table 2-8.***

FIGURE 2-7: PROPORTION OF OAA TO THE TOTAL REPORTED NUMBER OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE FROM JULY 2015 TO FEBRUARY 2022

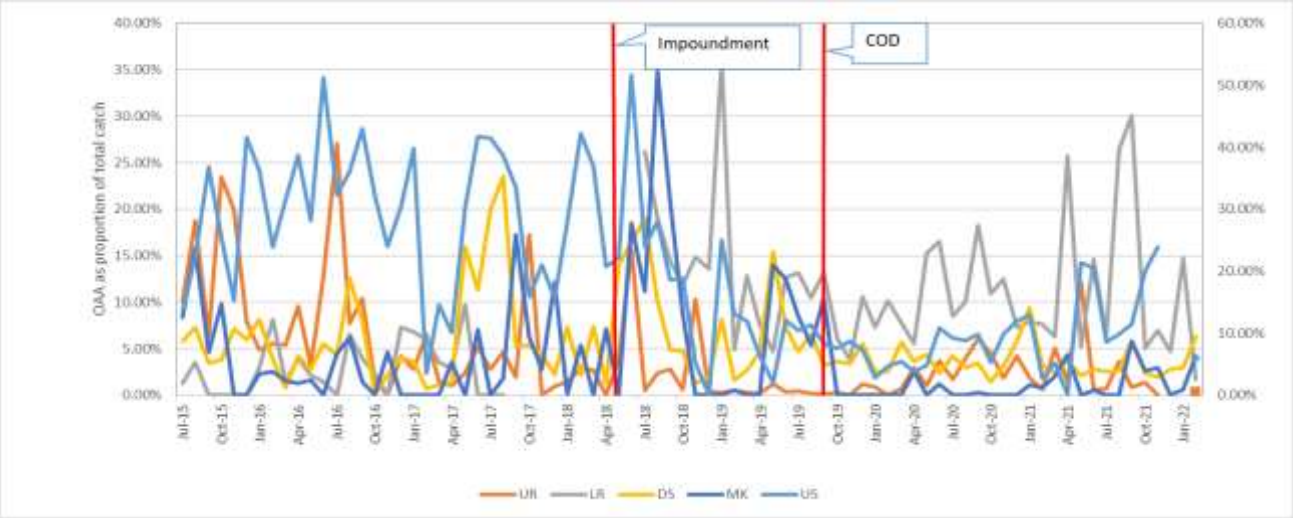


TABLE 2-8: PROPORTION OF OAA TO THE TOTAL REPORTED NUMBER OF FISH AND OAA FOR THE MONTH OF FEBRUARY FROM 2016 TO 2022

Fishing Zone	February 2016	February 2017	February 2018	February 2019	February 2020	February 2021	February 2022
Upstream	23.91%	3.57%	42.22%	13.10%	4.66%	2.86%	5.96%
Upper reservoir	5.57%	6.53%	2.90%	0.57%	0.07%	0.60%	0.38%
Lower reservoir	8.18%	5.98%	0.00%	4.86%	10.18%	7.61%	1.67%
Downstream	3.87%	0.71%	2.13%	1.66%	2.56%	3.17%	6.27%
Mekong	2.54%	0.00%	5.42%	0.50%	0.00%	0.77%	4.18%

3. EXTERNAL MISSIONS AND VISITS

There was no external mission and visit during the month of reporting.

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

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
2-Mar-22	pH	5.0 - 9.0		8.34	8.67	9.03												
3-Mar-22	pH	5.0 - 9.0					7.54	7.04	8.38	7.93								
4-Mar-22	pH	5.0 - 9.0									7.66	8.02	7.71	7.76			7.96	7.89
7-Mar-22	pH	5.0 - 9.0	7.92												7.61			
8-Mar-22	pH	5.0 - 9.0		8.18	7.4	7.28										8.12		
9-Mar-22	pH	5.0 - 9.0					7.02	7.18	7.42	7.38								
10-Mar-22	pH	5.0 - 9.0									6.87	7	6.79	6.88			7.03	6.98
15-Mar-22	pH	5.0 - 9.0		7.33	7.8	7.84										7.68		
16-Mar-22	pH	5.0 - 9.0					7.93	7.68	6.97	7.22								
17-Mar-22	pH	5.0 - 9.0									7.08	7.25	7.26	7.26			7.31	7.27
21-Mar-22	pH	5.0 - 9.0	6.78												6.71			
22-Mar-22	pH	5.0 - 9.0		6.78	7.33	7.61										6.93		
23-Mar-22	pH	5.0 - 9.0					7.18	7.06	6.89	6.94								
24-Mar-22	pH	5.0 - 9.0									7.07		7.12	7.16			7.32	
2-Mar-22	Sat. DO (%)			110.5	110.6	111.3												
3-Mar-22	Sat. DO (%)						115.1	115.9	91.3	84.3								
4-Mar-22	Sat. DO (%)										103.5	92.5	95.2	99.8			98.8	88.4
7-Mar-22	Sat. DO (%)		103.4												99.2			

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
8-Mar-22	Sat. DO (%)			95.3	99.1	103										99.5		
9-Mar-22	Sat. DO (%)						107.5	108.3	68.1	68.4								
10-Mar-22	Sat. DO (%)										90.6	90.2	88.2	87.3			82.4	77
15-Mar-22	Sat. DO (%)			95.8	106.8	107.4										102.6		
16-Mar-22	Sat. DO (%)						92.8	93.1	57.2	71.7								
17-Mar-22	Sat. DO (%)										91.2	86.1	89.2	89.6			88.9	86.3
21-Mar-22	Sat. DO (%)		79.2												97.4			
22-Mar-22	Sat. DO (%)			109.1	116.1	121										107.7		
23-Mar-22	Sat. DO (%)						87.6	86.5	83.6	71.4								
24-Mar-22	Sat. DO (%)										76.5		73.3	76.1			75.2	
2-Mar-22	DO (mg/L)	>6.0		9.49	8.89	9.11												
3-Mar-22	DO (mg/L)	>6.0					9.48	9.61	7.06	6.8								
4-Mar-22	DO (mg/L)	>6.0									8.7	7.76	7.81	8.05			8.3	7.54
7-Mar-22	DO (mg/L)	>6.0	8.79												8.66			
8-Mar-22	DO (mg/L)	>6.0		8.05	7.92	8.33										8.62		
9-Mar-22	DO (mg/L)	>6.0					8.73	8.85	5.45	5.32								
10-Mar-22	DO (mg/L)	>6.0									7.71	7.66	7.28	7.07			6.63	6.5
15-Mar-22	DO (mg/L)	>6.0		8.24	8.32	8.35										8.68		
16-Mar-22	DO (mg/L)	>6.0					7.34	7.42	4.85	5.63								
17-Mar-22	DO (mg/L)	>6.0									7.71	7.24	7.41	7.46			7.27	7.23
21-Mar-22	DO (mg/L)	>6.0	6.78												8.54			
22-Mar-22	DO (mg/L)	>6.0		9.19	8.94	9.31										9.05		
23-Mar-22	DO (mg/L)	>6.0					6.8	6.8	6.45	5.57								
24-Mar-22	DO (mg/L)	>6.0									6.62		6.36	6.25			6.14	

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
2-Mar-22	Conductivity (µs/cm)			78	81	74												
3-Mar-22	Conductivity (µs/cm)						73	73	81	74								
4-Mar-22	Conductivity (µs/cm)										79	80	81	82			163	59
7-Mar-22	Conductivity (µs/cm)		97												37			
8-Mar-22	Conductivity (µs/cm)			88	83	73										65		
9-Mar-22	Conductivity (µs/cm)						73	72	82	76								
10-Mar-22	Conductivity (µs/cm)										80	84	84	85			169	60
15-Mar-22	Conductivity (µs/cm)			81	88	74										93		
16-Mar-22	Conductivity (µs/cm)						72	73	79	77								
17-Mar-22	Conductivity (µs/cm)										79	86	74	76			161	30
21-Mar-22	Conductivity (µs/cm)		94												37			
22-Mar-22	Conductivity (µs/cm)			79	86	71										89		
23-Mar-22	Conductivity (µs/cm)						71	71	73	66								
24-Mar-22	Conductivity (µs/cm)										72		143	66			101	
2-Mar-22	Temperature (°C)			22.79	25.48	25.5												
3-Mar-22	Temperature (°C)						25.15	24.62	28.66	26.18								
4-Mar-22	Temperature (°C)										24.07	24.1	25.4	26.26			26.42	23.26
7-Mar-22	Temperature (°C)		23.37												22.03			
8-Mar-22	Temperature (°C)			23.79	26.87	26.14										22.45		
9-Mar-22	Temperature (°C)						25.9	25.65	26.87	28.05								
10-Mar-22	Temperature (°C)										23.37	23.39	25.23	26.13			26.53	23.81
15-Mar-22	Temperature (°C)			22.81	28.29	28.34										24.06		
16-Mar-22	Temperature (°C)						27.32	26.98	23.6	27.79								
17-Mar-22	Temperature (°C)										23.72	24.04	24.62	24.97			26.47	24.23

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01		NPH01		NXA01	NHS01
Date	Parameters (Unit)	Guideline																		
21-Mar-22	Temperature (°C)		23.74												22.19					
22-Mar-22	Temperature (°C)			23.96	28.73	29.01											23.95			
23-Mar-22	Temperature (°C)						28.7	27.84	28.94	28.1										
24-Mar-22	Temperature (°C)										23.89		24.89	25.35					26.09	
2-Mar-22	Turbidity (NTU)			29	2.1	0.86														
3-Mar-22	Turbidity (NTU)						0.7	0.58	4.1	9.22										
4-Mar-22	Turbidity (NTU)										2.94	2.96	2.52	5.51					3.42	3.04
7-Mar-22	Turbidity (NTU)		6.01												6.62					
8-Mar-22	Turbidity (NTU)			237	1.95	1.28											204			
9-Mar-22	Turbidity (NTU)						1.46	0.89	7.72	4.86										
10-Mar-22	Turbidity (NTU)										8.71	9.04	3.11	5.06					3.09	3.23
15-Mar-22	Turbidity (NTU)			12.9	2.75	0.95											5.27			
16-Mar-22	Turbidity (NTU)						1	1.32	4.21	3.92										
17-Mar-22	Turbidity (NTU)										3.27	4.19	5.97	12					8.22	6.46
21-Mar-22	Turbidity (NTU)		4.73												5.81					
22-Mar-22	Turbidity (NTU)			24.6	1.8	1.37											14.6			
23-Mar-22	Turbidity (NTU)						1.27	1.22	6.73	9.99										
24-Mar-22	Turbidity (NTU)										53.8		33	13.7					108	
7-Mar-22	TSS (mg/L)		<5												<5					
8-Mar-22	TSS (mg/L)			181.06		<5											118.75			
9-Mar-22	TSS (mg/L)						<5	<5												
10-Mar-22	TSS (mg/L)								7.06	<5	5.46	5.36	<5	<5					<5	<5
7-Mar-22	BOD_5 (mg/L)	<1.5	<1												<1					
8-Mar-22	BOD_5 (mg/L)	<1.5		<1		<1											<1			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Mar-22	BOD_5 (mg/L)	<1.5					<1	<1	1.84	1.36								
10-Mar-22	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
7-Mar-22	COD (mg/L)	<5.0	<5												<5			
8-Mar-22	COD (mg/L)	<5.0														12.8		
9-Mar-22	COD (mg/L)	<5.0							<5	<5								
10-Mar-22	COD (mg/L)	<5.0									<5		<5	6.4			<5	6.4
7-Mar-22	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
8-Mar-22	NH_3-N (mg/L)	<0.2		0.11		0.11										<0.2		
9-Mar-22	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
7-Mar-22	NO_3-N (mg/L)	<5.0	<0.02												0.08			
8-Mar-22	NO_3-N (mg/L)	<5.0		0.11		0.17										0.12		
9-Mar-22	NO_3-N (mg/L)	<5.0					0.07	0.07										
7-Mar-22	Faecal coliform (MPN/100 mL)	<1,000	26												49			
8-Mar-22	Faecal coliform (MPN/100 mL)	<1,000														27		
9-Mar-22	Faecal coliform (MPN/100 mL)	<1,000							8	17								
10-Mar-22	Faecal coliform (MPN/100 mL)	<1,000									22	33	130	170			170	130
7-Mar-22	Total Coliform (MPN/100 mL)	<5,000	70												79			
8-Mar-22	Total Coliform (MPN/100 mL)	<5,000														140		
9-Mar-22	Total Coliform (MPN/100 mL)	<5,000							13	33								
10-Mar-22	Total Coliform (MPN/100 mL)	<5,000									49	170	240	220			920	240
7-Mar-22	TKN		<1.5												<1.5			
8-Mar-22	TKN			<1.5		<1.5										<1.5		
9-Mar-22	TKN						<1.5	<1.5										
2-Mar-22	Secchi Disk (m)				3.4	3.25												

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
3-Mar-22	Secchi Disk (m)						3.6	3.8										
8-Mar-22	Secchi Disk (m)				3.2	3.5												
9-Mar-22	Secchi Disk (m)						4.5	4.8		1.5								
15-Mar-22	Secchi Disk (m)				2.25	3.5												
16-Mar-22	Secchi Disk (m)						4	4.1	0.9	1.3								
22-Mar-22	Secchi Disk (m)				2.1	2.3												
23-Mar-22	Secchi Disk (m)						4.5	3	1	0.85								
7-Mar-22	TOC (mg/L)		0.65												0.84			
8-Mar-22	TOC (mg/L)															2.81		
9-Mar-22	TOC (mg/L)								1.05	1.04								
10-Mar-22	TOC (mg/L)										0.96	0.94	0.97	0.78			1.51	2.17
8-Mar-22	Phytoplankton Biomass (g dry wt/m³)			174		0.8												
9-Mar-22	Phytoplankton Biomass (g dry wt/m³)						1	0.8										
7-Mar-22	Total Phosphorus (mg/L)		0.03												0.03			
8-Mar-22	Total Phosphorus (mg/L)			0.16		0.03										0.12		
9-Mar-22	Total Phosphorus (mg/L)						0.03	0.03										
7-Mar-22	Total Dissolved Phosphorus (mg/L)		0.02												0.02			
8-Mar-22	Total Dissolved Phosphorus (mg/L)			0.07		0.02										0.06		
9-Mar-22	Total Dissolved Phosphorus (mg/L)						0.02	0.02										
8-Mar-22	Hydrogen Sulfide (mg/L)			0.02		<0.02												
9-Mar-22	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
8-Mar-22	Turbidity (NTU)-bottom					4.78												
9-Mar-22	Turbidity (NTU)-bottom						8.7	12										

		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	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
8-Mar-22	TSS (mg/L)-bottom					<5												
9-Mar-22	TSS (mg/L)-bottom						<5	<5										
8-Mar-22	BOD_5 (mg/L)-bottom					<1												
9-Mar-22	BOD_5 (mg/L)-bottom						<1	<1										
8-Mar-22	NH_3-N (mg/L)-bottom					<0.2												
9-Mar-22	NH_3-N (mg/L)-bottom						<0.2	0.14										
8-Mar-22	NO_3-N (mg/L)-bottom					0.11												
9-Mar-22	NO_3-N (mg/L)-bottom						0.07	0.08										
8-Mar-22	TKN-bottom					<1.5												
9-Mar-22	TKN-bottom						<1.5	<1.5										
8-Mar-22	Total Dissolved Phosphorus (mg/L)-bottom					0.02												
9-Mar-22	Total Dissolved Phosphorus (mg/L)-bottom						0.02	0.02										
8-Mar-22	Total Phosphorus (mg/L)-bottom					0.03												
9-Mar-22	Total Phosphorus (mg/L)-bottom						0.03	0.03										
8-Mar-22	Hydrogen Sulfide (mg/L)-bottom					<0.02												
9-Mar-22	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
8-Mar-22	Phytoplankton Biomass (g dry wt/m^3)-bottom					3.4												
9-Mar-22	Phytoplankton Biomass (g dry wt/m^3)-bottom						3.2	4										

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN MARCH 2022

	Site Name	OSOV1 (Owner's Site Office and Village)			
	Station Code	EF01			
	Date	01-Mar-22	11-Mar-22	18-Mar-22	25-Mar-22
Parameters (Unit)	**Guideline**				
pH	6.0 - 9.0	7.62	6.92	6.86	7.07
Sat. DO (%)		45.7	42	47.5	40.3
DO (mg/L)		3.76	3.38	3.82	3.18
Conductivity (µs/cm)		355	332	343	245
Temperature (°C)		25.12	26.63	26.47	17.67
Turbidity (NTU)		3.29	0.82	0.7	2.13
TSS (mg/L)	<50	<5	<5	1.64	1.25
BOD_5 (mg/L)	<30	<6	<6	7.4	<6
COD (mg/L)	<125	<25	<25	<25	
NH_3-N (mg/L)	<10.0	3.7	2.8	4.1	
Total Nitrogen (mg/L)	<10.0	6.3	4.36	5.11	
Total Phosphorus (mg/L)	<2	1.22	1.51	1.51	
Oil & Grease (mg/L)	<10.0	<1			
Total coliform (MPN/100 mL)	<400	920	920	1,600	1,600
Faecal Coliform (MPN/100 mL)	<400	920	540	1,600	1,600

	Site Name	OSOV2 (ESD Camp)				Main Powerhouse		
	Station Code	EF13				EF19		
	Date	02-Mar-22	11-Mar-22	17-Mar-22	25-Mar-22	01-Mar-22	11-Mar-22	18-Mar-22
Parameters (Unit)	**Guideline**							
pH	6.0 - 9.0	7.81	7.49	7.22	7.54	8.05	7.49	7.9
Sat. DO (%)		77.6	80.1	87.3	84	68.8	51.6	69
DO (mg/L)		8.06	6.41	7.27	6.64	5.49	4	5.33
Conductivity (µs/cm)		527	543	505	376	941	959	908
Temperature (°C)		24.02	26.75	26.46	26.99	26.7	28.45	28.43
Turbidity (NTU)		18.9	11.8	8.64	6.61	5.8	7.55	10.1
TSS (mg/L)	<50	17.2	14.8	7.72	9.91	6.4	14.6	9.9
BOD_5 (mg/L)	<30	<6	7.23	<6	<6	<6	6.7	<6
COD (mg/L)	<125	38	39	33		33	54	42
NH_3-N (mg/L)	<10.0	24	26	22		7.1	27.8	12.6
Total Nitrogen (mg/L)	<10.0	31	34	23		17.5	28.5	13.9
Total Phosphorus (mg/L)	<2	2.27	2.39	1.88		7.3	7.7	7.6
Oil & Grease (mg/L)	<10.0	1				<1		
Total coliform (MPN/100 mL)	<400	1,600	1,600	23	0	1,600	1,600	23
Faecal Coliform (MPN/100 mL)	<400	920	920	8	0	1,600	1,600	13
Residual Chlorine (mg/L)	<1.0	0.74		1.86	1.26	0.11	0.11	0.24