NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

February 2023

					
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EXECUTIVE SUMMARY

During February 2023, the first ISO14001:2015 surveillance audit was carried on site by the SGS, which represents a crucial milestone of the NNP1PC in compliance with ISO14001:2015 standards. The mission consisted of site tours, interviews with the NNP1's key personnel and verification of the Environmental Management System (EMS) performance. A total of five (05) general observations and opportunity of improvements (OFIs) were identified including the management of solid waste, food waste and hazardous waste.

During this reporting period, no new document was submitted to the Environment Management Office (EMO) for review and approval. However, EMO issued one Non-Compliance Report (NCR) level 1 to the Contractor related to leachate from the food waste at SOSV1 canteen.

The wastewater treatment system operation and maintenance were closely monitored in February 2023 including chlorine dosing and bi-weekly inspections of the septic tanks and wetland systems. The results of the effluent analyses of the WWTSs show improvements as a result of continuous adjustments and corrective actions.

In February 2023, the water quality analyses for COD, TOC, ammonia nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, oil & grease, and TKN were pending due to delays in extending the laboratory services contract.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 5.8 mg/L in the upper 30 m varying between 3.1 mg/L and 7.7 mg/L with oxyclines at various depths. Anoxic conditions (less than 0.5 mg/L DO) were found at depths from 40 m to bottom (03 February 2023), from 38 m to bottom (08 February 2023), from 6.5 m to bottom (15 February 2023) and from 11 m to bottom (23 February 2023). At the water intake level, DO concentrations varied between 0.12 mg/L and 5.29 mg/L. In the Re-regulation Reservoir, the mean DO concentrations in the water column of the two monitoring stations were 4.4 mg/L and 4.1 mg/L respectively.

The DO measurements downstream the Re-regulation Dam during gate discharge was greater than 6 mg/L in all stations, except stations D (Km 13) and E (Km 14.6).

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. Water quality monitoring will be maintained, and the development of the situation in the reservoir and in the downstream area will be closely followed until a satisfactory situation has been reached. In this regard, it should be noted that since the Commercial Operation Date (COD) in September 2019 no dead fish have been observed in Nam Ngiep downstream the Re-regulation Dam.

The Bolikhan District Environment Management Unit or EMU has informed NNP1PC that the handover of the communities' solid waste management and the Houay Soup Landfill operation to the local authorities is being considered by the Bolikhan District Governor. It is expected that the hand over will be completed in 2023.

A total of 7.61 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 1.43 m^3 compared with January 2023. The communities' general waste collection and the Houay Soup Landfill operation is under hand-over process to be managed by the local authorities (Bolikhan District Environment Management Unit or EMU in Bolikhamxay Province).

The Bolikhamxay Watershed and Reservoir Protection Office (WRPO) continues with the implementation of the approved AIP2022 including the outreach campaign and forest patrolling in February 2023. Bolikhamxay WRPO obtained the approval from the Head of Bolikhamxay WRPO and submitted their AIP2023 to the Forest Protection Fund (FPF) office of Department of Forestry (DOF) - Ministry of Agriculture and Forestry (MAF) on 17 February 2023.

The Head of Xaysomboun WRPO informed that the meeting on the roles and responsibilities for the reservoir fishery co-management could not be organized in February 2023 due to his prior commitments with other assignments including the internal PAFO monthly meeting and the re-survey of reservoir check point location. NNP1 EMO has been closely following up on the rescheduling of the meeting which is now planed for the middle of March 2023. The Xaysomboun WRPO submitted the draft AIP2023 to NNP1 EMO on 1 February 2023. NNP1 EMO reviewed the draft and shared it to BSP-WCS on 9 February 2023. NNP1 EMO and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) will organize further discussion with Xaysomboun WRPO in March 2023.

The Bolikhamxay Biodiversity Offset Management Unit (BOMU) informed that the meeting for the approval of the Nam Chouane-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary was postponed to March 2023 due to the unavailability of the Head of Bolikhamxay Province Agriculture and Forestry Office (PAFO) and the Vice Governor of Bolikhamxay Province. However, BOMU successfully organized a Participatory Land Use Planning (PLUP) kick-off meeting in Viengthong District on 2 February 2023. Additionally, with technical support from Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) and NNP1 EMO, BOMU conducted the SMART, Standard Operation Protocol (SOP), and first aid training for the patrolling and snare removal team from 13-17 February 2023, and the patrolling and snare removal were began on 20 and 24 February 2023 respectively. BOMU submitted the draft AIP2023 on 15 February 2023 which was reviewed by the NNP1 EMO and shared with BOMU and BSP-WCS on 21 February 2023.

The Forest Protection Fund (FPF) office of the Ministry of Agriculture and Forestry (MAF) is currently reviewing the improved draft Financial Management Manual (FMM).

The fish catch monitoring for January 2023 in Nam Ngiep Watershed was dominated by *Oreochromis niloticus*, *Scaphiodonichthys acanthopterus* and *Channa striata* and species groups of 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 (DD) and *Oreochromis niloticus* which is an exotic species. The recorded catch of threatened species includes two Vulnerable species (VU): *Scaphognathops bandanensis* and *Tor sinensis*.

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During February 2023, the first ISO14001:2015 surveillance audit was carried on site days by the SGS, which represents a crucial milestone of the NNP1PC in compliance with ISO14001:2015 standards. The mission consisted of site tours, interviews with the NNP1's key personnel and verification of the Environmental Management System (EMS) performance. A total of five (05) general observations and opportunity of improvements (OFIs) were identified including the management of solid waste, food waste and hazardous waste.
The details of the five general observations and OFIs are shown in the table below.

TABLE 1.1-1: THE DETAILS OF GENERAL OBSERVATION AND OPPORTUNITY OF IMPROVEMENT

OFI	Description	Corrective Action
1.	Leachate from the food waste storage area at the OSOV1 canteen	The corrective actions were completed and an internal NCR level 1 was issued as a reference for the performance monitoring and following up, and relevant training will be provided.
2.	The lubricant oil container at the re-regulation Dam PH and the alcohol spray bottle at the Main Dam PH were found without an SDS label.	SDS labels to be attached by the O&M team
3.	The timing of emergency evacuation stated in the rehearsal sessions requires further testing in different situations across various operation sites such as fire, flooding, explosion, etc.	The emergency evacuation plan will be reviewed, updated and relevant drills will be conducted accordingly
4.	The hazardous waste management procedures for transmission line works lack clarity regarding the proper disposal of empty paint and spray cans, it is necessary to identify and address waste management in the environmental aspect assessment	The environmental aspect assessment for transmission line works will be reviewed and updated accordingly
5.	It is necessary to assess the environmental impact of "dam collapse" in the context of waste management during the post-emergency evacuation.	To include waste management procedures in the environmental aspect assessment for the post-emergency evacuation.

1.2 COMPLIANCE MANAGEMENT

In February 2023, EMO did not receive any document for review and approval. However, EMO issued one Non-Compliance Report (NCR) level 1 to the Contractor related to leachate from the food waste at SOSV1 canteen. The status of compliance reports (Observation of Non-Compliance or ONC; and Non-Compliance Report or NCR) issued by NNP1PC is summarized in ***Table 1.2-1.***

TABLE 1.2-1: SUMMARY OF ONC AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from January 2023	0	0	0	0
Newly Opened in February 2023	0	1	0	0
Total in February 2023	**0**	**1**	**0**	**0**
Resolved in February 2023	0	1	0	0
Carried over to March 2023	0	**0**	**0**	0
Unsolved Exceeding Deadlines	**0**	**0**	**0**	**0**

TABLE 1.2-2: SUMMARY OF NCR AND ONC ISSUED TO THE CONTRACTOR

Document Number / Date of Issue	Subject Description	Current Status at the end of February 2023
NC No. 01/23 Issued Date: 17-02-23 (NCR Level 1)	On 17 February 2023, the SGS auditor and the NNP1-ISO secretariate observed leachate leaking from food waste storage bins, contaminating soil, attracting flies, and posing hygiene risks to camp staff.	**The corrective actions were carried out as follows:** • Applied lime powder on the contaminated ground to neutralize the leachate and eliminate odour; • Collected contaminated soil and disposed at designated spoil disposal no. 6 by following the Standard Operating Procedure (SOP) on sewage and black water disposal; **The preventive actions were carried out as follows:** • Ensure complete separation of water from food waste before storing in the bins; • Conduct weekly routine inspections by EMO staff; • Perform random checks to prevent inadequate practices and; • Incorporate this nonconformity as a lesson learned for the waste management training in 2023.

During February 2023, the operation and maintenance of the wastewater treatment systems were closely monitored including chlorine dosing and storage and bi-weekly inspections of the septic tanks and wetland systems. As a result, the analyses of the effluent showed improvements.

1.2.1 Site Inspection by the Environment Management Unit (EMU)

There was no monthly site visit by the EMU of Bolikhan District, Bolikhamxay Province. On 28 February 2023, EMO received a draft bi-annual site visit report for 2022 from the EMU of Xaysomboun Province. NNP1 reviewed and returned the report to the EMU for consideration and approval. The final report from the EMU is expected to be available in March 2023.

1.2.2 Site Decommissioning and Rehabilitation

In June 2022, the signed memo of land use handover from the District Office of Energy and Mines confirmed their acceptance of the land use handover to GOL and was reported to the higher provincial government levels.

On 10 February 2023, a discussion on the handover of land (with non-exclusive land use rights) was carried out at OSOV1 with participation form the Department of Energy Business (DEB) of the Ministry of Energy and Mines (MEM), MONRE, BLX Adm., DOEM, DONRE, DAF-BLK district, HG village, PHX village and NNP1. The meeting concluded that:

1. NNP1 will send a letter to GOL (DEB-MEM) to consider the hand-over of sites with non-exclusive land use rights following CA requirements;
2. DEB-MEM will issue a letter to MONRE requesting the issuance of a certificate for the hand-over of sites with non-exclusive land use rights for NNP1PC;
3. NNP1PC is requested to coordinate directly with the relevant Bolikhamxay provincial offices for the use of some parts of the land during the concession period.

During February 2023, all 31 rehabilitated areas were inspected, and no site disturbances were identified. The assessment of the vegetation cover will be resumed in the rainy season of 2023.

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.

Due to delays with the extension of the contract for UAE lab services and delayed sampling of water in February 2023, the water quality analyses for COD, TOC, ammonia nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, oil & grease and TKN are pending but are expected to be reported in the March 2023 Report.

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 C:*** Results of Effluent Analyses 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 1.3-1.***

Table 1.3-1: Status of Corrective Actions for Non-Compliances at WWTSs in February 2023

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total coliform and fecal coliform.	1) Completed proper fence installation to prevent cattle from accessing the OSOV1 wetland ponds (31 March 2022). 2) Completed additional planting of reeds in the OSOV1 wetland ponds (31 March 2022). 3) The second adding of the proper sludge/seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System. 4) Closely monitor the residual chlorine content in the effluents of OSOV2 and the Main Powerhouse WWTS. Chlorination dosage adjustment was successful by June 2022. 5) Closely monitor the Influent to compare with the effluent for the specific parameters to check the treatment effectiveness (stopped in Q4 of 2022).
OSOV2	EF13	Non-compliance for total coliform and fecal coliform (first fortnightly sampling).	
Main Powerhouse	EF19	Non-compliance for total coliform and fecal coliform (second fortnightly sampling).	

1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

The ambient surface 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 1.3-1.***

The monitoring results for key parameters (DO, TSS and BOD_5) during February 2023 are presented in ***Table 1.3-2***, ***Table 1.3-3***, and ***Table 1.3-4.*** The full set of data for February 2023 is attached in Annex A. In addition, the DO depth profile timeseries for R05 are shown in ***Figure 1.3-2,*** and the results for DO timeseries are presented as line graphs in ***Figure 1.3-3*** and DO Long Profile graphs ***Figure 1.3-4***.

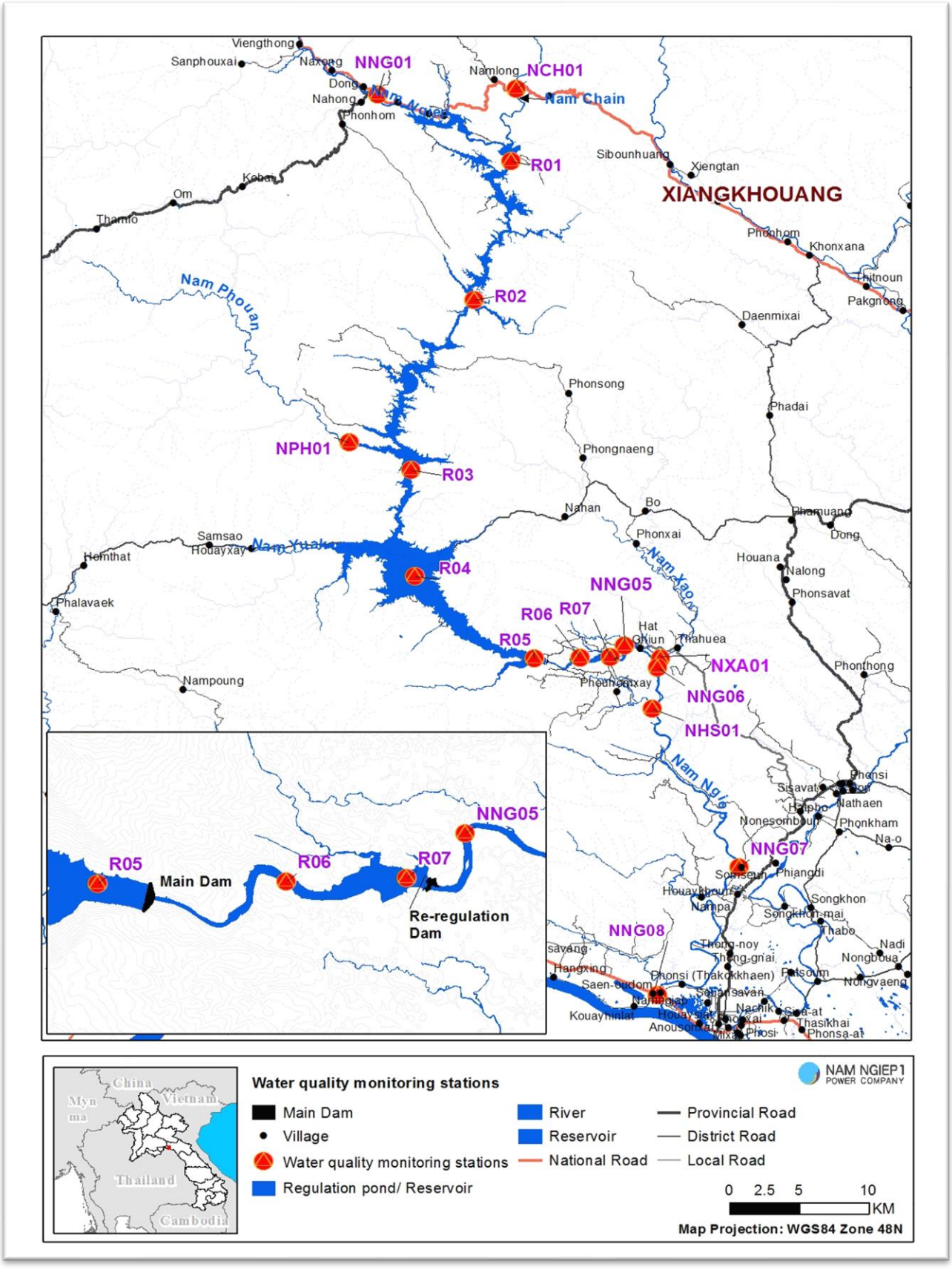

Figure 1.3-1: Surface Water and Re-regulation Reservoir Water Quality Monitoring Stations

Main Reservoir

During February 2023, the water level in the main reservoir decreased from El. 313.96 m asl to El. 313.58 m asl.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 5.8 mg/L in the upper 30 m varying between 3.1 mg/L and 7.7 mg/L. Due to the cool weather throughout the reporting period, the thermocline in R05 deepened to a depth of about 32 m - 38 m resulting in equalization of DO in the epilimnion to concentrations between 2.7 mg/L and 7.7 mg/L (mean 5.7 mg/L). Below the thermocline, the DO concentrations dropped to below 0.5 mg/L. The oxycline were found at depth of 40 m (on 03 February 2023), 38 m (on 08 February 2023), depth of 6.5 m (on 15 February 2023) and depth of 11 m (on 23 February 2023). Anoxic conditions (less than 0.5 mg/L) were found at depths from 45 m to bottom (03 February 2023), from 38 m to bottom (08 February 2023), from 36 m to bottom (15 February 2023) and from 34 m to bottom (23 February 2023). At the water intake level, DO concentrations varied between 0.12 mg/L and 5.29 mg/L.

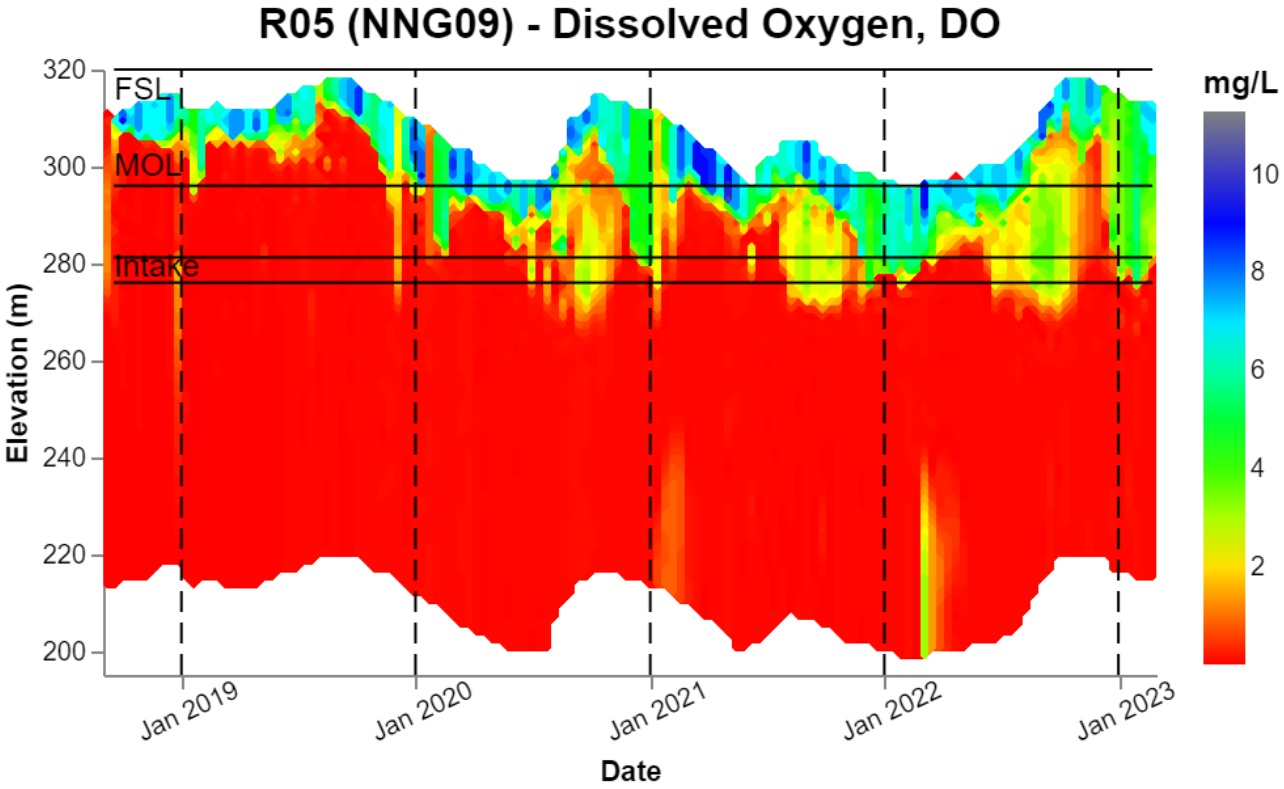

Figure 1.3-2: DO Depth Profiles Time Series in R05 (Since September 2018 to February 2023)

At R04, the average DO concentration was 7.3 mg/L in the upper 7.5 m varying between 5.3 mg/L and 8.3 mg/L. From 8.0 m to 30 m, DO concentration varied between 3.5 mg/L and 6.9 mg/L with an average of 5.0 mg/L. The oxycline were found at depths of 38 m (03 February 2023), 6.5 m (08 February 2023), 7.0 m (15 February 2023) and 8.0 m (23 February 2023). Anoxic conditions (less than 0.5 mg/L) were found at depths from 38 m to bottom (03 and 08 February 2023), from 45 m to bottom (15 February 2023) and from 36 m to bottom (23 February 2023).

At R03, the average DO concentration was 6.1 mg/L in the upper 6.5 m varying between 3.1 mg/L and 8.4 mg/L. An oxycline was found at depths between 4.0 m and 5.5 m. From 6 m to bottom, DO concentration varied between 0.1 mg/L and 5.2 mg/L with an average of 3.3 mg/L. Anoxic conditions

(less than 0.5 mg/L) were found at 40 m on 14 February 2023 and 45 m to bottom on 24 February 2023.

At R02, the average DO concentration was 6.3 mg/L in the upper 4.5 m varying between 3.1 mg/L and 8.9 mg/L. Oxyclines were found at depths between 3.5 m and 5.0 m. DO concentrations varied between 0.1 mg/L and 7.2 mg/L with an average of 2.3.

At R01, the DO levels in the water column varied between 5.4 mg/L and 8.21 mg/L with an average of 6.8 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 prior to impounding.

The BOD_5 measurements in both epilimnion and hypolimnion at R01, R03, R04 and R05 were less than 1.0 mg/L.

Re-regulation Reservoir

In February 2023, the turbine discharges from the Main Powerhouse varied between 65 and 225 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO concentrations in the water column of the two monitoring stations were 4.4 mg/L and 4.1 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 February 2023, the monthly downstream water quality monitoring was carried out during aa period with gate discharge from the Re-regulation Dam. The DO concentrations were greater than 6 mg/L in all stations, except stations D (13 Km) and E (14.6 Km), complying with the surface water quality standard.

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. Water quality monitoring will be maintained, and the development of the situation in the reservoir and in the downstream area will be closely followed. In this regard, it should be noted that since the Commercial Operation Date (COD) in September 2019 no dead fish have been observed in Nam Ngiep downstream the re-regulation dam.

The BOD_5 in the downstream stations were less than 1 mg/L and complied with the national surface water quality standard.

Main Tributaries to Nam Ngiep

The monitored parameters in the Nam Chiane (NCH01), Nam Xao (NXA01), Nam Phouan (NPH01) and Nam Houaysoup (NHS01) complied with the standards, except DO in Nam Houaysoup (NHS01).

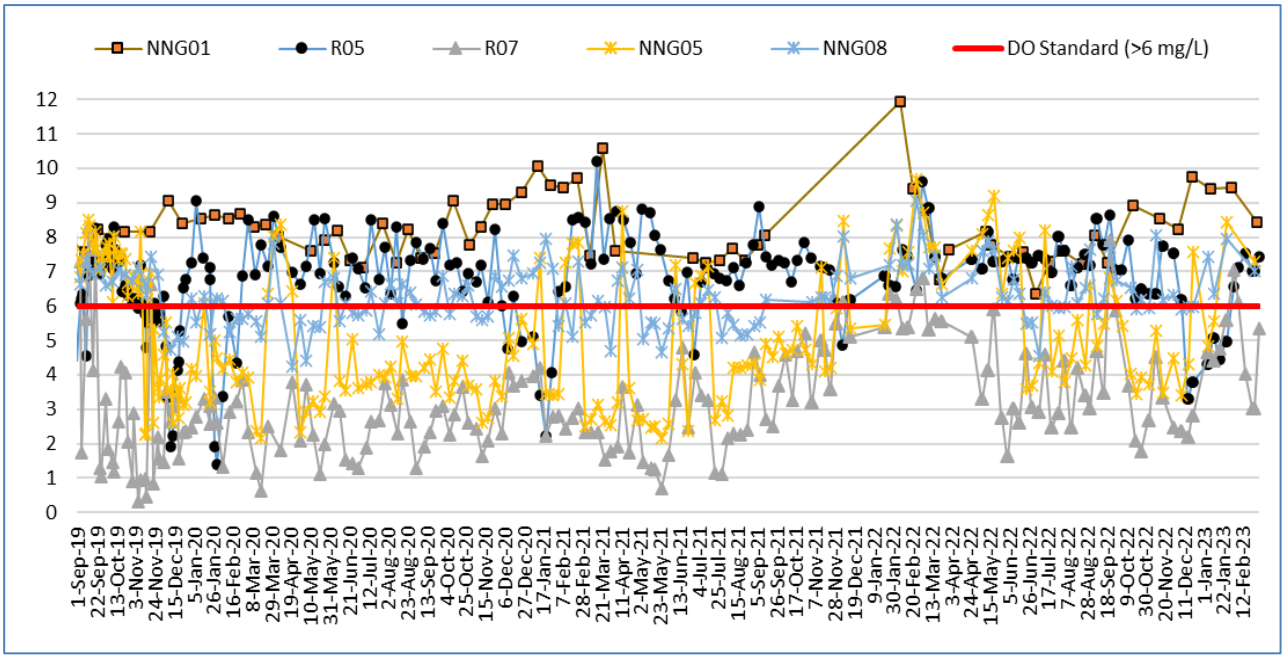

Figure 1.3-3: Concentration of Dissolved Oxygen (mg/L) in the upper 0.2 m since September 2019 to February 2023

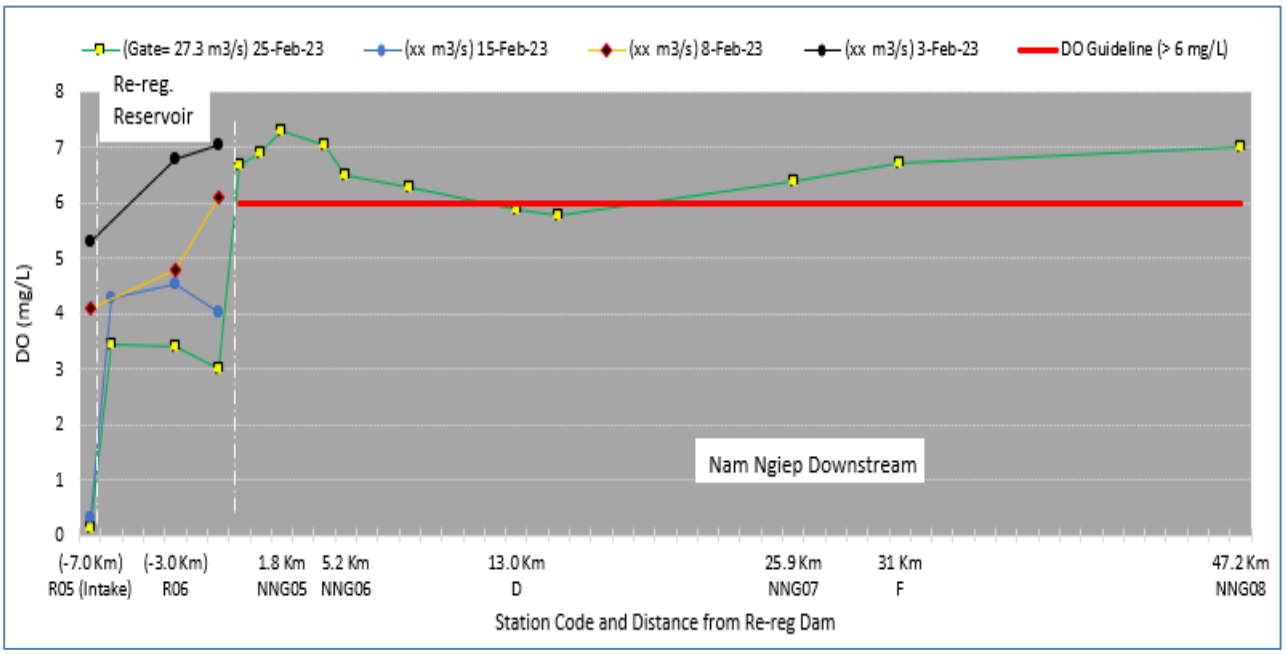

Figure 1.3-4: Dissolved Oxygen (Mg/L) Long Profile in February 2023 (from Immediately Upper Main Dam to Lower Nam Ngiep River)

Table 1.3-2: 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-Feb-23		6.57	4.29	5.55												
3-Feb-23					7.3	6.57	6.8	7.05								
7-Feb-23		8.08	6.57	7.21												
8-Feb-23					7.32	7.13	4.79	6.11								
14-Feb-23		6.41	7.21	6.66												
15-Feb-23					7.93	7.52	4.52	4.03								
23-Feb-23					8.22	7	3.41	3.02								
24-Feb-23		7.53	8.65	8.21										8.37		
25-Feb-23									7.29	6.48	6.37	7.02			6.4	5.8
27-Feb-23	8.42												8.67			

Table 1.3-3: 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
23-Feb-23					<5	<5	<5	<5								
23-Feb-23 Bottom					<5	<5										
24-Feb-23		<5		<5										<5		
24-Feb-23 Bottom				<5												
25-Feb-23									<5	<5	<5	<5			<5	<5
27-Feb-23	<5												<5			

Table 1.3-4: 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
23-Feb-23					<1	<1	<1	<1								
24-Feb-23		<1		<1										<1		
25-Feb-23									<1	<1	1.0	1			1.3	1.2
27-Feb-23	<1												<1			

1.3.3 Groundwater Quality Monitoring

During February 2023, community groundwater quality analyses were carried out for five out of seven wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village due to the water pumps in the two wells of Phouhomxay Village were broken. The community groundwater samples were taken from household water taps.

The results indicate that:

- The well in Somsuen Village fully complied with the Standards.
- The well in Thong Noy and Nam Pa Villages did not comply with the Standard for faecal coliform and *E. Coli* bacteria.
- The monitored parameters from two wells in Pou Village complied with the Standards.

The community groundwater quality monitoring results are presented in ***Table 1.3-5.***

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 1.3-5: Groundwater Quality Monitoring Results in Somsuen, Nam Pa, ThongNoy and Pou Villages

	Site Name	**Somseun Village**	**NamPa Village**	**ThongNoy Village**	**Pou Village**	
Parameter (Unit)	**Station**	**GSXN01**	**GNPA01**	**GTHN01**	**GPOU01**	**GPOU02**
	Guideline	13-Feb-23	13-Feb-23	13-Feb-23	31-Jan-23	31-Jan-23
pH	6.5 - 9.2	6.5	6.8	7.05	6.6	6.51
Sat. DO (%)		80	93.1	72.2	81	95.4
DO (mg/l)		6.09	7.38	5.74	6.93	7.79
Conductivity (µS/cm)		360	423	425	28	239
Temperature (°C)		29.54	27.3	27.07	23.2	25.52
Turbidity (NTU)	<20	1.25	0.91	0.71	2.65	1.27
Faecal coliform (MPN/100ml)	0	0	22	130	0	0
E.coli Bacteria (MPN/100ml)	0	0	22	79	0	0

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the water quality analyses are presented in ***Table 1.3-6.***

The concentration of Faecal Coliform and *E.coli* did not comply with the standards in the water supply of Thaheua Village (WTHH02), Hat Gnuin Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). In addition, non-compliance with pH were found in Phouhomxay's water supply system.

As observed in the field during water sampling, livestock are roaming around in 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 in accordance with the Law as mentioned in ***1.3.3*** as well as recommended to carry out the operation and maintenance improvement.

Table 1.3-6: Results of the Gravity Fed Water Supply Quality Monitoring

	Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
	Station	WTHH02	WHGN02	WPHX02	WPHX03
Parameter (Unit)	Guideline	26-Feb-23	26-Feb-23	26-Feb-23	26-Feb-23
pH	6.5 - 8.5	6.51	6.6	5.56	5.5
Sat. DO (%)		87.8	81.4	81.7	75
DO (mg/L)		7.38	7.1	7.09	6.58
Conductivity (µS/cm)	<1,000	73	129	23	21
Temperature (°C)	<35	24.52	22.1	22.69	21.64
Turbidity (NTU)	<10	1.15	1.11	0.83	0.7
Faecal Coliform (MPN/100 mL)	0	7.8	49	33	40
E.coli Bacteria (MPN/100 mL)	0	4.5	49	49	33

1.3.5 Landfill Leachate Monitoring

During February 2023, the landfill leachate monitoring was not conducted at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6) because the leachate in the treatment ponds became disconnected from each other in the dry season.

1.4 DISCHARGE MONITORING

1.4.1 Main Reservoir – Water Level, Inflow and Discharge

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in ***Figure 1.4-1*** and ***Figure 1.4-2*** presents the values recorded since January 2020.

During February 2023, the mean inflow to the main reservoir was 29 m^3/s. The minimum and maximum inflows were 32 m^3/s (on 23 February 2023) and 50 m^3/s (on 14 February 2023) respectively.

In February 2023, the water level in the main reservoir decreased from El. 313.96 m asl to El. 313.58 m asl.

During February 2023, the hourly turbine discharges from the Main Powerhouse varied between 65 m^3/s and 225 m^3/s usually interrupted by night-time periods with no discharge.

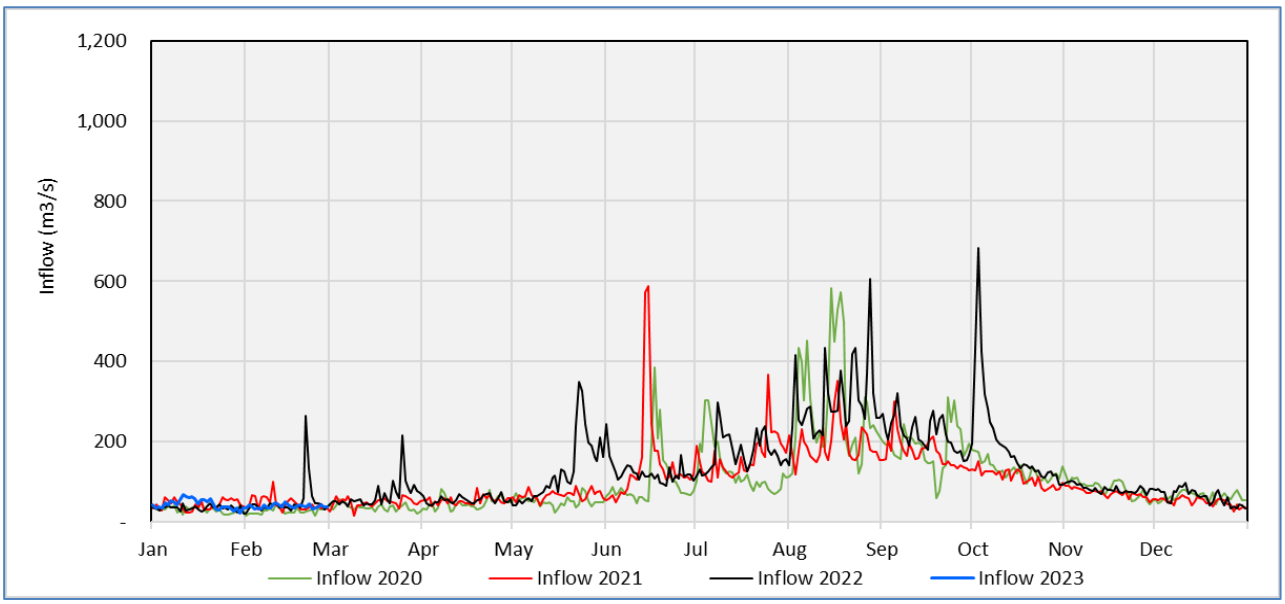

Figure 1.4-1: Inflow for the Main Reservoir during January 2020 to February 2023

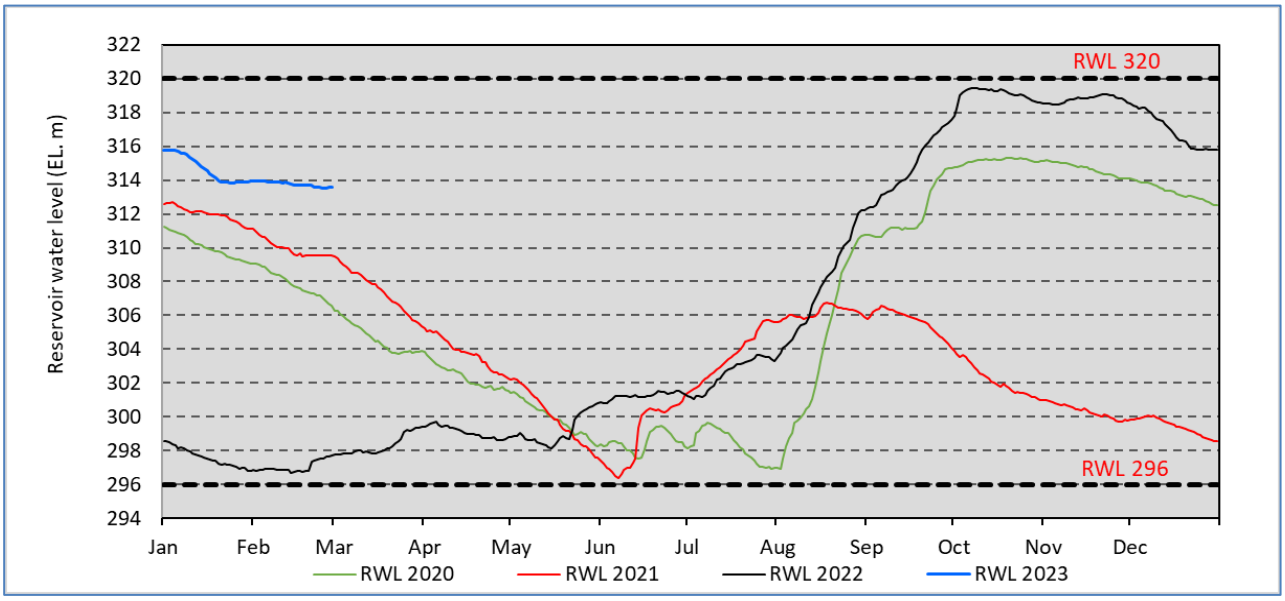

Figure 1.4-2: Water Level for the Main Reservoir during January 2020 to February 2023

1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during November 2022 to February 2023 is presented in ***Figure 1.4-3.***

During February 2023, the mean daily discharge from the Re-regulation Dam was about 43 m^3/s, hourly gate discharge varied between 27 m^3/s and 30 m^3/s, hourly turbine discharge varied between 48 m^3/s and 157 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.

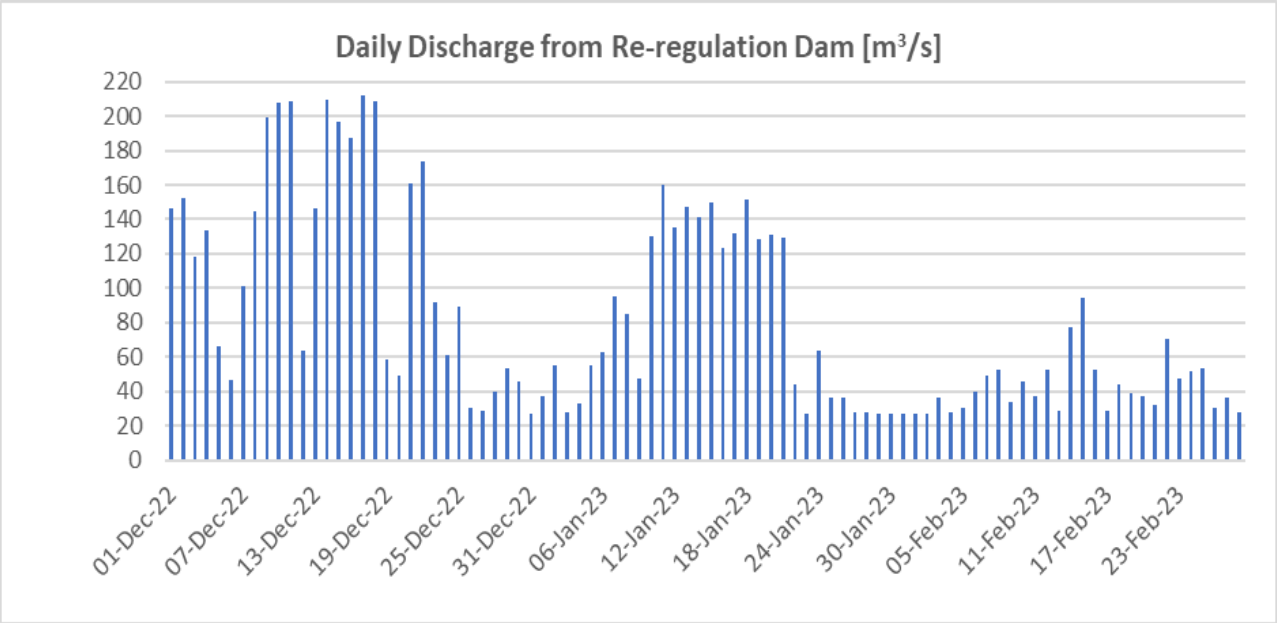

Figure 1.4-3: Discharge Monitoring at the Re-regulation Dam from December 2022 to February 2023

1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In February 2023, EMO carried out a 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 during the boat missions, the thalweg water depth was less than 0.5 m at three sites (distance between 1.5 km and 5.6 km from the Re-regulation Dam) during the discharge of about 27 m^3/s on 25 February 2023, but the team did not have any difficulties with boat navigation.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

A total of 7.61 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 1.43 m^3 compared with January 2023.

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 includes waste segregation and disposal, waste cover, grass cutting and repairing of the perimeter fences. In early February 2023, the solid waste collection contractor completed additional soil cover for the disposed solid waste as shown in ***Figure 1.5-1.*** The contractor will carry out a quarterly waste compaction in March 2023 before the upcoming rainy season.

On 21 February 2023, EMO and ADM conducted a Joint Site Inspection at OSOV1, OSOV1, Main dam and Re-regulation dam to assess the waste management system. It was discovered that the temporary waste storage facility has almost reached its maximum capacity as shown in ***Figure 1.5-***

1. The ADM was informed of the inspection findings and was requested to contact the authorized vendor to collect the recyclables from the site.

The total amount of recyclable waste sold and collected this month is summarized in ***Table 1.5-1***.

Table 1.5-1: Amounts of Recyclable Waste Sold and collection in February 2023

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by January 2023
1	Plastic bottles	kg	0	245
2	Aluminium can	kg	0	0
3	Paper/Cardboard	kg	0	87
4	Glass	kg	0	405
5	Scrap Metal	Kg	0	10
Total		**kg**	**0**	**747**

FIGURE 1.5-1: SOLID WASTE MANAGEMENT AND NNP1 LANDFILL OPERATION

Additional waste cover at NNP1 Landfill on 02 February 2023 by the local waste collection contractor

The temporary waste storage facility at OSOV2 will be emptied in March 2023

In February 2023, the villagers from Phouhomxay Village collected a total of 360 kg of food waste from the OSOV1 canteen for feeding their animals.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in February 2023 are shown in ***Table 1.5-2*** and ***Table 1.5-3*** respectively.

Table 1.5-2: Record of Hazardous Material Inventory in February 2023

No.	Type of Hazardous Material	Unit	Total in February 2023(A)	Used (B)	Remaining at the end of February 2023 (A – B)
1	Diesel	Litre	8,454	2,738	5,807
2	Gasoline	Litre	1,466	586	880
3	Lubricant (Turbine oil)	Litre	5,160	9	5,151
4	Colour Paint	Litre	299	0	299
5	Thinner	Litre	10	0	10
6	Grease Oil	Litre	150	0	150
7	Gear Oil	Litre	426.8	0	426.8
8	Chlorine Liquid	Litre	38	0	38
09	HA Cut AF	Litre	3,925	0	3,925.0
10	HA Cut Cat AF	Litre	372.5	0	372.5

Table 1.5-3: Record of Hazardous Waste Inventory

No.	Hazardous Waste Type	Unit	Total in February 2023 (A)	Disposed (B)	Remaining at the end of February 2023 (A - B)
1	Used Oil (Hydraulic + Engine)	Litre	335.3	0	335.3
2	Empty used oil drum/container (drum 200L)	Unit	53	0	**53**
3	Contaminated soil, sawdust and textile material	m^3	0.8	0	**1**
4	Used tyre	Drum	5	0	**5**
5	Empty used chemical drum/container (drum 20L)	Unit	34	0	**34**
6	Lead acid batteries	Unit	10	0	**10**
7	Empty paint and spray cans	Unit	61	0	**61**

No.	Hazardous Waste Type	Unit	Total in February 2023 (A)	Disposed (B)	Remaining at the end of February 2023 (A - B)
8	Halogen/fluorescent bulbs	kg	322	0	**322**
9	Empty cartridge (Ink)	Unit	130	0	**130**
10	Clinic Waste	Kg	5	0	**5**
11	Expired Chlorine Powder	Kg	65	0	**65**

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

The Bolikhan District Environment Management Unit or EMU has informed NNP1PC that the process of handing over the community waste bank to the Bolikhan District EMU is being considered by the Bolikhan District Governor. It is expected that the handover will be completed in 2023.

There were no recyclable waste trade activities in the community recyclable waste bank in February 2023

1.6.2 Community Solid Waste Management

The Bolikhan District Environment Management Unit or EMU has informed NNP1PC that the handover of the communities' solid waste management and the Houay Soup Landfill operation to the local authorities is being considered by the Bolikhan District Governor. It is expected that the handover will be completed in 2023.

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)

The progress of the actions that were discussed and agreed in the previous monthly meetings as well as the follow up discussions are summarized below:

- NNP1 EMO, Xaysomboun WRPO, and BSP-WCS visited the proposed location of the TPZ reservoir check points on 13 February 2023. Xaysomboun WRPO confirmed that the contractor will start construction by the end of February 2023 and they will keep NNP1 EMO and BSP-WCS team updated if there is any change.
- NNP1 EMO had discussions with Hom District Office of Energy and Mines on 17 and 21 February 2023 regarding the continuation of mining exploration as well as about the Nam Phouan Hydropower project in the NNP1 watershed Phou Samsao Totally Protected Zone (TPZ). NNP1 EMO noted from a letter by Boualaiy Mongkone Thong (the mine exploration company) to Xaysomboun Province Department of Energy and Mines on 9 January 2023 stating that that the Company will bring 5 excavators, 2 suction trucks, 5 trucks, 3 pick-up cars, 1 tractor and 3 drilling equipment into the area. EMO also noted that the Nam Phouan Company has transported 2

excavators to PhouNgou village in the week of 13 Feb 2023 and will construct an access road to the Nam Phouan site for drilling and collecting soil samples. NNP1 EMO will continue to follow up with Hom District Office of Energy and Mines on both projects.

- The Head of Xaysomboun WRPO informed NNP1 EMO at the end of February 2023 that a meeting on the roles and responsibilities of the NNP1 reservoir fishery management still could not be organized due to his prior commitments with other assignments including the internal PAFO monthly meeting and the re-survey of the reservoir check point location. NNP1 EMO has been closely following up on the rescheduling of the meeting which is now planed for the middle of March 2023.
- NNP1 EMO developed an action plan to address the long delays of Xaysomboun WRPO activities, which as of late February 2023 is under review by NNP1 management.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO organized the February monthly meeting on 13 February 2023 at Bolikhamxay WRPO office in Bolikhan District. The main objectives of the meeting were to present the results of forestry and reservoir patrol work in January 2023 and the plan for February 2023 patrolling.

NNP1 EMO and BSP-WCS noted that the February patrolling has focused on some areas outside NNP1 watershed which as noted in the patrolling report included an illegal logging with the volume of 7.731 m^3 in Phou Houa Seua (outside NNP1 watershed). The findings were reported and referred to Bolikhamxay Province Office of Forest Inspection (POFI) for further processing. NNP1 EMO requested BSP-WCS to assess the patrolling planning and implementation for discussion at the next monthly meeting.

2.1.1.3 NNP1PC EMO

There was no activity implemented under the NNP1 EMO watershed livelihood program this month. The team is fully occupied with other assignments, especially addressing the delays and pending issues of Xaysomboun WRPO.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

NNP1 EMO received the official fund disbursement request from Forest Protection Fund (FPF) office of Ministry of Agriculture and Forestry (MAF) on 20 January 2023. NNP1PC completed the fund disbursement to FPF on 31 January 2023. Xaysomboun WRPO re-submitted the original document to DOF-MAF FPF on 13 February 2023 for further fund transfer process to Xaysomboun WRPO account.

2.1.2.2 Bolikhamxay WRPO

Bolikhamxay WRPO informed that their AIP2022 fund for Q42022 was transferred by DOF-MAF on 2 November 2022.

2.1.3 Preparation of Annual Implementation Plan (AIP) 2023

2.1.3.1 Xaysomboun WRPO

The Head of Xaysomboun WRPO submitted the draft AIP2023 to NNP1 EMO on 1 February 2023. NNP1 EMO reviewed the draft and shared it to BSP-WCS on 9 February 2023. NNP1 EMO and BSP-WCS will organize further discussion with Xaysomboun WRPO in March 2023.

2.1.3.2 Bolikhamxay WRPO

ADB and the Independent Advisory Panel (IAP) confirmed no objection to the Bolikhamxay AIP2023 on 18 and 20 January 2023 respectively. Bolikhamxay WRPO further revised the budget based on the new GOL financial policy No. 0200/MoF that was issued on 25 January 2023. NNP1 EMO agreed with the revised version on 31 January 2023. Bolikhamxay WRPO obtained the approval from Head of Bolikhamxay WRPO and submitted their AIP2023 to Forest Protection Fund (FPF) office of Department of Forestry (DOF) - Ministry of Agriculture and Forestry (MAF) on 17 February 2023.

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 February 2023 is described below:

a. Component 1 - Spatial Planning and Regulation

The official approval of the Nam Chouan-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary was postponed to March 2023 due to the unavailability of the Head of Bolikhamxay Province Agriculture and Forestry Office (PAFO) and the Vice Governor of Bolikhamxay Province. Bolikhamxay Biodiversity Offset Management Unit (BOMU) will continue the process in March 2023. However, BOMU successfully organized a Participatory Land Use Planning (PLUP) kick-off meeting in Viengthong District on 2 February 2023. The meeting was chaired by the Deputy Head Bolikhamxay PAFO and co-chaired by the Vice District Governor of Viengthong District with attendance of representatives from relevant offices. The GOL emphasized the need to review and update the PLUB to cover the household level. However, NNP1 EMO clarified that that was beyond the scope of work and budget of the approved NNP1 BOMP. Following this, BOMU, BSP-WCS and NNP1 EMO held further discussions during their monthly meeting on 7 February 2023 and BOMU requested NNP1 EMO to submit an official clarification letter or arrange a meeting with the Deputy head Bolikhamxay PAFO. NNP1PC submitted an official clarification letter to the Deputy head Bolikhamxay PAFO on 17 February 2023, there was no response as of late February 2023.

b. Component 2 – Law Enforcement

NC-NX BOMU in collaboration with NNP1 EMO, BSP-WCS, and Lao Red Cross organized SMART refresher training, training on SOPs, and first aid training during 13-17 February 2023 in Viengthong District. A total of 46 people participated in the training including representatives from BOMU, NC-NX patrol team, snare removal team, NNP1 EMO, BSP-WCS, and Lao Red Cross. The February 2023 patrolling was scheduled from 20 February to 11 March 2023 and focuses on the TPZ highest and high priority area including Nam Xi, Nam Chouan, Nam San and Nam Houng. The February 2023 patrolling will be reported in March 2023.

The results of patrolling activity in January 2023 are as follows:

Table 2.2-1: Results of patrolling activity in January 2023

Team	Patrolling Area/distance	Observations/Actions Taken
1	Patrolling and safeguarding the temporary sub-station at the	No threats observed and recorded.

Team	Patrolling Area/distance	Observations/Actions Taken
	northwest edge of the TPZ highest priority area (Nam Xi)	
2	TPZ highest priority area including Nam Chouan, Nam Sone and Nam Chang (16 days covering a distance of 72 km on forest patrolling)	The team found and destroyed an old hunting camp located close to the upstream of Nam Chouan. The team also encountered a group of Vangphieng villagers (2 females and 6 males) doing illegal electro fishing in Nam Chouan. The team seized the electric fish shocker, issued a warning letter, and reported to Vangphieng village authority and the village cluster police for further actions.
3	TPZ highest priority area including Nam San and its northern tributaries (16 days covering a distance of 61 km on forest patrolling)	No threats observed and recorded.
4	TPZ high priority area including Nam Tan, Nam Houng, Houay Kanang, Houay San and Houay Pahok (16 days covering a distance of 86 km on forest patrolling)	The team observed two small newly improved roads for NTFP collection (one is along Nam Tan (outside TPZ) and another one is at Nam Houng (inside the TPZ high priority area). The team also found and destroyed three individual large spring snares at Houay San and heard a gunshot at Houay Vangmoun.

FIGURE 2.2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN JANUARY 2023

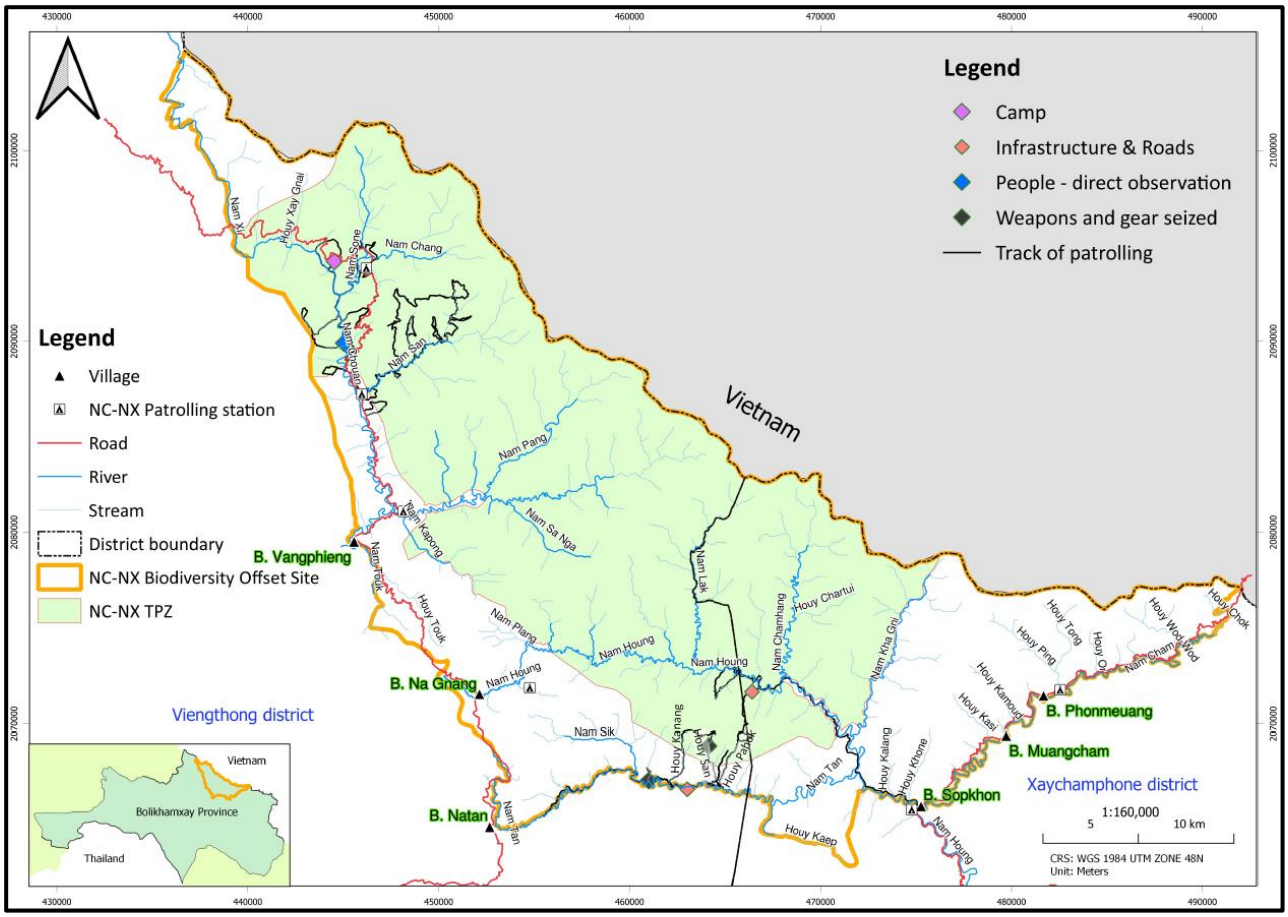

FIGURE 2.2-2: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN JANUARY 2023

	
Team 2 encountered with fishers doing illegal fishing at Nam Chouan	Hunting camp with carcass of muntjac found and destroyed by team 2 at Nam Chouan

Large spring snares found and destroyed by team 4 at Houay San

c. Component 3 – Conservation Outreach

The outreach activities that will include a training for the District Team and outreach campaign for the target audients is postponed to March 2023 due to the delay in some material purchasing by BOMU team.

d. Component 4 – Conservation linked livelihood development

The February 2023 snare removal was scheduled from 24 February to 10 March 2023 with the target area at TPZ highest priority area including Nam Xi and Houay Xay Gnai. The results will be recorded into SMART database.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2022

The funds under the AIP2022 for the remaining months of 2022 were transferred by DOF-MAF to Bolikhamxay BOMU on 11 November 2022.

2.2.3 Preparation of Annual Implementation Plan (AIP) 2023

The Head of Bolikhamxay BOMU submitted the draft AIP2023 on 15 February 2023. NNP1 EMO reviewed the draft and shared it to BOMU and BSP-WCS on 21 February 2023. BSP-WCS reviewed and provided their comments and shared it to BOMU on 22 February 2023. BOMU is finalizing the plan based on the comments from NNP1 EMO and BSP-WCS.

A 2-day follow up workshop on the Financial Management Manual (FMM) with GOL was organized on 19-20 January 2023. The Forest Protection Fund (FPF) office of the Ministry of Agriculture and Forestry (MAF) is currently reviewing the improved draft Financial Management Manual (FMM).

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.

The fish species dominating the fish catch by weight in January 2023 as listed in ***Table 2.3-1.*** 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 (DD) and *Oreochromis niloticus* is an exotic species.

Table 2.3-1: Fish Species dominating the Fish Catch in January 2023

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	133	LC
Oreochromis niloticus	ปานิน	123.5	LC
Scaphiodonichthys acanthopterus	ปาม้อม	67.2	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาขาวอุาย	66.1	DD, LC
Channa striata	ปาถ่	58.2	LC

The recorded catch of Threatened species (IUCN Red List classification) in January 2023 are presented in ***Table 2.3-2.*** The list includes two species that are classified as Vulnerable species (VU).

Table 2.3-2: Threatened Species of January 2023 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Scaphognathops bandanensis	ปาว฽นไฟ/ปาป่฽น	13	VU
Tor sinensis	ปาแดง	16.7	VU

Species abundance and occurrence is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey in January 2023. The catch covered three areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in January 2023 for above dam, below dam and Mekong area are presented in ***Table 2.3-3.***

Table 2.3-3: Main Biodiversity Indicators for January 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total number of species and groups recorded	15	35	30
Single species	14	22	20

[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.

Biodiversity Indicators	Mekong	Below dam	Above dam
Species groups	1	13	10
Top 15 species (% total catch weight)	100.00%	81.25%	93.19%
Proportion for species groups	3.83%	57.42%	37.63%
Diversity index (Shannon)	1.6754	2.9943	2.4812

Figure 2.3-1 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 40% and 63% of active fishing households for all fishing zones in January 2023.

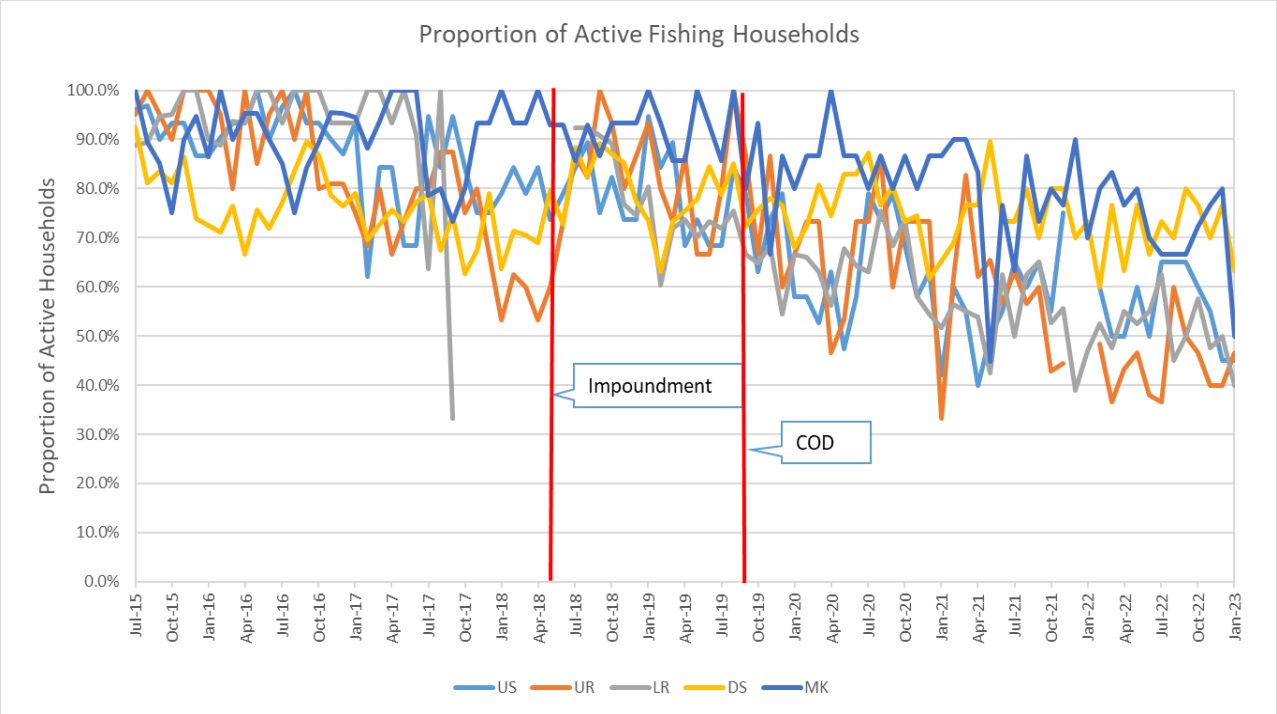

Figure 2.3-1: Proportion of total number of households actively fishing by fishing zone from July 2015 to January 2023

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

Figure 2.3-2 shows the average (mean) of monthly household fishing days from July 2015 to January 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

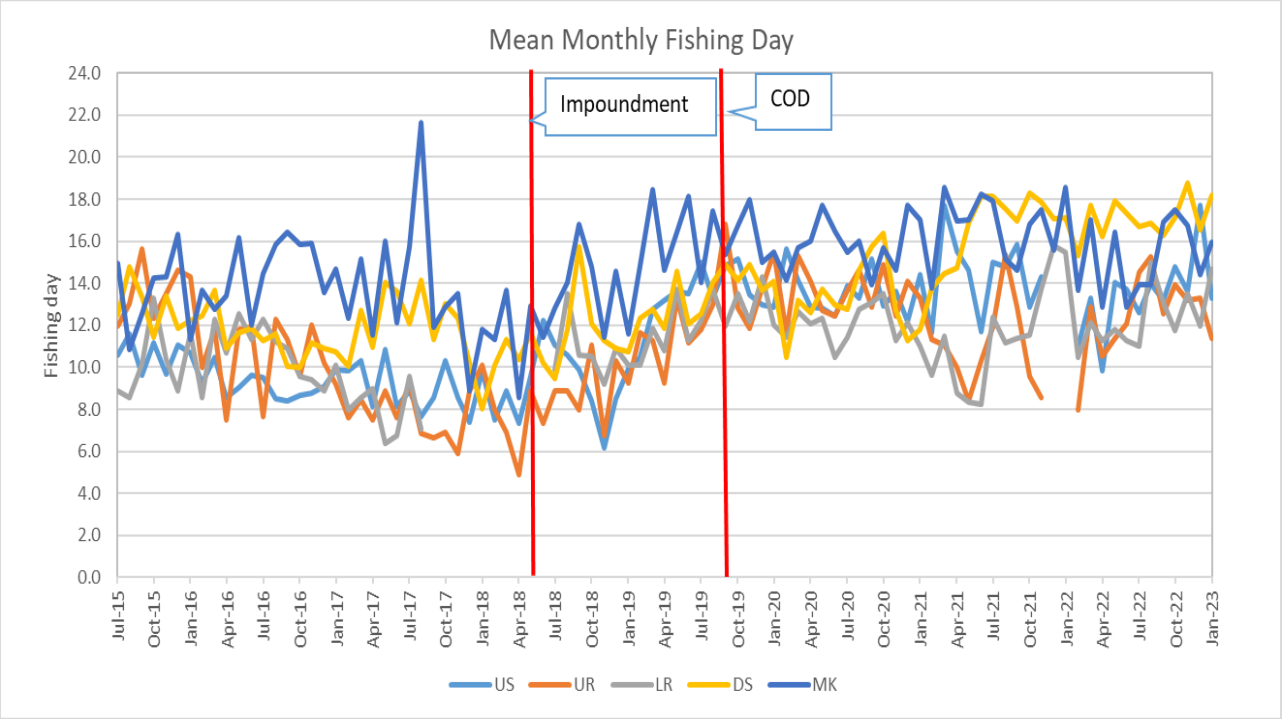

Figure 2.3-2: Mean of monthly fishing day from July 2015 to January 2023

The mean monthly number of fishing days for the month of January from 2016 to 2023 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2.3-4.***

Table 2.3-4: Mean reported number of fishing days by fishing zone for the month of January from 2016 to 2023

Fishing Zone	January 2016 (day)	January 2017 (day)	January 2018 (day)	January 2019 (day)	January 2020 (day)	January 2021 (day)	January 2022 (day)	January 2023 (day)
Upstream	10.67	9.91	9.84	9.96	12.88	14.39	NA	13.29
Upper reservoir	14.31	9.23	10.12	9.26	15.50	13.29	NA	11.39
Lower reservoir	11.63	10.12	NA	10.10	12.00	11.00	15.50	14.67
Downstream	12.24	10.72	8.05	10.72	14.12	11.81	17.11	18.18
Mekong	11.35	14.67	11.81	11.58	15.50	17.03	18.56	15.94

The mean monthly household fish catch from July 2015 to January 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 2.3-3.***

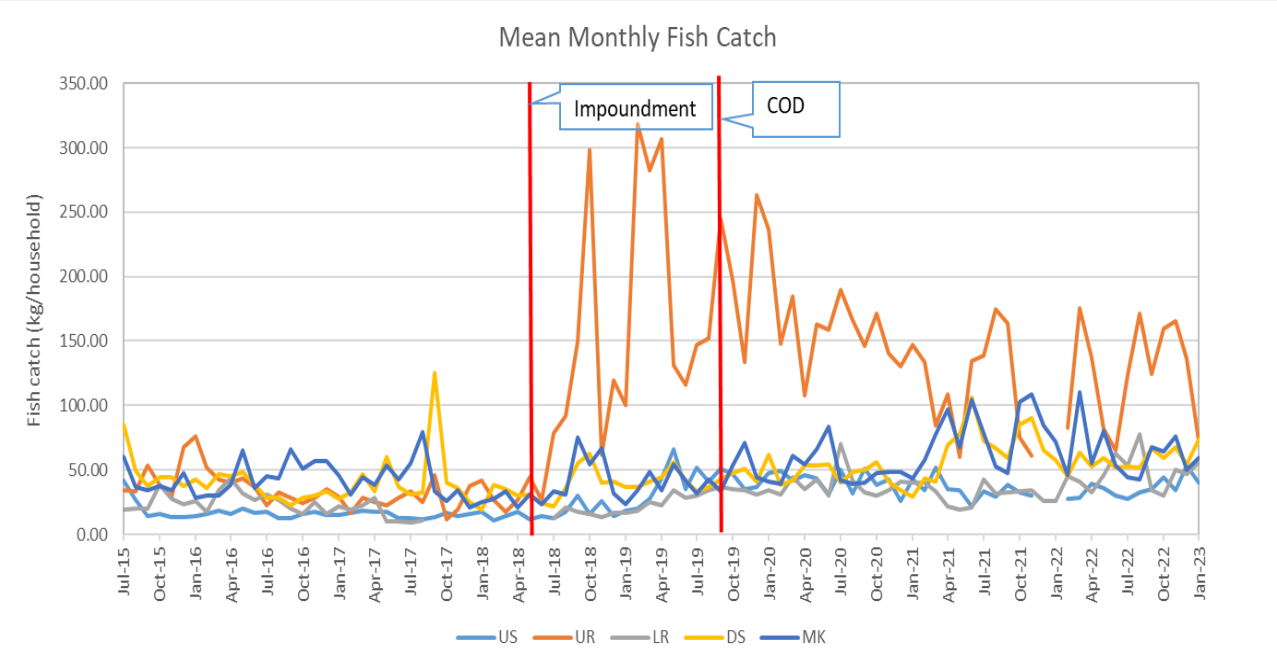

Figure 2.3-3: Mean Monthly Household Fish Catch from July 2015 to January 2023

The mean household fish catch for the month of January from 2016 to 2023 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2.3-5.***

Table 2.3-5: Mean Monthly Household Fish Catch for the month of January from 2016 to 2023

Fishing Zone	January 2016 (kg)	January 2017 (kg)	January 2018 (kg)	January 2019 (kg)	January 2020 (kg)	January 2021 (kg)	January 2022 (kg)	January 2023 (kg)
Upstream	14.57	14.87	17.81	18.24	47.99	42.51	NA	40.00
Upper reservoir	76.04	29.41	41.82	100.49	236.71	146.94	NA	72.79
Lower reservoir	25.74	21.57	NA	16.90	34.47	39.93	25.58	56.13
Downstream	42.37	27.67	19.06	36.36	62.14	29.29	57.29	73.47
Mekong	28.54	46.00	24.87	23.27	41.08	43.09	71.74	59.31

The mean daily fish catch per household from July 2015 to January 2023 are displayed in ***Figure 2.3-4*** and the mean fish catch per household per fishing day for the month of January from 2016 to 2023 are shown in ***Table 2.3-6.***

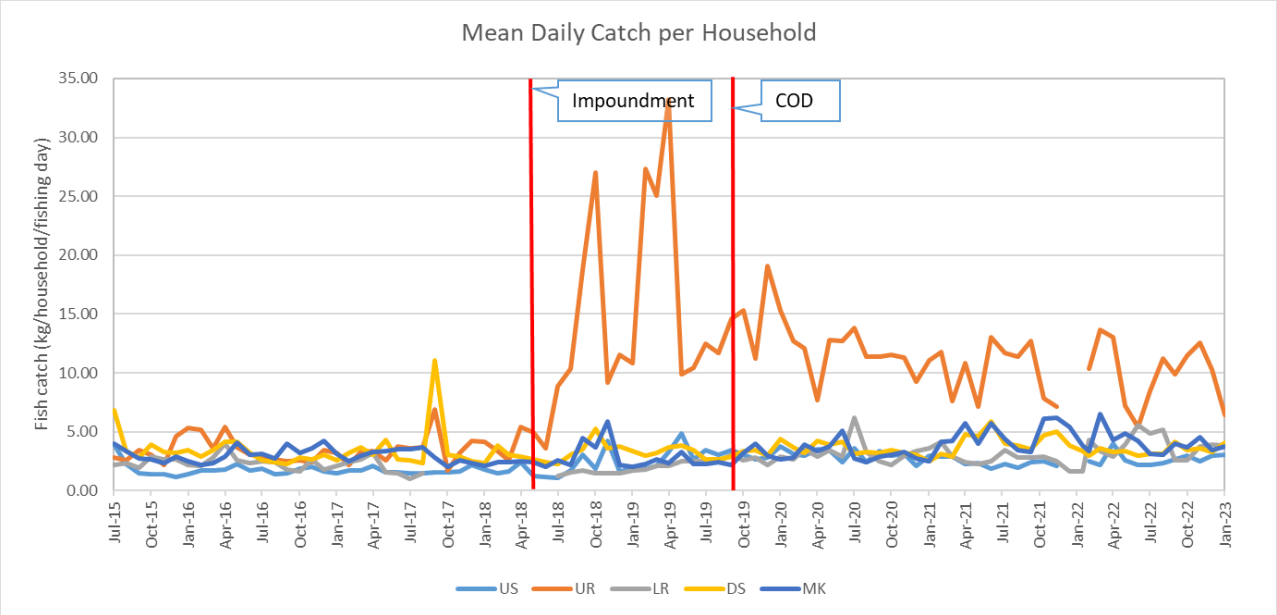

Figure 2.3-4: Mean Daily Fish Catch per Household from July 2015 to January 2023

Table 2.3-6: Mean Daily Fish Catch per Household for the month of January from 2016 to 2023

Fishing Zone	January 2016 (kg)	January 2017 (kg)	January 2018 (kg)	January 2019 (kg)	January 2020 (kg)	January 2021 (kg)	January 2022 (kg)	January 2023 (kg)
Upstream	1.37	1.50	1.81	1.83	3.73	2.95	NA	3.01
Upper reservoir	5.31	3.19	4.13	10.85	15.27	11.06	NA	6.39
Lower reservoir	2.21	2.13	NA	1.67	2.87	3.63	1.65	3.83
Downstream	3.46	2.58	2.37	3.39	4.40	2.48	3.35	4.04
Mekong	2.51	3.14	2.11	2.01	2.65	2.53	3.87	3.72

The survey results in January 2023 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitats for the upper reservoir, lower reservoir and Mekong zones are reservoir, tributaries and streams and Mekong respectively. The proportion of fishing habitats in January 2023 are displayed in ***Table 2.3-7.***

Table 2.3-7: Proportion of the catch reported by main habitats (%) in January 2023

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	6.7%	90.5%
Nam Ngiep	76.6%	9.9%	0.0%	41.0%	4.7%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	0.0%	89.2%	0.0%	0.0%	0.0%
Tributaries and streams	23.4%	0.9%	99.0%	31.4%	0.0%
Wetlands	0.0%	0.0%	1.0%	20.9%	4.7%
Others	0.0%	0.0%	0.0%	0.0%	0.0%

Total proportion of other aquatic animals (OAA) in the total reported catch of fish and OAA for the same 7-day period from July 2015 to January 2023 are presented in ***Figure 2.3-5*** and the proportion of OAA catch for the month of January from 2016 to 2023 are shown in ***Table 2.3-8.***

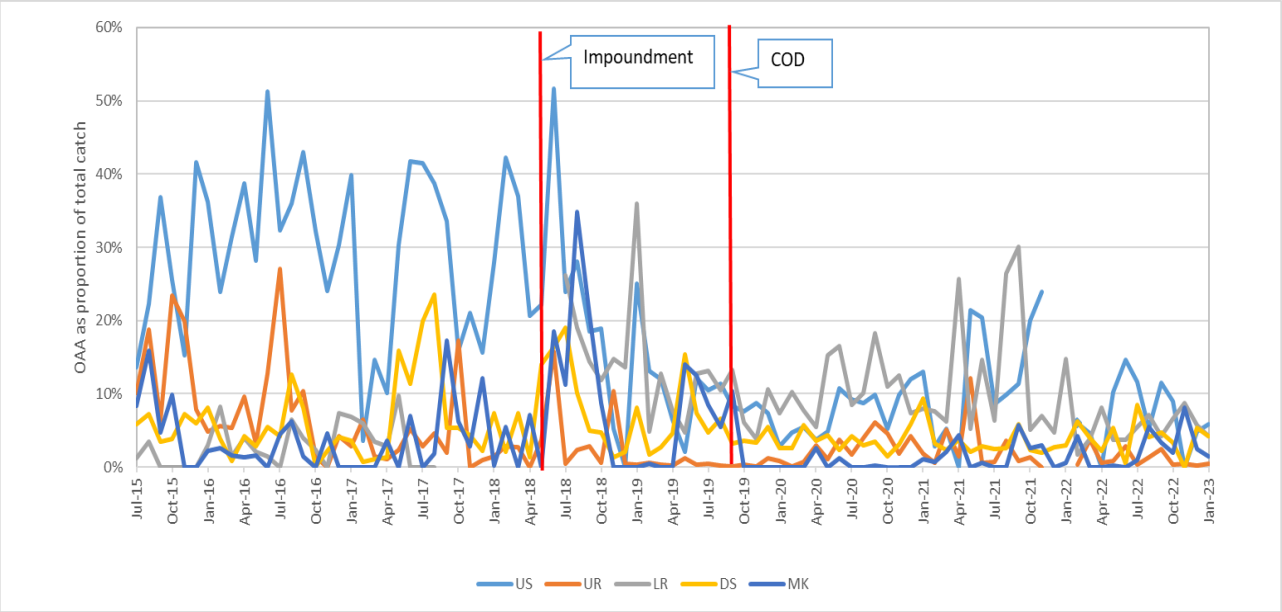

Figure 2.3-5: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone from July 2015 to January 2023

Table 2.3-8: Proportion of OAA to the total reported number of fish and OAA for the month of January from 2016 to 2023

Fishing Zone	January 2016	January 2017	January 2018	January 2019	January 2020	January 2021	January 2022	January 2023
Upstream	36.16%	39.85%	27.89%	25.03%	2.85%	13.02%	NA	5.79%
Upper reservoir	4.90%	2.80%	1.49%	0.32%	0.85%	1.89%	NA	0.43%
Lower reservoir	2.92%	6.83%	NA	35.97%	7.33%	7.92%	14.76%	4.20%
Downstream	8.11%	3.65%	7.34%	8.13%	2.56%	9.37%	3.00%	4.17%
Mekong	2.27%	0.00%	0.15%	0.00%	0.00%	1.09%	0.58%	1.47%

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 CHIAN 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	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA0 1	NHS01
Date	Parameters (Unit)	Guideline																
2-Feb-23	pH	5.0 - 9.0		6.66	6.72	6.78												
3-Feb-23	pH	5.0 - 9.0					6.8	6.74	6.77	6.9								
7-Feb-23	pH	5.0 - 9.0		6.55	6.59	6.7												
8-Feb-23	pH	5.0 - 9.0					6.77	6.83	6.91	6.96								
14-Feb-23	pH	5.0 - 9.0		6.7	6.6	6.5												
15-Feb-23	pH	5.0 - 9.0					6.5	6.4	6.89	6.91								
23-Feb-23	pH	5.0 - 9.0					6.8	6.9	6.7	6.62								
24-Feb-23	pH	5.0 - 9.0		6.87	6.74	6.66										6.92		
25-Feb-23	pH	5.0 - 9.0									6.5	6.8	6.86	7.05			7.0	6.3
27-Feb-23	pH	5.0 - 9.0	7												6.0			
2-Feb-23	Sat. DO (%)			76	51.4	67.5												
3-Feb-23	Sat. DO (%)						86.1	77.1	82.6	84.5								
7-Feb-23	Sat. DO (%)			97.5	79.5	87.6												
8-Feb-23	Sat. DO (%)						88.1	85.4	59.1	76.2								
14-Feb-23	Sat. DO (%)			79.6	89.1	81.1												
15-Feb-23	Sat. DO (%)						96.4	91.1	53.3	48.4								
23-Feb-23	Sat. DO (%)						100.5	85.8	35.1	39.8								
24-Feb-23	Sat. DO (%)			93.3	107.4	102.6										97.7		
25-Feb-23	Sat. DO (%)										86	76	75.5	84.5			76.9	67.2
27-Feb-23	Sat. DO (%)		94.1												93.6			
2-Feb-23	DO (mg/L)	>6.0		6.57	4.29	5.55												
3-Feb-23	DO (mg/L)	>6.0					7.3	6.57	6.8	7.05								
7-Feb-23	DO (mg/L)	>6.0		8.08	6.57	7.21												

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA0 1	NHS01
Date	Parameters (Unit)	Guideline																
8-Feb-23	DO (mg/L)	>6.0					7.32	7.13	4.79	6.11								
14-Feb-23	DO (mg/L)	>6.0		6.41	7.21	6.66												
15-Feb-23	DO (mg/L)	>6.0					7.93	7.52	4.52	4.03								
23-Feb-23	DO (mg/L)	>6.0					8.22	7.0	3.41	3.02								
24-Feb-23	DO (mg/L)	>6.0		7.53	8.65	8.21										8.37		
25-Feb-23	DO (mg/L)	>6.0									7.29	6.48	6.37	7.02			6.4	5.8
27-Feb-23	DO (mg/L)	>6.0	8.42												8.67			
2-Feb-23	Conductivity (µs/cm)			83	82	76												
3-Feb-23	Conductivity (µs/cm)						74	74	78	77								
7-Feb-23	Conductivity (µs/cm)			82	82	75												
8-Feb-23	Conductivity (µs/cm)						73	74	79	77								
14-Feb-23	Conductivity (µs/cm)			84	82	75												
15-Feb-23	Conductivity (µs/cm)						73	73	83	80								
23-Feb-23	Conductivity (µs/cm)						74	74	85	82								
24-Feb-23	Conductivity (µs/cm)			85	81	75										71		
25-Feb-23	Conductivity (µs/cm)										81	83	83	82			168	68
27-Feb-23	Conductivity (µs/cm)		99												37			
2-Feb-23	Temperature (°C)			22.68	24.69	25.18												
3-Feb-23	Temperature (°C)						23.44	23.47	25.15	24.6								
7-Feb-23	Temperature (°C)			24.81	25.01	25.25												
8-Feb-23	Temperature (°C)						24.65	24.4	26.52	26.75								
14-Feb-23	Temperature (°C)			26.57	26.03	25.39												
15-Feb-23	Temperature (°C)						25.61	25.02	23.65	23.98								
23-Feb-23	Temperature (°C)						25.75	25.73	23.09	23.03								
24-Feb-23	Temperature (°C)			26.18	26.38	26.67										23.01		
25-Feb-23	Temperature (°C)										23.58	23.52	23.66	24.38			24.74	22.5
27-Feb-23	Temperature (°C)		20.89												19.11			

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA0 1	NHS01
Date	Parameters (Unit)	Guideline																
27-Feb-23	Temperature (°C)																	
27-Feb-23	Temperature (°C)																	
1-Feb-23	Temperature (°C)			25.77	25.21	24.7										20.46		
2-Feb-23	Temperature (°C)						24.73	24.52	24.43	26.53								
2-Feb-23	Turbidity (NTU)			2.55	1.14	0.84												
3-Feb-23	Turbidity (NTU)						1.57	1.44	2.67	2.34								
7-Feb-23	Turbidity (NTU)			2.46	1.3	0.86												
8-Feb-23	Turbidity (NTU)						1.03	1.07	2.04	1.75								
14-Feb-23	Turbidity (NTU)			2.78	1.47	1.29												
15-Feb-23	Turbidity (NTU)						1.49	0.9	1.06	1.97								
23-Feb-23	Turbidity (NTU)						1.57	1	1	1.72								
24-Feb-23	Turbidity (NTU)			3.8	1.59	1.94										3.21		
25-Feb-23	Turbidity (NTU)										1.48	1.6	2.23	4.67			3.15	3.75
27-Feb-23	Turbidity (NTU)		3.78												3.18			
23-Feb-23	TSS (mg/L)						<5	<5	<5	<5								
24-Feb-23	TSS (mg/L)			<5		<5										<5		
25-Feb-23	TSS (mg/L)										<5	<5	<5	<5			<5	<5
27-Feb-23	TSS (mg/L)		<5												<5			
23-Feb-23	BOD_5 (mg/L)	<1.5					<1	<1	<1	<1								
24-Feb-23	BOD_5 (mg/L)	<1.5		<1		<1										<1		
25-Feb-23	BOD_5 (mg/L)	<1.5									<1	<1	1.01	1			1.34	1.22
27-Feb-23	BOD_5 (mg/L)	<1.5	<1												<1			
24-Feb-23	Faecal coliform (MPN/100 mL)	<1,000														17		
25-Feb-23	Faecal coliform (MPN/100 mL)	<1,000									7	8	11	14			34	33
27-Feb-23	Faecal coliform (MPN/100 mL)	<1,000	21												33			

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN FEBRUARY 2023

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	10-Feb-23	22-Feb-23	09-Feb-23	22-Feb-23	10-Feb-23	22-Feb-23
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	6.7	6.9	6.9	6.82	6.9	7.04
Sat. DO (%)		44.5	51.5	68.6	79.2	38.8	32
DO (mg/L)		3.63	4.27	5.56	6.48	3.08	2.53
Conductivity (µs/cm)		390	378	484	475	1,171	1,490
Temperature (°C)		25.61	24.75	26.07	25.55	27.06	27.13
Turbidity (NTU)		0.89	1.57	14.7	17.1	42.4	51.7
TSS (mg/L)	<50	<5	<5	20.33	<5	56.5	59.1
BOD_5 (mg/L)	<30	<6	<6	9.57	<6	<6	<6
COD (mg/L)	<125	Pending	Pending	Pending	Pending	Pending	Pending
NH_3-N (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total Nitrogen (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total Phosphorus (mg/L)	<2	Pending	Pending	Pending	Pending	Pending	Pending
Oil & Grease (mg/L)	<10.0	Pending	Pending	Pending	Pending	Pending	Pending
Total coliform (MPN/100 mL)	<400	700	1,600	16,000	0	0	1,600
Faecal Coliform (MPN/100 mL)	<400	460	5	9,200	0	0	1,600
Residual Chlorine (mg/L)	<1.0			0.04	0.69	0.17	0.17