NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

August 2023

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EXECUTIVE SUMMARY

During August 2023, activities related to ISO14001:2015 implementation continued such as the implementation of the four (04) Environmental Management Plans (EMPs). The EMPs will be executed from April 2023 to March 2024 including 1) HSE awareness training for NNP1PC staff and contractors, 2) reducing the paper consumption in NNP1 offices, 3) minimizing the quantity of waste disposal at NNP1 project landfill, and 4) planting trees. The annual ISO14001:2015 Internal Audit for 2023 is scheduled from mid-September to October 2023, covering all NNP1PC work function areas. Tasks in progress for the Internal Audit preparations include (i) updating the lists of ISO Committee and ISO Internal Auditors, (ii) refresher training on the ISO14001:2015 Internal Audit to the Internal Auditors by SGS (Lao) Sole Co., Ltd. and (iii) preparing the detailed plan for the ISO Internal Audit 2023 and coordinate with relevant parties to schedule. During this reporting period, no documents were submitted to the Environment Management Office (EMO) for review and approval.

On 17 August 2023, EMO and TD conducted a joint site inspection to verify the corrective actions for the closure of holes at the former RCC Plant which were identified by the LTA during their mission in May 2023. The inspection observed small holes due to successive rainfall over three weeks were. TD will request PKCC contractor to backfill with additional soil-rock until stability is achieved.

During August 2023, a monthly monitoring of the rehabilitation sites was carried out at the main former camp sites (Kenber camp, Songda 5 camp no 2, Right tunnel camp and spoil disposal no. 6. No evidence of erosion or instability were observed at any of the inspected sites.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 5.5 mg/L in the upper 6.0 m varying between 2.7 mg/L and 8.0 mg/L. Anoxic conditions (less than 0.5 mg/L) were found at depths from 30 m to bottom (03 August 2023), at depth from 32 m to bottom (09 August 2023), at depth from 24 m to bottom (15 August 2023), at depths from 22 m to 34 m and 45 m to bottom (23 August 2023) and at depth from 50 m to bottom (30 August 2023). At the water intake level, DO concentrations varied between 0.10 mg/L and 5.32 mg/L.

In the Re-regulation Reservoir, the mean DO concentrations in the water column of R06 and R07 were 2.4 mg/L and 2.3 mg/L respectively.

The DO measurements downstream the Re-regulation Dam during turbine discharge was less than 6 mg/L in some stations, except at NNG08.

NNP1PC discussed the results is of the ongoing water quality monitoring program with the LTA during their May 2023 visit. The LTA recommended to maintain the monitoring program, and concluded in the site visit report dated 01 September 2023 that other measures aiming at improving the water quality, such as artificial re-aeration of the water in the re-regulation pond for increasing oxygen content, are not required.

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.

A total of 6.8 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 0.2 m^3 compared with July 2023.

NNP1PC received the official request for the second two-quarter of funds disbursement under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 from the Forest Protection Fund (FPF) of the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF) on 28 July 2023. NNP1PC transferred the funds on 17 August 2023, totalling 583,688,000 LAK, from which 163,490,000 LAK is under NNP1 NNL and 420,198,000 is under GOL CA. Bolikhamxay WRPO will resume patrolling and implement other activities during the remaining months of 2023 after receiving the second two quarters funds of AIP 2023 from FPF DOF-MAF.

Xaysomboun WRPO made some progress per the agreement from the meeting in April 2023, except for the construction of two reservoir checkpoints. The continuation of the project development within the NNP1 watershed Totally Protected Zone (TPZ) is subject to review and approval by the Xaysomboun Provincial Management and relevant Ministry offices. The patrolling in the TPZ, watershed forest, and reservoir was carried out without changing the patrol team arrangement. Xaysomboun WRPO organized a meeting with Thathom and Hom District on the Fishery Co-Management Plan (FCMP) on 22 and 29 August 2023, respectively, but did not follow the meeting plan as agreed under the AIP2019 and the Minute of the Meeting on 21 May 2020. The Xaysomboun AIP2023 was finalized and submitted to ADB and IAP for review and approval on 16 August 2023. NNP1 EMO did not receive any reply as of the end of August 2023.

Bolikhamxay Biodiversity Offset Management Unit (BOMU) planned to conduct patrolling and snare removal activity during 5-24 August and 11-25 August 2023, respectively. However, the activities were postponed after discussion among NNP1 EMO, BOMU, and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) considering the safety aspect of accessing the area, difficulties in the logistic arrangement, and challenges in case of emergency under the continuous heavy rain in Viengthong.

Bolikhamxay BOMU completed the livestock farmer groups establishment under the agreed Community Development Plan (CDP) for 2023. BSP-WCS shared the report with NNP1 EMO and BOMU on 15 August 2023. The report is expected to be finalized and submitted to relevant district authorities in the first week of September 2023 as the soonest for official approval by the farmer groups. BOMU submitted the request for the second two-quarter of fund disbursement under their approved AIP2023 to FPF DOF-MAF on 18 August 2023. NNP1PC expects to receive the official request from FPF DOF-MAF in the first week of September 2023 as the soonest.

The fish catch monitoring for July 2023 in Nam Ngiep Watershed was dominated by *Oreochromis niloticus* and species groups of Mastacembelus, Hampala, Poropuntius, and *Sikukia gudgeri* and *Amblyrhynchichthys truncatus*. They are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Sikukia gudgeri* is classified as Data Deficient (DD), and *Oreochromis niloticus* 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 August, activities related to ISO14001:2015 implementation continued such as the implementation of the four (04) Environmental Management Plans (EMPs). The EMPs will be executed from April 2023 to March 2024 including 1) HSE awareness training for NNP1PC staff and contractors, 2) reducing the paper consumption in NNP1 offices, 3) minimizing the quantity of waste disposal at NNP1 project landfill, and 4) planting tree. The details of EMPs 2023 implementation are shown in ***Table 1.1-1*.**

Table 1.1-1:The Details of EMPs 2023 implementation

EMP No.	Activity Description	KPI	The EMP Evaluation Schedule	Implementation Progress
01/2023*	Providing HSE awareness training to NNP1PC staff and contractors	80% of NNP1PC staff and the Contractors are trained on Health, Safety and Environmental awareness during April 2023 to March 2024	Oct 2023 – Feb 2024	The training is scheduled to be carried out by October 2023
02/2023*	Reducing the paper consumption in NNP1 offices	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Oct 2023 – Dec 2024	On going monitoring and gathering data on monthly basis
03/2023*	Reducing the quantity of waste disposal at NNP1 Project Landfill	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Sept 2023 – Mar 2024	On going monitoring and gathering data on monthly basis
04/2023#	Planting tree	Percentage of plant survival, the potential plantation fields in contributing to the environmentally sustainability objectives (refer to Tree Planting Plan)	Feb 2024	The tree planting event took place in July 2023 and monitoring of plant survival is scheduled for the middle September 2023

** EMPs implemented in 2022 will continue in 2023 for further success*

 # New EMP suggested by the external ISO Auditor (SGS)

1.2 ANNUAL ISO14001:2015 INTERNAL AUDIT

The annual ISO14001:2015 Internal Audit for 2023 is scheduled from mid-September to October 2023, covering all NNP1PC work function areas. Tasks in progress for the Internal Audit preparations include (i) updating the lists of ISO Committee and ISO Internal Auditors, (ii) refresher training on the ISO14001:2015 Internal Audit to the Internal Auditors by SGS (Lao) Sole Co., Ltd. and (iii) preparing the detailed plan for the ISO Internal Audit 2023 and coordinate with relevant parties.

1.3 COMPLIANCE MANAGEMENT

In August 2023, no documents were submitted to the Environment Management Office (EMO) for review and approval.

1.3.1 Joint Monthly Site Inspection

On 17 August 2023, EMO and TD conducted a joint site inspection to verify the corrective actions for the closure of the holes at the former RCC Plant which were identified by the LTA during their mission in May 2023. The inspection observed small holes due to successive rainfall over three weeks. TD will request PKCC contractor to backfill additional soil-rock until stability is achieved. The inspection photos are shown in ***Figure 1.3-1***

Figure 1.3-1: Joint Monthly Inspection in August 2023

Evidence: Small holes created due to successive rainfall over three weeks.

Additional Action: PKCC contractor will be requested to backfill additional soil-rock until stability is achieved.

Next verification: The next joint site verification inspection is scheduled for 22 September 2023.

1.3.2 Site Inspection by the Environment Management Unit (EMU)

No inspection by the EMU of Bolikhamxay province and Bolikhan, Thathom, and Hom districts.

1.3.3 Site Decommissioning and Rehabilitation

During August 2023, a monthly monitoring of the rehabilitation sites was carried out at the main former camp sites (Kenber camp, Songda 5 camp no. 2, Right Tunnel camp and spoil disposal no. 6. No evidence of erosion or instability were observed at any of the inspected sites.

1.4 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/.

1.4.1 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 1.4-1***

Table 1.4-1: Status of Corrective Actions for Non-Compliances at WWTSs in August 2023

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for faecal coliform (1 out of 2 samplings) and total coliform.	In July 2023, EMO, ADM and TD conducted a monthly joint inspection of the operation and maintenance of the WWTS. The inspection results are outlined in the above section 1.2.1 1) Closely monitor the residual chlorine content and chlorination dosage adjustment for the effluents of OSOV2 and the Main Powerhouse WWTS.;
OSOV2	EF13	Non-compliance for total coliform, fecal coliform, total phosphorus, total nitrogen and ammonia-nitrogen.	
Main Powerhouse	EF19	Non-compliance for total nitrogen, ammonia-nitrogen, and total phosphorus.	

1.4.2 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 1.4-1.***

The monitoring results for key parameters (DO, TSS and BOD_5) during August 2023 are presented in ***Table 1.4-2, Table 1.4-3*** and ***Table 1.4-4.*** The full set of data for August 2023 is attached in Annex A. In addition, the DO depth profile timeseries for R05 are shown in ***Figure 1.4-2,*** and the results for DO timeseries are presented as line graphs in ***Figure 1.4-3*** and DO Long Profile graphs ***Figure 1.4-4.***

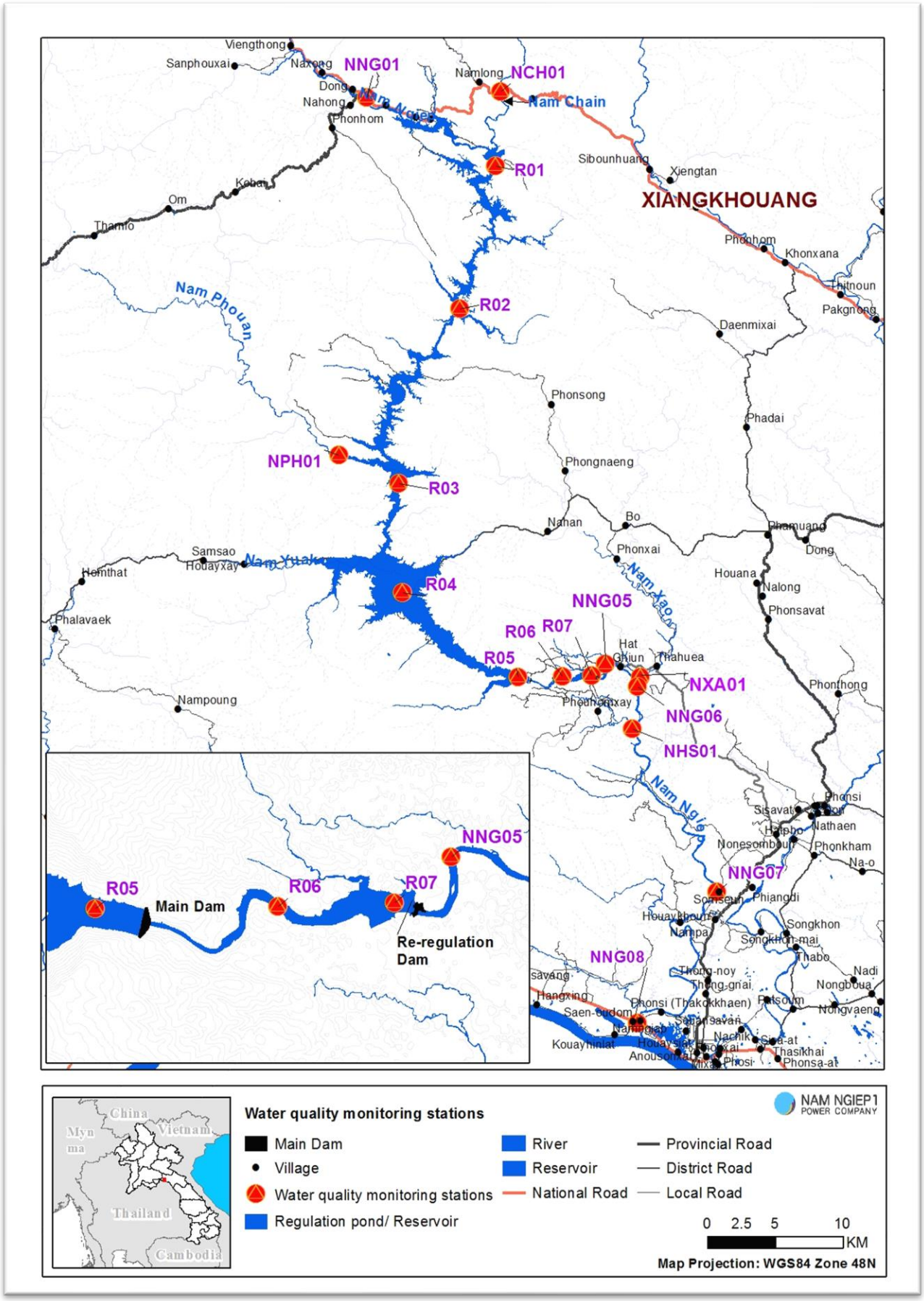

Figure 1.4-1: Surface Water and Re-regulation Reservoir Water Quality Monitoring Stations

Main Reservoir

In August 2023, the water level in the main reservoir increased from El. 298.00 m asl to El. 312.38 m asl by the end of the month.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 5.5 mg/L in the upper 6.0 m varying between 2.7 mg/L and 8.0 mg/L. Over the month the depth to the oxycline decreased from 6.0 m on 03 August 2023 to 2.0 m on 09 August 2023 and then gradually increased to 7.5 m on 30 August 2023. Anoxic conditions (less than 0.5 mg/L) were found at depths from 30 m to bottom (03 August 2023), at depth from 32 m to bottom (09 August 2023), at depth from 24 m to bottom (15 August 2023), at depths from 22 m to 34 m and 45 m to bottom (23 August 2023) and at depth from 50 m to bottom (30 August 2023). At the water intake level, DO concentrations varied between 0.10 mg/L and 5.32 mg/L.

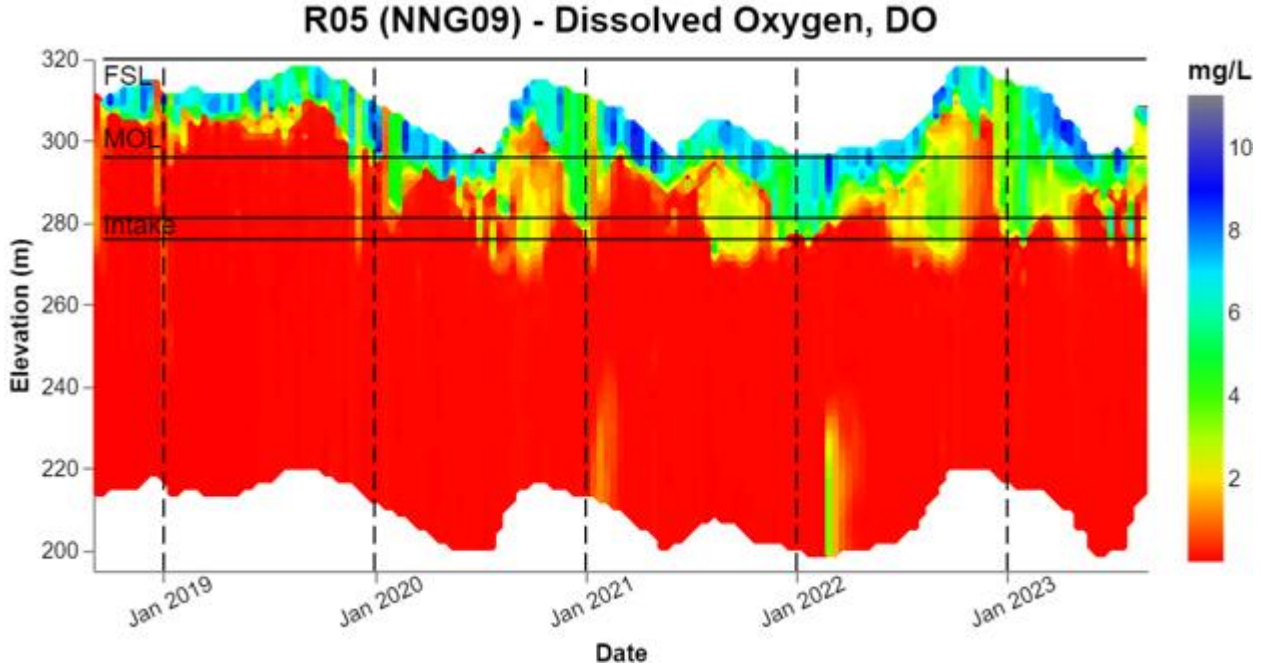

Figure 1.4-2: DO Depth Profiles Time Series in R05 (Since September 2018 to August 2023)

At R04, the average DO concentration was 7.2 mg/L in the upper 7.5 m varying between 4.2 mg/L and 8.7 mg/L. From 8.0 m to the bottom, the DO concentrations varied between 0.1 mg/L and 6.4 mg/L with an average of 2.6 mg/L. Oxyclines were found at depths between 6.5 m and 12 m. Anoxic conditions (less than 0.5 mg/L) were found at depth from 24 m to the bottom (on 03 August 2023), at depth from 38 m to bottom (on 09 August 2023), at depth from 45 m to bottom (15 August 2023) and at depths from 50 m to bottom (on 23 and 30 August 2023).

At R03, the average DO concentration was 7.7 mg/L in the upper 5.0 m varying between 5.0 mg/L and 10.0 mg/L. Oxyclines were found at depths between 5.0 m and 8.0 m. From 5.5 m to bottom, DO concentrations varied between 3.0 mg/L and 7.2 mg/L with an average of 5.1 mg/L (08 and 16 August 2023). In addition, from 5.5 m to the bottom, DO concentrations varied between 0.1 mg/L and 7.0 mg/L with an average of 4.2 mg/L (03, 22 and 29 August 2023). Anoxic conditions (less than 0.5 mg/L) were found at depths from 26 m to the bottom (03 August 2023) and at the depths 50 m to bottom (22 and 29 August 2023).

At R02, the average DO concentration in entire water column was 6.9 mg/L with variation between 2.7 mg/L and 9.4 mg/L. Oxyclines were found at depths between 1.5 m and 2.5 m (16 – 29 August 2023). No anoxic conditions were detected during the month.

At R01, the DO concentrations in entire water column varied between 7.2 mg/L and 9.7 mg/L with an average of 8.3 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, except at R01 due to the large inflow with high turbidity caused from the heavy rain.

The BOD_5 measurements in epilimnion at R01, R03, R04 and R05 were less than 1.0 mg/L and in the hypolimnion at R03, R04 and R05 were less than 1 mg/L, less than 1 mg/L and 5.9 mg/L respectively.

Re-regulation Reservoir

In August 2023, the turbine discharges from the Main Powerhouse varied between 13 and 235 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO concentrations in the water column of R06 and R07 were 2.4 mg/L and 2.3 mg/L respectively.

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

Nam Ngiep Downstream

During August 2023, the monthly downstream water quality monitoring was carried out during periods of turbine discharge from the Re-regulation Dam, and the DO concentrations were less than 6 mg/L in the downstream stations, thus not complying with the surface water quality standard, except at F (31 Km from Re-regulation Dam) and NNG08 (47.2 Km from Re-regulation Dam).

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

Similar to the previous month, the monitored parameters in the main tributaries did not comply with the standards as detailed below:

- Nam Chiane (NCH01): COD
- Nam Phouan (NPH01): faecal coliform.
- Nam Xao (NXA01): COD.
- and Nam Houaysoup (NHS01): COD.

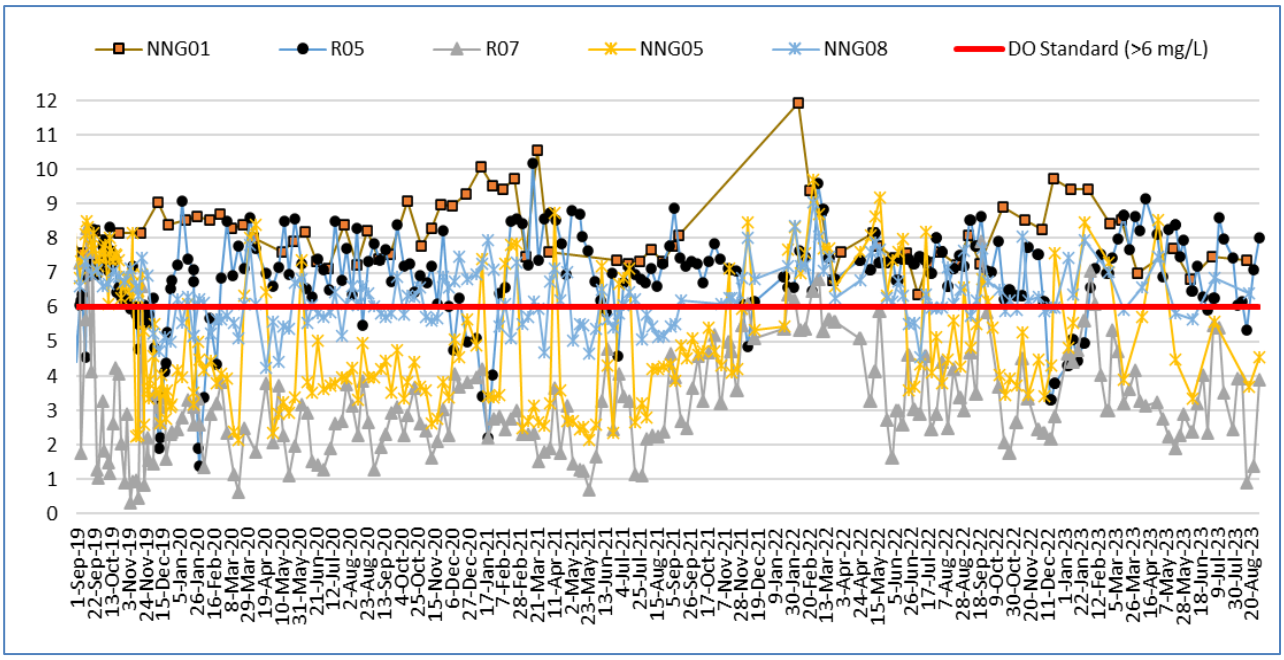

Figure 1.4-3: Concentration of Dissolved Oxygen (mg/L) in the upper 0.2 m since September 2019 to August 2023

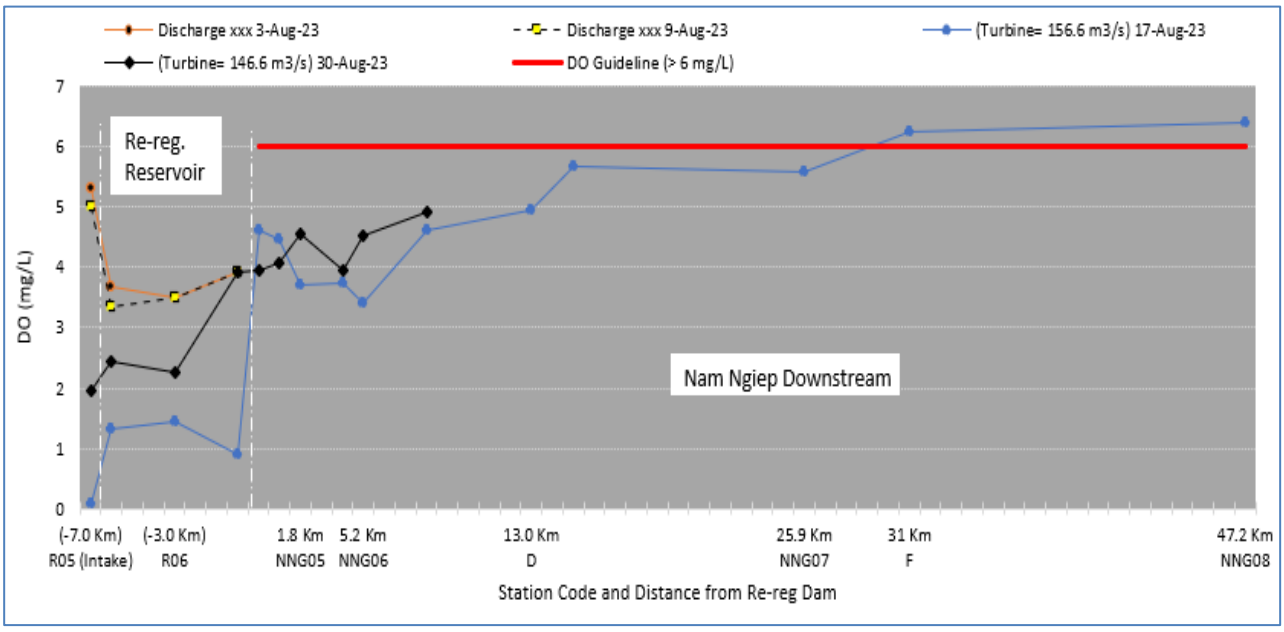

Figure 1.4-4: Dissolved Oxygen (Mg/L) Long Profile in August 2023 (from Immediately Upper Main Dam to Lower Nam Ngiep River)

Table 1.4-2: 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
3-Aug-23				7.18	6.54	6.05	3.48	3.92								
8-Aug-23		9.73	8.82	6.22												
9-Aug-23					6.84	6.17	3.5	3.93								
14-Aug-23	7.38												8.39			
15-Aug-23					8.02	5.33	1.45	0.9								
16-Aug-23		8.5	9.27	8.53										8.77		
17-Aug-23									3.69	3.4	5.57	6.4			7.9	7.56
22-Aug-23		7.53	8.42	8.39												
23-Aug-23					7.82	7.09	2.41	1.39								
29-Aug-23		8.77	8.97	9.82												
30-Aug-23					8.56	8.01	2.27	3.91	4.54	4.52					7.62	7.59

Table 1.4-3: 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
14-Aug-23	4330												52.4			
15-Aug-23					<5	<5	13.77	8.6								
15-Aug-23 Bottom					<5	<5										
16-Aug-23		773		<5										1319		
16-Aug-23 Bottom				<5												
17-Aug-23									11.5	12.3	15.4	10			17.77	6.94

Table 1.4-4: 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
14-Aug-23	<1												1.26			
15-Aug-23					<1	1	<1	<1								
15-Aug-23 Bottom																
16-Aug-23		<1		<1										<1		
16-Aug-23 Bottom																
17-Aug-23									<1	<1	<1				<1	<1

1.4.3 Groundwater Quality Monitoring

During August 2023, community groundwater quality analyses were carried out for all 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 water taps. Note that no water samples were taken from the two boreholes (GPHX01 and GPHX02) in Phouhomxay Village due to no electricity supply for the two water pumps on the sampling date.

The results indicate that:

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

The community groundwater quality monitoring results are presented in ***Table 1.4-5.***

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 1.4-5: Groundwater Quality Monitoring Results in Phouhomxay, Somsuen, Nam Pa, ThongNoy and Pou Villages

Parameter (Unit)	Site Name	Phouhomxay		Somseun Village	NamPa Village	ThongNoy Village	Pou Village	
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
	Guideline	28-Aug-23	28-Aug-23	28-Aug-23	28-Aug-23	28-Aug-23	14-Aug-23	14-Aug-23
pH	6.5 - 9.2			6.46	6.62	6.5	6.57	6.61
Sat. DO (%)				72.5	82.2	59.4	85	84.4
DO (mg/l)				5.64	6.46	4.76	6.71	6.76
Conductivity(µS/cm)				501	466	335	368	67
Temperature (°C)				28.19	27.69	27.16	27.0	26.62
Turbidity (NTU)	<20			0.56	0.42	0.78	0.31	0.96
Faecal coliform (MPN/100ml)	0			0	0	79	0	0
E.coli Bacteria (MPN/100ml)	0			0	0	22	0	0

1.4.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

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 was recorded for Phouhomxay's Water Supply.

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 ***1.4.3*** as well as recommended to carry out the operation and maintenance improvement.

Table 1.4-6: Results of the Gravity Fed Water Supply Quality Monitoring

	Site Name	**Thaheua Village**	**Hat Gnuin Village**	**Phouhomxay**	
	Station	**WTHH02**	**WHGN02**	**WPHX02**	**WPHX03**
Parameter (Unit)	**Guideline**	28-Aug-23	28-Aug-23	28-Aug-23	28-Aug-23
pH	6.5 - 8.5	6.8	6.78	6.00	5.71
Sat. DO (%)		79	78.1	78.4	72.2
DO (mg/L)		6.19	6.20	6.31	5.71
Conductivity (µS/cm)	<1,000	43	103	10	10
Temperature (°C)	<35	27.71	27.36	27.98	27.5
Turbidity (NTU)	<10	6.51	1.64	1.52	1.06
Faecal Coliform (MPN/100 mL)	0	11	22	6.8	14
E.coli Bacteria (MPN/100 mL)	0	8	14	4	4.5

1.4.5 Landfill Leachate Monitoring

During August 2023, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond - LL4) and Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that Houay Soup Landfill Leachate did not comply with the relevant standard for total and faecal coliform bacteria and NNP1 Project Landfill did not comply with the standard for total coliform. The landfill leachate monitoring results for August 2023 can be found ***Table 1.4-7***.

Table 1.4-7: Results of the Landfill Leachate Monitoring

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
11-Aug-23	pH	6.0 - 9.0				6.58		6.75	
11-Aug-23	Sat. DO (%)					123.1		110.8	
11-Aug-23	DO (mg/L)					9.19		8.37	
11-Aug-23	Conductivity (µS/cm)					71		202	
11-Aug-23	Temperature (°C)					30.65		29.91	
11-Aug-23	Turbidity (NTU)					15		8.45	
11-Aug-23	BOD_5 (mg/L)	<30				<6		<6	
11-Aug-23	COD (mg/L)	<125				32		<25	
11-Aug-23	Faecal Coliform (MPN/100mL)	<400				220		1,600	
11-Aug-23	Total Coliform (MPN/100mL)	<400				1,600		1,600	
11-Aug-23	Total Nitrogen (mg/L)	<10				0.9		2.95	
11-Aug-23	Ammonia nitrogen (mg/L)	<10				<2		2.70	
11-Aug-23	Oil & Grease (mg/L)	<10				2.5		1.3	

1.5 DISCHARGE MONITORING

1.5.1 Main Reservoir – Water Level, Inflow and Discharge

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in ***Figure 1.5-1*** and ***Figure 1.5-2*** presents the values recorded since January 2020.

During August 2023, the mean inflow to the main reservoir was 384 m^3/s. The minimum and maximum inflows were 162 m^3/s (on 162 August 2023) and 918 m^3/s (on 06 August 2023) respectively.

In August 2023, the water level in the main reservoir increased from El. 298.00 m asl to El. 312.38 m asl by the end of the month.

During August 2023, the hourly turbine discharges from the Main Powerhouse varied between 13 m^3/s and 235 m^3/s usually interrupted by night-time periods with no discharge.

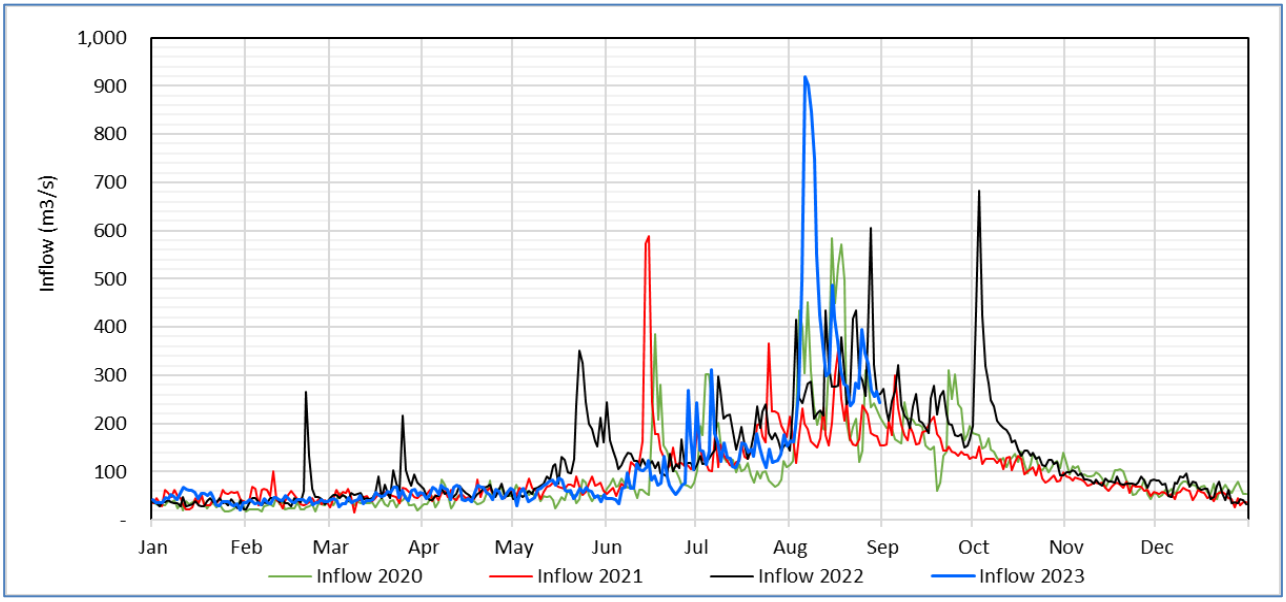

Figure 1.5-1: Inflow for the Main Reservoir during January 2020 to August 2023

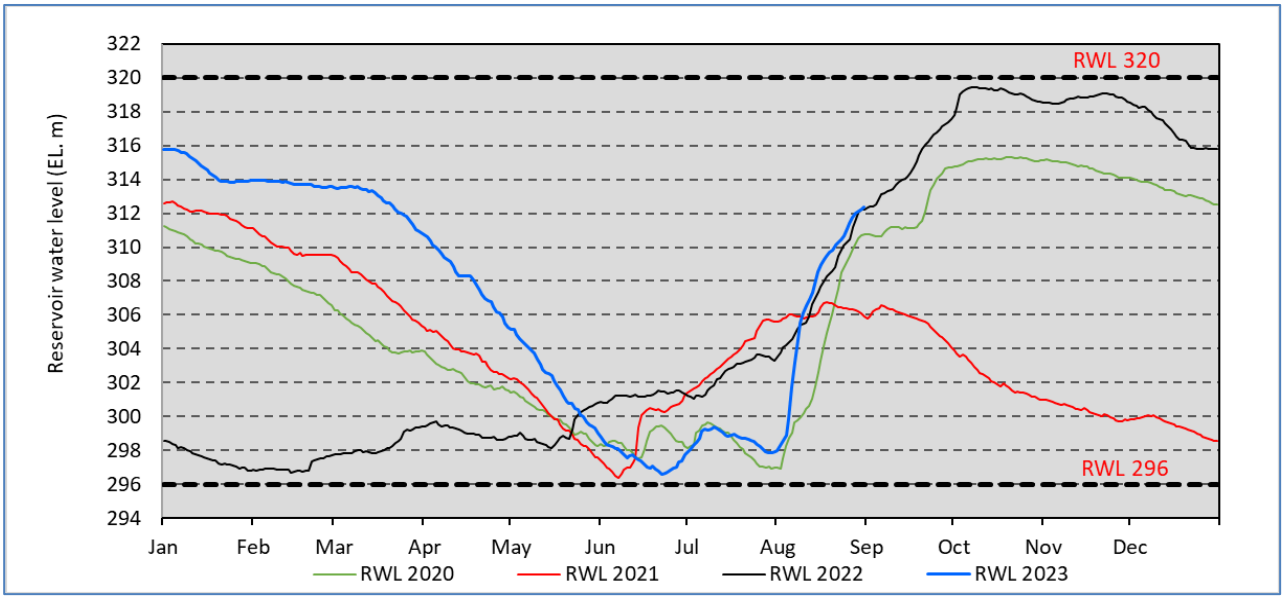

Figure 1.5-2: Water Level for the Main Reservoir during January 2020 to August 2023

1.5.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during May to August 2023 is presented in ***Figure 1.5-3***.

During August 2023, the mean daily discharge from the Re-regulation Dam was about 129 m^3/s, with hourly gate discharge varying between 27 m^3/s and 28 m^3/s, and hourly turbine discharge varying between 48 m^3/s and 163 m^3/s. The hourly combined gate, labyrinth and turbine discharges varied between 48 m^3/s and 219 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.

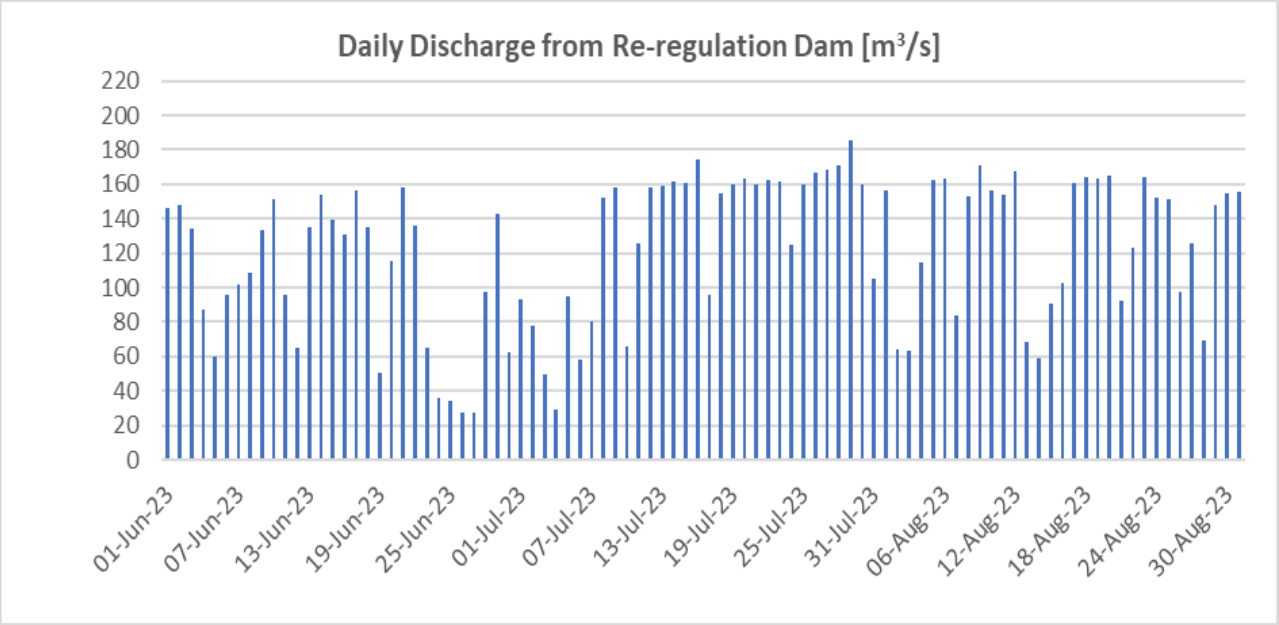

Figure 1.5-3: Discharge Monitoring at the Re-regulation Dam in June to August 2023

1.5.3 Nam Ngiep Downstream Water Depth Monitoring

In August 2023, due to the discharge from Re-regulation Dam was greater than 30 m^3/s, EMO did not carry out any boat missions to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam.

1.6 PROJECT WASTE MANAGEMENT

1.6.1 Solid Waste Management

A total of 6.8 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 0.2 m^3 compared with July 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, grass cutting and repairing of the perimeter fences. The waste compaction at NNP1 landfill is still on hold, waiting for ADM to finalize an arrangement for waste compaction.

The total amount of recyclable waste sold and collected this month is summarized in ***Table 1.6-1***.

Table 1.6-1: Amounts of Recyclable Waste Sold and collection in August 2023

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total By August 2023
1	Plastic bottles	kg	57	59
2	Aluminium can	kg	0	0
3	Paper/Cardboard	kg	0	83
4	Glass	kg	0	180
5	Scrap Metal	Kg	0	0
Total		**kg**	**57**	**322**

In August 2023, the villagers from Phouhomxay Village collected a total of 310.2 kg of food waste from the OSOV1 canteen for feeding their animals.

1.6.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in August 2023 are shown in ***Table 1.6-2*** and ***Table 1.6-3*** respectively.

Table 1.6-2: Record of Hazardous Material Inventory in August 2023

No.	Type of Hazardous Material	Unit	Total in August 2023 (A)	Used (B)	Remaining at the end of August 2023 (A – B)
1	Diesel	Litre	430	0	430
2	Gasoline	Litre	631	530	101
3	Lubricant (Turbine oil)	Litre	72	0	72
4	Colour Paint	Litre	39	0	39
5	Thinner	Litre	1	0	1
6	Grease Oil	Litre	785	0	785
7	Gear Oil	Litre	16,5	0	16,5
8	Chlorine Liquid	Litre	90	0	90
09	HA Cut AF	Litre	3,925	0	3,925.0
10	HA Cut Cat AF	Litre	372.5	0	372.5

Table 1.6-3: Record of Hazardous Waste Inventory

No.	Hazardous Waste Type	Unit	Total in August 2023 (A)	Disposed (B)	Remaining at the end of August 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	1.2	0	**1.2**
4	Used tyre	Drum	5	0	**5**
5	Empty used chemical drum/container (drum 20L)	Unit	23	0	**23**
6	Lead acid batteries	Unit	6	0	**6**
7	Empty paint and spray cans	Unit	65	0	**65**
8	Halogen/fluorescent bulbs	kg	414	0	**414**
9	Empty cartridge (Ink)	Unit	108	0	**108**
10	Clinic Waste	Kg	4.2	0	**4.2**
11	Expired Chlorine Powder	Kg	65	0	**65**

1.7 COMMUNITY WASTE MANAGEMENT

1.7.1 Community Solid Waste Management and Recycling Programmes

NNP1 EMO is waiting for the EMU to initiate discussions on the transfer of the management of the communities' solid waste and Houay Soup Landfill to the local authorities.

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 upon during the meeting with the Head of Xaysomboun Province Agriculture and Forestry Office (PAFO) on 26 April 2023 are summarized below:

- The Xaysomboun PAFO agreed to provide updates about the mining exploration and Nam Phouan Hydropower Project development in the NNP1 watershed Totally Protected Zone (TPZ) 15 working days after the meeting. NNP1 EMO met with the Head of Hom District Energy and Mine Office (DEMO) on 1 August 2023. He informed NNP1 EMO that the MOU for the first phase

of the mining company, Boualay Mangkone Thong, was expired, and the extension for the second phase is being processed at the Provincial level. Hom DEMO received the draft MOU extension from the Xaysomboun Province Planning and Investment Office (PPIO) in July 2023. He noted that the province is considering a 1-year extension, but he is unsure about the decision from the Xaysomboun Provincial management. He also informed NNP1 EMO that the Company did not cooperate with the Hom District Level until now, particularly with the progress report and the detailed activity plan. However, Hom DEMO agreed with the MOU extension, but the company shall report the progress and collaborate with the district level. He also informed NNP1 EMO on the possibility of the Nam Phouan HEP construction even though DEMO does not have detailed documents. He noted that Nam Phouan HEP Company had collected soil or rock samples and crest dam data. The Company has stopped surveying and drilling in the rainy season, and they will return to continue drilling and surveying the reservoir area after the rainy season. NNP1 EMO also met with the Xaysomboun Provincial Department of Energy and Mines (PDEM) representative on 3 August 2023. The staff clarified to NNP1 EMO that the continuation of mining exploration by Boualay Mangkone Thong Company is subject to the review and consideration of the MOU extension by the Xaysomboun Provincial management. The staff also explained that the Prime Minister's Office (PMO) issued a suspension notification for Nam Phouan HEP in the last quarter of 2022 because the owner of the Project did not follow the obligation or requirement to further negotiate the Concession Agreement (CA), particularly on the detailed Feasibility Study, Environmental and Social Management Plan, funding sources, and the power purchase plan.

- The Xaysomboun PAFO agreed to update the NNP1 EMO team 15 working days after the meeting about the Fishery Co-Management Plan (FCMP). Xaysomboun WRPO did not share the detailed meeting agenda with NNP1 EMO and organized the meeting with Thathom and Hom District on 22 and 29 August 2023, respectively. NNP1 EMO was not invited to the meeting at Thathom District. EMO noted that Xaysomboun WRPO did not discuss with Thathom District the organizations' roles and responsibilities of the FCMP and review the draft FCMP and fishery regulation for approval. Instead, they discussed developing new fishery regulations. NNP1 EMO was invited to the meeting in the Hom District. NNP1 EMO noted that the head of XSB PAFO, XSB WRPO, Thathom DAFO, and Hom DAFO proposed to adapt fishery management regulations of Nam Ngum 2 for the NNP1 fishery management. NNP1 EMO recommended to review the existing draft fishery management regulations instead to ensure the alignment with NNP1 WMP, draft FCMP, and the MOM on 21 May 2020. XSB WRPO confirmed that they will review the fishery management regulations and will share it to the NNP1 EMO prior further approval process. XSB WRPO is preparing the minutes of meetings with both Thathom and Hom districts held on 22 and 29 Aug 2023 respectively and will share the minutes with NNP1 EMO.
- NNP1 EMO, Xaysomboun WRPO, and BSP-WCS discussed on 8 August 2023 the schedule, target patrolling area, and the arrangement of the patrol teams comprised of 4 TPZ, 2 Forest, and 1 reservoir team. The patrol will focus on NNP1 TPZ1, the northern part of the watershed forest within Hatsamkhone, Phiengta, Nahong and Phonhom village, and reservoir zone 3 (TPZ area). NNP1 EMO noted that Xaysomboun did not review and take further action the team re-establishment as discussed during the meeting on 26 April 2023 to involve the district military personnel in the patrolling activities. This contributes to the ineffective implementation of patrolling efforts to address the alarming threats in the NNP1 watershed and TPZ, as reported by ADB and IAP during their May 2023 mission. Xaysomboun WRPO and BSP-WCS discussed further on 15 August 2023 the preparation for patrolling, focusing on using field equipment and data recording. Xaysomboun WRPO proposed that the TPZ patrolling be conducted only for 13

days in August 2023 because the rain caused difficulties and challenges in accessing the target area, and most of the team members have less experience in patrolling and doing the fieldwork in the forest. BSP-WCS agreed with the proposal, and it will be evaluated at the next monthly meeting. Three patrol teams started patrolling on 22 August 2023, and another three patrol teams started on 26 August 2023. NNP1 EMO and BSP-WCS will follow up with Xaysomboun WRPO and discuss the results during the monthly meeting.

- The Head of Xaysomboun WRPO shared the budget plan to fix the Xaysomboun WRPO sub-office on 21 August 2022. NNP1 EMO reviewed the plan and communicated it with Xaysomboun WRPO for improvement on 22 August 2023. NNP1 EMO also requested Xaysomboun WRPO to issue the official assignment for the staff to be based in the sub-office in September 2023 as a condition to fix the sub-office and its operation.
- The Head of Xaysomboun WRPO informed NNP1 EMO that he could not contact the Contractor to construct two reservoir check points that were supposed to start in August 2023. NNP1 EMO continues to follow up with the Head of Xaysomboun WRPO, but as of the end of August 2023, the construction had not started.

Xaysomboun WRPO also shared the financial summary of the AIP fund utilization until the end of July 2023. NNP1 EMO requested some clarification on the expenditures that appeared not to be in line with the approved AIP and which had not been discussed with NNP1 EMO. NNP1 EMO also recommended to comply with the approved NNP1 Financial Management Manual (FMM) to improve the financial practice.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO will resume patrolling and implement other activities during the remaining months of 2023 after receiving the second two quarters funds of AIP 2023 from FPF DOF-MAF. Please refer to section 2.1.3.2 on the fund disbursement of Bolikhamxay AIP2023. Bolikhamxay WRPO shared the financial summary of the AIP fund utilization until the end of June 2023. NNP1 EMO requested some clarification on the expenditures that appeared not to be in line with the approved AIP and which had not been discussed with NNP1 EMO. NNP1 EMO also recommended to comply with the approved NNP1 FMM to improve the financial practice.

2.1.1.3 NNP1PC EMO

NNP1 EMO discussed with the Hom District Agriculture and Forestry Office (DAFO) on 21 August 2023 on the work plans for the farmer groups in PhouNgou and Houayxay Village under the 5 years action plan for strengthening capacity of local producers and market linkages of Hom District. The key discussion points are summarized as follow:

- Hom DAFO shall replace the production group license issued by the Hom District Governor in 2021 referring to the revised policy of MAF on the role and responsibility of the production group.
- Hom DAFO confirmed that the official letter to replace the existing license will be issued after completing the development of production group regulations.
- Hom DAFO agreed to prepare a work plan and budget for the establishment of the production group at Ban Phou Ngou and Houayxai.
- After the head of Hom DAFO approves the regulation, the meeting on the dissemination of production group regulation at the village level shall be organized.
- Hom DAFO requested technical support from NNP1 EMO to record the total area of pineapple and orange plantation of the production groups.

NNP1 EMO is reviewing the working plan and proposed budget that was submitted by Hom DAFO on 23 Aug 2023 and the activities is expected to start in September 2023.

NNP1 EMO also discussed with Thathom DAFO on 31 August 2023 on the work plan for the agriculture extension service in Phonhom and Nahong Village that the activity was scheduled in mid to late September 2023.

The key discussion points are summarized as follow:

- Thathom DAFO and NNP1 EMO agreed to continue the greenhouse vegetable activity at Ban Phonhom and the activity at Ban Nahong will be considered in 2024.
- Thathom DAFO agreed with the NNP1 EMO recommendation that their request for the office supplies and vehicle for implementing Activity 6.1 and 6.2 of the NNP1 WMP will be further discussed and included in 2024.
- Thathom DAFO agreed with NNP1 EMO that the establishment of Kai Noy Rice and Weaving groups will be discussed in 2024.
- Thathom DAFO will share the work plan to NNP1 EMO in the second week of September 2023.

In addition, NNP1 EMO distributed 23 hard copies of the approved NNP1 Financial Management Manual (FMM) to the relevant offices in Xaysomboun Province including the Xaysomboun Provincial Administration Office, Xaysomboun PAFO, Xaysomboun Provincial Nation Treasure Office, Xaysomboun Provincial Military Office, Hom DAFO, Hom Administration Office, Anouvong DAFO and Administration Office, Thathom DAFO and Administration Office at the end of August 2023. NNP1 EMO will distribute the hard copies to Bolikhamxay WRPO, Bolikhan Administration Office, and DAFO in the first week of September 2023.

The Department of Energy Business (DEB) of the Ministry of Energy and Mines (MEM) informed NNP1PC in the end of August 2023 that the planned meeting with the relevant GOL parties on the risks and challenges in achieving the No Net Loss (NNL) is expected to be organized within September 2023 because more information about the existing development projects in the NNP1 Watershed TPZ has to be discussed internally considering the information provided by the related Xaysomboun provincial offices and it also subjects to the availability of Deputy Director General (DDG) of DEB.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

The Xaysomboun WRPO informed NNP1 EMO on 3 August 2023 that they had received the funds under the approved AIP2022 from FPF DOF-MAF on 26 July 2023.

2.1.3 Preparation of Annual Implementation Plan (AIP) 2023

2.1.3.1 Xaysomboun WRPO

The draft of AIP2023 was finalized after the 8th revision by NNP1 EMO, Xaysomboun WRPO, and BSP-WCS and it was submitted to ADB and IAP for review and approval on 16 August 2023. NNP1 EMO did not receive any reply from ADB and IAP as of the end of August 2023.

2.1.3.2 Bolikhamxay WRPO

NNP1PC received the official request for the second two-quarter funds disbursement under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 from the Forest Protection Fund (FPF) of the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF) on 28 July

2023. NNP1PC transferred the funds on 17 August 2023, totalling 583,688,000 LAK, from which 163,490,000 LAK is under NNP1 NNL and 420,198,000 is under GOL CA.

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 August 2023 is described below:

a. Component 1 - Spatial Planning and Regulation

BSP-WCS is still reviewing and analyzing the information collected from Participatory Land Use Planning (PLUP). The results will be further discussed among BOMU, NNP EMO, and BSP-WCS when they are ready. The results will be presented, discussed, and agreed upon with the relevant district authorities and communities in September 2023, and the dissemination of the updated PLUP is scheduled for October 2023.

b. Component 2 – Law Enforcement

Bolikhamxay BOMU planned to conduct patrolling during 5-24 August 2023, focusing on the TPZ highest and high priority area. NNP1 EMO, BOMU, and BSP-WCS discussed and agreed to postpone the activity because of the safety aspect of accessing the area, difficulties in the logistic arrangement, and challenges in case of emergency under the continued heavy rain in Viengthong.

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

Team	Patrolling Area/distance	Observations/Actions Taken
1	TPZ highest priority area including Nam San, Houay Payang, Houay Poung (the tributary of Nam Sone) and Nam Sone downstream (15 days covering a distance of 94 Km on distance forest patrolling)	The team did not observe any threats during the patrolling.
2	TPZ highest priority area including Nam Sone, Nam Chang, Nam Chouan and Houay Poung (15 days covering a distance of 62 Km on distance forest patrolling)	The team did not observe any threats during the patrolling.
3	TPZ high priority area including Nam Ma, Nam Pang, Nam Mong and some mountain ridges (15 days covering a distance of 76 Km on distance forest patrolling)	The team observed and destroyed an old hunting camp at Nam Mong and an old fire place for fishing at Nam Pang. The team suspected local villagers/hunters made it during the period when forest patrolling had not been carried out in the area.
4	TPZ highest priority area including Nam San, some tributaries and some mountain ridges	The team observed and destroyed an old fishing camp at Nam San. The team suspected local villagers/hunters made it

Team	Patrolling Area/distance	Observations/Actions Taken
	(15 days covering a distance of 63 Km on distance forest patrolling)	during the period when forest patrolling had not been carried out in the area.

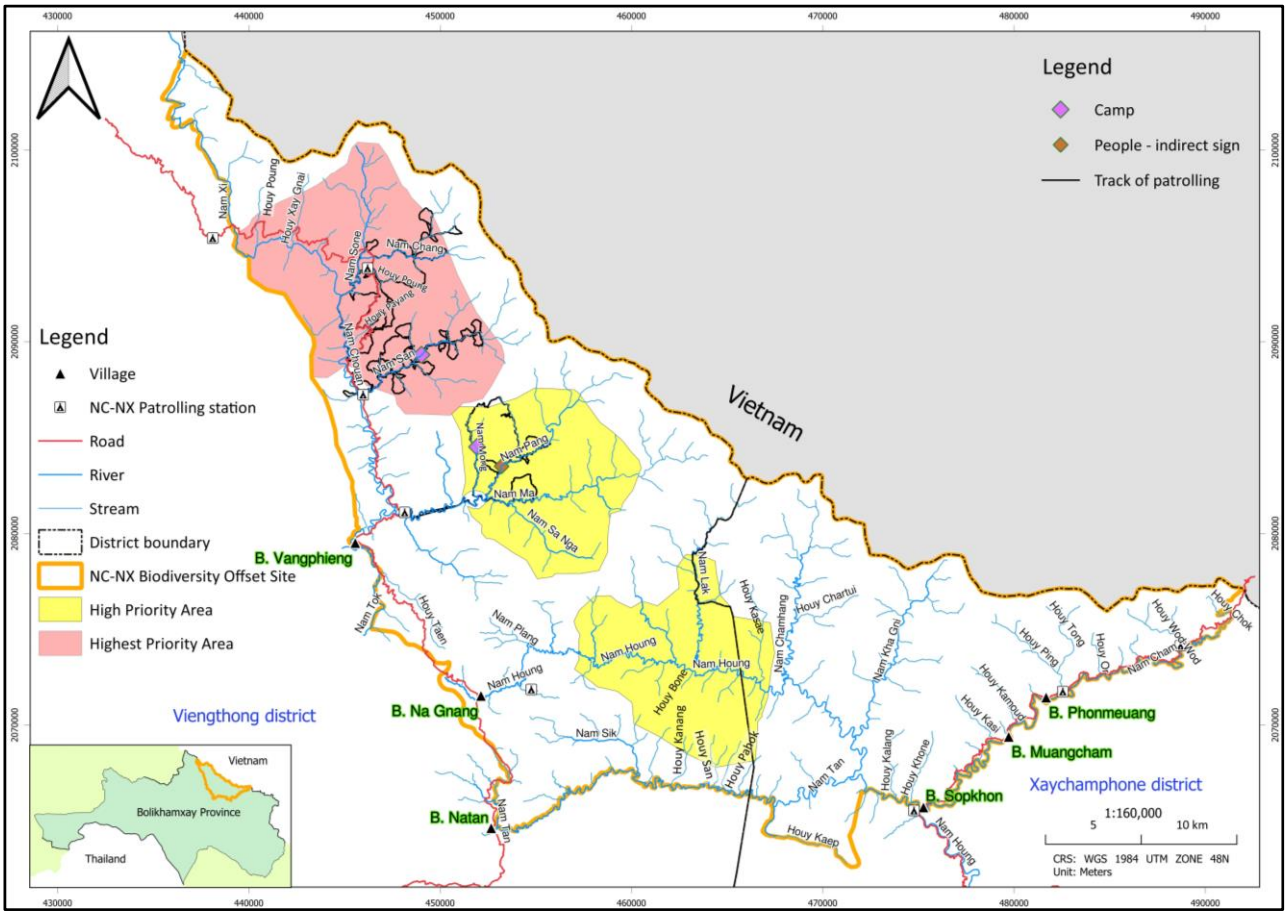

FIGURE 2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN JULY 2023

c. Component 3 – Conservation Outreach

BSP-WCS is preparing the report for the outreach activity conducted in April 2023. The outreach activities under the approved AIP2023 are scheduled from September to December 2023.

d. Component 4 – Conservation linked livelihood development

Bolikhamxay BOMU with the participation of the Livestock and Fishery Section of Bolikhamxay PAFO, relevant district offices, the NNP1 EMO, and BSP-WCS established the livestock farmer groups at Viengthong and Xaychamphone District from 26 July to 3 August 2023. BSP-WCS shared the report with NNP1 EMO and BOMU on 15 August 2023. NNP1 EMO reviewed the report on 16 August 2023 for revision, while BOMU is still reviewing the report until the end of August 2023. The report is expected to be finalized and submitted to relevant district authorities in the first week of September 2023 as the soonest for official approval by the farmer groups.

The snare removal activity was scheduled from 11 to 25 August 2023, focusing on the TPZ highest priority area. However, continued rain caused some damage to road sections and bridges from Viengthong municipality to the site. Therefore, the monthly snare removal was postponed until the road is accessible.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2023

Bolikhamxay BOMU submitted the request for the second two-quarter fund disbursement under their approved AIP2023 to FPF DOF-MAF on 18 August 2023.

The FMM books (50 hard copies) were printed and NNP1 EMO is distributing the books to relevant GOL offices.

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, covering the upstream, upper reservoir, lower reservoir, downstream and Mekong areas.

The fish species dominating the fish catch by weight in July 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, 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 July 2023

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Oreochromis niloticus	ปานิน	142.2	LC
Mastacembelus armatus, Mastacembelus favus	ปาໜາດ	95.8	LC
Hampala dispar, Hampala macrolepidota	ปาสูด	99.3	LC
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	94.9	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาຂาວຊາຍ	79.3	DD, LC

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

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

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Scaphognathops bandanensis	ปาป่ຽม/ปาอຽมไฟ	38.1	VU
Tor sinensis	ปาแดง	17	VU

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

Table 2.3-3: Main Biodiversity Indicators for July 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total number of species and groups recorded	21	30	34
Single species	17	19	22
Species groups	4	11	12
Top 15 species (% total catch weight)	97.19%	89.49%	88.10%
Proportion for species groups	6.86%	58.69%	43.77%
Diversity index (Shannon)	1.9656	2.6772	2.7476

Figure 2.3-1 shows the fish diversity index (Shannon) for above the dam, below the dam and the Mekong area from July 2015 to July 2023. Note that high values in the index (Shannon) mean high biodiversity.

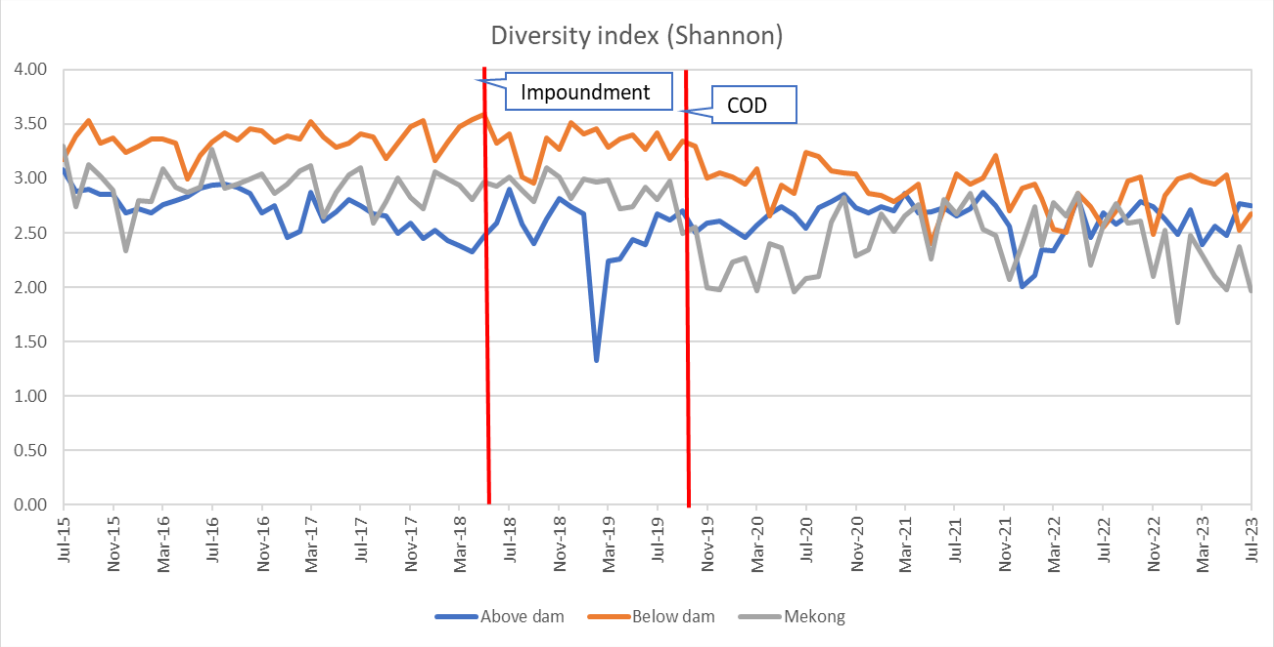

Figure 2.3-1: Fish diversity index (Shannon) by fishing zone from July 2015 to July 2023

Figure 2.3-2 shows the proportion of the 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 70% of active fishing households for all fishing zones in July 2023.

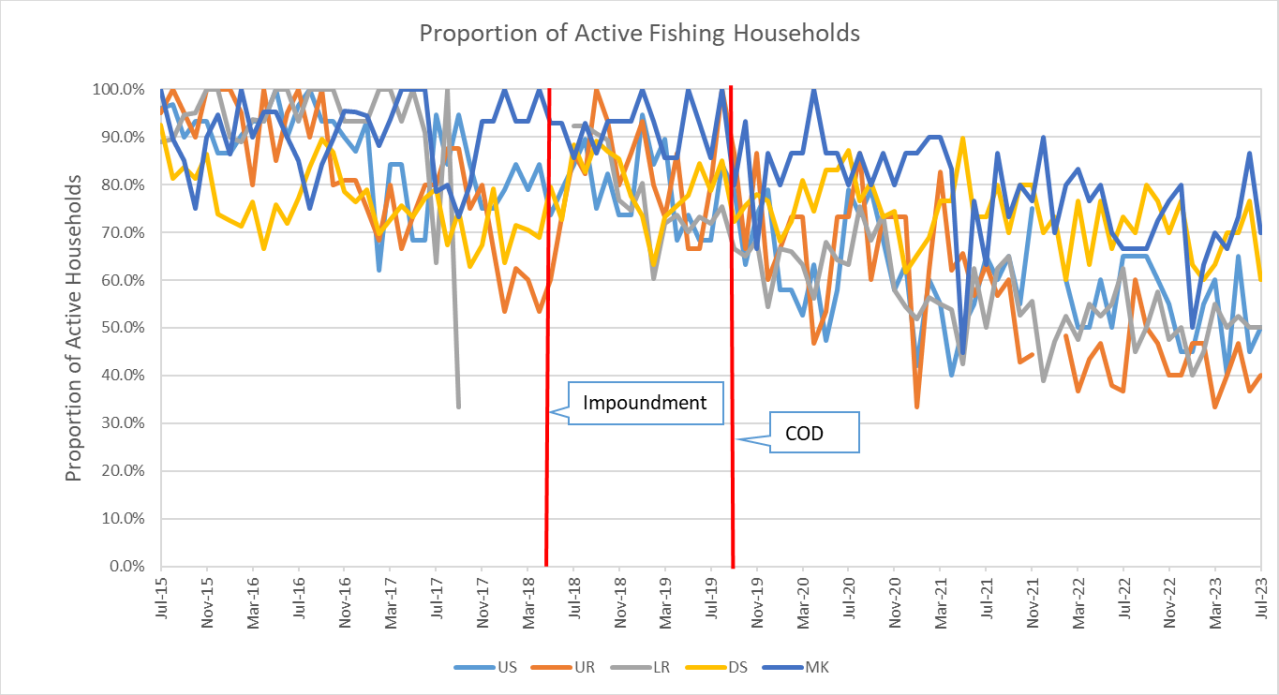

Figure 2.3-2: Proportion of total number of households actively fishing by fishing zone from July 2015 to July 2023

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

Figure 2.3-3 shows the average (mean) of monthly household fishing days from July 2015 to July 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

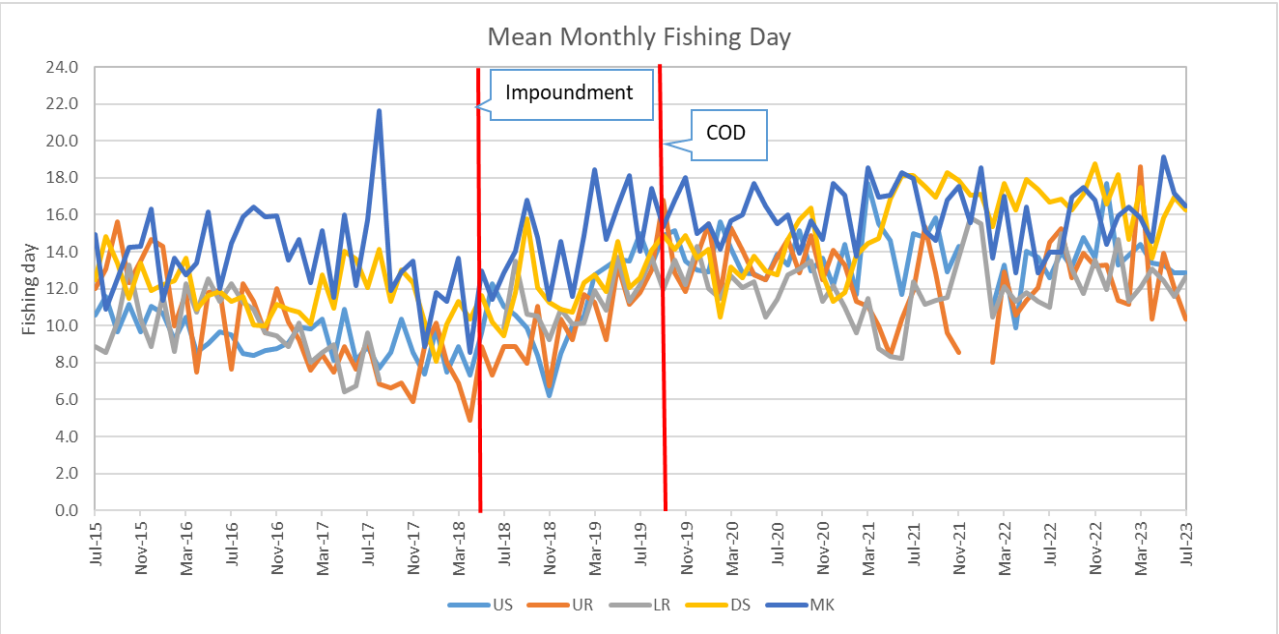

Figure 2.3-3: Mean of monthly fishing day from July 2015 to July 2023

The mean monthly number of fishing days for the month of July from 2015 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 July from 2015 to 2023

Fishing Zone	July 2015 (day)	July 2016 (day)	July 2017 (day)	July 2018 (day)	July 2019 (day)	July 2020 (day)	July 2021 (day)	July 2022 (day)	July 2023 (day)
Upstream	10.56	9.52	8.86	11.07	14.99	13.88	14.99	12.60	12.84
Upper reservoir	11.98	7.65	9.26	8.86	11.81	13.69	11.89	14.49	10.33
Lower reservoir	8.86	12.26	9.60	9.88	12.21	11.44	12.40	10.98	12.62
Downstream	12.50	11.29	12.05	9.46	12.57	12.75	18.12	16.71	16.24
Mekong	14.95	14.47	15.75	12.84	14.02	15.50	17.95	13.95	16.45

The mean monthly household fish catch from July 2015 to July 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 2.3-4.***

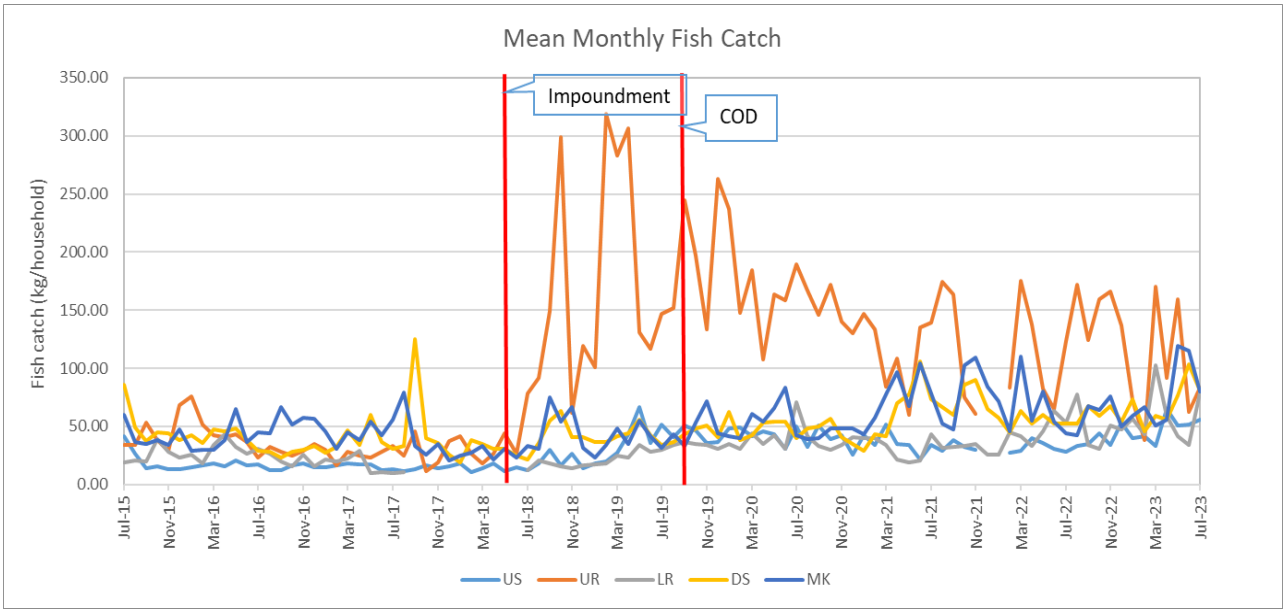

Figure 2.3-4: Mean Monthly Household Fish Catch from July 2015 to July 2023

The mean household fish catch for the month of July from 2015 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 July from 2015 to 2023

Fishing Zone	July 2015 (kg)	July 2016 (kg)	July 2017 (kg)	July 2018 (kg)	July 2019 (kg)	July 2020 (kg)	July 2021 (kg)	July 2022 (kg)	July 2023 (kg)
Upstream	41.36	17.49	12.74	12.29	51.71	49.81	33.55	27.70	55.58
Upper reservoir	33.97	22.91	33.17	78.19	146.88	189.46	139.10	123.28	83.55
Lower reservoir	19.19	31.00	9.45	12.58	30.00	70.40	42.98	53.21	78.92
Downstream	85.46	28.76	30.88	21.66	33.66	39.85	72.95	52.42	80.99
Mekong	59.95	44.96	55.36	33.39	31.85	42.11	78.15	43.89	80.20

The mean daily fish catch per household from July 2015 to July 2023 is displayed in ***Figure 2.3-5*** and the mean fish catch per household per fishing day for the month of July from 2015 to 2023 is shown in ***Table 2.3-6.***

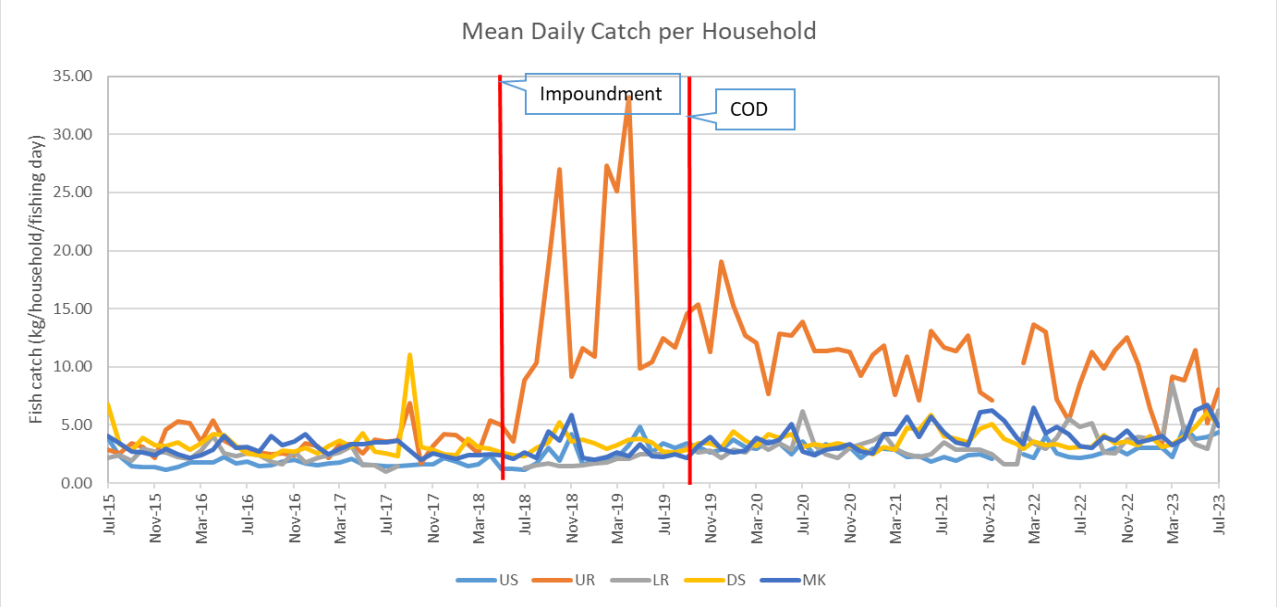

Figure 2.3-5: Mean Daily Fish Catch per Household from July 2015 to July 2023

Table 2.3-6: Mean Daily Fish Catch per Household for the month of July from 2015 to 2023

Fishing Zone	July 2015 (kg)	July 2016 (kg)	July 2017 (kg)	July 2018 (kg)	July 2019 (kg)	July 2020 (kg)	July 2021 (kg)	July 2022 (kg)	July 2023 (kg)
Upstream	3.92	1.84	1.44	1.11	3.45	3.59	2.24	2.20	4.33
Upper reservoir	2.83	2.99	3.58	8.83	12.44	13.84	11.70	8.51	8.09
Lower reservoir	2.17	2.53	0.98	1.27	2.46	6.15	3.47	4.85	6.25
Downstream	6.83	2.55	2.56	2.29	2.68	3.13	4.03	3.14	4.99

Fishing Zone	July 2015 (kg)	July 2016 (kg)	July 2017 (kg)	July 2018 (kg)	July 2019 (kg)	July 2020 (kg)	July 2021 (kg)	July 2022 (kg)	July 2023 (kg)
Mekong	4.01	3.11	3.52	2.60	2.27	2.72	4.35	3.15	4.88

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

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

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	7.1%	91.4%
Nam Ngiep	54.7%	14.3%	0.0%	64.0%	2.9%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	0.0%	78.2%	56.1%	0.0%	0.0%
Tributaries and streams	43.4%	4.5%	43.9%	28.9%	0.0%
Wetlands	1.9%	3.1%	0.0%	0.0%	5.7%
Others	0.0%	0.0%	0.0%	0.0%	0.0%

The 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 July 2023 is presented in ***Figure 2.3-6*** and the proportion of OAA catch for the month of July from 2015 to 2023 are shown in ***Table 2.3-8.***

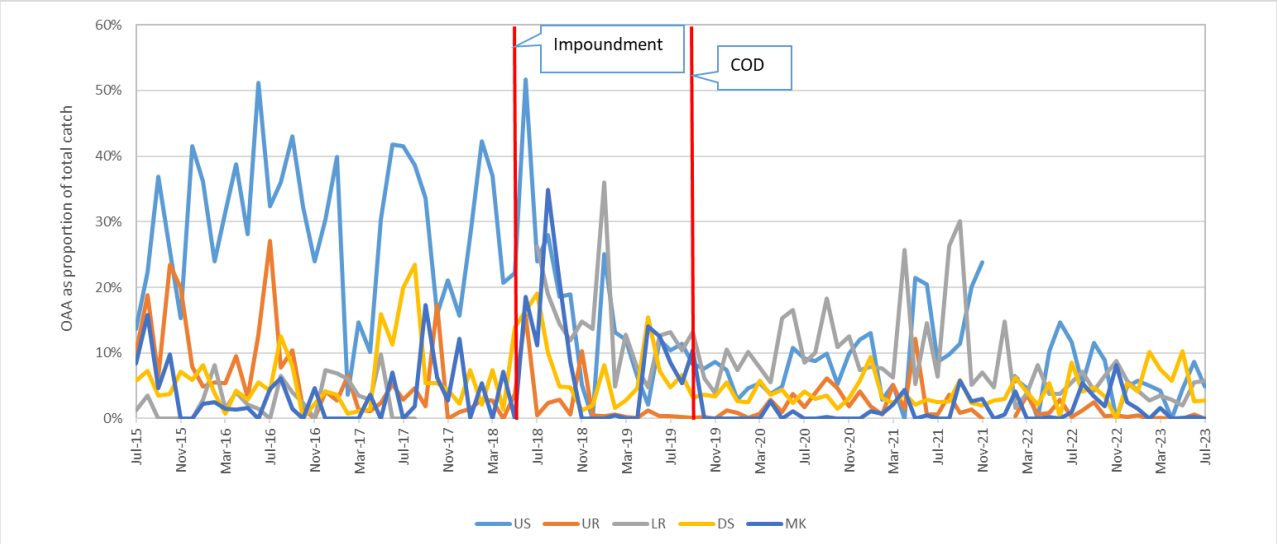

Figure 2.3-6: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone from July 2015 to July 2023

Table 2.3-8: Proportion of OAA to the total reported number of fish and OAA for the month of July from 2015 to 2023

Fishing Zone	July 2015	July 2016	July 2017	July 2018	July 2019	July 2020	July 2021	July 2022	July 2023
Upstream	13.66%	32.31%	41.47%	23.97%	10.44%	9.20%	8.63%	11.63%	4.92%
Upper reservoir	10.07%	27.05%	2.83%	0.50%	0.43%	1.73%	0.67%	0.29%	0.00%
Lower reservoir	1.27%	0.00%	0.00%	26.23%	13.14%	8.48%	6.41%	5.50%	5.81%
Downstream	5.81%	4.27%	19.90%	19.04%	4.74%	4.18%	2.50%	8.54%	2.72%
Mekong	8.38%	4.45%	0.00%	11.19%	8.48%	0.00%	0.00%	1.00%	0.00%

3 EXTERNAL MISSIONS AND VISITS

There are no external missions and visits in August 2023.

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	NXA01	NHS 01
Date	Parameters (Unit)	Guideline																
3-Aug-23	pH	5.0 - 9.0				6.68	6.62	6.51	6.75	6.9								
8-Aug-23	pH	5.0 - 9.0		6.96	6.85	6.6												
9-Aug-23	pH	5.0 - 9.0					6.52	6.59	6.74	6.83								
14-Aug-23	pH	5.0 - 9.0	6.88												6.7			
15-Aug-23	pH	5.0 - 9.0					6.6	6.69	6.65	6.82								
16-Aug-23	pH	5.0 - 9.0		6.92	6.82	6.77										7.02		
17-Aug-23	pH	5.0 - 9.0									6.65	6.74	6.9	7.05			7.11	7.06
22-Aug-23	pH	5.0 - 9.0		6.89	6.79	6.7												
23-Aug-23	pH	5.0 - 9.0					6.5	6.55	6.56	6.72								
29-Aug-23	pH	5.0 - 9.0		6.98	6.81	6.58												
30-Aug-23	pH	5.0 - 9.0					6.62	6.77	6.6	6.82	6.89	6.91					7.15	7.03
3-Aug-23	Sat. DO (%)					95.1	85.8	77.9	43.2	48.7								
8-Aug-23	Sat. DO (%)			112.6	102.9	79.4												
9-Aug-23	Sat. DO (%)						87.2	75.8	42.4	48.8								
14-Aug-23	Sat. DO (%)		87.5												100.2			
15-Aug-23	Sat. DO (%)						103.2	67.2	17.2	10.8								
16-Aug-23	Sat. DO (%)			100.1	115.9	110.2										103.3		
17-Aug-23	Sat. DO (%)										44.4	40.8	67.7	78.5			98.8	92.9
22-Aug-23	Sat. DO (%)			89.3	110.9	110.3												
23-Aug-23	Sat. DO (%)						102.3	91.3	28.6	16.9								
29-Aug-23	Sat. DO (%)			104.8	117.2	129.8												
30-Aug-23	Sat. DO (%)						111.7	102.6	27.4	48.9	49.6	55.3					97	96.2

		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	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA01	NHS 01
Date	Parameters (Unit)	Guideline																
3-Aug-23	DO (mg/L)	>6.0				7.18	6.54	6.05	3.48	3.92								
8-Aug-23	DO (mg/L)	>6.0		9.73	8.82	6.22												
9-Aug-23	DO (mg/L)	>6.0					6.84	6.17	3.5	3.93								
14-Aug-23	DO (mg/L)	>6.0	7.38												8.39			
15-Aug-23	DO (mg/L)	>6.0					8.02	5.33	1.45	0.9								
16-Aug-23	DO (mg/L)	>6.0		8.5	9.27	8.53										8.77		
17-Aug-23	DO (mg/L)	>6.0									3.69	3.4	5.57	6.4			7.9	7.56
22-Aug-23	DO (mg/L)	>6.0		7.53	8.42	8.39												
23-Aug-23	DO (mg/L)	>6.0					7.82	7.09	2.41	1.39								
29-Aug-23	DO (mg/L)	>6.0		8.77	8.97	9.82												
30-Aug-23	DO (mg/L)	>6.0					8.56	8.01	2.27	3.91	4.54	4.52					7.62	7.59
3-Aug-23	Conductivity (µs/cm)					89	79	79	74	74								
8-Aug-23	Conductivity (µs/cm)			69	64	91												
9-Aug-23	Conductivity (µs/cm)						82	83	71	71								
14-Aug-23	Conductivity (µs/cm)		76												32			
15-Aug-23	Conductivity (µs/cm)						81	82	87	84								
16-Aug-23	Conductivity (µs/cm)			75	78	81										86		
17-Aug-23	Conductivity (µs/cm)										81	82	79	65			120	20
22-Aug-23	Conductivity (µs/cm)			71	86	80												
23-Aug-23	Conductivity (µs/cm)						79	80	82	82								
29-Aug-23	Conductivity (µs/cm)			91	84	80												
30-Aug-23	Conductivity (µs/cm)						79	80	79	75	78	80					108	21
3-Aug-23	Temperature (°C)					29.8	29.55	28.61	26.46	26.56								
8-Aug-23	Temperature (°C)			22.75	23.06	27.49												
9-Aug-23	Temperature (°C)						27.73	27.99	25.15	26.28								
14-Aug-23	Temperature (°C)		23.91												24.36			

		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	NXA01	NHS 01
Date	Parameters (Unit)	Guideline																
15-Aug-23	Temperature (°C)						28.42	27.38	24.35	24.86								
16-Aug-23	Temperature (°C)			23.58	26.76	28.64										23.42		
17-Aug-23	Temperature (°C)										24.74	24.71	25.27	26.03			26.82	25.79
22-Aug-23	Temperature (°C)			23.9	29.52	29.69												
23-Aug-23	Temperature (°C)						29.38	28.43	24.49	24.84								
29-Aug-23	Temperature (°C)			24.52	28.69	29.7												
30-Aug-23	Temperature (°C)						29.23	28.17	24.61	27.11	25.3	25.56					27.78	27.58
3-Aug-23	Turbidity (NTU)					1.58	1.69	1.44	3.38	3.28								
8-Aug-23	Turbidity (NTU)			679	442	4.95												
9-Aug-23	Turbidity (NTU)						4.91	3.02	5.52	7.58								
14-Aug-23	Turbidity (NTU)		5790												84.5			
15-Aug-23	Turbidity (NTU)						1.67	1.98	26.1	27.4								
16-Aug-23	Turbidity (NTU)			1600	9.74	1.6										1540		
17-Aug-23	Turbidity (NTU)										25.3	26.3	22.5	19.6			20	5.85
22-Aug-23	Turbidity (NTU)			316	4.8	1.39												
23-Aug-23	Turbidity (NTU)						1.55	1.06	27.4	23.2								
29-Aug-23	Turbidity (NTU)			55.9	3.15	1.78												
30-Aug-23	Turbidity (NTU)						1.27	0.85	19.9	18.5	18.5	22.5					46	5.21
14-Aug-23	TSS (mg/L)		4330												52.4			
15-Aug-23	TSS (mg/L)						<5	<5	13.77	8.6								
16-Aug-23	TSS (mg/L)			773.3		<5										1319		
17-Aug-23	TSS (mg/L)										11.53	12.37	15.4	10			17.77	6.94
14-Aug-23	BOD_5 (mg/L)	<1.5	<1												1.26			
15-Aug-23	BOD_5 (mg/L)	<1.5					<1	1	<1	<1								
16-Aug-23	BOD_5 (mg/L)	<1.5		<1		<1										<1		
17-Aug-23	BOD_5 (mg/L)	<1.5									<1	<1	<1				<1	<1

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA01	NHS 01
Date	Parameters (Unit)	Guideline																
15-Aug-23	COD (mg/L)	<5.0							9.6	16								
17-Aug-23	COD (mg/L)	<5.0									6.4	<5	9.6	16			16	22.4
14-Aug-23	Faecal coliform (MPN/100 mL)	<1,000	1,600												540			
16-Aug-23	Faecal coliform (MPN/100 mL)	<1,000														1,600		
17-Aug-23	Faecal coliform (MPN/100 mL)	<1,000									2	7	5	7			23	130
14-Aug-23	Total Coliform (MPN/100 mL)	<5,000	1,600												540			
16-Aug-23	Total Coliform (MPN/100 mL)	<5,000														1,600		
17-Aug-23	Total Coliform (MPN/100 mL)	<5,000									140	540	1,600	540			1,600	1,600
15-Aug-23	TOC (mg/L)								1.8	1.58								
17-Aug-23	TOC (mg/L)										1.63	1.51	1.63	1.64			1.65	3.1
15-Aug-23	Turbidity (NTU)-bottom						1.67	1.98										
16-Aug-23	Turbidity (NTU)-bottom					1.6												
15-Aug-23	BOD_5 (mg/L)-bottom						<1	5.92										
16-Aug-23	BOD_5 (mg/L)-bottom					<1												

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

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	11-Aug-23	24-Aug-23	11-Aug-23	24-Aug-23	11-Aug-23	24-Aug-23
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	6.55	6.66	6.99	6.73	7.11	6.92
Sat. DO (%)		56.2	28.1	37.1	64	66.9	40.8
DO (mg/L)		4.47	2.22	2.89	4.96	5.43	3.14
Conductivity (µs/cm)		343	380	522	561	1,268	1,500
Temperature (°C)		26.84	27.41	28.41	28.55	28.86	28.89
Turbidity (NTU)		2.18	1.09	6.93	7.72	25.1	15.5
TSS (mg/L)	<50	<5	<5	10.36	7.8	19.8	27.1
BOD_5 (mg/L)	<30	<6	<6	7.11	<6	<6	<6
COD (mg/L)	<125	<25	<25	27	34	39	45
NH_3-N (mg/L)	<10.0	2.1	<1.5	14.2	23.0	22.7	16.3
Total Nitrogen (mg/L)	<10.0	2.5	4.9	15.1	24.7	23.7	19.4
Total Phosphorus (mg/L)	<2	1.1	1.4	1.2	2.1	6.2	5.7
Oil & Grease (mg/L)	<10.0	<1		<1		<1	
Total coliform (MPN/100 mL)	<400	9,200	1,600	16,000	5,400	0	0
Faecal Coliform (MPN/100 mL)	<400	1,100	94	16,000	2,400	0	0
Residual Chlorine (mg/L)	<1.0			0.04	0.06	1.08	1.59