NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

September 2020

					
					
A	21 October 2020	Hendra WINASTU Khamsone SAYSOMPHOU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BBS	Biodiversity Baseline Survey
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
CA	Concession Agreement between the NNP1PC and GOL,
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
CTA	Common Terms Agreement
DEB	Department of Energy Business, MEM
DEPP	Department of Energy Policy and Planning, MEM
DEQP	Department of Environment and Quality Promotion, MONRE
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
DLA	Department of Land Administration, MONRE
DSRP	Dam Safety Review Panel
EC	Electrolytic Conductivity
ECOCD	EGAT Construction Obligation Commencement Date
EDL	Electricite du Laos
EDL PPA	Power Purchase Agreement between NNP1PC and EDL
EGAT	Electricity Generating Authority of Thailand
EGATi	EGAT International Company Limited
EIA	Environmental Impact Assessment
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ERIC	Environmental Research Institute Chulalongkhorn University

ERM	Environmental Resource Management
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
FY	Fiscal Year
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HH	Household
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
km	kilometre
kV	kilo-Volt
LEPTS	Lao Electric Power Technical Standard
LHSE	Lao Holding State Enterprise
LTA	Lender's Technical Advisor
M	million
m	metre
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOF	Ministry of Finance, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NBCA	National Biodiversity Conservation Area
NCI	Non-Compliance Issue
NCR	Non-Compliance Report
NN2	Nam Ngum 2 Power Company Limited
NNP1PC	Nam Ngiep 1 Power Company Limited
NPF	National Protection Forest
NTFP	Non-Timber Forest Products
NT2	Nam Theun 2 Hydropower Project

OC	Obayashi Corporation
ONC	Observation of Non-Compliance
PAFO	Provincial Department of Agriculture and Forestry
PAP	Project Affected People
PD	Property Damage
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PPA	Provincial Protection Area
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SLBMP	Salvage Logging Biomass Management Plan
SOP	Standard Operating Procedure
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TD	Technical Division of NNP1PC
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
UXO	Unexploded Ordinance
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Waste Water Treatment System

EXECUTIVE SUMMARY

In September 2020, NNP1PC invited the interested bidders to complete the bidding process for the Service of the ISO Training and Certification Audit to achieve the ISO14001:2015. The bidding, evaluation/selection and contract signing with the selected service provider is expected to be completed by the end of Oct 2020 and the online trainings for four ISO14001:2015 subjects (Requirement and Interpretation of ISO14001:2015, Organization Context and Risk Management for ISO14001, Documentation Information, and Internal Audit) are to be provided to relevant staff during Q4 2020 to Q1 2021.

During the month, the Environmental Management Office (EMO) of Nam Ngiep 1 Power Company (NNP1PC) received one Environmental and Social Checklist for review and approval.

Monitoring of vegetation cover at previous construction sites in September 2020 indicates that the revegetation cover has increased at 21 out of 23 sites compared with the previous months.

During September 2020, EMO continued monitoring the Wastewater Treatment Systems (WWTSs) efficiency in OSOV1, OSOV2, Main Dam and Re-Regulation Dam and also discussed with the Consultant via VDO conference to conclude the modification and/or replacement options for NNP1PC management's consideration by early October 2020. Based on the existing treatment efficiency of those four WWTSs, the Consultant recommended NNP1PC to maintain the WWTSs in OSOV1 and the Re-regulation Dam, for OSOV2 he recommended either to install a Sequencing Batching Reactor System or to construct 2 new wetland ponds, and finally he recommended to improve the operation of the WWTS in the Main Dam by adjusting the wastewater pumping and switching to the automatic chlorination.

During the month, Dissolved Oxygen (DO) levels at the surface of the main reservoir (R01, R02, R03, R04 and R05) were generally between 6 and 8 mg/L. In the re-regulation reservoir (R06 and R07), the DO levels were below 4 mg/L.

The discharge from the re-regulation dam mainly went through the turbine and occasionally went through both the turbine and the gate. The DO levels were generally less than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and thus were non-compliant with the GoL Standard. No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is in the process of collecting information to assist in the development of measures to improve the DO levels downstream.

A total of 18.7 m3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 0.9 m3 compared in August 2020 and 17.1 m3 of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at the Houay Soup Landfill. There was no trading of recyclable waste in the community waste bank, and the total amount of recyclable waste in the bank remains at 3,192 kg as recorded in August 2020.

Bolilkhamxay Provincial WRPO distributed more than 200 booklets of the Agreement on Bolikhamxay Provincial Regulation for Forest Resource and Biodiversity Protection in the NNP1 Watershed within Bolikhamxay administrative area in the second and third week of September 2020. The training on patrolling and SMART basic user for the ranger teams and the SMART/GIS officers of Xaysomboun and Bolikhamxay WRPO was organized between 14-30 September 2020.

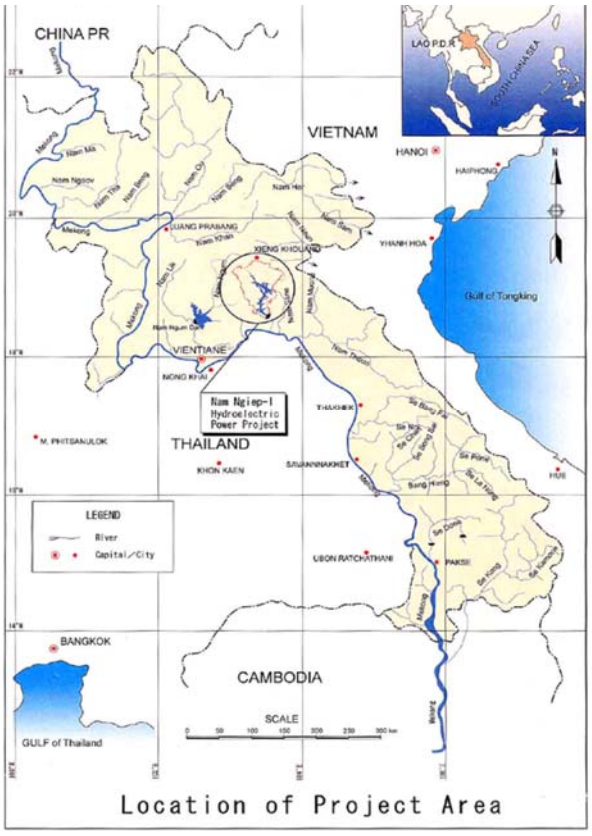
Biodiversity offset related activities under the components of law enforcement and conservation linked livelihood continued in September 2020.

The fish catch monitoring for August 2020 in Nam Ngiep watershed was dominated by Channa striata and Clarias batrachus and species groups of Hampala, Mastacembelus and Poropuntius and that are classified as Least Concern (LC) according to the IUCN Red List.

1. INTRODUCTION

The Nam Ngiep originates in the mountains of Xieng Khouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhan District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province (Fig. 1-1).

FIGURE 1-1: LOCATION MAP



The project will consist of two dams. The main dam which is located 9.0 km upstream of Hat Gnuin Village in Bolikhan District, will create a 70-km-long, narrow reservoir that extends up the Ngiep Valley as far as Thathom District. At almost 150 m high, the main dam will be the second largest in Lao PDR. The Power Station at this dam will generate up to 272 MW of electricity for export to Thailand. With a combined capacity of 290 MW, Nam Ngiep 1 will generate around 1,620 GWh of electricity annually. Two transmission lines will be required to transport the electricity generated by the project. From the main power station, a 230-kV line will run for 125 km to the Nabong outside Vientiane Capital. A 115-kV transmission line will be constructed by EDL from the Re-regulation Power Station to Pakxan substation over a distance of 40 km.

This Environmental Monthly Monitoring Report (EMMR) provides a summary of environmental monitoring activities and mitigation actions in January 2017. The EMMR was prepared by the Project's Environmental Management Office (EMO). It has been internally reviewed and cleared by EMO senior technical staff and management prior to submitting the report to the Government of Lao PDR (GoL) related agencies.

The EMMR and other related reports including related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are publicly disclosed on the Project website in line with the ADB and GoL Public Disclosure Policies. Hard copies of the final reports will also be available upon requests at the Project's main office in Vientiane Capital and field office in Pakxan, Bolikhamxay Province.

2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

Construction works for the Project have been carried out through four separate main construction contracts under the supervision of the Technical Division of NNP1PC. The four contracts are the Civil Works, the Electrical and Mechanical Works, the Hydraulic Metal or Hydro-Mechanical Works and the 230 kV Transmission Line Works. Each Contract is in its Defects Notification Period all ending variously in 2020 or 2021 following the issue of Taking-over Certificates in 2018 and 2019.

2.1 OPERATION AND POWER GENERATION

2.1.1 Power Production

2.1.1.1 Main Power Station

Figure 2.1 and ***Figure 2.2*** shows the generation data at the main power station in September 2020. The generation was higher than the previous month.

FIGURE 2-1: UNIT GENERATED ENERGY (MAIN POWER STATION)

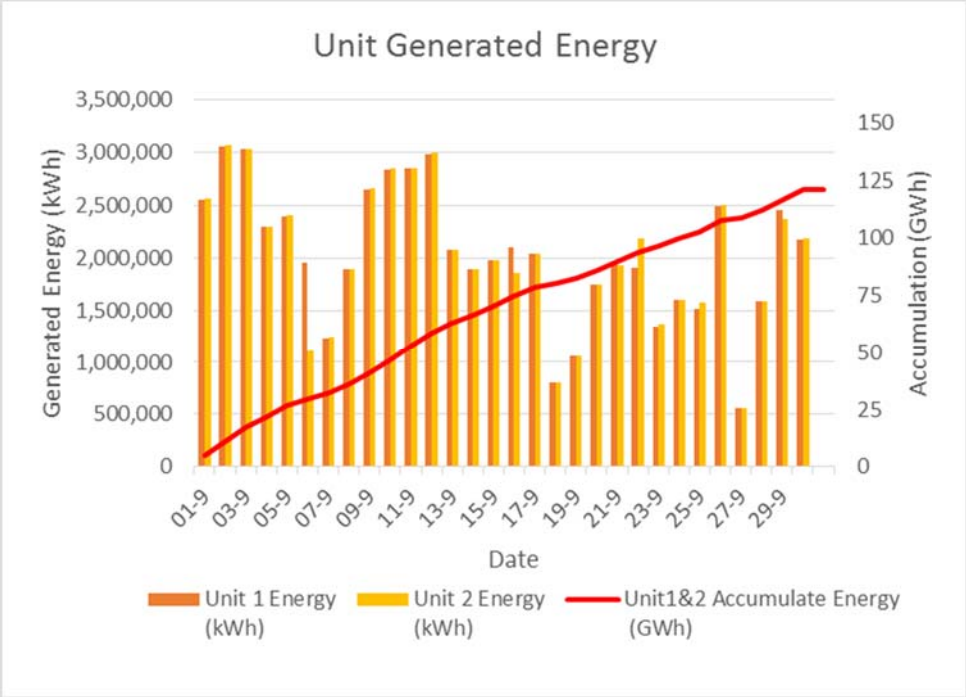


FIGURE 2-2: UNIT OPERATION HOURS (MAIN POWER STATION)

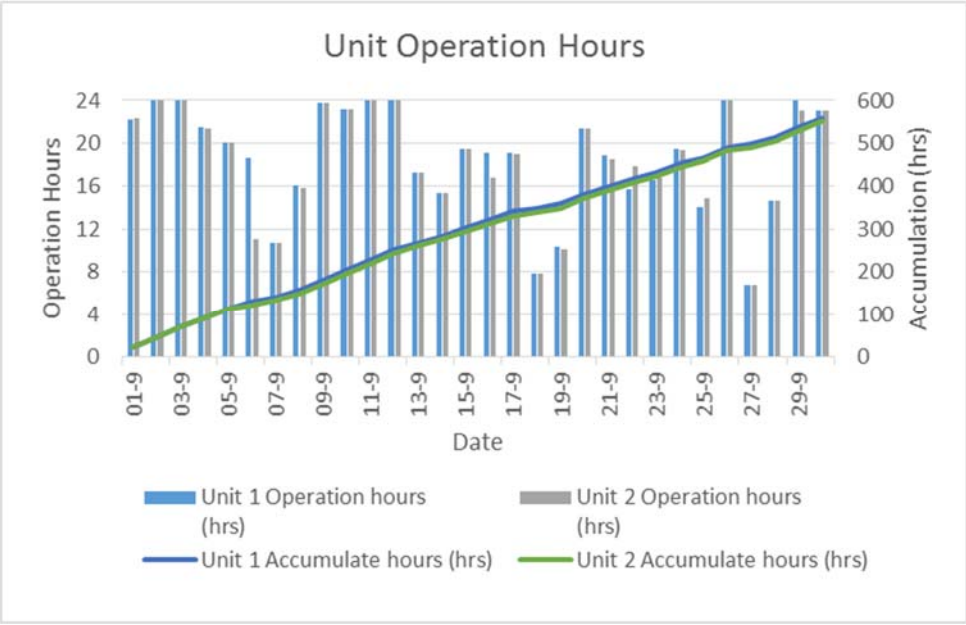


TABLE 2-1: SUMMARY OF THE MAIN DAM OPERATION IN SEPTEMBER 2020

Dam Data	Unit	Quantity
Main dam water level at Beginning of the Month	m asl	310.78
Main dam water level at End of the Month	m asl	314.73
Effective storage at Beginning of the Month	MCM	646.4
Effective storage at End of the Month	MCM	862.2
Inflow	MCM	629.9
Turbine discharge	MCM	385.58
Spillage (excluding riparian release)	MCM	0.0

Table 2-2, 2-3 and ***2-4*** shows the generation data at the main power station. In September 2020, the Actual Generation (118.73GWh) was higher than the Aggregate Declaration (114.6GWh).

TABLE 2-2 : SUMMARY OF MAIN POWER STATION IN SEPTEMBER 2020

Power Station Data	Unit	Quantity	
Generated Energy	GWh	121.24	
Delivery Energy at Delivery Point	GWh	118.73	
Station Service Energy	kWh	216,309	
		Unit 1	**Unit 2**
Period of Operation	Hours	559:14	550:39
Planned Outage	Hours	0	9:00
Unplanned Outage	Hours	10:01	1:01
Number of Unit Starts	No.	54	54

TABLE 2-3 : ENERGY AMOUNT IN SEPTEMBER 2020 (MAIN POWER STATION)

Month	Energy amount for the month (MWh)				Imported Energy (MWh)	Station Service Energy (MWh)
	Primary Energy	Secondary Energy	Excess Energy	Total		
January	104,444.6	0	0	104,444.6	182.5	146.0
February	92,536.8	0	0	93,536.8	174.6	157.3
March	61,790.7	0	0	61,790.7	224.5	172.0
April	44,676.9	0	0	44,676.9	131.9	148.6
May	51,541.1	0	0	51,541.1	212.9	187.4
June	51,227.3	0	0	51,227.3	202.2	180.7
July	109,358.1	100.7	0	109,458.8	94.6	226.6

Month	Energy amount for the month (MWh)				Imported Energy (MWh)	Station Service Energy (MWh)
	Primary Energy	Secondary Energy	Excess Energy	Total		
August	81,332.5	41,485.7	0	122,808.2	110.1	213.6
September	108,465.0	0	0	108,465.0	83.7	216.3

TABLE 2-4 : DECLARATION (MAIN POWER STATION)

Declaration	Unit	September 2020		October 2020 Aggregate Declaration
		Aggregate Declaration	Final Declaration	
Primary Energy	MWh	111,900	108,465	116,200
Secondary Energy	MWh	2,700	0	7,800
Total	**MWh**	**114,600**	**108,465**	**124,000**

2.1.1.2 Re-Regulation Power Station

Figures 2-3 and ***2-4*** shows the generation data at the re-regulation power station in September 2020. The generation and operation time are affected by the operations of the main power station according to EGAT PPA. So, the amount of inflow is determined by the operation resulting at the main power station. Notwithstanding, even if the main power station is stopped, the specified 27 m^3/sec water from re-regulation power station must be discharged to downstream.

FIGURE 2-3: UNIT GENERATED ENERGY (RE-REGULATION POWER STATION)

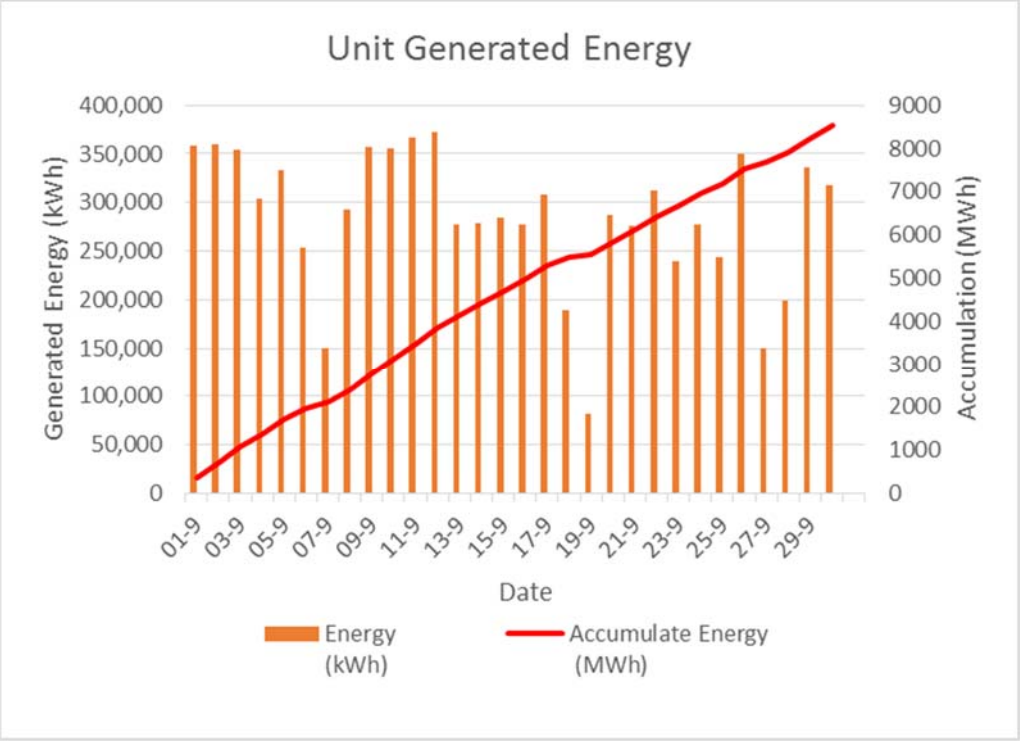


FIGURE 2-4: UNIT OPERATION HOURS (RE-REGULATION POWER STATION)

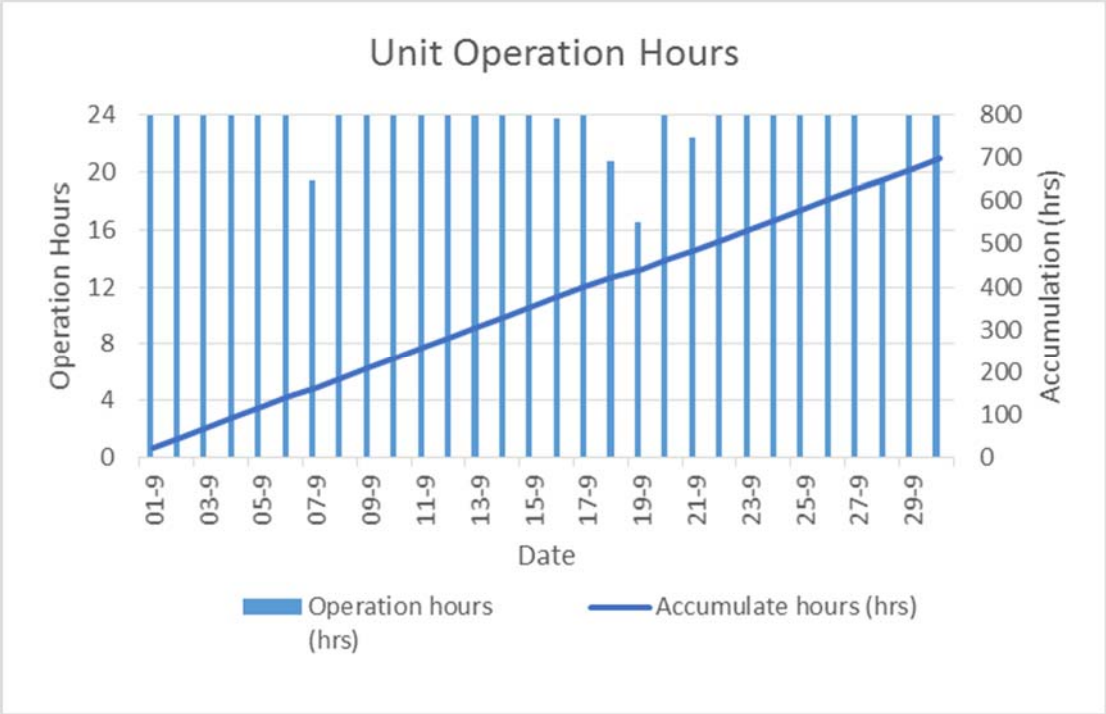


Table 2-5, 2-6 and ***2-7*** shows the dam data at the re-regulation dam and generation data at the re-regulation power station.

TABLE 2-5 : SUMMARY OF RE-REGULATION DAM IN SEPTEMBER 2020

Dam Data	Unit	Quantity
Dam Water Level at Beginning of the Month	m asl	178.81
Dam water Level at End of the Month	m asl	178.55
Inflow	MCM	385.57
Turbine Discharge	MCM	313.91
Spillage	MCM	71.98

TABLE 2-6: SUMMARY OF RE-REGULATION POWER STATION IN SEPTEMBER 2020

Power Station Data	Unit	Quantity
Generated energy	GWh	8.96
Delivery Energy at billing meter	GWh	8.54
Station service energy	kWh	75,606
Operation Hour	Hours	698:28
Planned outage	Hours	0
Unplanned outage	Hours	0:14
Number of unit start	No.	6

TABLE 2-7: ENERGY AMOUNT IN SEPTEMBER 2020 (RE-REGULATION POWER STATION)

Month	Energy Amount for the Period (MWh)	Imported Energy (MWh)	Station Service Energy (MWh)
January	4,573	18.8	67.8
February	5,179	11.0	66.2
March	4,764	37.5	64.2
April	4, 801	61.1	59.8
May	6,681	10.7	75.7
June	6,497	30.5	70.7
July	9,376	2.9	77.9
August	8,684	1.7	77.5
September	8,543	8.1	75.6

2.1.1.3 Reservoir Operation

Figure 2-5 shows the dam water level compared with the rule curve. The dam was filled with water up to Full Supply Level at El. 320 m on 17 August 2019, but had slightly decreased because generating discharge was higher than the inflow.

The actual dam water level increased from the middle of September 2020 due to rain.

FIGURE 2-5: DAM RESERVOIR LEVEL

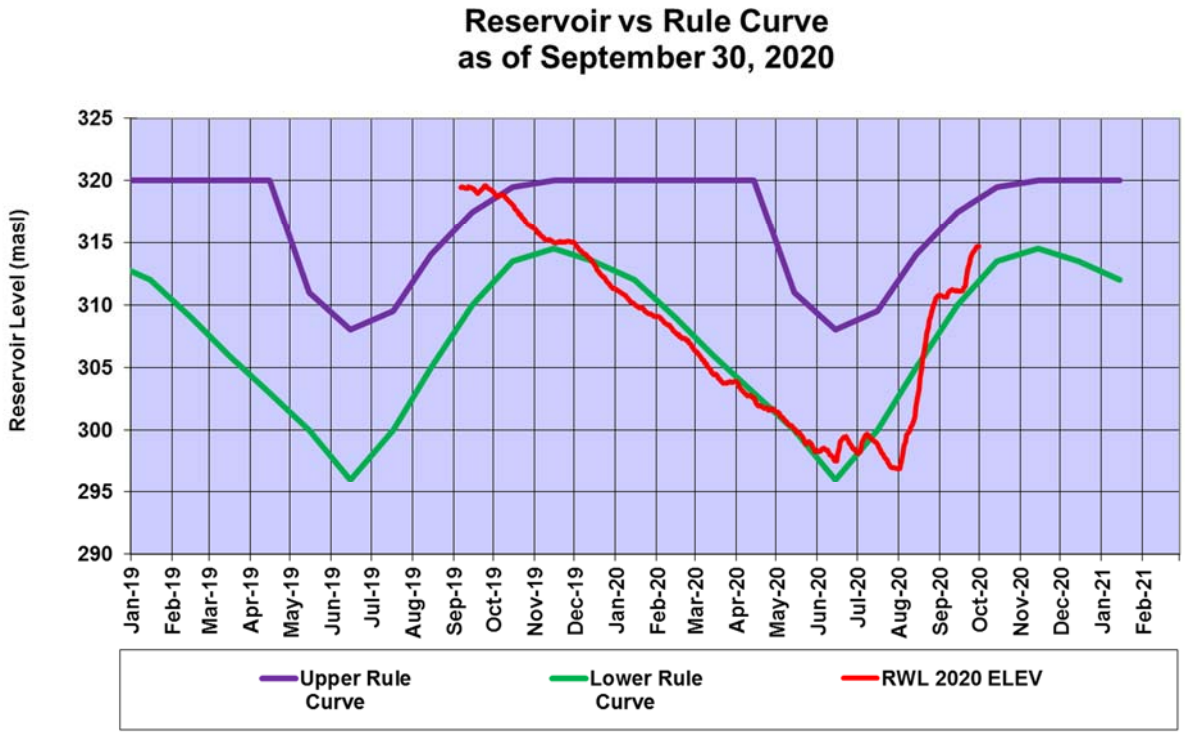
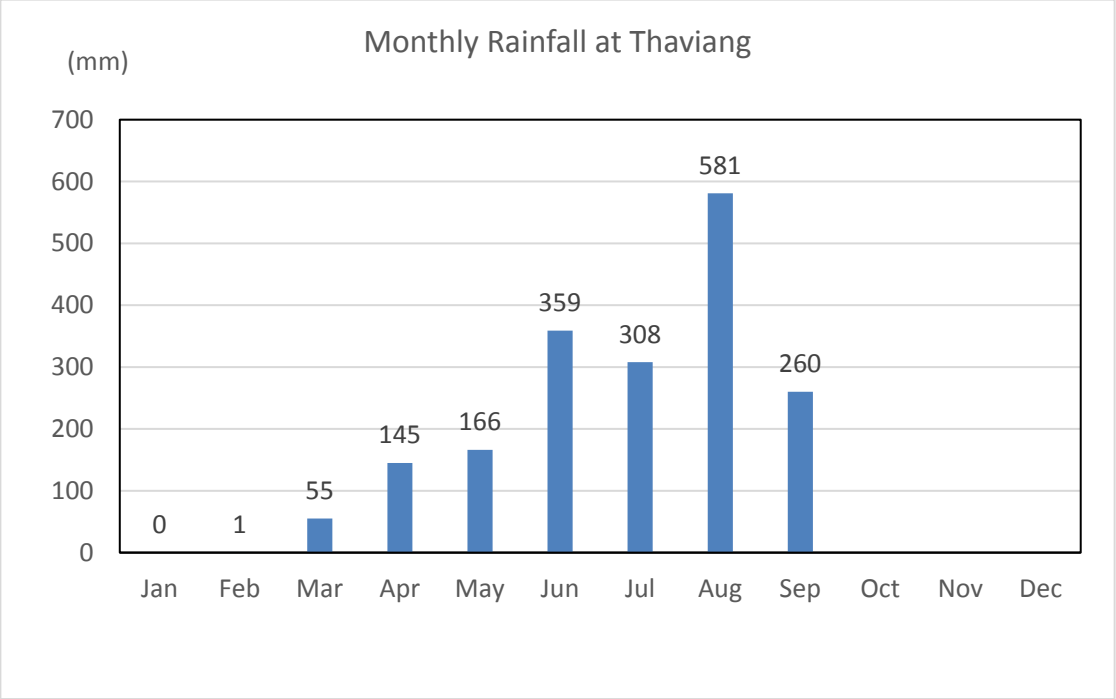


FIGURE 2-6: MONTHLY RAINFALL AT THAVIENG



2.1.2 Outage, Liquidated Damages and Unavailability

TABLE 2-8: UNAVAILABILITY AND SIGNIFICANT EVENT IN SEPTEMBER 2020 (MAIN POWER STATION)

Unit	Date/Time		Event	Outage Type	Period of Outage (Hours)
	Started	Finished			
1	09 Sep (23:18)	09 Sep (23:42)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:24
	17 Sep (21:31)	17 Sep (21:50)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:19
	22 Sep (18:10)	22 Sep (18:28)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:18
	27 Sep (08:00)	27 Sep (17:00)	Maintenance for 22kV Cub and SCADA	Short Notice Outage	9:00
2	09 Sep (23:18)	09 Sep (23:42)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:24
	17 Sep (21:31)	17 Sep (21:50)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:19

Unit	Date/Time		Event	Outage Type	Period of Outage (Hours)
	Started	Finished			
	22 Sep (18:10)	22 Sep (18:28)	Tripped because station service power was lost due to 22kV DL ground fault	Forced Outage	0:18
	27 Sep (08:00)	27 Sep (17:00)	Flushing of cooling water system	Short Notice Outage	9:00

TABLE 2-9: LIQUIDATED DAMAGE IN SEPTEMBER 2020 (MAIN POWER STATION)

USD Portion	*Baht Portion*
1,544.20	85,087.11

(Estimation)

TABLE 2-10: UNAVAILABILITY AND SIGNIFICANT EVENT IN SEPTEMBER 2020 (RE-REGULATION POWER STATION)

Unit	Date/Time		Event	Outage Type	Period of Outage (Hours)
	Started	Finished			
1	16 Sep (08:28)	16 Sep (08:42)	Cleaned oil cooler's flow sensor	Forced Outage	0:14

2.2 MAINTENANCE WORK (EGAT OM)

TABLE 2-11: MAINTENANCE ACTIVITY

Date	Activity
27 September 2020	Main Power Station: Flushing of Thrust Bearing's Cooling Coil for Unit2

2.3 CIVIL AND APPURTENANT STRUCTURE

2.3.1 Reservoir

FIGURE 2-7: RESERVOIR OF MAIN DAM. WL. 314.72	*FIGURE 2-8: RESERVOIR OF RE-REG. DAM*
	

2.3.2 Dam and Power Plant

2.3.2.1 Rehabilitation works

Plant Yards

Demobilization of plant facilities for both RCC and CVC plants was completed in December 2019. The vegetation improvement for rehabilitation of those areas is ongoing.

FIGURE 2-9: RE-VEGETATION OF RCC PLANT YARD	*FIGURE 2-10: RE-VEGETATION OF CVC PLANT YARD*
	

Quarry

The final blasting was carried out 27 March 2018. GOL have acknowledged that the quarry operation is complete. After several inspections by GOL and ADB for the Lenders, the quarry site has been improved by such as partial levelling, vegetation at the berms of slopes and large rock installation at top of slopes from an environmental and a safety point of view. Fence for safety was installed at top slope at right side. The grading at the quarry bottom and spreading of top soil was completed in January 2020.

FIGURE 2-11: QUARRY AREA VIEW SHOWING RE-VEGETATION AND SAFETY FENCE INSTALLATION

AS OF 20 JULY 2020

AS OF 27 SEPTEMBER 2020

2.3.2.2 Disposal Areas and Solid Waste Landfill Sites

The operation of both HSRA and Project landfills is ongoing with collection waste materials from Resettlement "Phouhomxay", neighbour villages and the Owner Site Office and Village.

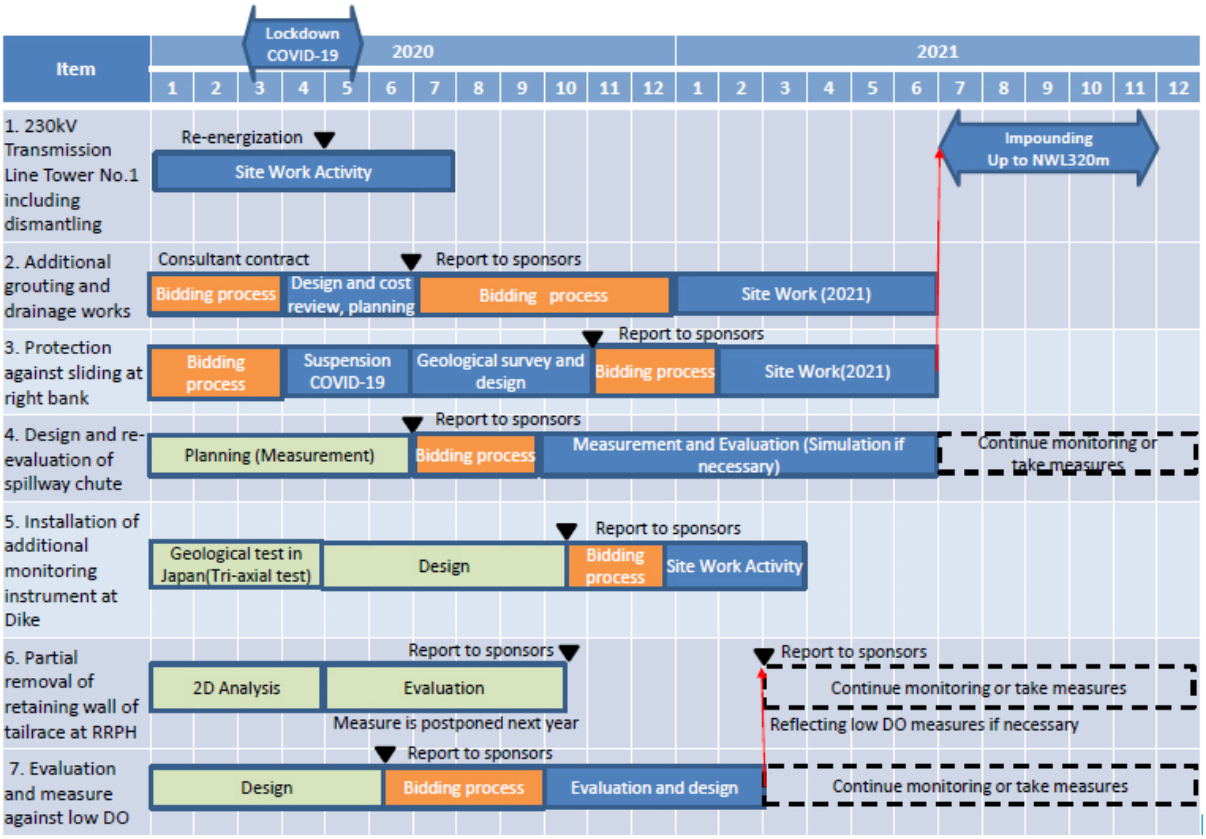
FIGURE 2-12: PHASE 2 OF PROJECT LANDFILL DEVELOPMENT ON 08 JUNE 2017

CURRENT CONDITION OF LANDFILL

2.3.2.3 Remaining Work

As shown in ***Figure 2-12***, there remain seven items of significant works. Nos. 1, 2, 3, 4 are related to the main powerhouse and Nos. 5 and 6 are related to the re-regulation powerhouse. No. 7 is related to power operation and environmental issues.

FIGURE 2-13: SCHEDULE OF SIGNIFICANT REMAINING WORKS IN 2020



2.4 TRANSMISSION SYSTEM

2.4.1 Tower No.1 of 230 kV TL Replacement and Dismantling

The Tower No.1 was damaged due to the slope failure of approximately 150 m3 volume of material above and behind Tower No.1 that occurred overnight on 17 to 18 of August 2019. Some of the structural steel members of the Tower No.1 were deformed. Tower No.1 did not move significantly but remained an unsafe structure. Movement of the upper part of the steel structure of the tower was observed.

Therefore, a Temporary Tower No.1 was constructed and the transmission line was moved to this tower from the damaged tower over the period of 06 to 24 September 2019. The construction of the permanent Replacement Tower No.1 and disassembly of existing Tower No.1 was contracted in late December 2019. The foundation excavation for the legs of the new Tower No.1 started in the middle of January 2020 was completed on February 2020; the damaged Tower No.1 was almost dismantled in January 2020. The installation of gantry structure and new Tower No.1 was completed in the beginning of April 2020. Energization test was completed on 30 April 2020. The gabion mattress installation for slope protection of gantry structure was completed in September. An additional slope protection work around existing tower foundation will be started in October 2020 and will be completed in middle of October.

FIGURE 2-14: TOP VIEW OF GANTRY STRUCTURE _SLOPE PROTECTION AROUND FOUNDATION ONGOING

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

On 29 September 2020, NNP1PC invited the interested bidder to complete the bidding process for the Service of the ISO Training and Certification Audit to achieve the ISO14001:2015. The bidding, evaluation/selection and contract signing with the selected service provider is expected to be completed by the end of October 2020 and as shown in ***Table 3-1***, the online training for four ISO14001:2015 subjects will be provided to relevant staff during Q4 2020 to Q1 2021.

TABLE 3-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021			
		Q3	Q4	Q1	Q2	Q3	Q4
1	Continue to prepare EMS documents (8 Standard Operating Procedures are completed)						
2	**NNP1PC Environmental Policy announcement**						
3	NNP1PC ISO Committee establishment						
4	Training relevant staff on: - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit						
5	Implement the EMS procedures and processes						
6	ISO14001:2015 Internal Audit						
7	Implement the corrective actions and preventive actions according to the Internal Audit						
8	Management Review by NNP1PC Management						
9	ISO 14001:2015 Assessment and Certification Audit – **1st Stage** (***remote audit*** on the documentation review)						
10	Implement the corrective actions and preventive actions according to the 1st Stage Audit						
11	ISO 14001:2015 Assessment and Certification Audit – **2nd Stage** (***on-site audit***)						
12	Implement the corrective actions and preventive actions according to the 2nd Stage Audit						
13	**Certify of ISO14001:2015 upon successful completion of the audit**						

3.2 COMPLIANCE MANAGEMENT

In September 2020, EMO received one Environmental and Social Checklist for review and approval. The status is presented in ***Table 3-2.***

TABLE 3-2: SS-ESMMP AND DOCUMENT REVIEW STATUS IN SEPTEMBER 2020

Title	Date Received	Status
Environmental and Social Checklist for Survey and Design of Water Supply System Improvement in Ban Pou (2UR).	04 Sep 2020 (1st submission)	No objection with comments on 09 September 2020.

Two observations of non-compliance were issued during September 2020. The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC to the Contractors is summarized in ***Table 3-3*** and the status of the ONCs and NCRs that are unsolved exceeding deadlines are presented in ***Table 3-4.***

TABLE 3-3: SUMMARY OF ONCS AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from August 2020	2	2	0	0
Newly Opened in September 2020	2	0	0	0
Total in September 2020	**4**	**2**	**0**	**0**
Resolved in September 2020	1	0	0	0
Carried over to October 2020	3	**2**	0	0
Unsolved Exceeding Deadlines	**2**	**2**	**0**	**0**

TABLE 3-4: SUMMARY OF THE ONCS AND NCRS THAT ARE UNSOLVED EXCEEDING DEADLINES

Document Number / Date of Issue	Subject Description	Current Status at the end of September 2020
ONC_AM-0003 / 28 Feb 2020	Issued to ADM to carry out the improvement work for the second wetland pond similarly to the first wetland pond. (Based on the LTA's recommendation made during the mission in August 2019 to improve the OSOV's WWTS)	NNP1PC and the WWTS Consultant have checked and evaluated the treatment efficiency of the existing WWTS and are preparing a proposal for improvement for management review/consideration by early October 2020.
ONC_OC-0349 / 24 Mar 2020	Issued to remind the OC Contractor to use only the approved tree species for revegetation and dead plant replacement.	The contractor is continuing routine inspection combined with revegetation and maintenance of perimeter fence as necessary

		The ONC will be closed by the end of the contractor's liability period (Jan 2021)
NNP1-ESD-EMO-NCR-VSP-0001 / 13 Jul 2020 **(NCR Level 1)**	Non-Compliance with site rehabilitation at the Spoil Disposal Area for the construction of the irrigation canal	The site was partially covered with a thin green of sown LUZI grass seed germination. ***The NCR1 will be closed when the revegetation has been successfully completed***
NNP1-ESD-EMO-NCR-HM-0007 / 06 Apr 2020 **(NCR Level 1)**	Non-Compliance with the site revegetation requirements at HM Hydro's Labour Camp No.2 (LILAMA10 Camp)	The corrective action was completed on 08 September 2020 by HM Hydro Contractor. This revegetated site will be monitored by NNP1-EMO until the end of rainy season 2020. The first joint site inspection and evaluation of the revegetation will be conducted three months after the date of re-vegetation completion. ***The NCR1 will be closed when the revegetation has been successfully completed***

3.2.1 Site Inspection by Environment Management Unit

A monthly site visit by the Bolikhan District EMU (Bolikhamxay Province) and a quarterly mission of EMU Xaysomboun Province were not carried out in September 2020.

On 11 September 2020, EMO had a meeting with Bolikhan DoNRE at the Bolikhan District Office to jointly plan for community consultations during Q4 2020 with Thaheua, Hat Gniun and Phouhomxay village authorities to discuss:

- The community involvement in the waste management (e.g., waste collection fee, labor inputs for landfill maintenance) from year 2021 onwards. The consultation is expected to be carried out during Q4 2020;
- Handing over of the revegetated sites which is expected to be conducted during Q1 2021.

3.2.2 Site Decommissioning and Rehabilitation

During September 2020, EMO monitored the revegetated sites for grass seed germination and green cover as well as site stability. The vegetation-cover at 21 out of 23 revegetated sites has increased compared with the previous months. On 23 September 2020, EMO, TD and the relevant contractors conducted a joint monitoring and evaluation of the progress of revegetation and the stability of the revegetated sites. The results of the evaluation are shown in ***Table 3-5*** and ***Figure 3-1*** below.

TABLE 3-5: SUMMARY THE GREEN COVER PERCENTAGE IN SEPTEMBER 2020

Site Name	Site ID	GPS Coordinate		Monitoring status	Decommissioning		Rehabiliatation	Percentage of green cover	
		Easting	Northing		Status	Completion date	Status	Jun-20	Sep-20
Kenber Camp	KB_C	2062551	345120	Rehabilitation	Complete	15-Jan-19	N/A	80%	n/a
LiLaMa10 Camp	LLM_C	2063206	348582	Rehabilitation	Complete	20-Nov-19	Continue	5%	20%
Obayashi Camp	OC_C	2062595	347519	Rehabilitation	Complete	09-Jan-19	Continue	80%	90%
Right Tunnelling Camp	RT_C	2062859	346151	Rehabilitation	Complete	25-Dec-19	Continue	70%	90%
Songda5 Camp N#1	SD_C1	2062709	349737	Rehabilitation	Complete	27-Feb-20	Continue	90%	98%
Songda5 Camp N#2	SD_C2	2062600	346071	Rehabilitation	Complete	09-May-19	Continue	80%	95%
Sinno Hydro Camp	SH_C	2062060	345590	Rehabilitation	Complete	06-Nov-18	N/A	80%	95%
TCM & GFE Camp	TCM_C	2062581	349711	Rehabilitation	Complete	29-May-20	N/a	70%	90%
V&K Concrete Sole Camp	V&K_C	2062759	346120	Rehabilitation	Complete	06-Nov-19	Continue	50%	70%
Zhefu Camp	ZF_C	2063183	348446	Rehabilitation	Complete	30-May-19	N/A	60%	75%
Spoil Disposal Area 1	DA1	2062551	345120	Rehabilitation	Complete	25-Dec-18	N/A	80%	90%
Spoil Disposal Area 2	DA2	2062506	345713	Rehabilitation	Complete	31-Dec-19	Continue	60%	75%
Spoil Disposal Area 6	DA6	2061897	346673	Rehabilitation	Complete	27-Mar-20	Continue	70%	75%
Spoil Disposal Area 8	DA8	2062086	345622	Rehabilitation	Complete	06-Dec-19	Continue	40%	60%
Spoil Disposal Area 10 and Re-regulation dam workshop	DA10	2062555	345610	Rehabilitation	Complete	08-Dec-19	Continue	80%	85%
Main Quarry	Qr	2061841	345046	Rehabilitation		04-Feb-20	Continue	50%	70%
Aggregate Plant Yard	AP	2061583	345742	Rehabilitation	Complete	06-Nov-18	Continue	80%	85%
CVC Plant	CVC	2062171	345775	Rehabilitation	Complete	17-Oct-19	Continue	60%	70%
IHI Field shop and contractor camp	IHI.I	2062152	346028	Rehabilitation	Complete	30-May-19	N/A	70%	85%
RCC Plant	RCC	2062386	345903	Rehabilitation	Complete	05-Jan-20	Continue	50%	70%
Songda5 Batching Blant & Stock yard	SD.BP	2062035	346030	Rehabilitation	Complete	28-Nov-19	Continue	80%	95%
Sino and Song Da's Magazine Area	SH_M	2061983	346675	Rehabilitation	Complete	10-Oct-19	Continue	70%	80%
Sand Stock Yard	S_SY	N/A	N/A	Rehabilitation	Complete	25-Mar-20	Continue	n/a	60%

Legend:
1-20%
21-40%
41-60%
61-80%
81-90%

FIGURE 3-1: ADDITIONAL COUNTER MEASURES FOR THE SITE REHABILITATION IN SEPTEMBER 2020

OC CAMP Temporary perimeter fence maintenance	***LILAMA10 CAMP*** Local grass planting/revegetation
	
AGGREGATE PLANT (BOTTOM PLATFORM) EMO, TD and OC joint quarterly inspection	***MAIN QUARRY (BOTTOM VIEW)***

3.3 ENVIRONMENTAL QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD5), Faecal Coliform, E. Coli Bacteria and Total Coliform 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/

3.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the ***Annex B*** of this Report. The effluent camp monitoring results in September 2020 indicated non-compliances for some parameters in OSOV1 (EF01), OSOV2 (EF13) and the Main Powerhouse (EF19).

In September 2020, EMO continued monitoring the Wastewater Treatment Systems (WWTSs) efficiency in OSOV1, OSOV2, Main Dam and Re-Regulation Dam and also discussed with the Consultant via VDO conference to conclude on the modification and/ or replacement options for NNP1PC management's consideration by early October 2020. Based on the existing treatment efficiency of those four WWTSs, the Consultant recommended NNP1PC to maintain the WWTSs in OSOV1 and the Re-regulation Dam, for OSOV2, the Consultant recommended to either install a Sequencing Batching Reactor System or to construct two new wetland ponds, and the Consultant also recommended to improve the operation of the WWTS at the Main Dam by adjusting the wastewater pump from the Septic Tank to the Septic Biofilm Tank thereby extending the detention time of wastewater to be treated in the Septic Biofilm Tank as well as switching to the automatic chlorination before discharging the effluents.

The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities that continue to have non-compliances are summarized in ***Table 3-6.***

TABLE 3-6: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN SEPTEMBER 2020

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for Total Coliform and Faecal Coliform	The treatment capacity was checked. Two VDO conferences were held with the consultant in September 2020 to discuss and the improvements recommended by the Consultant which will be concluded for NNP1PC management's consideration by early October 2020.
OSOV2 (ESD Camp)	EF13	Non-compliance for Total Nitrogen, Ammonia-Nitrogen, Faecal Coliform and Total Coliform in the second fortnightly sampling.	As above
Main Powerhouse	EF19	Non-compliance for Ammonia Nitrogen, Total Nitrogen and Total Phosphorus in the first fortnightly sampling. No effluent discharge during second fortnightly sampling.	As above

3.3.2 Ambient Surface 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 Phouane [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

In addition, weekly depth profile monitoring (pH, DO, conductivity, TDS and temperature) has been undertaken since 18 September 2018 for stations located in the re-regulation and main reservoirs. The locations of the monitoring stations are shown in ***Figure 3-2*****.**

The monitoring results for key parameters (DO, TSS and BOD_5) during September 2020 are presented in ***Table 3-7, Table 3-8*** *and* ***Table 3-9*****.** The full set of data for September 2020 is attached in ***Annex A***. In addition, the results for DO are presented as line graphs in ***Figure 3-3*****.**

Main Reservoir

From 01 to 30 September 2020, the water level in the main reservoir increased from El. 310.78 m asl to El. 314.73 m asl.

Thermal stratification, oxycline and anoxic condition were observed in the main reservoir at some stations. The inflow during the wet season contributed to a higher DO level at the deeper layers in the main reservoir.

At R05, during September 2020, the DO level in the upper 6.0 m was generally between 6 and 8 mg/L, and an oxycline had formed at a depth between 6.0 and 8.0 m corresponding to El. 303 m asl – 305 m asl. with DO levels generally between 1.5 mg/L and 3 mg/L and below 50.0 m with DO levels less than 0.5 mg/L (anoxic condition).

At R04, the DO level in the upper 5.0 m was generally between 6 and 7 mg/L. From 7.0 m and below the DO levels generally fell to less than 2 mg/L and the entire water column below 45.0 m was anoxic.

The DO level at R03 was recorded between 7 and 8 mg/L in the upper 4.5 m falling to between 2 mg/L and 4 mg/L in the deeper layers until reaching anoxic conditions at a depth of 50 m.

At R02, the DO concentrations in the upper 4.5 m were about 8.5 mg/L dropping to between 2 and 4 mg/L at greater depths.

At R01, the DO levels were generally between 6.5 and 8.3 mg/L in the entire water column.

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 to the high flow season means of about 100 – 250 mg/L and low flow season means of 20 - 50 mg/L.

The BOD_5 measurements at R03, R04 and R05 in the epilimnion were less than 1 mg/L, but in the hypolimnion, BOD_5 was recorded at 13.1, 13.6 and 11.8 mg/L respectively.

Re-regulation Reservoir

In September 2020, the turbine discharges from the main powerhouse varied between 27 m^3/s and 236 m^3/s usually interrupted by night-time periods with no discharge.

The DO measurements at R06 and R07 representing turbine discharges from the main dam generally had DO concentrations below 4 mg/L in the entire water column.

The BOD_5 concentrations in R06 and R07 were less than 1 mg/L.

Downstream

During September 2020, the discharge from the re-regulation dam mainly went through the turbine and occasionally went through both the turbine and the gate. The DO levels were less than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and thus were non-compliant with the GoL Standard, except on 16 September 2020. No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is in the process of collecting information to assist in developing measures to improve the DO levels downstream.

The BOD_5 in the downstream stations were below 1.0 mg/L (complied with national surface water quality standard).

FIGURE 3-2: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

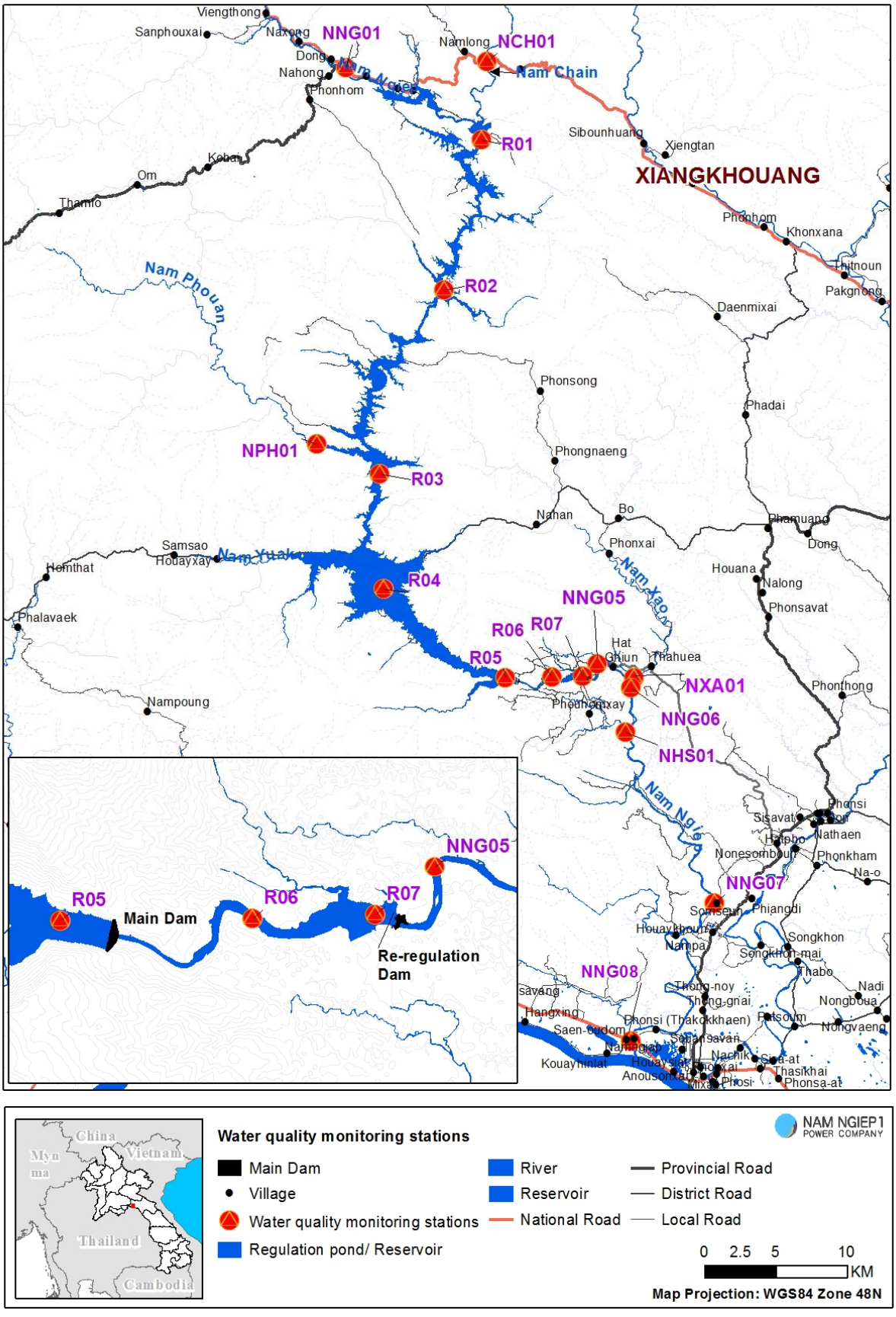


FIGURE 3-3: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO SEPTEMBER 2020

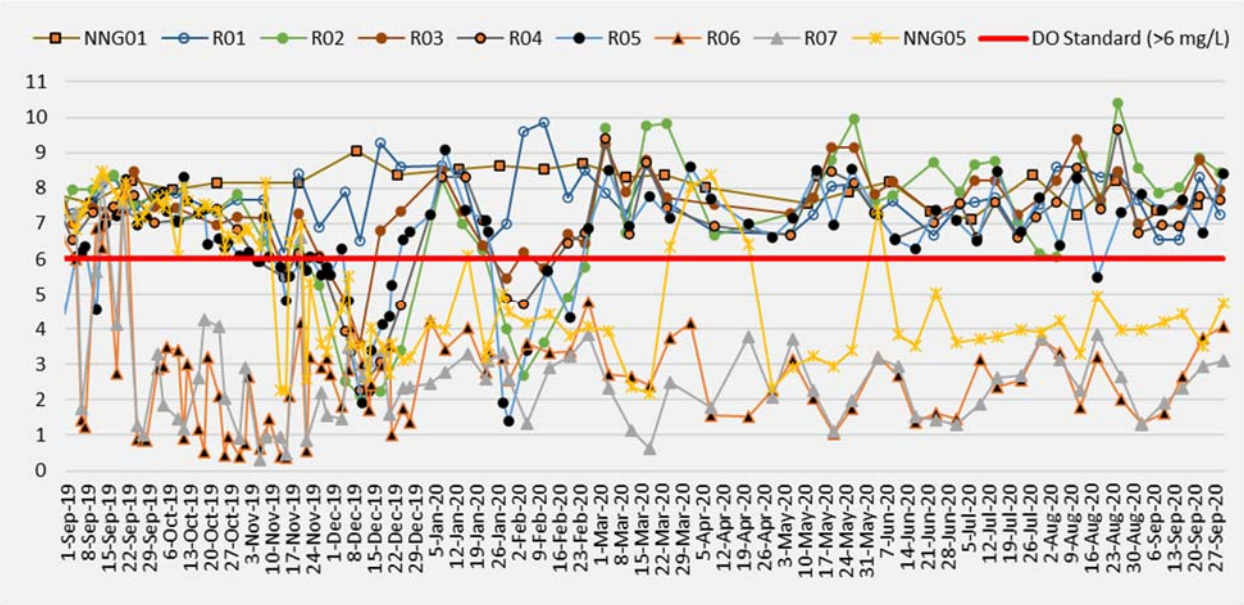


TABLE 3-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
1-Sep-20		7.7	8.56	7	6.75									8.62		
2-Sep-20						7.84	1.34	1.3	3.97	5.65	5.71	6.03			7.05	7.14
7-Sep-20	7.39												7.86			
8-Sep-20		6.5	7.86											7.79		
9-Sep-20				7.37	6.96	7.37										
10-Sep-20							1.63	1.93	4.21	4.61	5.36	5.83			6.79	6.74
15-Sep-20		6.6	8.04	7.54	6.93											
16-Sep-20						7.67	2.64	2.32	4.43	4.19	6.25	5.73			6.86	7.23
21-Sep-20	7.55												7.65			
22-Sep-20		8.3	8.87	8.8	7.78									10.01		
23-Sep-20						6.75	3.75	2.94	3.51	4.48	5.6	5.82			6.75	6.6
29-Sep-20		7.3	8.43	7.95	7.66									8.2		
30-Sep-20						8.4	4.08	3.1	4.75	5.11	6.32	6.87			7.96	7.63

TABLE 3-8: RESULTS OF SURFACE WATER QUALITY MONITORING FOR TOTAL SUSPENDED SOLIDS (MG/L)

Total Suspended Solids (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
7-Sep-20	1,485												18.12			
8-Sep-20		42												23.91		
9-Sep-20				<5	<5	<5										
9-Sep-20 Hypolimnion				17.39	20.78	9.76										
10-Sep-20							<5	<5	7.2	30.24	32.68	38.27			197.22	13.28

TABLE 3-9: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD5 (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

BOD_5 (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
7-Sep-20	<1												<1			
8-Sep-20		<1												<1		
9-Sep-20				<1	<1	<1										
9-Sep-20 Hypolimnion				13.14	13.6	11.86										
10-Sep-20							<1	<1	<1	<1	<1	<1			1.14	<1

3.3.3 Groundwater Quality Monitoring

During September 2020, community groundwater quality analyses were carried out for six wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village.

The results indicated compliance with the groundwater quality standards for water supply purposes, except for pH, Faecal Coliform and *E.coli* Bacteria as presented in *Error! Reference source not found.*. In September 2020, EMO investigated the potential sources of bacterial contamination and water samples were taken.

On 25 September 2020, EMO and INFRA team of SMO jointly inspected and investigated the potential cause of bacterial contamination in the ground water supply system of Somseun, Nam Pa and ThongNoy villages. The teams reviewed the design drawings for the groundwater supply system and the water quality results were discussed with the Village Water Use Committee responsible for the operation and maintenance of the water supply system. The teams also interviewed some water consumers for feedback and collected water samples at the water tap nearest to the water well and the tap farthest from the well. The community groundwater investigation report will be prepared separately once the water quality results are available.

TABLE 3-10: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONGNOY AND POU VILLAGES

Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline						
pH	6.5 - 9.2	6.28	6.76	6.86	7.08	6.82	7.72
Sat. DO (%)		40	43.8	89.9	99.1	52	83.2
DO (mg/L)		3.22	3.58	6.84	7.58	3.95	6.34
Conductivity (µS/cm)		193	425	323	427	3.85	12.59
Temperature (°C)		26.32	26.09	29.6	29.3	30.05	26.9
Turbidity (NTU)	<20	5.46	10.02	2.34	2.43	2.41	3.43
Fecal Coliform (MPN/100mL)	0	4.5	11	4.5	4.5	240	350
E.coli Bacteria (MPN/100mL)	0	4.5	11	4.5	4.5	240	350
Arsenic (mg/L)	<0.05	0.005	0.012	0.0013	0.0009	0.0019	Pending
Cadmium (mg/L)	<0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Total Iron (mg/L)	<1	2.34	1.24	0.017	0.032	0.042	0.059
Manganese (mg/L)	<0.5	0.03	0.01	<0.005	<0.005	0.016	0.014
Mercury (mg/L)	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Lead (mg/L)	<0.05	<0.008	<0.008	<0.008	<0.008	<0.008	Pending

In addition, on 18 September 2020, NNP1PC carried out landfill groundwater monitoring at NNP1 Solid Waste Landfill (only three wells were monitored due to the water sampling equipment got stuck in monitoring well MW2) and at Houay Soup Solids Waste Landfill (one monitoring well). Similar to the previous monitoring results, the concentration of lead in the monitoring wells MW1, MW3, MW4 and MW5 exceeded the relevant groundwater quality standard. This is most likely the (natural) background level and is not attributed to the landfill. Lead has been detected in all wells from time to time both upstream and downstream the landfill. Furthermore, lead has not been detected in the leachate from landfill treatment ponds and the waste pits and all ponds of both landfills are lined with a HDPE liner protecting the groundwater against infiltration of leachate. These boreholes are more than 50 m deep and not used by staff or villagers.

TABLE 3-11: LANDFILL GROUNDWATER QUALITY MONITORING RESULTS IN NNP1 AND HOUAY SOUP LANDFILLS

		Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline					
18-Sep-20	pH		6.25		6.13	5.66	5.87
18-Sep-20	Sat. DO (%)		60.3		26.4	23.4	30.8
18-Sep-20	DO (mg/l)		4.88		2.18	1.88	2.45
18-Sep-20	Conductivity (µS/cm)		211		260	144	141
18-Sep-20	Temperature (°C)		26.28		26	26.68	27.19
18-Sep-20	Turbidity (NTU)		3.85		3.65	3.18	3.31
18-Sep-20	Total Nitrogen (mg/l)		0.72		1.61	1.23	1.17
18-Sep-20	Lead (mg/l)	<0.01	0.388		0.588	0.596	0.212
18-Sep-20	Faecal Coliform (MPN/100ml)		0		70	11	0
18-Sep-20	Ecoli Bacteria (MPN/100ml)		0		4	2	0
18-Sep-20	NH_3-N (mg/l)		0.26		1.16	0.16	0.76
18-Sep-20	Copper (mg/l)	<1	<0.003		0.003	<0.003	<0.003
18-Sep-20	Total Petroleum (mg/l)		<3		<3	<3	<3
18-Sep-20	Water level (m)		22.1		20.05	17.35	7.63

3.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the water quality analyses are presented in ***Table 3-12.*** All parameters complied with the GoL Drinking Water Standards except for Faecal Coliform and *E.coli* that exceeded the standards in all stations (WTHH02, WHGN02, WPHX01-intake before the filtration system, WPHX02-tap water at the primary school in Phouhomxay Village, and WPHX03-tap water at a house in Phouhomxay Village).

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

TABLE 3-12: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
14-Sep-20	pH	6.5 - 8.6	6.78	6.64	7.24	6.89	6.44
14-Sep-20	Sat. DO (%)		118.1	109.7	117.1	110.3	112
14-Sep-20	DO (mg/L)		8.77	8.53	9.55	8.24	8.39
14-Sep-20	Conductivity (µS/cm)	<1,000	35	50	9	10	10
14-Sep-20	Temperature (°C)	<35	31.04	28.19	25.69	30.68	30.42
14-Sep-20	Turbidity (NTU)	<10	4.5	3.21	2.21	2.53	2.61
14-Sep-20	Faecal Coliform (MPN/100 mL)	0	8	17	14	17	27
14-Sep-20	E.coli Bacteria (MPN/100 mL)	0	8	17	14	17	27
14-Sep-20	Arsenic (mg/L)	<0.05	<0.0003	<0.0003	NA	<0.0003	<0.0003
14-Sep-20	Cadmium (mg/L)	<0.003	<0.002	<0.002	NA	<0.002	<0.002
14-Sep-20	Iron (mg/L)		0.12	0.086	NA	0.114	0.112
14-Sep-20	Lead (mg/L)	<0.01	<0.01	<0.01	NA	<0.01	<0.01
14-Sep-20	Manganese (mg/L)	<0.5	0.009	0.014	NA	0.006	<0.005
14-Sep-20	Mercury (mg/L)	<0.001	<0.0002	<0.0002	NA	<0.0002	<0.0002

3.3.5 Landfill Leachate Monitoring

During September 2020, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond – LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that:

- The NNP1 Project Landfill fully complied with the standard.
- The water sampled from the last pond of Houay Soup Landfill did not comply with the Faecal Coliform and Total Coliform Bacteria Standards, however, the water will be treated in a wetland pond before it is discharged to an open ditch.

EMO will continue to monitor the leachate and report the results in the next monthly progress report. The landfill leachate monitoring results for September 2020 can be found in ***Table 3-13***.

TABLE 3-13: RESULTS OF THE LANDFILL LEACHATE MONITORING

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
3-Sep-20	pH	6.0-9.0				8.72		7.39	
3-Sep-20	Sat. DO (%)					128.8		139.4	
3-Sep-20	DO (mg/L)					8.76		9.15	
3-Sep-20	Conductivity (µS/cm)					38.3		313	
3-Sep-20	Temperature (°C)					32.9		32.5	
3-Sep-20	Turbidity (NTU)					4.32		10.2	
3-Sep-20	BOD_5 (mg/L)	<30				<6		10.47	
3-Sep-20	COD (mg/L)	<125				<25		91.6	
3-Sep-20	Faecal Coliform (MPN/100mL)	<400				0		1,600	
3-Sep-20	Total Coliform (MPN/100mL)	<400				240		1,600	
3-Sep-20	Total nitrogen (mg/L)	<10				1.85		5.58	
3-Sep-20	Lead (mg/L)	<0.2				<0.01		<0.01	
3-Sep-20	Copper (mg/L)					<0.006		<0.006	
3-Sep-20	Iron (mg/L)					<0.01		0.166	
3-Sep-20	Ammonia nitrogen (mg/L)	<10				<2		4.40	
3-Sep-20	Oil & Grease (mg/L)	<10				<1		<1	

3.3.6 Discharge Monitoring

3.3.6.1 Main Reservoir – Water Level, Inflow and Discharge

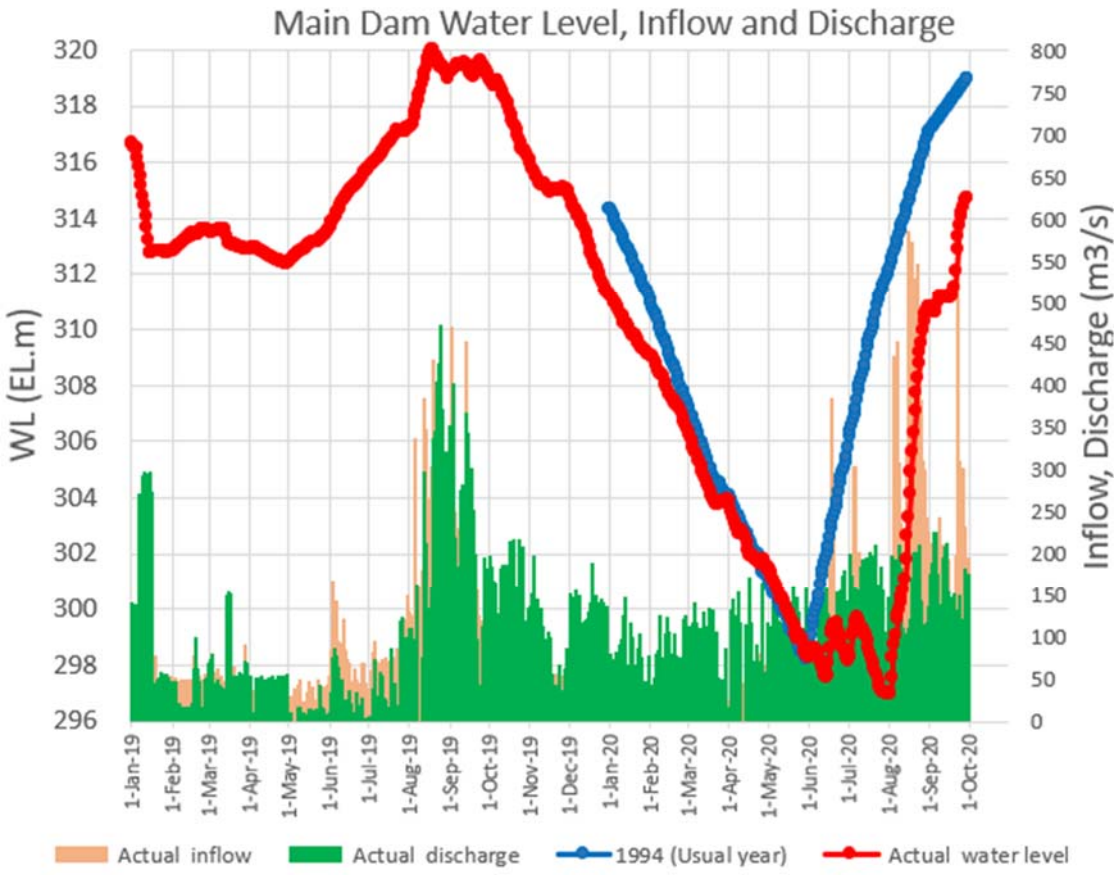
The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in ***Figure 3-4*** presents the values recorded since 01 January 2019.

During September 2020, the mean inflow to the main reservoir was 190 m^3/s during the first two weeks where after the inflow increased to a mean of about 240 m^3/s during the remaining part of September 2020 corresponding to almost the end of wet season. The minimum and maximum inflow were 142 (on 17 September 2020) and 532 m^3/s (on 22 September 2020) respectively.

From 01 to 30 September 2020, the main reservoir was filling up and the water level increased by 3.95 m from El. 310.78 m asl to El. 314.73 m asl on 30 September 2020.

In September 2020, the turbine discharges from the main powerhouse varied between 27 and 236 m^3/s usually interrupted by night-time periods with no discharge.

FIGURE 3-4: WATER LEVEL, INFLOW AND DISCHARGE FOR THE MAIN RESERVOIR



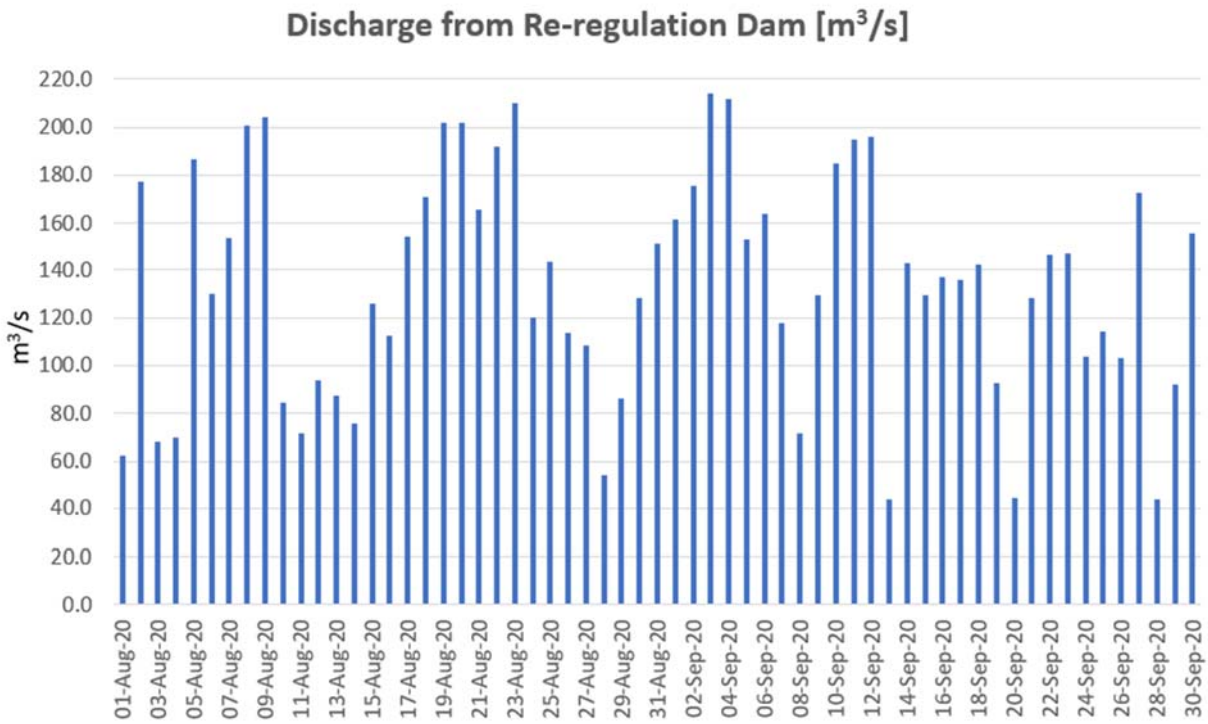
3.3.6.2 Re-regulation Reservoir – Discharge

The discharge monitoring data for the re-regulation dam during August and September 2020 is presented in ***Figure 3-5***.

During September 2020, the mean discharge from the re-regulation dam was about 135 m^3/s with turbine discharges varying between 32 and 167 m^3/s, combined with gate discharge varying between 27 and 250 m^3/s. On 21 September 2020, there was a short period of overflow at the Labyrinth Spillway of about 11 m^3/s. The 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 3-5: DISCHARGE MONITORING AT THE RE-REGULATION DAM IN AUGUST AND SEPTEMBER 2020



3.3.7 Nam Ngiep Downstream Water Depth Monitoring

In September 2020, EMO carried out five boat missions to monitor the water depth in the Nam Ngiep downstream of the re-regulation dam. A total of 19 sites have been identified with potential shallow water depths but none of them were found to be difficult to navigate.

3.4 PROJECT WASTE MANAGEMENT

3.4.1 Solid Waste Management

In September 2020, a total of 18.7 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 0.9 m^3 compared in August 2020.

During September 2020, the local Waste Collection Contractor continued the work performance for the routine operation and maintenance activities of both landfills which included waste separation, waste covering and waste inventory, and clean-up of vegetation and scattered waste, leachate ponds wastewater circulation, clean-up of Houay Soup Landfill's wetland pond and replacement of hyacinth plants.

No recyclable waste was sold this month. The cumulative amounts are presented in ***Table 3-14.***

TABLE 3-14: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by September 2020
1	Plastic bottle	kg	0	78
2	Aluminium	kg	0	94
3	Paper/Cardboard	kg	0	63
4	Glass	kg	0	64
Total		**kg**	**0**	**299**

The villagers from Phouhomxay Village collected a total of 603 kg of food waste from the OSOV1 canteen for animal feed in September 2020, the same amount as recorded in the previous month.

3.4.2 Hazardous Materials and Waste Management

The types and amounts of hazardous material and hazardous waste stored on site in September 2020 are shown in ***Table 3-15*** and ***Table 3-16*****.**

TABLE 3-15: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in September 2020 (A)	Used (B)	Remaining (A – B)
1	Diesel	Litre	11,504	7,754	**3,750**
2	Gasoline	Litre	181	83	**98**
3	Lubricant (Turbine oil)	Litre	7,210	0	**7,210**
4	Colour Paint	Litre	266	0	**266**
5	Thinner	Litre	12	0	**12**
6	Grease Oil	Litre	725	0	**725**
7	Gear Oil	Litre	220	0	**220**
8	Chlorine Liquid	Litre	50	15	**35**
9	Chlorine Powder	Kg	65	0	**65**
10	SIKA	Litre	7	0	**7**

TABLE 3-16: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in September 2020 (A)	Disposed (B)	Remaining (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	197	0	**197**
2	Empty 200L drum of used oil	Unit	3	0	**3**
3	Contaminated soil, sawdust and textile material	M^3	0.42	0	**0.42**

No.	Hazardous Waste Type	Unit	Total in September 2020 (A)	Disposed (B)	Remaining (A - B)
4	Empty paint and spray cans	Can	121	0	**121**
5	Halogen/fluorescent bulbs	Unit	272	0	**272**
6	Empty cartridge (Ink)	Unit	149	0	**149**
7	Clinic Waste	Kg	3.7	0	**3.7**

3.5 COMMUNITY WASTE MANAGEMENT

3.5.1 Community Recycling Programme

In September 2020, there was no trading of recyclable waste at the community waste bank, and the total amount of 3,192 kg recyclable waste in the bank remains the same as recorded in August 2020.

TABLE 3-17: TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY RECYCLE WASTE BANK

Types of Waste	Unit	Remaining in August 2020	Additional in September 2020	Sold/ dispose	Remaining in September 2020
Glass bottles	kg	2,304	0	0	**2,304**
Paper/cardboard	kg	852.5	0	0	**852.5**
Plastic bottles	kg	35.5	0	0	**35.5**
Aluminium cans	kg	0	0	0	**0**
Scrap metal	kg	0	0	0	**0**
Total	**kg**	**3,192**	**0**	**0**	**3,192**

3.5.2 Community Solid Waste Management

In September 2020, approximately 17.1 m^3 of solid waste was collected from Phouhomxay Village and the host villages for disposal at Houay Soup landfill, a decrease of 1 m^3 compared to the previous month.

On 30 September 2020, EMO and the local contractor jointly conducted a quarterly waste management consultation with Thaheau, Hat Gnuin and Phouhomxay village authorities to review the community solid waste management over the second quarter of 2020. The meeting aimed to provide feedback to the communities to improve waste segregation and avoid uncontrolled waste disposal.

FIGURE 3-6: COMMUNITY SOLID WASTE COLLECTION AND CONSULTATION

SOLID WASTE COLLECTION IN NNP1'S PROJECT SITE (OSOV1)	***SOLID WASTE COLLECTION IN THE COMMUNITY AREAS (PHOUHOMXAY SCHOOL)***
	
COMMUNITY CONSULTATION WITH THAHEAU, HAT GNUIN AND PHOUHOMXAY VILLAGE AUTHORITIES ON 23 SEPTEMBER 2020.	***IN SEPTEMBER 2020, THE LOCAL CONTRACTOR PROVIDED A QUARTERLY ENVIRONMENTAL AND SAFETY TOOLKITS TO ITS WASTE COLLECTION TEAM AT THE LAND FIELD SITES.***
	

3.6 WATERSHED AND BIODIVERSITY MANAGEMENT

3.6.1 Watershed Management

3.6.1.1 Implementation of Annual Implementation Plan (AIP) 2019

Xaysomboun Provincial WRPO patrolled the reservoir between 04-13 August 2020 in the reservoir Zone 4 in Thathom District and in the reservoir Zone 2 and 3 in Hom District.

The observations and actions by reservoir patrolling in the reservoir zone 4 in Thathom District are summarized as below:

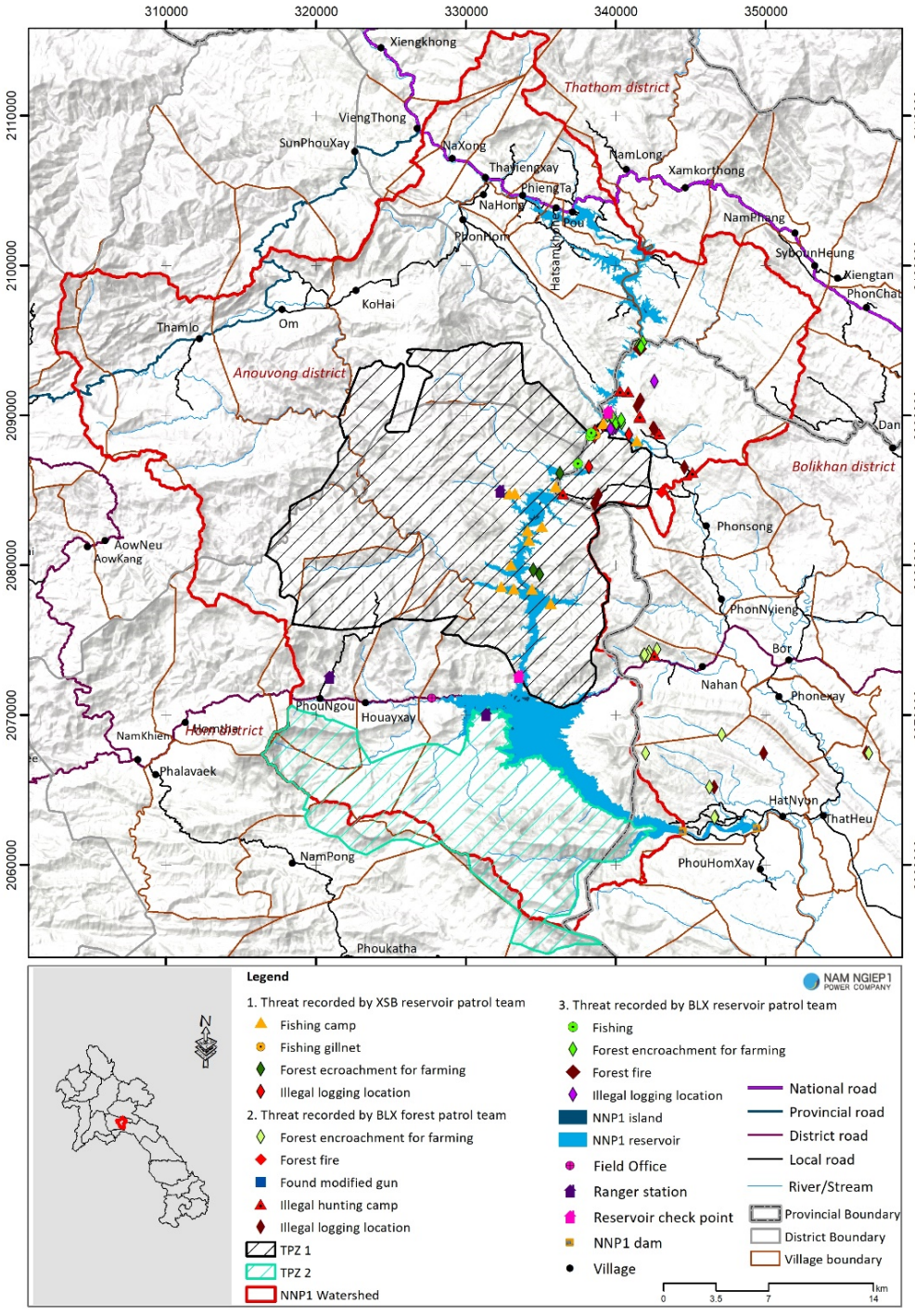
- The patrol team confiscated one homemade gun in Houay Xan, one gun in Houay Nonsoung and two gillnets around the TPZ reservoir. Warning letters were issued to the owners and the confiscated objects were handed over to DAFO of Thathom District for further process.

- The patrol team also confiscated timber collected in Soup Khai, Houay Xan and Houay Xou as well as around Houay Xou and Houay Pakhao. The team reported the situation to PAFO for further inspection and action.

The observation and action by reservoir patrolling in the reservoir zone 2 and 3 in Hom District are summarized below:

- The patrol team encountered four fishing camps in Nam Phouane and two fishing camps in Houay Phamom. The fishers informed that they were fishing for their own consumption and sale. One of the fishing camps in Nam Phouane and one of the fishing camps in Hoay Phamom are within the TPZ reservoir and so the patrol team issued warning letters, ordered them to move out from the area and educated them on fishing regulations including not to use destructive fishing gears and not to enter the TPZ reservoir area.
- The patrol team also encountered fishing in tributaries to the reservoir including four boats with 24 gillnets in Houay Nam Om and one boat with 300 fishhooks in Houay Sath. The fishers informed that they were fishing for their own consumption and sale.
- The patrol team also found two timber collection sites and two machines for cutting trees in livestock area. The first site had a total of 33 pieces of timber and five logs. The second site had a total of 41 pieces of timber. The team reported the situation to PAFO for further inspection and action.

FIGURE 3-7: MAP OF RECORDED THREATS FROM PATROLLING ACTIVITY BY XAYSOMBOUN WRPO PATROL TEAM BETWEEN 04-13 AUGUST 2020

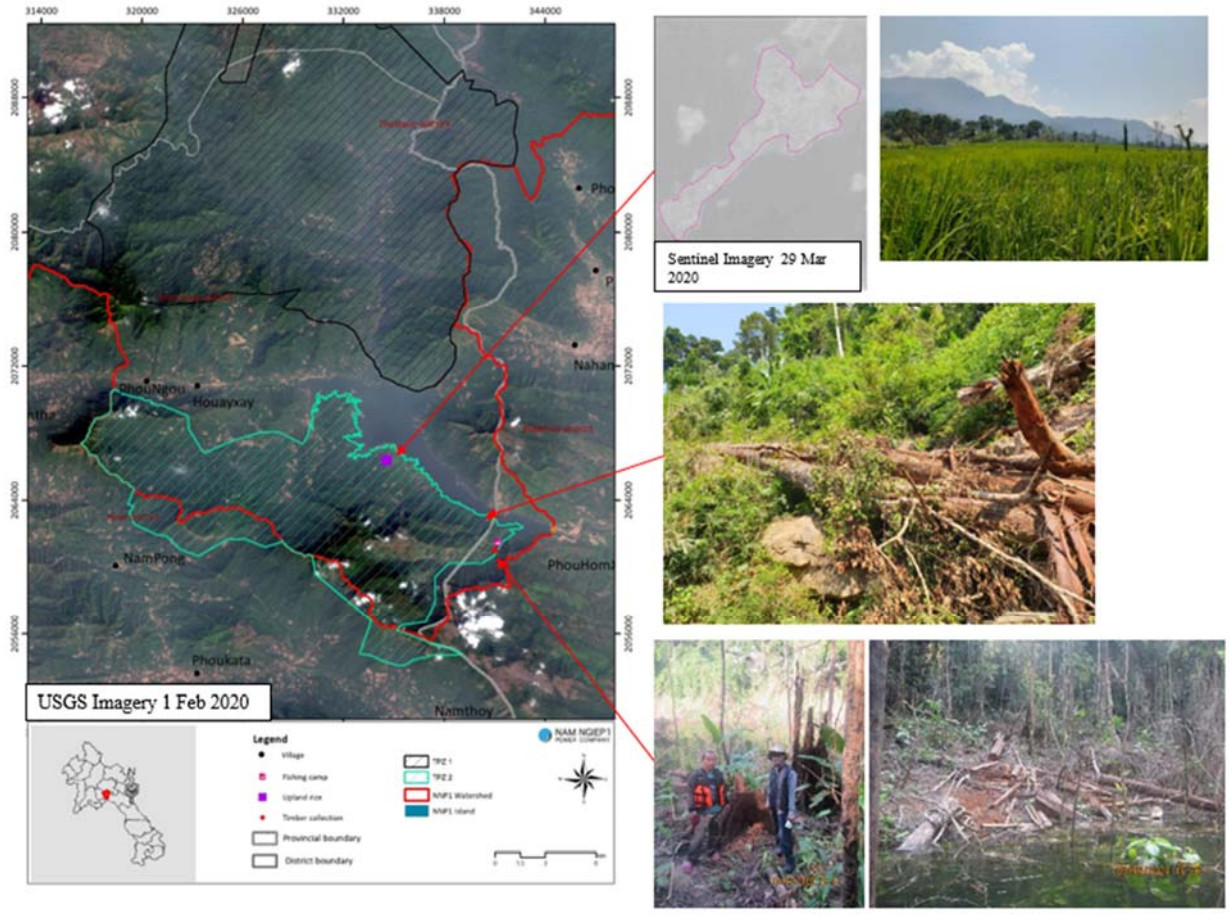


NNP1PC EMO Team conducted reservoir monitoring on 3 September 2020 around the middle and lower reservoir areas with the summary notes as below:

- The EMO Team found new upland cultivation of rice, rubber trees, and pineapple around 35 ha. Based on information from some of the families, it appears that the cultivation started in April 2020 and is being carried out by about 20 project affected households that self-resettled. The team informed

- these families that the area that they are cultivating is within TPZ2 and as per the Xaysomboun Provincial Governor regulation on watershed management farming is not allowed within the area and will be ordered stopped by GoL staff under the TPZ protection and management program.
- The Team also found one boat dock near Katha stream but nobody was around. The team also found logging spot around and one fishing camp around 200 meters from this spot. The team advised the fisher to move out because this is still within TPZ2 area.
- The team have prepared and submitted a detailed observation report to Xaysomboun and Bolikhamxay provincial WRPO at the end of September 2020 for further action.

FIGURE 3-8: MAP AND PICTURES OF RECORDED THREATS FROM RESERVOIR MONITORING BY NNP1PC EMO TEAM ON 03 SEPTEMBER 2020



Agreement on Bolikhamxay Provincial Regulation for Forest Resource and Biodiversity Protection in the NNP1 Watershed within Bolikhamxay administrative area was issued by Provincial Governor on 17 August 2020. Bolilkhamxay Provincial WRPO distributed more than 200 booklets of this agreement to nine villages adjacent to NNP1 watershed and to relevant GoL agencies at district level such as District Administration Office, DAFO, DoNRE, militaries, and police in the second and third week of September 2020.

The training on patrolling and SMART basic user for the ranger teams and the SMART/GIS officers of Xaysomboun and Bolikhamxay WRPO was organized between 14-30 September 2020. The training comprised classroom activities and simple field exercises on planning, execution, reporting on patrolling including the use SMART system to support the patrolling.

A working session on monitoring and reporting on the Project fund was organized on 15-16 September 2020 at Xaysomboun PAFO. The meeting was attended by four representatives from Xaysomboun Provincial PAFO/WRPO, two representatives from Xaysomboun Provincial Treasury and two representatives from NNP1PC EMO. The discussion notes could be summarized as below:

- It is noted that as per the guideline from Minister of Finance (MoF), provincial departments/offices are not allowed to open project bank account with a commercial bank. The project fund shall be kept and administered through a project account under Provincial Treasury's bank account. The fund payment can be made by cash or cheque based on the approved payment request from PAFO.
- Xaysomboun Provincial Treasury can certify the monthly account statements of project fund for Xaysomboun Provincial PAFO/WRPO.
- The monthly financial report of Xaysomboun Provincial WRPO shall include the overall financial statement, monthly expenditure, to date expenditure by activities, and certified account statement.
- Xaysomboun Provincial PAFO/WRPO internal payment request for the implementation of activities shall include advance request form with the attachment of detail activity. This payment shall be recorded as advance. After completion of the activity implementation, an advance clearance form shall be prepared with the attachment of receipts, report and relevant documents and filed properly. The actual expenditure shall be recorded in the month that advance is cleared.
- Project assets and equipment shall be inventoried and recorded every time if it is borrowed by Officers/others.

The final draft of Fishery Co-Management Plan (FCMP) in English was finalized by NNP1PC EMO at the end of September 2020 prior to submission to ADB and approval by Xaysomboun PAFO.

The report of assessment on sustainable livelihood opportunities for NNP1 watershed communities was finalized by NNP1PC EMO in early October 2020 for further review by NNP1 EMO and ESD management.

ADB provided confirmation of no objection on WMP AIP2020 for the activities from October to December 2020 on 27 Aug 2020. An official request for fund disbursement by DOF-MAF for the WMP AIP2020 of Bolikhamxay Province was issued on 10 September 2020. The fund is expected to be available in the first week of October 2020 at the soonest. NNP1PC has further worked with Xaysomboun Provincial WRPO to finalize their activity progress report and financial summary of the AIP2019 in the third week of September 2020. IAP Biodiversity Specialist provided confirmation of no objection on the WMP AIP2020 of Xaysomboun Provincial WRPO on 18 September 2020. The official letter for fund disbursement by DOF-MAF is expected to be issued in the first week of October 2020 then the fund is expected to be available in the third week of October 2020 as soonest.

3.6.2 Biodiversity Offset Management

3.6.2.1 Engagement of Biodiversity Service Provider (BSP)

At the end of September 2020, the MOU between NNP1PC, ADB and WCS was still under discussion. WCS proposed additional text to the final draft MOU and endorsed by ADB, NNP1PC legal counsel was consulted on the statement revising.

NNP1PC-EMO and the BSP continued to make progress on the preparation of a Law Enforcement Strategy (LES) document for NC-NX offset site, the overall biological monitoring program for NNP1 watershed and NC-NX offset site, community outreach program, conservation linked livelihood and the trainings on patrolling and SMART.

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

Bolikhamxay Provincial NC-NX BOMU received funds for the implementation of activities under the first and second quarters of AIP2020 from DOF-MAF on 08 June 2020.

Progresses on the implementation of key activities by Component in September 2020 are described below:

a. Component 1 - Spatial Planning and Regulation

The dissemination and outreach activity on the TPZ boundary were further postponed to October 2020 because of the impassable access after weeks of heavy rain in Viengthong and Xaychamphone District.

b. Component 2 – Law Enforcement

The training on SMART basic user for the Head and Deputy Head of the Patrolling Team and the SMART/GIS officers of Bolikhamxay Provincial BOMU was organized on 15-17 September 2020. The training comprises of classroom activities using the information from NC-NX patrolling between 2017 to 2019.

The four patrol teams continued the patrolling between 05 to 25 September 2020 with the focus on Nam Ma TPZ high priority area including Nam Ma, Nam Pang, Nam Mong; Xaychamphone District including Nam Kha Gni and Nam Chamhung; Nam Houng TPZ High Priority Area including Nam Tan, Nam Sik, Nam Kama and Nam Kapa; and TPZ Highest Priority including Nam San and Nam Chouan. The results of September 2020 patrolling will be presented and discussed in October 2020 Monthly Report.

The results of patrolling activity in August 2020 are as follow:

- *The first team* carried out patrolling at Nam Ma area including Nam Ma, Nam Phai and Houay Phaphard. They spent 16 days covering a distance of 66 km on forest patrolling and 7 km on road patrol. The team made a total of four direct observations and six indirect observations of the following wildlife: wild pig, muntjacs, macaques, Black Giant Squirrels, Brown Hornbill, White-cheeked Gibbon, Great Hornbill and Rufous-necked Hornbill. The team encountered with 15 large wire snares at the south of Houay Phaphard and heard sound of the gun at Nam Ma. The snares were destroyed by the patrolling team.

- *The second team* carried out patrolling at at Xaychamphone District including Houay Chok, Houay Wod-Wod, Houay Mouang, Houay Or, Houay Tong, Houay Ping, Houay Kamoud, Houay Kasi, Houay Khone and Nam Houng. They spent 16 days covering a distance of 74 km on forest patrolling and 28 km on road patrolling. The team made a total of six direct observations and two indirect observations of the following wildlife: Macaques, Phayre's leaf monkeys, Brown Hornbills, Black Giant Squirrel, White-Cheeked Gibbon, Eagle, Muntjac and Wild Pig. The team

encountered a small inactive hunting camp in Houay Wod-Wod, two small inactive hunting camps in Houay Tong and a small inactive hunting camp in Houay Kasi. These camps were destroyed by the team.

- *The third team* carried out patrolling at Nam Houng TPZ high priority area (Viengthong District) including Nam Houng and Nam Kha Gna. They spent 16 days covering a distance of 83 km on forest patrolling and 3 km on road patrol. The team made a total of six direct observations and three indirect observations of the following wildlife: Phayre's Leaf Monkey, Macaques, Black Giant Squirrels, Brown Hornbills, Grey-Fish Eagle, Wild Pigs, Indochinese Serow and Otter. The team encountered and destroyed one inactive fishing camp at Nam Houng.

- *The fourth team* carried out patrolling at TPZ highest priority area in Nam Chang, Nam Sone, Houay Xay-Gnai and Houay Xay-Noi. They spent 16 days covering a distance of 89 km on forest patrolling and 20 km on road patrolling. The team made a total of six direct observations and three indirect observations of the following wildlife: White-Cheeked Gibbons, macaques, Great Hornbills, Muntjac, Impressed Tortoise, Wild Pig, and Indochinese Serow. The team encountered and destroyed five large wire-snares at the south of Houay Phai.

FIGURE 3-9: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN AUGUST 2020

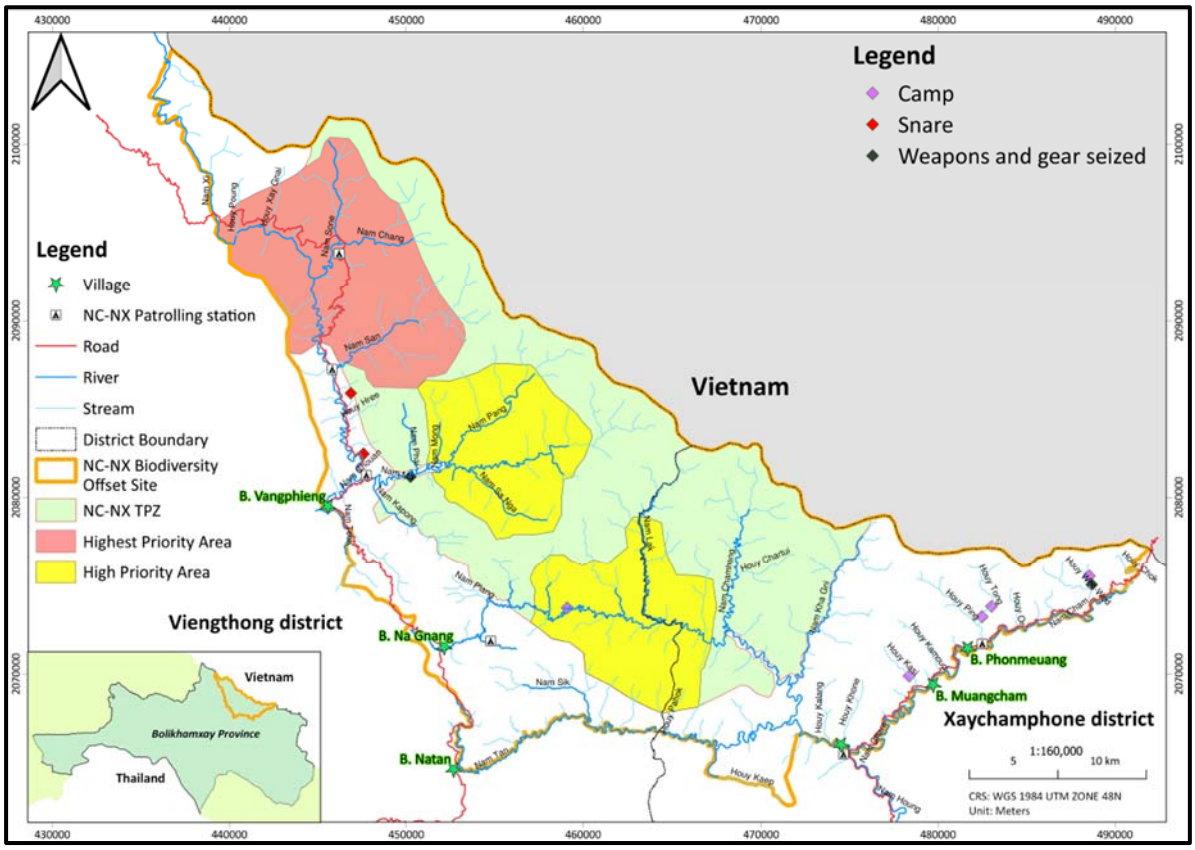


FIGURE 3-10: MAP OF WILDLIFE SIGNS RECORDED BY PATROLLING TEAMS IN AUGUST 2020

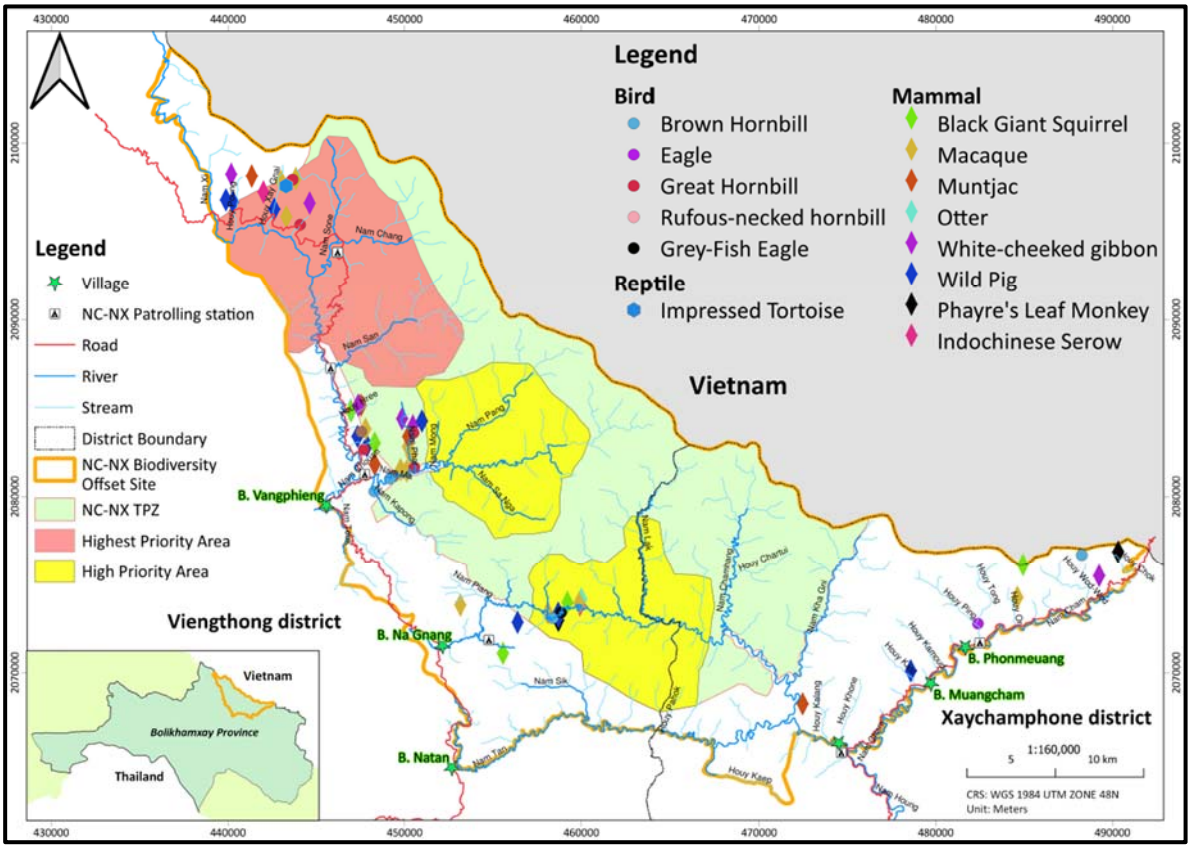


FIGURE 3-11: SMALL HUNTING CAMP FOUND BY TEAM 2 AT HOUAY TONG

FIGURE 3-12: FISHING CAMP FOUND BY TEAM 3 AT NAM HOUNG

FIGURE 3-13: LARGE SPRING SNARE FOUND BY TEAM 4 AT SOUTH OF HOUAY PHAI

FIGURE 3-14: WHITE-CHEEKED GIBBON

FIGURE 3-15: GREY FISH EAGLE

FIGURE 3-16: IMPRESSED TORTOISE

c. Component 3 – Conservation Outreach

The BSP team continued with the progress of NC-NX Outreach Development. The pre-assessment of the target audiences and the timeline of activities was further discussed with NNP1PC and NC-NX BOMU during the monthly meeting held on 03 September 2020. The pre-assessment survey was tentatively scheduled in the first week of October 2020.

d. Component 4 – Conservation linked livelihood development

The consultant contracted to develop a Community Development Plan (CDP) made a series of revisions to the draft CDP addressing the comments from NNP1PC EMO and BSP. The submission to ADB is expected to be further delayed to October 2020.

The establishment and training of a team for snare removal was further discussed during the monthly meeting on 03 September 2020. The training was tentatively scheduled in the first week of October 2020.

e. Component 6 – Biological Monitoring

During September 2020, the BSP worked on improving the biological monitoring matrix. It is expected that the submission of the improved matrix to NNP1PC management, ADB and IAP for their review and comment will be delayed to October 2020.

3.7 FLOATING DEBRIS REMOVAL

There was no field work carried out during this reporting period.

4. FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in August 2020 as listed in ***Table 4-1.*** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species[1].

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN AUGUST 2020

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Hampala dispar, Hampala macrolepidota	ปาสูด	198.4	LC
Channa striata	ปาถ่ำ	143.8	LC
Mastacembelus armatus, Mastacembelus favus	ปาหูาด	104.9	LC
Clarias batrachus	ปาดุก	103.8	LC
Poropuntius normani, Poropuntius laoensis,Poropuntius carinatus	ปาจาด	105.9	LC

The recorded catch of Threatened and Near Threatened species (IUCN Red List classification) in August 2020 is presented in ***Table 4-2.*** The list includes three species that are classified as Vulnerable (VU) species and four Near Threatened (NT) species.

TABLE 4-2: THREATENED SPECIES OF AUGUST 2020 FISH CATCH

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cirrhinus molitorella	ปาแกง	54	NT
Cyprinus carpio	ปาไน	18.5	VU
Neolissochilus stracheyi	ปาสอง	2.1	NT
Onychostoma gerlachi	ปาถึง	1.4	NT
Scaphognathops bandanensis	ปาอวนไฟ / ปาป่วน	17.8	VU
Tor sinensis	ปาแดง	60	VU
Wallago attu	ปาถ้าอ	1	NT

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

The total recorded monthly fish catch for the downstream and upstream fishing households and the Mekong control group involved in the monitoring programme from July 2015 to August 2020 is presented in ***Figure 4-1***. Note that the upstream fish catch excludes the fish catch from the fishing households in Zone 2LR because these households were resettled during Q4 2017.

FIGURE 4-1: TOTAL MONTHLY FISH CATCH JULY 2015 – AUGUST 2020

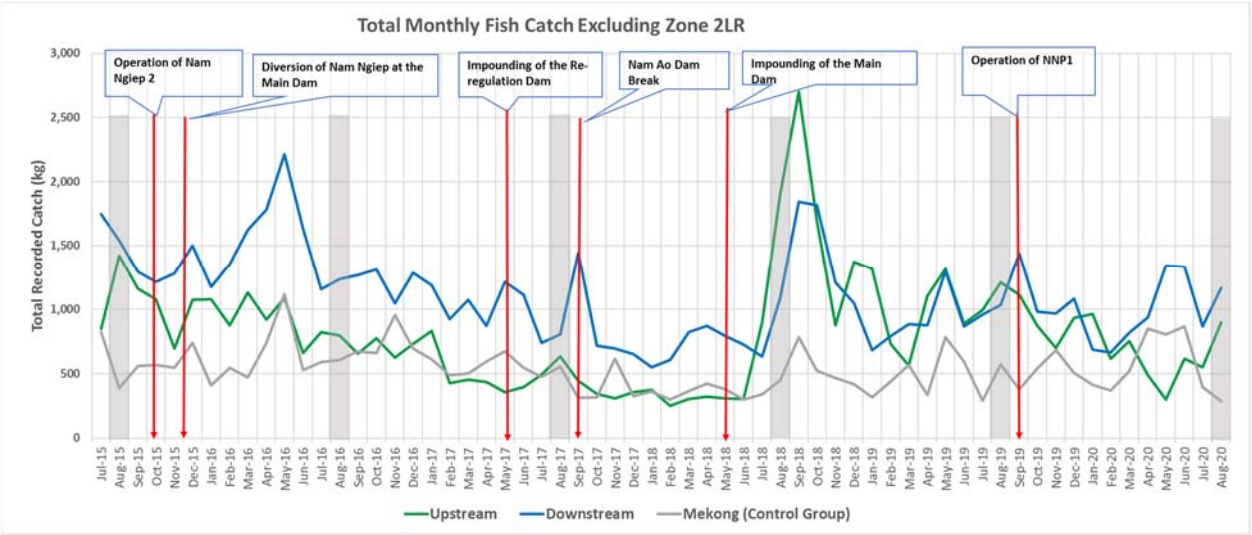
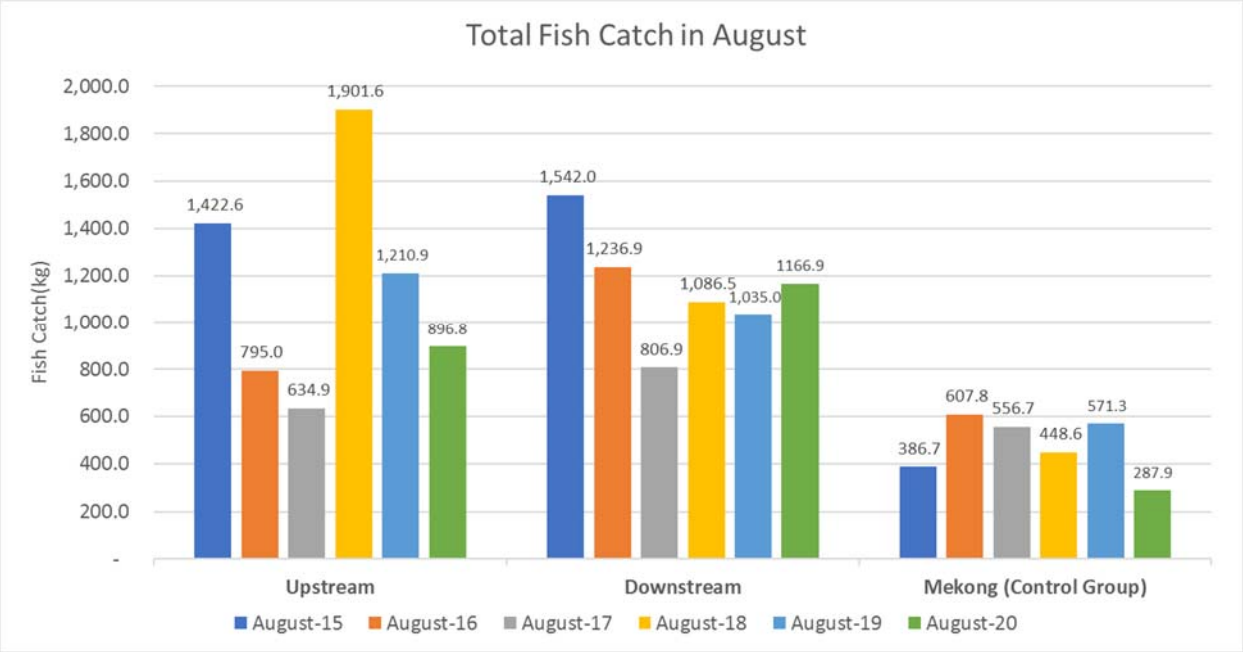


Table 4-3 and ***Figure 4-2*** show the total recorded fish catch for the month of August from 2015 to 2020 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group. The total fish catch data represents the total fish supply provided by the involved fishing households.

TABLE 4-3: TOTAL FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS FOR THE MONTH OF AUGUST FROM 2015 TO 2020

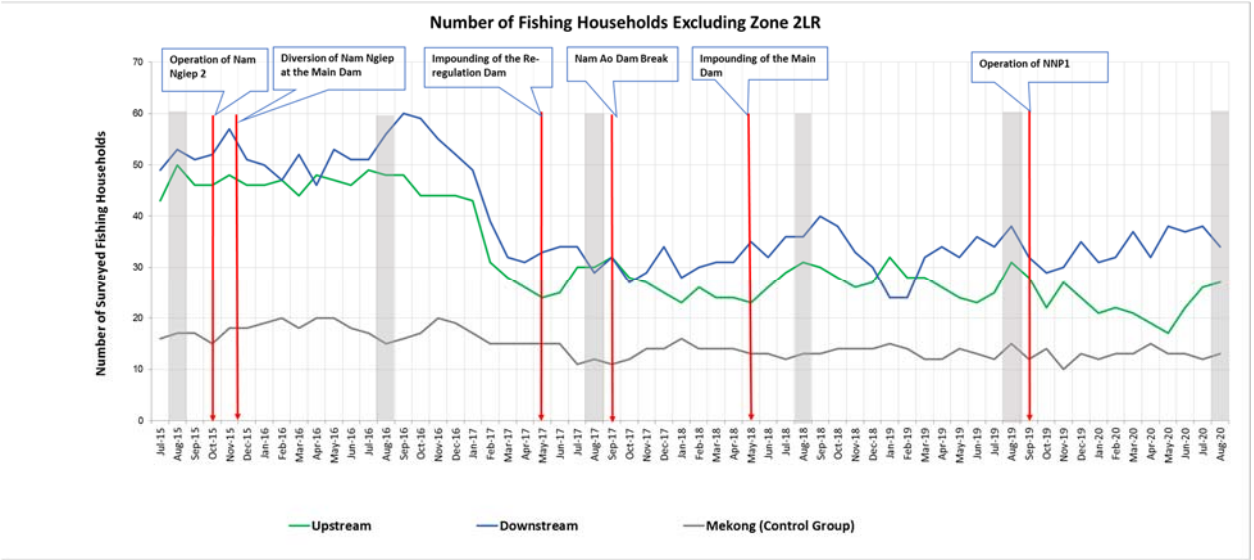
Fishing Zone	August 2015 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)	August 2019 (kg)	August 2020 (kg)
Upstream	1,422.6	795.0	634.9	1,901.6	1,210.9	896.8
Downstream	1,542.0	1,236.9	806.9	1,086.5	1,035.0	1,166.9
Mekong Control Group	386.7	607.8	556.7	448.6	571.3	287.9

FIGURE 4-2: TOTAL FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS FOR THE MONTH OF AUGUST FROM 2015 TO 2020



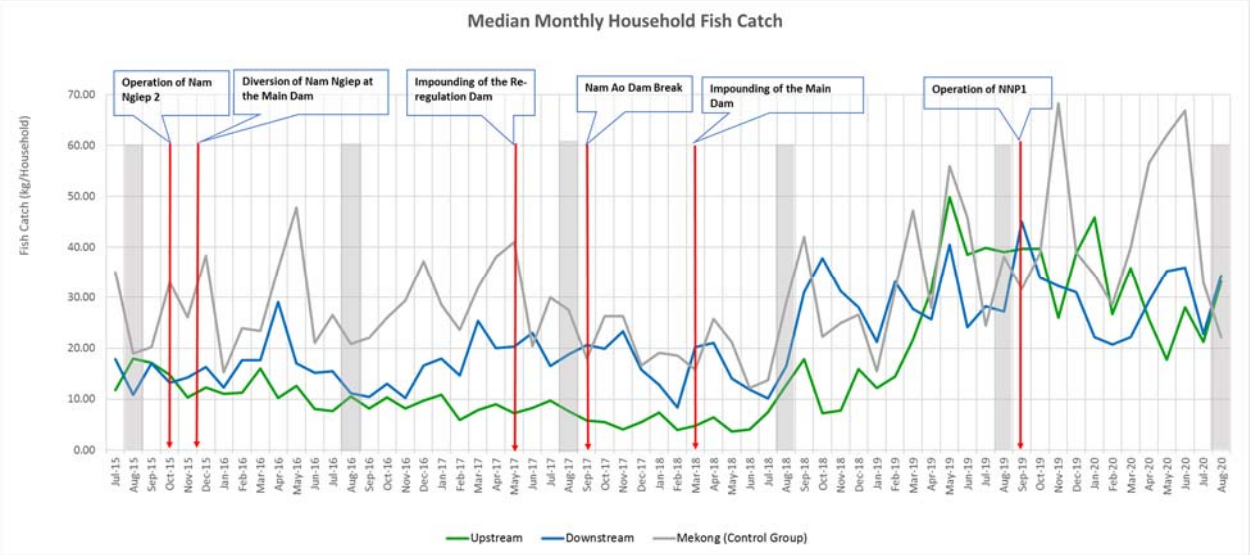
The numbers of fishing households involved in the fish catch monitoring programme are displayed in ***Figure 4-3.***

FIGURE 4-3: NUMBER OF FISHING HOUSEHOLDS INVOLVED IN THE FISH CATCH MONITORING PROGRAMME



The median monthly household fish catch from July 2015 to August 2020 for the upstream (excluding Zone 2LR) and downstream communities, and the Mekong control group are presented in ***Figure 4-4.***

FIGURE 4-4: MEDIAN MONTHLY HOUSEHOLD FISH CATCH WITHOUT ZONE 2LR



The median household fish catch for the month of August from 2015 to 2020 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group are displayed in ***Table 4-4.***

TABLE 4-4: MEDIAN MONTHLY HOUSEHOLD FISH CATCH IN THE UPSTREAM AND DOWNSTREAM COMMUNITIES EXCLUDING ZONE 2LR FOR THE MONTH OF AUGUST FROM 2015 TO 2020

Fishing Zone	August 2015 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)	August 2019 (kg)	August 2020 (kg)
Upstream	17.9	10.5	7.7	12.8	39.1	33.2
Downstream	10.8	11.2	18.8	16.6	27.2	34.3
Mekong Control Group	19.0	20.8	27.6	29.1	38.1	22.1

The median daily fish catch per household are displayed in ***Figure 4-5***, and the median fish catch per household per fishing day for the month of August from 2015 to 2020 are shown in ***Table 4-5.***

FIGURE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD

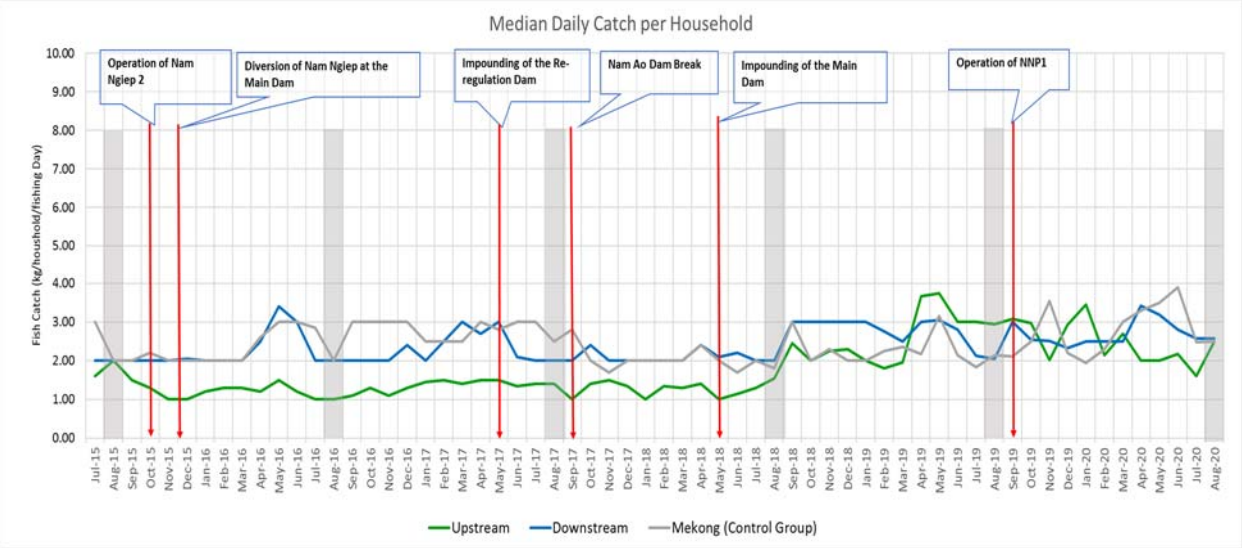


TABLE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD FOR THE MONTH OF AUGUST FROM 2015 TO 2020

Fishing Zone	August 2015 (kg)	August 2016 (kg)	August 2017 (kg)	August 2018 (kg)	August 2019 (kg)	August 2020 (kg)
Upstream	2.00	1.00	1.40	1.55	2.94	2.50
Downstream	2.00	2.00	2.00	2.00	2.05	2.58
Mekong Control Group	2.00	2.00	2.50	1.80	2.15	2.50

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

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

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
1-Sep-20	pH	5.0 - 9.0		7.0	7.93	7.41	6.62							
2-Sep-20	pH	5.0 - 9.0						6.96	6.36	6.41	6.22	6.67	6.6	6.62
7-Sep-20	pH	5.0 - 9.0	6.86											
8-Sep-20	pH	5.0 - 9.0		6.49	7.84									
9-Sep-20	pH	5.0 - 9.0				7.89	7.22	7.26						
10-Sep-20	pH	5.0 - 9.0							7.3	7.35	7.34	7.62	7.55	7.85
15-Sep-20	pH	5.0 - 9.0		6.33	8.01	7.67	7.75							
16-Sep-20	pH	5.0 - 9.0						7.42	7.39	7.21	7.16	7.67	7.57	7.67
21-Sep-20	pH	5.0 - 9.0	7.49											
22-Sep-20	pH	5.0 - 9.0		7.54	6.86	8.43	8.53							
23-Sep-20	pH	5.0 - 9.0						6.52	7.08	7.01	6.75	7.02	6.88	7.01
29-Sep-20	pH	5.0 - 9.0		7.38	6.88	6.78	6.75							
30-Sep-20	pH	5.0 - 9.0						7.76	6.71	6.52	6.56	6.72	6.81	7.18
1-Sep-20	Sat. DO (%)			94.6	117.2	93.8	90.1							
2-Sep-20	Sat. DO (%)							102.3	16.2	15.8	49	69.6	72.3	75.1
7-Sep-20	Sat. DO (%)		94.4											
8-Sep-20	Sat. DO (%)			78.5	106.5									
9-Sep-20	Sat. DO (%)					99.8	92.8	97.2						
10-Sep-20	Sat. DO (%)								19.5	23.2	51.1	55.7	68.5	72.1
15-Sep-20	Sat. DO (%)			85.3	110.5	102.7	93.2							
16-Sep-20	Sat. DO (%)							100.9	32	28.2	54.9	52.1	78.9	71.5
21-Sep-20	Sat. DO (%)		95.3											
22-Sep-20	Sat. DO (%)			99.6	116.3	116.4	101.5							
23-Sep-20	Sat. DO (%)							87.1	45.4	35.7	45.4	54.9	69.6	72.4
29-Sep-20	Sat. DO (%)			92.7	111.4	105.4	101							
30-Sep-20	Sat. DO (%)							109.1	49.4	37.4	58.9	63.4	79.1	85.5
1-Sep-20	DO (mg/L)	>6.0		7.68	8.56	7	6.75							
2-Sep-20	DO (mg/L)	>6.0						7.84	1.34	1.3	3.97	5.65	5.71	6.03
7-Sep-20	DO (mg/L)	>6.0	7.39											
8-Sep-20	DO (mg/L)	>6.0		6.53	7.86									
9-Sep-20	DO (mg/L)	>6.0				7.37	6.96	7.37						
10-Sep-20	DO (mg/L)	>6.0							1.63	1.93	4.21	4.61	5.36	5.83
15-Sep-20	DO (mg/L)	>6.0		6.55	8.04	7.54	6.93							
16-Sep-20	DO (mg/L)	>6.0						7.67	2.64	2.32	4.43	4.19	6.25	5.73
21-Sep-20	DO (mg/L)	>6.0	7.55											
22-Sep-20	DO (mg/L)	>6.0		8.3	8.87	8.8	7.78							

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
23-Sep-20	DO (mg/L)	>6.0						6.75	3.75	2.94	3.51	4.48	5.6	5.82
29-Sep-20	DO (mg/L)	>6.0		7.26	8.43	7.95	7.66							
30-Sep-20	DO (mg/L)	>6.0						8.4	4.08	3.1	4.75	5.11	6.32	6.87
1-Sep-20	Conductivity (µs/cm)			74	71	66	65							
2-Sep-20	Conductivity (µs/cm)							63	72	71	71	71	69	63
7-Sep-20	Conductivity (µs/cm)		52.5											
8-Sep-20	Conductivity (µs/cm)			67	68									
9-Sep-20	Conductivity (µs/cm)					64	63	61						
10-Sep-20	Conductivity (µs/cm)								69	67	67	66	59	50
15-Sep-20	Conductivity (µs/cm)			95	67	64	63							
16-Sep-20	Conductivity (µs/cm)							61	66	64	66	67	63	58
21-Sep-20	Conductivity (µs/cm)		58.4											
22-Sep-20	Conductivity (µs/cm)			77	65	62	61							
23-Sep-20	Conductivity (µs/cm)							60	57	56	61	54	49	41
29-Sep-20	Conductivity (µs/cm)			86	65	62	60							
30-Sep-20	Conductivity (µs/cm)							59	64	62	76	65	69	64
1-Sep-20	Temperature (°C)			25.84	31.65	30.71	30.19							
2-Sep-20	Temperature (°C)							29.22	24.79	24.84	25.92	26.03	26.82	26.49
7-Sep-20	Temperature (°C)		25.4											
8-Sep-20	Temperature (°C)			24.99	31.3									
9-Sep-20	Temperature (°C)					31.33	30.44	29.93						
10-Sep-20	Temperature (°C)								24.79	24.86	25.19	25.34	26.08	26.23
15-Sep-20	Temperature (°C)			29.23	32.23	31.63	30.64							
16-Sep-20	Temperature (°C)							29.86	25.01	25.21	26.41	26.45	27.35	26.8

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
21-Sep-20	Temperature (°C)		24.8											
22-Sep-20	Temperature (°C)			24.43	30.13	29.99	29.25							
23-Sep-20	Temperature (°C)							28.55	25.02	25.55	25.91	26	26.59	26.31
29-Sep-20	Temperature (°C)			27.89	30.14	29.89	29.68							
30-Sep-20	Temperature (°C)							28.94	25.07	25.2	26.27	26.07	26.72	26.4
1-Sep-20	Turbidity (NTU)			6.59	2.46	2.13	2.55							
2-Sep-20	Turbidity (NTU)								4.06	8.64	4.66	7.68	6.23	6.39
7-Sep-20	Turbidity (NTU)		1988											
8-Sep-20	Turbidity (NTU)			26.04	2.28									
9-Sep-20	Turbidity (NTU)					1.89	2.57	1.6						
10-Sep-20	Turbidity (NTU)								2.98	4.47	6.56	52.11	12.44	10.37
15-Sep-20	Turbidity (NTU)			6.5	2.83	2.57	2.46							
16-Sep-20	Turbidity (NTU)							2.56	4.05	3.75	3.85	7.4	5.77	6.58
21-Sep-20	Turbidity (NTU)		36.37											
22-Sep-20	Turbidity (NTU)			12.38	2.98	2.4	3.02							
23-Sep-20	Turbidity (NTU)							2.7	4.57	5.08	5.64	16.43	17.44	7.51
29-Sep-20	Turbidity (NTU)			4.57	2.71	3.17	2.76							
30-Sep-20	Turbidity (NTU)							2.69	3.99	3.44	4.2	8.73	6.31	5.5
7-Sep-20	TSS (mg/L)		1,484											
8-Sep-20	TSS (mg/L)			42.25										
9-Sep-20	TSS (mg/L)					<5	<5	<5						
10-Sep-20	TSS (mg/L)								<5	<5	7.2	30.24	32.68	38.27
9-Sep-20	TSS (mg/L)-Hypolimnion					17.39	20.78	9.76						
8-Sep-20	BOD_5 (mg/L)	<1.5		<1										
7-Sep-20	BOD_5 (mg/L)	<1.5	<1											
9-Sep-20	BOD_5 (mg/L)	<1.5				<1	<1	<1						
10-Sep-20	BOD_5 (mg/L)	<1.5							<1	<1	<1	<1	<1	<1
9-Sep-20	BOD_5 (mg/L)-Hypolimnion	<1.5				13.14	13.6	11.86						
7-Sep-20	COD (mg/L)	<5.0	20.3											
8-Sep-20	COD (mg/L)	<5.0												
10-Sep-20	COD (mg/L)	<5.0							<5.0	<5.0	<5.0	5.2	5.2	<5.0
7-Sep-20	NH_3-N (mg/L)	<0.2	<0.2											
8-Sep-20	NH_3-N (mg/L)	<0.2		<2										
9-Sep-20	NH_3-N (mg/L)	<0.2				<0.2	<0.2	<0.2						
9-Sep-20	NH_3-N (mg/L)-Hypolimnion	<0.2				0.88	0.88	<0.2						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
7-Sep-20	NO_3-N (mg/L)	<5.0	0.1											
8-Sep-20	NO_3-N (mg/L)	<5.0		<0.02										
9-Sep-20	NO_3-N (mg/L)	<5.0				<0.02	<0.02	<0.02						
9-Sep-20	NO_3-N (mg/L)-Hypolimnion					<0.02	<0.02	<0.02						
7-Sep-20	Faecal coliform (MPN/100 mL)	<1,000	1,600											
8-Sep-20	Faecal coliform (MPN/100 mL)	<1,000		1,600										
9-Sep-20	Faecal coliform (MPN/100 mL)	<1,000				23	2	2						
10-Sep-20	Faecal coliform (MPN/100 mL)	<1,000							33	33	79	920	140	540
9-Sep-20	Faecal coliform (MPN/100 mL)-Hypolimnion					0	0	0						
7-Sep-20	Total Coliform (MPN/100 mL)	<5,000	5,400											
8-Sep-20	Total Coliform (MPN/100 mL)	<5,000		1,600										
9-Sep-20	Total Coliform (MPN/100 mL)	<5,000				170	34	130						
10-Sep-20	Total Coliform (MPN/100 mL)	<5,000							140	540	920	920	350	1,600
9-Sep-20	Total Coliform (MPN/100 mL)-Hypolimnion					33	170	130						
7-Sep-20	TKN		<1.5											
8-Sep-20	TKN			<1.5										
9-Sep-20	TKN					<1.5	<1.5	<1.5						
9-Sep-20	TKN-Hypolimnion					<1.5	<1.5	<1.5						
7-Sep-20	TOC (mg/L)		1.68											
8-Sep-20	TOC (mg/L)													
10-Sep-20	TOC (mg/L)								1.1	1.18	1.84	1.98	2.35	2.38
8-Sep-20	Phytoplankton Biomass (g dry wt/m^3)			44.4										
9-Sep-20	Phytoplankton Biomass (g dry wt/m^3)					2.2	2	2.2						
9-Sep-20	Phytoplankton Biomass (g dry wt/m^3)-Hypolimnion					19.8	20.6	8						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
7-Sep-20	Total Phosphorus (mg/L)		0.19											
8-Sep-20	Total Phosphorus (mg/L)			0.13										
9-Sep-20	Total Phosphorus (mg/L)					0.04	0.08	0.04						
9-Sep-20	Total Phosphorus (mg/L)-Hypolimnion					0.71	0.07	0.24						
7-Sep-20	Total Dissolved Phosphorus (mg/L)		0.18											
8-Sep-20	Total Dissolved Phosphorus (mg/L)			0.12										
9-Sep-20	Total Dissolved Phosphorus (mg/L)					0.04	0.07	0.05						
9-Sep-20	Total Dissolved Phosphorus (mg/L)-Hypolimnion					0.7	0.07	0.24						
8-Sep-20	Hydrogen Sulfide (mg/L)			0.04										
9-Sep-20	Hydrogen Sulfide (mg/L)					<0.02	<0.02	<0.02						

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

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
2-Sep-20	pH	5.0 - 9.0		7.21		
7-Sep-20	pH	5.0 - 9.0			6.6	6.41
8-Sep-20	pH	5.0 - 9.0	8.69			
9-Sep-20	pH	5.0 - 9.0		7.3		
15-Sep-20	pH	5.0 - 9.0			7.51	7.57
21-Sep-20	pH	5.0 - 9.0			7.53	7.6
22-Sep-20	pH	5.0 - 9.0	8.61			
23-Sep-20	pH	5.0 - 9.0		7.83		
29-Sep-20	pH	5.0 - 9.0			6.91	7.08
30-Sep-20	pH	5.0 - 9.0		7.92		
1-Sep-20	Sat. DO (%)				7.26	7.22
2-Sep-20	Sat. DO (%)			113.9		
7-Sep-20	Sat. DO (%)				90.8	89.5
8-Sep-20	Sat. DO (%)		99.6			
9-Sep-20	Sat. DO (%)			94.1		
15-Sep-20	Sat. DO (%)				84.8	83.4
21-Sep-20	Sat. DO (%)				89.2	92.1
22-Sep-20	Sat. DO (%)		97.5			
23-Sep-20	Sat. DO (%)			116.2		
29-Sep-20	Sat. DO (%)				84.1	82.6
30-Sep-20	Sat. DO (%)			97.9		
1-Sep-20	DO (mg/L)	>6.0			100.2	96.1
2-Sep-20	DO (mg/L)	>6.0		8.62		
7-Sep-20	DO (mg/L)	>6.0			7.05	7.14
8-Sep-20	DO (mg/L)	>6.0	7.86			
9-Sep-20	DO (mg/L)	>6.0		7.79		
15-Sep-20	DO (mg/L)	>6.0			6.79	6.74
21-Sep-20	DO (mg/L)	>6.0			6.86	7.23
22-Sep-20	DO (mg/L)	>6.0	7.65			
23-Sep-20	DO (mg/L)	>6.0		10.01		
29-Sep-20	DO (mg/L)	>6.0			6.75	6.6
30-Sep-20	DO (mg/L)	>6.0		8.2		
1-Sep-20	Conductivity (µs/cm)				7.96	7.63
2-Sep-20	Conductivity (µs/cm)			68		
7-Sep-20	Conductivity (µs/cm)				74	20
8-Sep-20	Conductivity (µs/cm)		18.32			
9-Sep-20	Conductivity (µs/cm)			78		
15-Sep-20	Conductivity (µs/cm)				57	12
21-Sep-20	Conductivity (µs/cm)				82	19
22-Sep-20	Conductivity (µs/cm)		15.89			
23-Sep-20	Conductivity (µs/cm)			72		
29-Sep-20	Conductivity (µs/cm)				57	13

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**				
30-Sep-20	Conductivity (µs/cm)			65		
1-Sep-20	Temperature (°C)				73	20
2-Sep-20	Temperature (°C)			23.52		
7-Sep-20	Temperature (°C)				28.39	27.58
8-Sep-20	Temperature (°C)		24.7			
9-Sep-20	Temperature (°C)			24.9		
15-Sep-20	Temperature (°C)				26.57	25.83
21-Sep-20	Temperature (°C)				29.15	27.82
22-Sep-20	Temperature (°C)		25.1			
23-Sep-20	Temperature (°C)			23.1		
29-Sep-20	Temperature (°C)				26.59	26.4
30-Sep-20	Temperature (°C)			23.32		
1-Sep-20	Turbidity (NTU)				27.31	27.1
2-Sep-20	Turbidity (NTU)			8.35		
7-Sep-20	Turbidity (NTU)				9.88	7.32
8-Sep-20	Turbidity (NTU)		14.22			
9-Sep-20	Turbidity (NTU)			9.05		
15-Sep-20	Turbidity (NTU)				115	6.8
21-Sep-20	Turbidity (NTU)				12.56	6.6
22-Sep-20	Turbidity (NTU)		11.59			
23-Sep-20	Turbidity (NTU)			16.1		
29-Sep-20	Turbidity (NTU)				34.66	4.31
30-Sep-20	Turbidity (NTU)			6.55		
7-Sep-20	TSS (mg/L)				11.01	9.51
8-Sep-20	TSS (mg/L)		18.12			
9-Sep-20	TSS (mg/L)			23.91		
9-Sep-20	TSS (mg/L)-Hypolimnion				197.22	13.28
8-Sep-20	BOD_5 (mg/L)	<1.5		<1		
7-Sep-20	BOD_5 (mg/L)	<1.5	<1			
7-Sep-20	COD (mg/L)	<5.0		7.2		
8-Sep-20	COD (mg/L)	<5.0			8.8	13.5
7-Sep-20	NH_3-N (mg/L)	<0.2		<0.2		
9-Sep-20	NH_3-N (mg/L)	<0.2	0.11			
9-Sep-20	NH_3-N (mg/L)-Hypolimnion			<0.02		
8-Sep-20	NO_3-N (mg/L)	<5.0	350			
9-Sep-20	NO_3-N (mg/L)	<5.0		540		
7-Sep-20	Faecal coliform (MPN/100 mL)	<1,000			1,700	1,600
8-Sep-20	Faecal coliform (MPN/100 mL)	<1,000	1,600			
9-Sep-20	Faecal coliform (MPN/100 mL)	<1,000		920		
9-Sep-20	Faecal coliform (MPN/100 mL)-Hypolimnion				2,800	1,600

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**				
7-Sep-20	Total Coliform (MPN/100 mL)	<5,000	<1.5			
8-Sep-20	Total Coliform (MPN/100 mL)	<5,000		<1.5		
9-Sep-20	Total Coliform (MPN/100 mL)-Hypolimnion			5.08		
7-Sep-20	TKN				5.46	6.02
9-Sep-20	TKN-Hypolimnion		0.08			
7-Sep-20	TOC (mg/L)			0.04		
8-Sep-20	Phytoplankton Biomass (g dry wt/m^3)			0.04		

ANNEX B: RESULTS OF EFFLUENT ANALYSES

TABLE B-1: RESULTS OF CAMP EFFLUENTS IN SEPTEMBER 2020

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	03-Sep-20	17-Sep-20	03-Sep-20	17-Sep-20	03-Sep-20	17-Sep-20
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	7.02	7.61	7.15	7.59	6.95	
Sat. DO (%)		57.6	51.8	35.2	31.7	31.9	
DO (mg/L)		4.19	3.91	2.51	2.39	2.26	
Conductivity (µs/cm)		318	423	386	383	781	No discharge.
TDS (mg/L)		159	211.5	193	191.5	390.5	
Temperature (°C)		30.1	30.59	31.2	30.27	31.8	
Turbidity (NTU)		4.19	4.19	6.45	8.23	10.03	
TSS (mg/L)	<50	<5	<5	9.8	13.7	34.6	
BOD_5 (mg/L)	<30	<6	8.28	<6	<6	<6	
COD (mg/L)	<125	<25	4.4	<25	31	68.6	
NH_3-N (mg/L)	<10.0	9	<25	<2	14.4	37.6	
Total Nitrogen (mg/L)	<10.0	13.4	5.39	1.11	20.4	61.1	
Total Phosphorus (mg/L)	<2	1	1	1.18	1.22	3.76	
Oil & Grease (mg/L)	<10.0	3		<1		<1	
Total coliform (MPN/100 mL)	<400	1,600	1,600	0	16,000	0	
Faecal Coliform (MPN/100 mL)	<400	1,600	170	0	16,000	0	
Effluent Discharge Volume (L/mn)		6	6	3.75	6	1410	
Chlorination Dosing Rate (mL/mn)		n/a	n/a	40		350	
Residual Chlorine (mg/L)	<1.0	n/a	n/a	1.20	0.04	1.18	