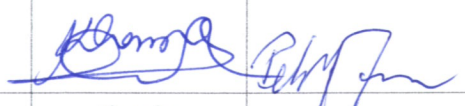
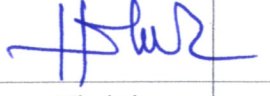
NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management
Monthly Monitoring Report

July 2019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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
PvPA	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 July 2019, the Environmental Management Office (EMO) of Nam Ngiep 1 Power Company (NNP1PC) received one Detailed Work Programme and Site Specific Environmental & Social Monitoring and Management Plan (DWP & SS-ESMMP) and one Site Decommissioning and Rehabilitation Plan for review and approval.

During 30 – 31 July 2019, Bolikhan District EMU carried out a monthly site visit to the construction sites of NNP1PC. There was a minor issue related to wastewater management of the Song Da 5 Subcontractor. The draft EMU report is under preparation and will be circulated to NNP1PC by early August 2019.

The effluent monitoring results for the camps in July 2019 indicate that the results of COD, BOD_5, ammonia nitrogen and total nitrogen comply with the relevant effluent standards for some camps whereas the results for the H-MH Camp [EF13] did not comply with the Standards. In addition, minor non-compliances for total coliform and faecal coliform were recorded at the Obayashi Camp [EF02]. The V&K Camp [EF10] was fully compliant with the Standard.

In July 2019, the Dissolved Oxygen (DO) levels at the surface of the Main Reservoir (R1, R2, R3, R4 and R5) were between 4.85 mg/L – 8. 4 mg/L, for the Re-regulation Reservoir (R6 and R7) DO was generally between 0.38 mg/L – 4.78 mg/L and the DO at the Nam Ngiep downstream of the Re-regulation Dam (NNG05) was between 2.2 mg/L – 7.47 mg/L.

During July 2019, all measurements of the DO in the re-regulation reservoir and downstream stations have been recorded as less than 6 mg/L. In addition, some dead fish still was observed during 10-13 July 19, on 24 July 19 and on 31 July 2019 in the re-regulation reservoir. The wet-testing of the turbines at the main powerhouse created discharges varying between 7 m^3/s and 147 m^3/s. NNP1PC submitted an incident report to ADB on 04 July 2019 and received comments on 26 July 2019 which will be followed by NNP1PC.

A total of 99.5 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 15.5 m^3 compared to May 2019. EMO conducted three waste spot checks at the NNP1 Project Landfill, construction sites and the camps. A total of 3,180 kg of recyclable waste was recorded at the Community Waste Bank. A total of 51 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at the Houay Soup Landfill.

NNP1PC continued to refine the Lao version of Watershed Management Plan (WMP) in July 2019. The Plan is expected to be submitted to the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF) on 05 August 2019 for approval and signing by Minister of MAF. The English version of the Plan will be further refined after this approval.

NNP1PC submitted the translated full AIP2019 of DOF-MAF and Bolikhamxay provincial WRPO to ADB and IAP for review and approval on 11 July 2019. ADB provided response on 26 July 2019 and the IAP provided comments on 31 July 2019. Xaysomboun Provincial WRPO submitted their full AIP2019 to NNP1PC-EMO on 17 July 2019. The submission of Xaysomboun Provincial AIP2019 to ADB is expected to be in the second week of August 2019.

NNP1PC submitted the refined version of Biodiversity Offset Management Plan (BOMP) to DOF-MAF on 17 July 2019 for approval and signing by Director General of DOF-MAF. The English version of the plan will be further refined after this approval.

NNP1PC completed fund transfer to DOF-MAF on 26 July 2019 for second quarter funding that will cover the implementation period from July to September 2019. DOF-MAF is processing the fund transfer to BOMU until end of July 2019.

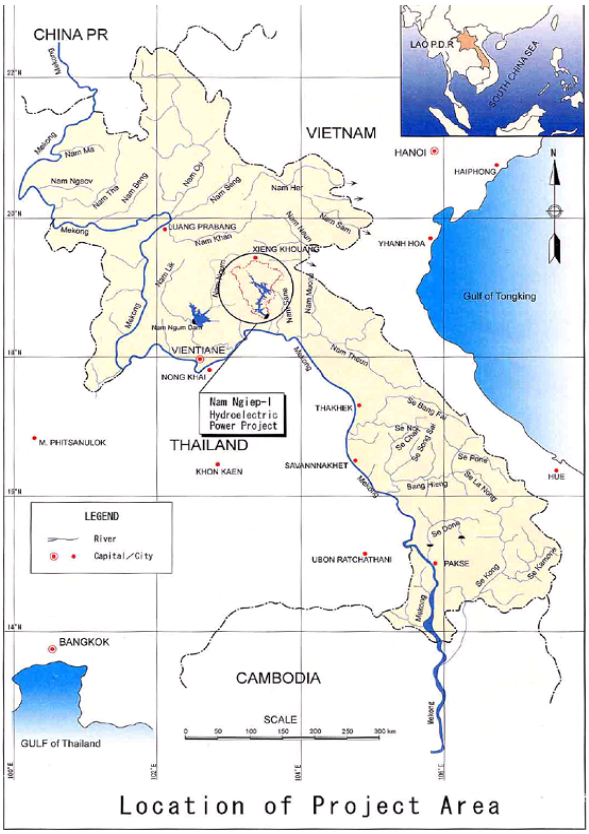
Activities under component of spatial planning and regulation, enforcement, and community outreach were carried out according to the schedule.

The fish catch monitoring for June 2019 in Nam Ngiep watershed was dominated by two species groups and three species. Three species are classified as Least Concern (LC), two species as Not Evaluated (NE) and one Data Deficient (DD) according to the IUCN Red List. However, the record also included four species that are classified as Vulnerable (VU) species and four Near Threatened (NT) species.

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.

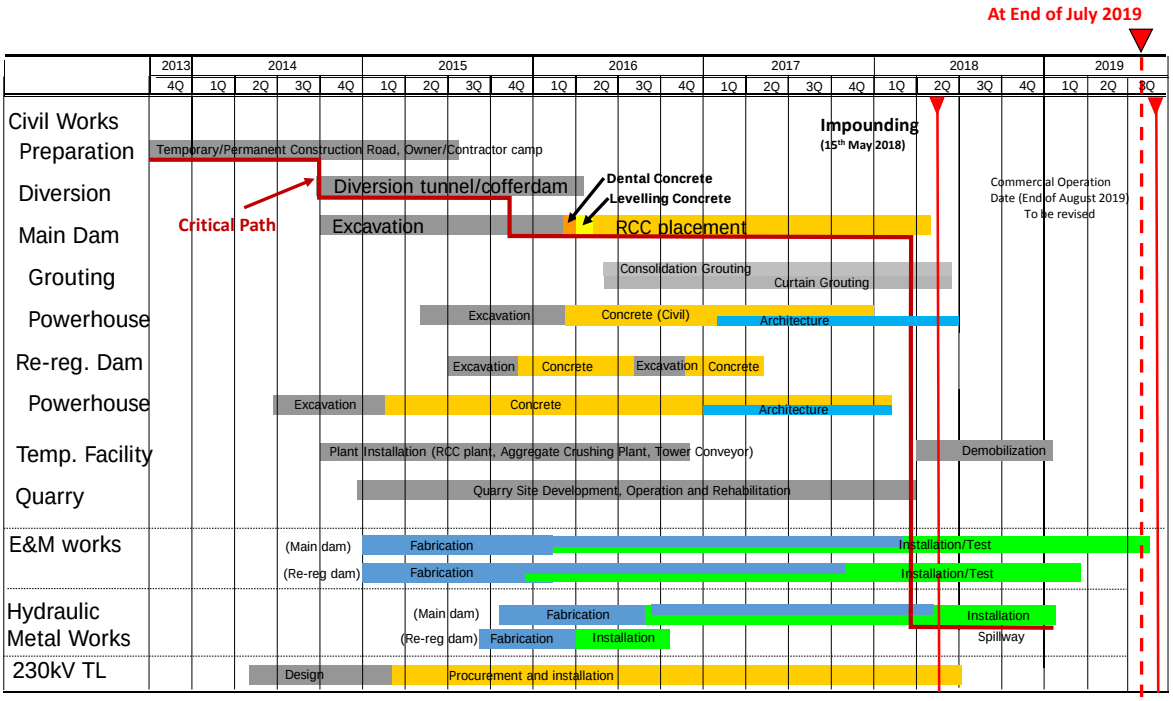
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

Construction works for the Project are being 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. (yellow is the same)

Figure 2-2 shows the overall progress of the Project in terms of value of work done and paid. It is shown that all works are substantially complete except for the Hydro-Mechanical Works. In

fact the works of this Contractor are complete but not yet paid under contract payment terms. Both Civil and Transmission Line Works are complete except for minor outstanding work and defects with the Civil Contractor carrying out almost 20 per cent more value of work in the original contract period. The Electrical and Mechanical Works Contractor is shown almost 100 per cent complete but additional work has been necessary to disassemble and reassemble the units due to the main powerhouse inclination problem. Actual overall cumulative work progress by value of work carried out and paid for until the end of June 2019 for all Contracts was 99.3 %[1] (compared to planned progress of 100 %), the overall construction schedule and progress curve (by achieved Milestone Payments) are shown in ***Figure 2-1*** and ***Figure 2-2*** respectively. ***Figure 2-3***[2] illustrates progress with the values of additional (mainly Civil) Works achieved through agreed Variation Orders and other Adjustments permitted under the Contracts.

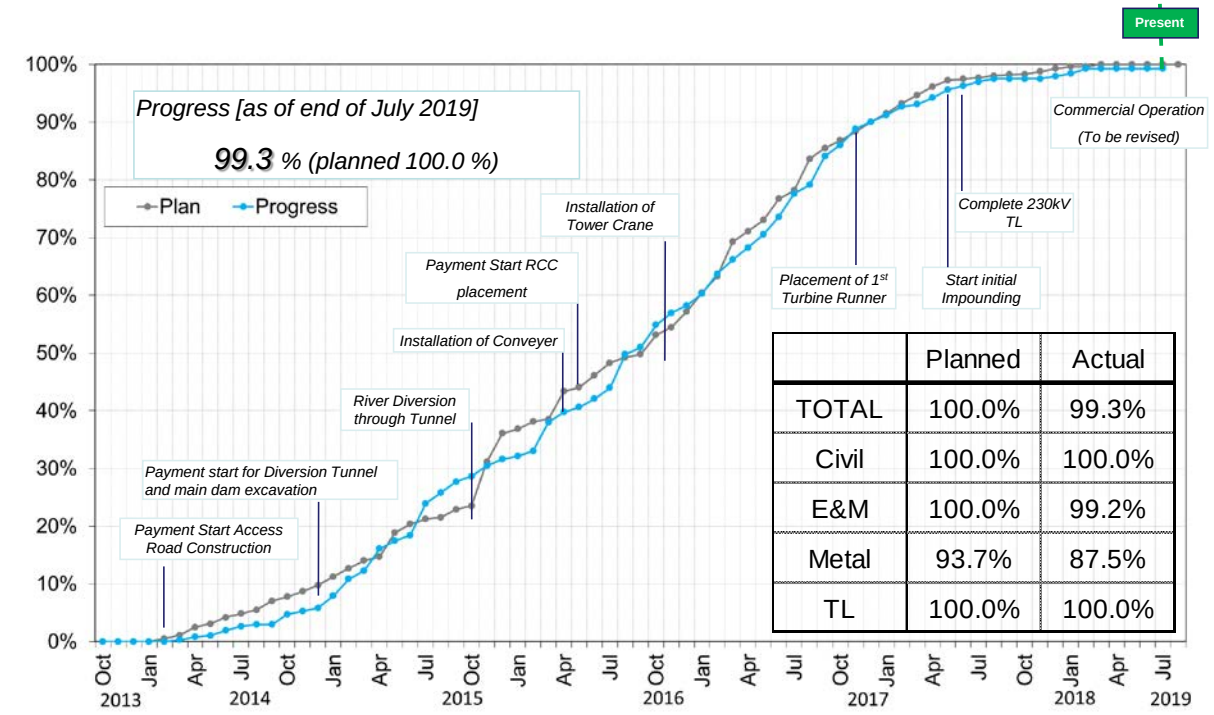
FIGURE 2-1: OVERALL CONSTRUCTION SCHEDULE



[1] The progress to-date is calculated as (Cumulative Amount of Achieved Interim Milestone Payments) / (Total Agreed Original Price of Construction Contracts) and expressed as a percentage. These totals exclude varied works and other adjustments allowed under each Contract.

[2] The progress to-date is calculated as (Cumulative Value Achieved for Completed Work by Variation Order or Other Adjustment) / (Total Budget Contingency Amount)

Figure 2-2: Overall Construction Progress Curve[1]

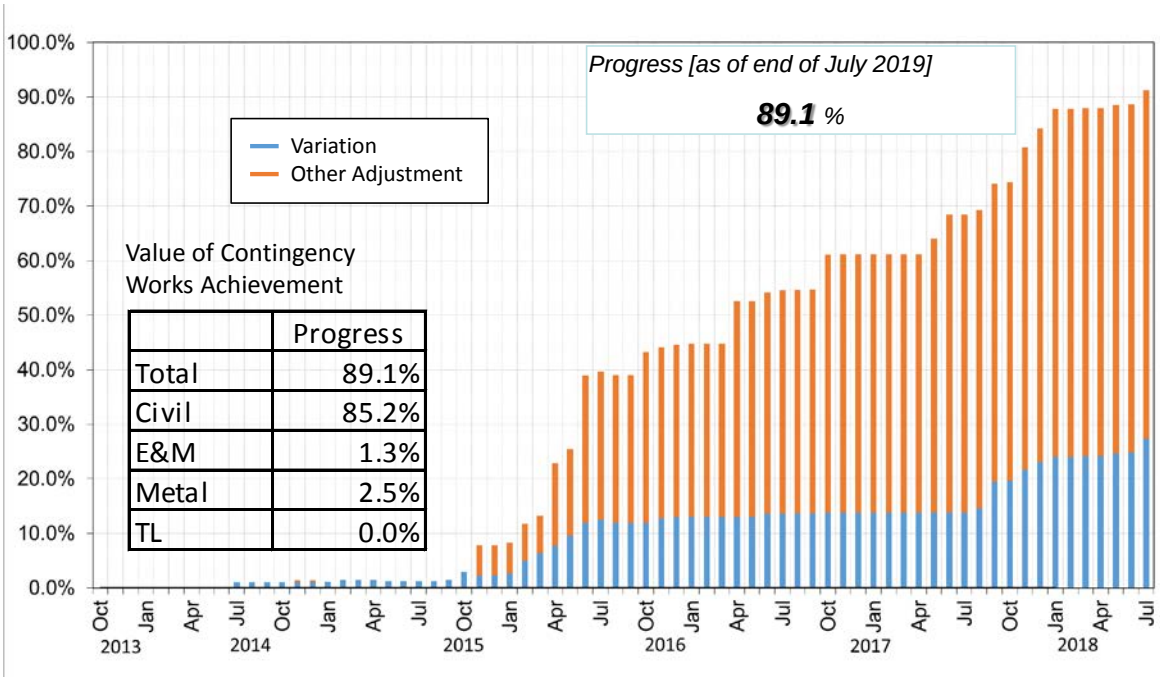


	Planned	Actual
TOTAL	100.0%	99.3%
Civil	100.0%	100.0%
E&M	100.0%	99.2%
Metal	93.7%	87.5%
TL	100.0%	100.0%

Figure 2-3: Progress Percentage by Value (All Construction Works)

	Contractor	Planned	Actual	Ahead	Behind
Overall	-	100.0 %	99.3 %	-	0.7 %
Civil	Obayashi Corporation	100.0 %	100.0 %	-	-
Electrical and Mechanical	Hitachi-Mitsubishi Hydro Corporation	100.0 %	99.2 %	-	0.8 %
Hydro-Mechanical	IHI Infrastructure Systems Co. Ltd.	93.7 %	87.5 %	-	-
230 kV TL	Loxley and Sri Consortium	100.0 %	100.0 %	-	-

Figure 2-4: Progress of Additional Contingency Works by Value of Variation Orders and Other Adjustments [2]



2.1 CIVIL WORK

The Civil Works Contract was executed between Obayashi Corporation and the Nam Ngiep 1 Power Company on 30 September 2013 and the Notice to Proceed was issued on 03 October 2014. Excavation works of the main dam, the diversion tunnel and the re-regulation dam were commenced in October 2014 and completed in February 2016, following which the concreting works were commenced.

The cumulative actual work progress of the Civil Works until the end of March 2019 was 100 % (compared to planned progress of 100 %) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

The Civil Works overall was always on or ahead of schedule despite increased quantities of dam excavation and slope stabilisation and additional RCC placed in the shear key. During the initial dam excavation and since, it has been written in each Monthly Report, *'the complex bedding of hard over soft layers of rock and the folding nature of these layers in the foundation rock of the main dam below the old river bed had created difficulty to finalise the foundation design to the satisfaction of the Dam Safety Review Panel in all respects'.*

The repairs to the 230 kV TL Tower No.1 foundation leg 4 were completed in February 2019. The remaining excavation of the plunge pool was finished in January 2019. The reinforced concrete parapet wall was completed in December 2018 and road deck to the main dam crest and the concrete spillway chutes and piers completed in January 2019.

2.1.1 MAIN DAM AND POWER HOUSE

After starting the main dam excavation in October 2014 on the left bank, these works were about one month advanced when diversion of the Nam Ngiep River was achieved at the end of October

2015. However, excavated volumes were 20 % greater in total than expected and part of this additional work was necessary to construct a 'shear key' structure due to the weak layers of rock encountered in the dam foundation. Following significant efforts on Site, the additional excavation work was completed at the end of February 2016.

Main powerhouse sub-structure excavation works were completed in January 2016 and levelling concrete works were started in coordination with installation of the grounding system and the penstock concrete encasement. Major concrete of the main powerhouse was substantially completed in December 2017. The powerhouse concreting works has been completed in January 2019.

2.1.2 RE-REGULATION DAM AND POWERHOUSE

The re-regulation powerhouse excavation and cofferdam works for the first river diversion were commenced in early October 2014. The excavation works for the powerhouse on the left bank were fully completed down to El. 146.7 m at the end of February 2015.

Structural concrete works were commenced in March 2015, in coordination with installation of the grounding system. The progress of overall re-regulating dam and powerhouse works at the left bank section and the right bank and labyrinth weir are shown in ***Figure*** below:

FIGURE 2-3: COMPLETED RE-REGULATION DAM AND POWERHOUSE AT THE END OF JUNE 2018

2.1.3 TEMPORARY WORK FACILITY

2.1.3.1 DIVERSION TUNNEL INLET AND OUTLET

The diversion tunnel, excavated over 600 m in length and 10 m in diameter, was commenced in October 2014 by drill and blast techniques and completed in late September 2015. The river diversion took place on 31 October 2015 after completion of inlet and outlet structures together with construction of earth-fill cofferdams upstream and downstream.

The second diversion to divert the river from the diversion tunnel through the bottom outlet or conduit in the dam was implemented on 13 January 2018. Dewatering of the diversion tunnel and construction of the concrete plug was commenced during January 2018. Concrete works and the valve installation for discharge was completed before the start of main dam impounding. On 22 May 2018, the valve discharge commenced by using 3 valves with around 5 m^3/s discharge in total. Construction of concrete plug including valve was completed on 27 January 2019.

2.1.3.2 SECONDARY UPSTREAM COFFERDAM

The concrete placement works in both conventional and roller-compacted concrete (CVC and RCC respectively) for the secondary upstream cofferdam were started in November 2015 and completed ahead of construction schedule in the middle of February 2016. The grout curtain works for this cofferdam were completed on 02 April 2016.

2.1.3.3 PLANT YARDS

These comprise the Aggregate Crushing Plant, the CVC Batching Plant and the RCC Batching Plant.

Foundation work and installation of equipment were completed at all the plant yards and the belt conveyor system from the RCC plant to the main dam was completed in early April 2016. Decommissioning and rehabilitation is underway on both plants and almost completed for the Aggregate Crushing Plant.

2.1.3.4 QUARRY

After removal of overburden the excavation of raw materials for aggregate crushing were started in July 2015. The nature and type of the rock being exploited is acceptable though unsuitable soil layers are removed to spoil disposal areas, and good quarry management continues.

2.1.3.5 DISPOSAL AREAS

The disposal areas are on the right bank has been available for operation since January 2015, as was the adjacent waste Disposal Area No.9. Disposal Area No.9 along Road P1 near the start of Road T5 started operation in April 2015. Unsuitable material from the quarry has ceased to be hauled to Disposal Area No.6 and Disposal Area No.9 has been developed by the Electrical and Mechanical Works Contractor as stated above.

2.2 ELECTRICAL AND MECHANICAL WORKS

The EMW Contract was executed between Hitachi-Mitsubishi Hydro Corporation and NNP1PC on 13 June 2014 and the NTP was issued in 03 October 2014. The cumulative work progress of the Electrical and Mechanical Works by value at the end of May 2019 was 98.8 % (compared to planned progress of 100.0 %).

Figure 4.2-1: AGVC test for Unit 2

Figure 4.2-2: Commencing of trial run test for Unit 2

Figure 4.2-3: Unit loading and de-loading rate test for Unit 1

Figure 4.2-4: Unit primary response test for Unit 1

Figure 4.2-5: Punch list work for clean and touch up paint inside turbine pit

Figure 4.2-6: Punch list work for oil leakage on lubrication oil tank

2.3 HYDRO-MECHANICAL WORKS

The HMW Contract was executed between IHI Infrastructure Systems (IIS) and NNP1PC on 18 April 2014 and the NTP was issued to the Contractor on 03 October 2014. The actual cumulative work progress of the Hydro-Mechanical Works until the end of March 2019 was 100 % (compared to planned progress of 100 %).

2.4 230 KV TRANSMISSION LINE WORKS

The 230 kV Transmission Line Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and the TP was issued to the 230 kV TL Works Contractor on 03 October 2014. The cumulative work progress of the Transmission Line Works until the end of June 2018 was 100 % (compared to planned progress of 100 %).

FIGURE 2-5: CUMULATIVE WORK PROGRESS OF TOWER FOUNDATION (ORIGINAL/REVISED PLANNED AND ACTUAL)

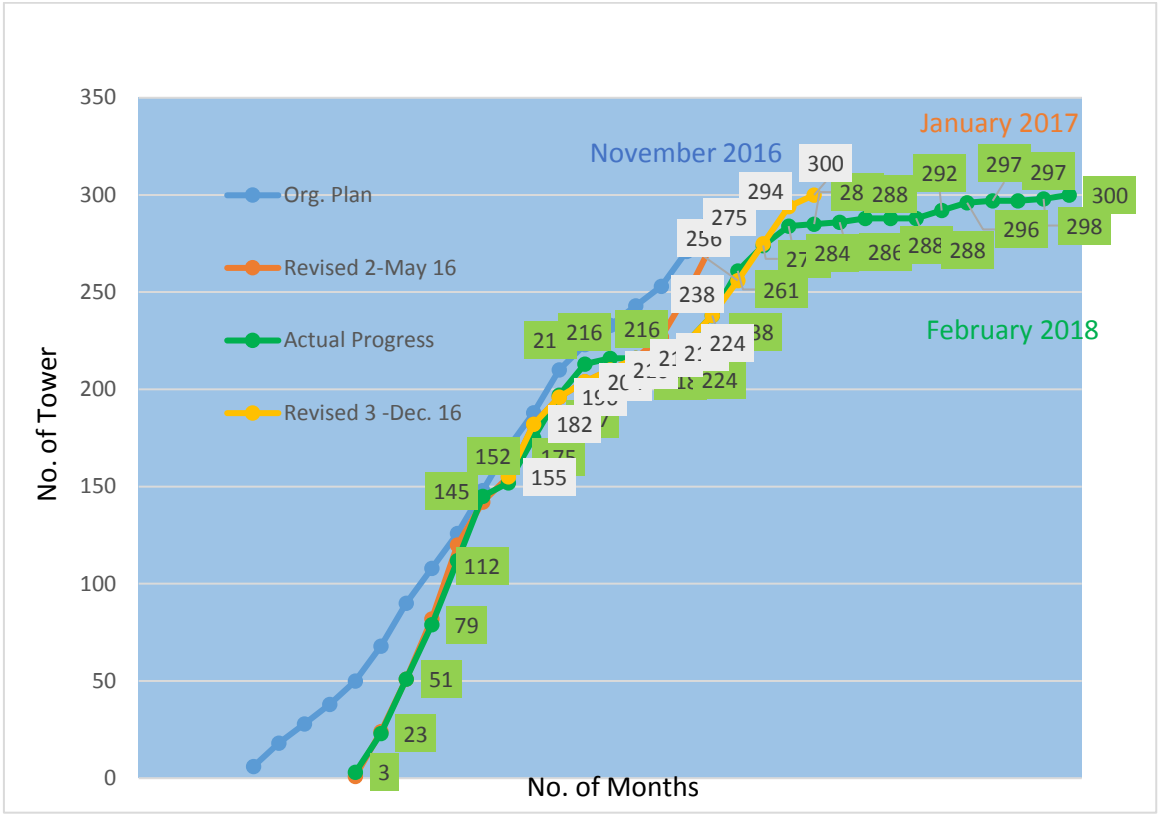


FIGURE 2-6: REVISED CUMULATIVE WORK PROGRESS OF TOWER ERECTION (PLANNED AND ACTUAL)

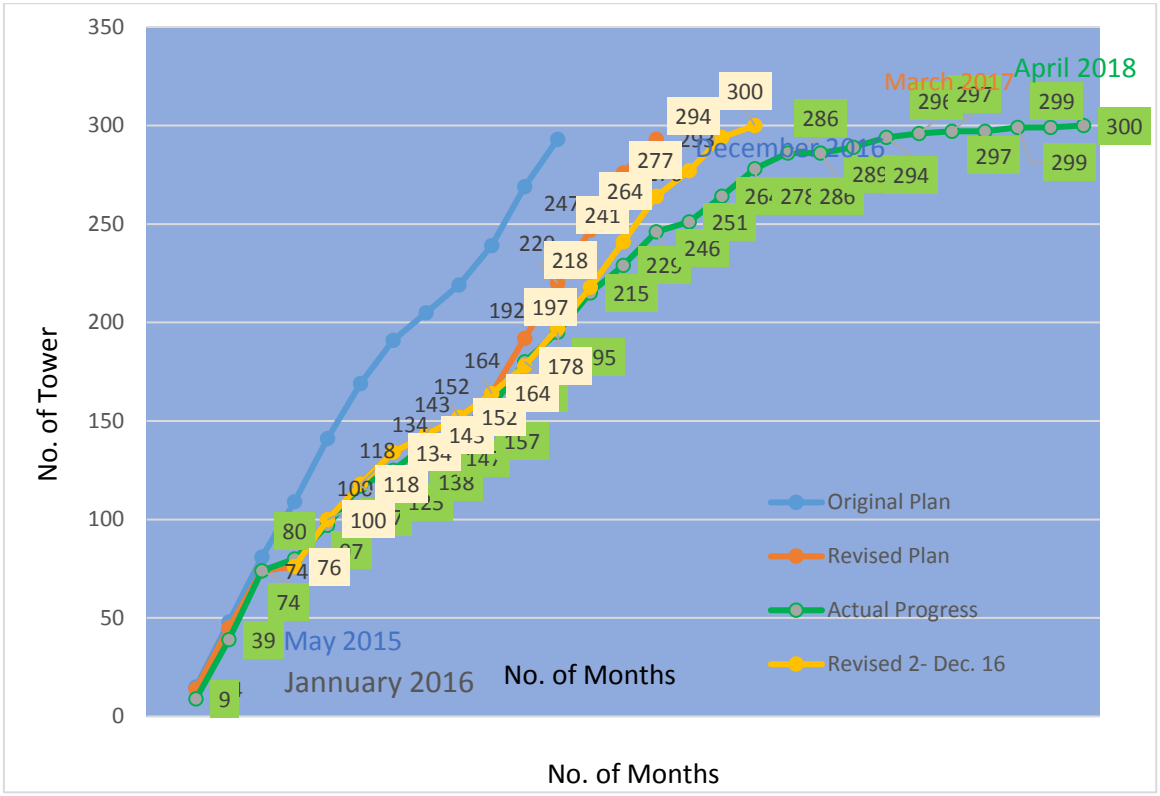
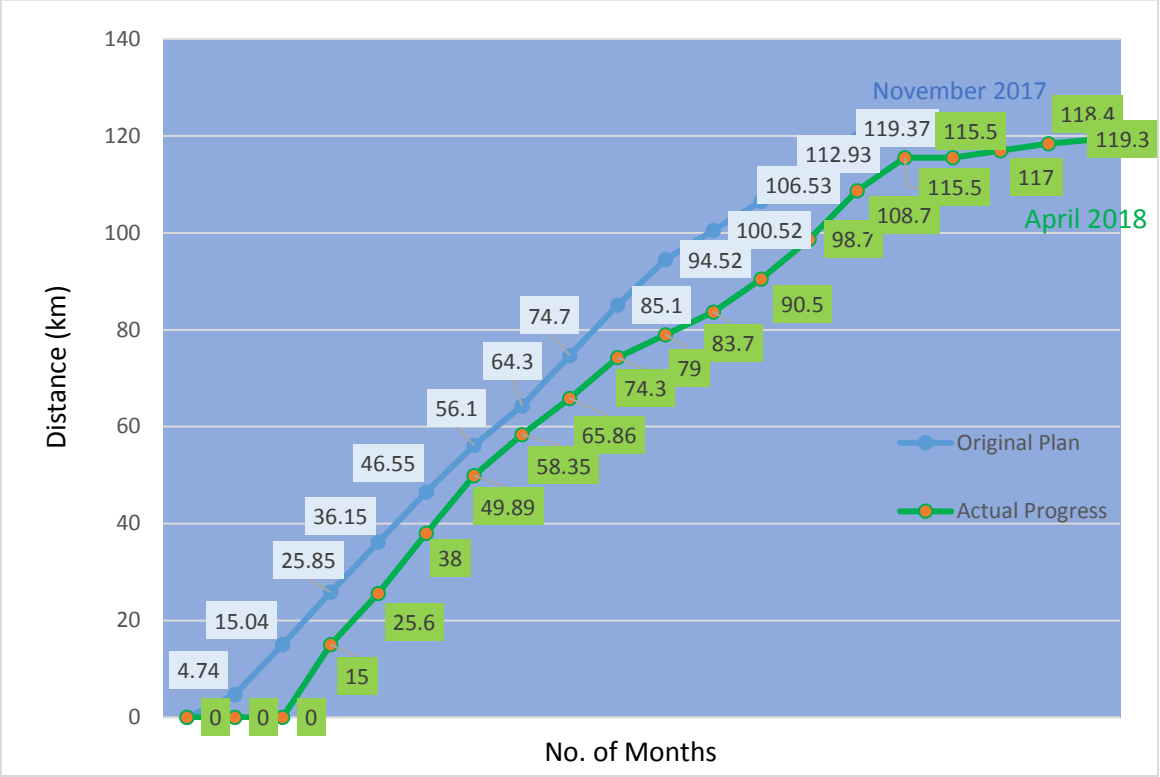


Figure 2-7: Cumulative Progress of Stringing Works (Planned & Actual)



3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 COMPLIANCE MANAGEMENT

In July 2019, the Environmental Management Office (EMO) of Nam Ngiep 1 Power Company (NNP1PC) received one Detailed Work Programme and Site Specific Environmental & Social Monitoring and Management Plan (DWP & SS-ESMMP) and one Site Decommissioning and Rehabilitation Plan for review and approval.

TABLE 3-1: SS-ESMMP AND DOCUMENTS REVIEW STATUS IN JULY 2019

Title	Date Received	Status
DWP & SS-ESMMP for the Construction of Drainage Adit at the Right Bank of the Main Dam under VO 94	17 July 2019 (3rd submission)	17 July 2019 No-objection with no further comments
Site Decommissioning and Rehabilitation Plan for Lilama 10 Camp	20 July 2019 (2nd submission)	30 July 2019 No-objection with no further comments

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 3-2***.

TABLE 3-2: SUMMARY OF ONC AND NCR

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from June 2019	0	0	0	0
Newly Opened in July 2019	5	0	1	0
Total in July 2019	**5**	**0**	**1**	**0**
Resolved in July 2019	3	0	0	0
Carried over to August 2019	2	0	1	0
Unsolved Exceeding Deadlines	**1**	**0**	**0**	**0**

3.1.1 INSPECTION BY ENVIRONMENT MANAGEMENT UNIT

During 30 – 31 July 2019, the Bolikhan District EMU carried out a monthly site visit to construction sites of NNP1PC. There was a minor issue related to wastewater management of Song Da 5 Subcontractor. The draft EMU report is under preparation and will be circulated to NNP1PC by early August 2019.

3.2 ENVIRONMENTAL QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD), faecal coliforms, E.Coli bacteria and total coliforms 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/

3.2.1 EFFLUENT DISCHARGE FROM CAMPS AND CONSTRUCTION SITES

Detailed monitoring results are provided in ***Annex B*** of this Report. The effluent monitoring results for the camps in July 2019 indicate that the results of COD, BOD_5, ammonia nitrogen and total nitrogen comply with the relevant effluent standards for some camps whereas the results for the H-MH Camp [EF13] did not comply with the Standards. In addition, minor non-compliances for total coliform and faecal coliform were recorded at the Obayashi Camp [EF02]. The V&K Camp [EF10] was fully compliant with the Standard.

The status of implementation of the corrective actions addressing non-compliances at the camps and key construction sites that continue to have non-compliances is summarized in ***Table 3-3***.

TABLE 3-3: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT CAMPS AND CONSTRUCTION SITES

Site	Sampling ID	Status	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Non-compliance for total nitrogen.	
Obayashi Corporation Camp	EF02	Non-compliance for total nitrogen, BOD5, total	

Site	Sampling ID	Status	Corrective Actions
		coliform and faecal coliform in the first fortnightly sampling. In addition, total coliform in the second fortnightly was non-compliance.	
Song Da 5 Camp No. 1	EF07	Non-compliance for ammonia nitrogen and total nitrogen.	
V&K Camp	EF10	Full compliance.	
H-MH Main Camp (WWTS)	EF13	Non-compliance for BOD_5, COD, ammonia nitrogen and total nitrogen.	The NCR level 2 was issued to the Contractor on 12 July 2018 concerning the inadequate treatment of the wastewater prior to discharging to the environment.
ESD Camp (former IHI Main Camp)	EF14	Non-compliance for BOD_5, faecal coliform and total coliform in the first fortnight sampling. However, full compliance in the second fortnight.	The chlorine dosing container and chlorine dripping valve was under maintenance during the first fortnight.
Lilama 10 Camp	EF17	No sampling because no outflow from the wetland system.	The camp is under decommissioning
CVC Plant	DS03	No discharged water during the sampling dates.	
Spoil Disposal Area No.2	DS04	Full compliance.	
Upstream Spoil Disposal Area No.2	DS04-US	Full compliance.	

3.2.2 AMBIENT SURFACE WATER QUALITY MONITORING

The ambient surface water quality monitoring programme comprises five monitoring stations in the main reservoir (R1-R5), two stations in the re-regulation reservoir (R6 and R7), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

In addition, weekly depth profile monitoring (pH, DO, Conductivity, TDS and Temperature) has been carried out since 18 September 2018 for stations located in the re-regulation and main

reservoirs. The water quality programme is summarized in ***Table 3-4*** and the location of the monitoring stations are shown in ***Figure** 3-1.*

TABLE 3-4: MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Saturday	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C) and Turbidity (NTU).	- R5, main reservoir immediately upstream the main dam; - NNG05, Nam Ngiep downstream the re-regulation dam at Hat Gniun Village.
Wednesday and Friday (Intensive Monitoring)	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C) and Turbidity (NTU)	- R5, main reservoir immediately upstream the main dam; - Tailrace main dam; - Re-regulation reservoir: R6 and R7; - Tailrace re-regulation dam; - Nam Ngiep at the bridge; - NNG05, Nam Ngiep downstream the re-regulation dam at Hat Gniun Village
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l), BOD_5 (mg/l), Faecal coliform (MPN/100 ml), Total coliform (MPN/100 ml)	- Main Reservoir: R1, R2, R3, R4, R5; - Nam Ngiep downstream: NNG05, NNG06, NNG07 and NNG08; Tributaries: Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01].
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All stations
Monthly	TSS (mg/l), BOD_5 (mg/l), COD (mg/l), NH_3-N (mg/l), NO_3-N (mg/l), total coliform (MPN/100 ml), faecal coliform (MPN/100 ml) and Hydrogen sulphide (mg/l)	All stations

The monitoring results for key parameters (DO, TSS and BOD_5) during July 2019 are presented in ***Table 3-5***, ***Table 3-6***, and ***Table 3-7***. The full set of data for July 2019 is attached in ***Annex A***. In addition, the results for DO are presented as line graphs in ***Figure** 3-**2***.

Main Reservoir

At R5, the DO level in the upper 4.5 m fluctuated from about 5.37 mg/L to 7.83 mg/L and the entire water column below 16.0 m had DO levels less than 1.22 mg/L.

At R4, the DO level in the upper 6.5 m fluctuated from 6.41 mg/L to 7.89 mg/L and the entire water column below 9.0 m had DO levels below 1.18 mg/L.

The DO concentrations at R3 were recorded between 6.17 mg/L and 8.50 mg/L in the upper 5.5 m and the concentration of DO in the entire water column below 12.0 m was less than 1.41 mg/L.

The DO concentrations at R2 were between 5.47 mg/L and 8.09 mg/L in the upper 3.5 m and DO concentration in entire water column below 5.5 m was less than 1.56 mg/L.

And at R1, the DO level fluctuated between 3.07 mg/L – 8.7 mg/L in the upper 14.0 m and with some water temperatures changed from the surface to the bottom of the reservoir.

The measurements indicate the formation of oxy-clines in R1, R2, R3, R4, R5, and R7 except R6.

As expected, the TSS concentrations in the main reservoir have been consistently low since the start of impounding with a mean in R4 and R5 of 5 mg/L compared to high flow season means of about 100 mg/L – 250 mg/L and low flow season means of 20 mg/L - 50 mg/L.

The BOD_5 measurements in July 2019 were all (except R1, R6, R7, NNG05 and NNG06) within the standard and some of them below the limit of detection.

Re-regulation Reservoir

During July 2019 the wet testing of both generators in the main powerhouse continued with intermittent discharge during the first three weeks and almost constant discharge from one of the generators during the last week of July. There was no discharge from the main dam spillways during July 2019.

At R6, the mean DO concentration of the depth profiles was 1 mg/L with a maximum of 4.2 mg/L. During the last week of July 2019, the DO level was below 1 mg/L in the entire water column.

At R7, the mean DO concentration of the depth profiles was 0.7 mg/L with a maximum of 4.8 mg/L. During the first three weeks, the DO level in the upper 1.5 m was between 2.5 mg/L and 4.5 mg/L. In the same period the DO below 1.5 m was below 2.5 mg/L. In the last week of July 2019, the mean DO level was 0.2 mg/L with a maximum of 2.5 mg/L.

Some dead fish still was observed during 10-13 July, 24 July and 31 July 2019 in the re-regulation reservoir.

NNP1PC is investigating the occurrence and the extent, magnitude, impact and cause of the dead fish.

Downstream

During July 2019, the discharges from the Re-regulation Dam alternated between only gate discharges of about 10 m^3/s - except on 31 July 2019 when the gate discharge was about 100 m^3/s - and combined gate (10 m^3/s – 27 m^3/s) and generator discharges (50 m^3/s – 110 m^3/s). During periods with only gate discharge the DO levels downstream the re-regulation dam were above 6 mg/L (DO measurements on 03 July, 12 July, 13 July, 17 July, and 31 July 2019). During periods with combined gate and generator discharges, the DO levels from the -re-regulation dam to NNG06 were between 2 mg/L and 4 mg/L (DO measurements on 05 July, 10 July, 24 July, and 26 July) increasing to 6 mg/L and above at NNG07.

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

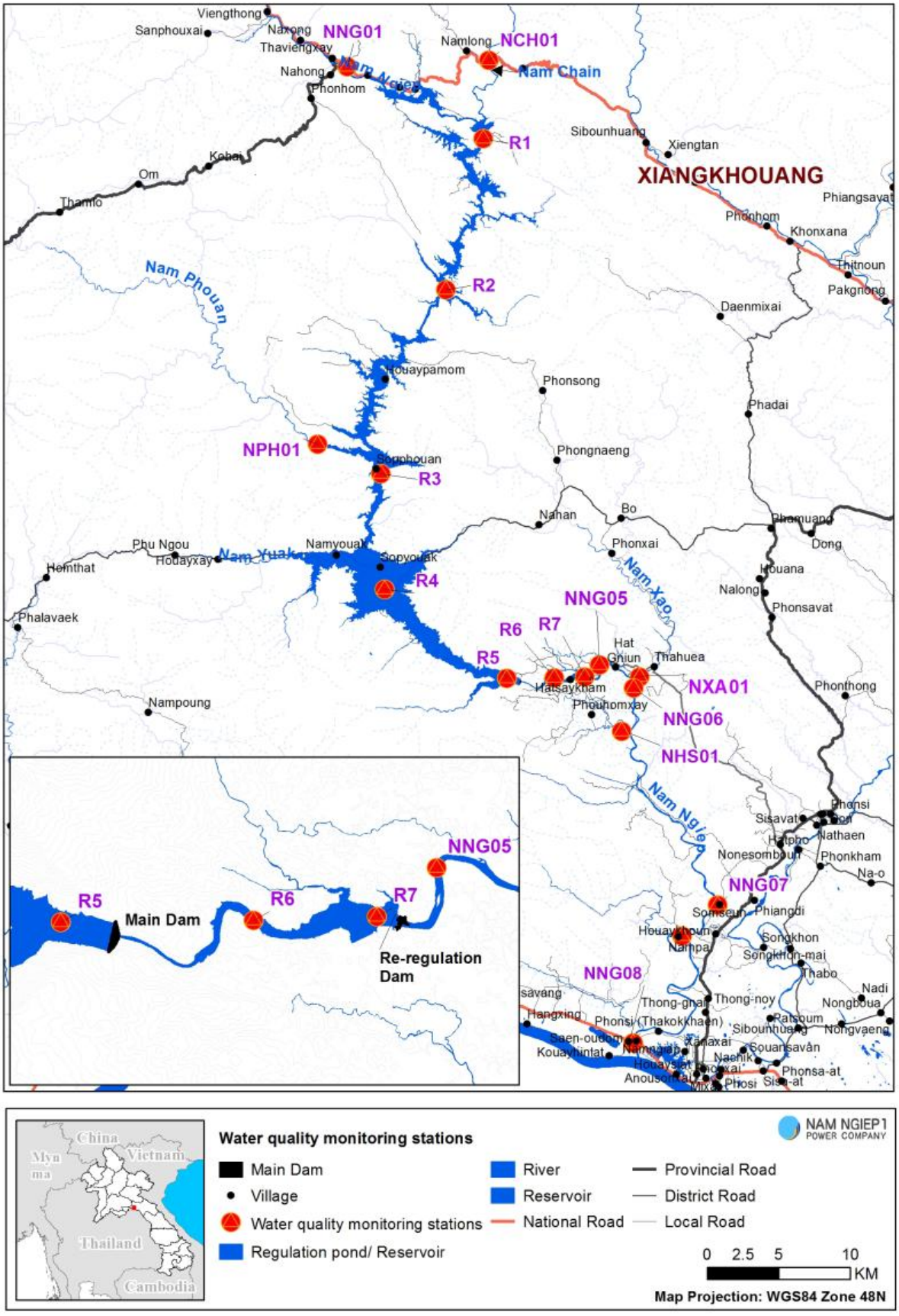


FIGURE 3-2: CONCENTRATION OF DISSOLVED OXYGEN IN THE UPPER 0.2 M SINCE THE START OF IMPOUNDING

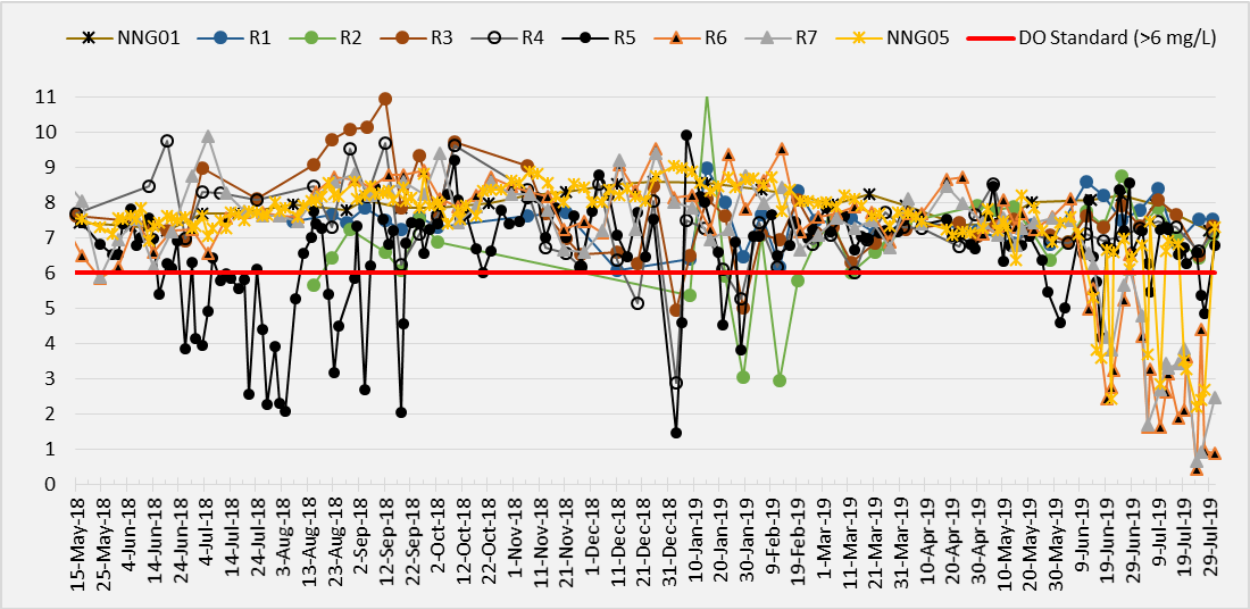


TABLE 3-5: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, WATER QUALITY STANDARD: >6.0 MG/L

Dissolved Oxygen (mg/L)	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Jul-19		7.79	7.29	7.35	7.28									8.4		
3-Jul-19						7.22	4.22	4.78	6.8	6.71	7.16	7.31			7.2	7.05
5-Jul-19						6.28	1.62	1.7	3.69							
6-Jul-19						5.45	3.26		7.47							
8-Jul-19	7.94												8.07			
9-Jul-19		8.4	7.84	8.08	7.46									7.76		
10-Jul-19						7.25	1.62	2.68	2.87	2.93	6.38	6.3			6.53	7.89
12-Jul-19						7.29	2.62	3.45	6.63	6.28	6.65				7.25	6.79
13-Jul-19						7.24	3.13	3.3	6.91	6.43	7.39	6.82			6.95	7.2
16-Jul-19		6.84	7	7.65	7.3									7.14		
17-Jul-19						6.54	1.88	3.45	6.81	6.82	7.52	6.21			7.02	7.08
19-Jul-19						6.73	2.11	3.84	3.54	6.09					6.14	
20-Jul-19						6.26	3.64		3.28							
24-Jul-19						6.61	0.43	0.66	2.22	2.63	5.83	6.45			6.98	7.02
25-Jul-19		7.54	6.42	6.49	6.63									7.21		
26-Jul-19						5.38	4.4	0.92	2.41	2.92					6.12	
27-Jul-19						4.85	0.94		2.69							
29-Jul-19	7.22												7.78			
30-Jul-19		7.53	7.09	7.32	7.15									7.85		
31-Jul-19						6.78	0.88	2.48	7.3	6.95	6.68	6.48			7.22	7.7

TABLE 3-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR TOTAL SUSPENDED SOLIDS (MG/L) - WATER QUALITY STANDARD: NO STANDARD

Total Suspended Solids (mg/L)	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Jul-19						<5	10.28	<5	6.25							
8-Jul-19	17.2												18.77			
9-Jul-19		<5	<5	<5	<5									9.36		
10-Jul-19						<5	6.88	8.18	7.64	8.13	46.9	9.76			14.31	21.25
17-Jul-19						<5	7.09	<5	<5							
24-Jul-19						<5	9.66	7.66	12							

TABLE 3-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD_5 (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

Total Suspended Solids (mg/L)	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
03-Jul-19						<1.0	5.32	1.58	<1.0							
08-Jul-19	1.06												1.13			
9-Jul-19		1.77	1.32	1.02	<1.0									<1.0		
10-Jul-19						<1.0	6.32	2.04	2.55	2.61	<1.0	<1.0			<1.0	<1.0
17-Jul-19						<1.0	1.81	1.21	<1.0							
24-Jul-19						1.34	6.66	5.46	5.96							

As a result of low DO in the re-regulation reservoir during the wet testing, some dead fish was still observed during 10-13 July 19, 24 July 19 and 31 July 2019 in the re-regulation reservoir but not downstream from the re-regulation dam. NNP1PC submitted the incident report to ADB on 04 July 2019 and received comments on 26 July which will be incorporated by NNP1PC into the final report.

3.2.3 GROUNDWATER QUALITY MONITORING

During July 2019, community groundwater quality analyses were carried out for four wells located in Somseun Village, Nam Pa Village, Thong Noy Village and Pou Village.

All results of community groundwater complied with the groundwater quality standards for water supply purposes, except faecal coliform and E.Coli bacteria in Somsenu, Nam Pa and Thong Noy Villages as per below Table.

TABLE 3-8: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONG NOI AND POU VILLAGES

Parameter (Unit)	Site Name	Somseun Village	Nam Pa Village	Thong Noy Village	Pou Village
	Station	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline				
Conductivity (µS/cm)		193.2	260	291	14
TDS (mg/l)		96.8	130	145.5	7
Temperature (°C)		28	28.4	28.8	29.3
Turbidity (NTU)	<20	1.35	1.94	1.89	2.14
Fecal coliform (MPN/100 ml)	0	27	79	1,600	0
E.coli Bacteria (MPN/100 ml)	0	27	22	1,600	0
Arsenic (mg/)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003
Total Iron (mg/l)	<1	<0.118	0.011	0.046	0.048
Magnesium (mg/l)		3.6	<0.005	6.45	0.252
Manganese (mg/l)	<0.5	0.005	<0.005	0.01	0.047
Fluoride (mg/l)	<1	0.13	0.12	0.22	0.08
Total hardness (mg/l)	<500	142	168	184	11.7
Nitrate (mg/l)	<45	0.49	0.31	0.53	<0.09
Nitrite (mg/l)	<3	<0.07	<0.07	<0.07	<0.07
Lead (mg/l)	<0.05	0.012	0.009	0.008	0.01

3.2.4 GRAVITY FED WATER SUPPLY (GFWS) QUALITY MONITORING

During July 2019, water samples from water taps at Hat Gniun Village and Phouhomxay Village were analysed. The WPHX01 represents raw water in the head tank before the filtration system. In addition, there is no water sampling at Thahuea Village because of the broken gravity fed water supply system during the scheduled mission.

The results of the water quality analyses are presented in ***Table 3-9.*** All parameters complied with the National Drinking Water Standards except for faecal coliforms and E.Coli at WHGN02, WPHX01 (intake), WPHX02 (tap water at the primary school in Phouhomxay Village) and WPHX03 (tap water at a house in Phouhomxay Village). The villagers generally use tap water for washing and cleaning. They were informed about the results and were encouraged to boil the water before drinking.

TABLE 3-9: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

Date	Parameter (Unit)	Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
		Guideline					
01-Jul-19	pH	6.5 - 8.6		8.47	8.82	8.11	7.76
01-Jul-19	Sat. DO (%)			101.5	92.3	98.5	101.7
01-Jul-19	DO (mg/l)			7.5	7.18	7.43	8.02
01-Jul-19	Conductivity (µS/cm)	<1,000		75.9	6.2	5.64	5.24
01-Jul-19	TDS (mg/l)	<600		37.9	3.1	2.32	2.5
01-Jul-19	Temperature (°C)	<35		29.3	26.2	28.3	25.6

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
01-Jul-19	Turbidity (NTU)	<10		2.11	1.52	1.36	1.24
01-Jul-19	Faecal Coliform (MPN/100 ml)	0		79	11	14	17
01-Jul-19	E.coli Bacteria (MPN/100 ml)	0		79	11	14	17

3.2.5 LANDFILL LEACHATE MONITORING

During July 2019, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that NNP1 Project Landfill and Houay Soup Landfill did not comply with the standards on faecal coliform and total coliform. The leachate was contained in the leachate ponds without discharging to the environment. EMO will continue to monitor the results during the next MPR. The landfill leachate monitoring results for July 2019 can be found in

Table 3-10.

***Table 3-10*: RESULTS OF THE LANDFILL LEACHATE MONITORING**

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Last Pond	Discharge Point	Last Pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
04-Jul-19	pH	6.0-9.0				8.92		8.83	
04-Jul-19	Sat. DO (%)					105.6		101.7	
04-Jul-19	DO (mg/l)					8.02		7.82	
04-Jul-19	Conductivity (µS/cm)					82.6		228	
04-Jul-19	TDS (mg/l)					41.3		114	
04-Jul-19	Temperature (°C)					27.5		26.9	
04-Jul-19	Turbidity (NTU)					8.84		12.08	
04-Jul-19	BOD_5 (mg/l)	<30				<6		16.62	
04-Jul-19	COD (mg/l)	<1250				44.2		120	
04-Jul-19	Faecal Coliform (MPN/100 ml)	<400				920		540	
04-Jul-19	Total Coliform (MPN/100 ml)	<400				1,600		1,600	

3.2.6 DUST MONITORING

The results indicate that the dust levels at all monitoring stations comply with the National Standard during the monitored period in July 2019. The results were shared internally with NNP1PC Technical Department as a reference for following-up inspection to ensure proper establishment of health and safety procedures.

3.2.7 NOISE MONITORING

During July 2019, noise monitoring was conducted for 72 consecutive hours at Hat Gniun Village and Phouhomxay Village, and for 24 consecutive hours at the Main Dam, Song Da 5 Camp No.2, Lilama 10 Camp and the Main Powerhouse.

The results indicate that the recorded maximum noise levels and averaged noise levels complied with the Standard for all stations, except Phouhomxay Village (01-03 July 2019 during 22:01-06:00). The exceedances of the noise standard at those sites were caused by heavy rain.

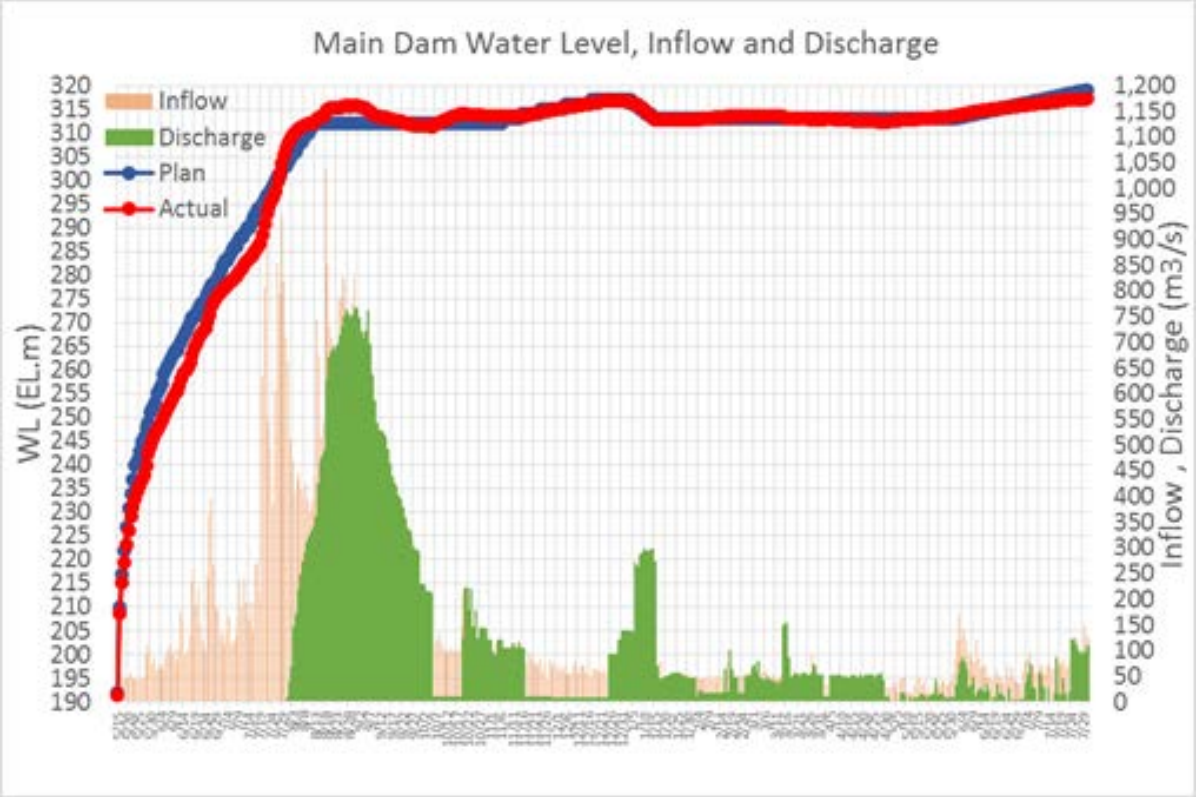
3.2.8 DISCHARGE MONITORING

The progress of impounding from 15 May 2018 to 31 July 2019 is presented on the graph in ***Figure 3-3*** indicating the water level in the main reservoir, the inflow to the main reservoir and the discharge from the main reservoir into the re-regulation reservoir.

During July 2019, the wet testing of both generators in the main powerhouse continued with intermittent discharge during the first three weeks and almost constant discharge from one of the two generators during the last week of July. There was no discharge from the main dam spillways during July 2019.

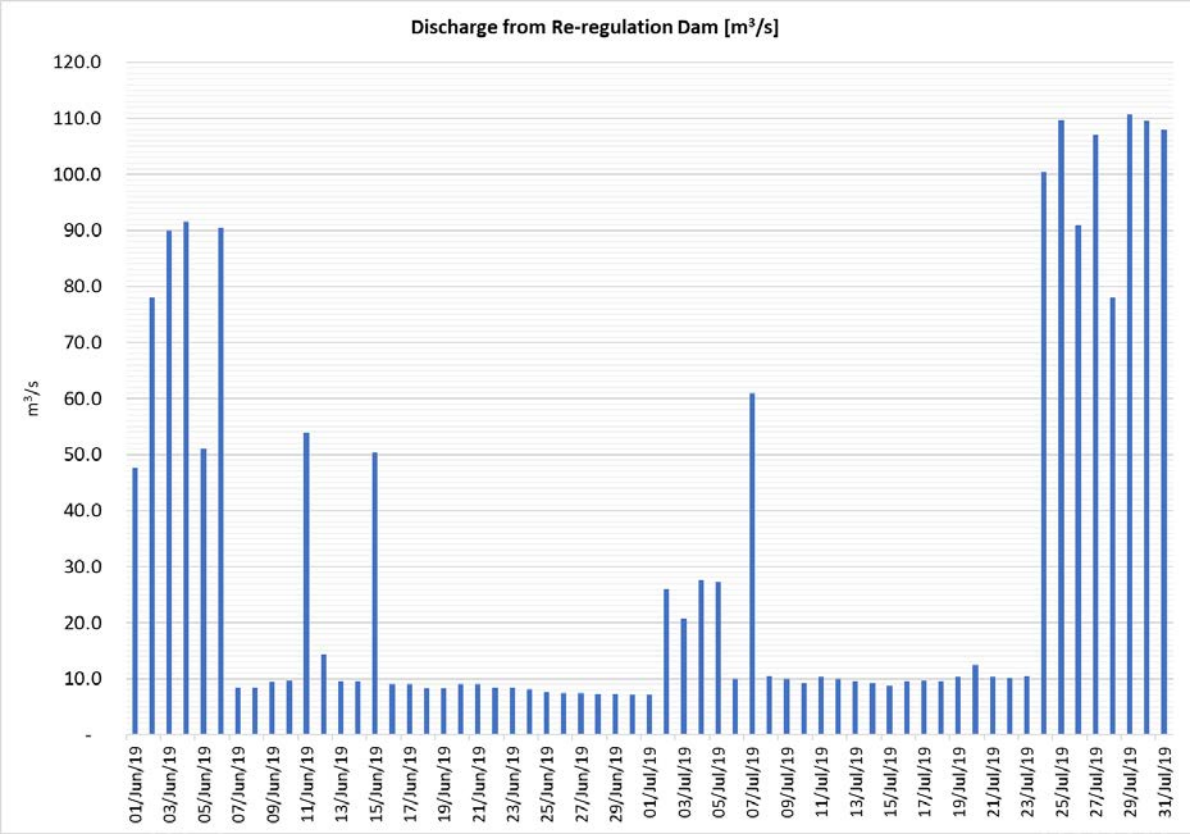
The discharge monitoring data for the re-regulation dam (June and July 2019) is presented in ***Figure 3-4***. During July 2019, the discharges from the Re-regulation dam alternated between only gate discharges of about 10 m^3/s - except on 31 July 2019 when the gate discharge was about 100 m^3/s - and combined gate (10 m^3/s – 27 m^3/s) and generator discharges (50 m^3/s – 110 m^3/s).

FIGURE 3-3: PROGRESS OF IMPOUNDING THE MAIN RESERVOIR



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 3-4: DISCHARGE MONITORING AT THE RE-REGULATION DAM IN APRIL AND JULY 2019



3.2.9 NAM NGIEP DOWNSTREAM WATER DEPTH MONITORING

In July 2019, EMO carried out four missions by boat to monitor the water depth in the Nam Ngiep downstream of the re-regulation dam. EMO has identified 19 sites with potential shallow water depths. Out of 19 sites monitored, there were 01 site (03 July 2019) and 5 sites (12 and 17 July 2019) that were difficult to navigate due to shallow water depths caused by decreased discharge from the re-regulation dam and low amount of rainfall as mentioned in Section 1.3 above.

3.3 PROJECT WASTE MANAGEMENT

3.3.1 SOLID WASTE MANAGEMENT

In July 2019, a total of 99.5 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 15.5 m^3 compared to June 2019. During July 2019, EMO conducted three waste spot checks at the NNP1 Project Landfill, construction sites and the camps. Mixed waste inside the waste bins was found out at the Song Da 5 Camp No.1, V&K Camp, RCC Plant, CVC Plant and Main Dam Drainage Adit on the right bank. NNP1PC instructed the supervisors of all concerned Contractors and Subcontractors to improve and ensure proper waste management practices.

A total of 331.5 kg of recyclable waste (mostly scrap metal) was sold to Khounmixay Processing Factory by the Contractors. The remaining scrap metal will be sold or transported off site by the Contractor at a later date.

TABLE 3-11: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by 31 July 2019
Construction Activity				
1	Scrap metal	kg	0	5,028
Sub-Total 1		**kg**	**0**	**5,028**
Camp Operations				
2	Glass bottles	kg	22	426
3	Plastic bottles	kg	48.5	77.5
4	Paper/Cardboard	kg	243	63
5	Aluminium cans	kg	18	25.5
Sub-Total 2		**kg**	**331.5**	**592**
Grand Total 1+2		**kg**	**331.5**	**5,620**

The villagers of Phouhomxay Village collected a total of 2,933 kg of food waste from selected camps for animal feed in July 2019, a decrease of 51 kg compared to June 2019 as a result of GFE, Zhefu and 276 Camp decommissioning and a reduction in the number of construction workers at the Song Da 5 Camps.

TABLE 3-12: AMOUNTS OF FOOD WASTE COLLECTED BY VILLAGERS

No.	Site Name	Unit	Total
1	Song Da 5 Camp No. 1	kg	527
2	Obayashi Corporation Camp	kg	905
3	Owner's Village and Site Office (OSOV)	kg	977
4	Lilama 10 Camp	kg	524
Total		**kg**	**2,984**

3.3.2 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

The types and amounts of hazardous waste collected and transported for off-site treatment and final disposal at Khounmixay Processing Factory in July 2019 are shown below.

TABLE 3-13: RESULTS OF HAZARDOUS MATERIAL INVENTORY

No.	Hazardous Waste Type	Unit	Total in July 2019 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre	4,672	0	4,672
2	Contaminated soil, sawdust and concrete	bag	498	0	498
3	Used tyre	piece	238	0	238
4	Used oil filters	piece	201	0	201
5	Used oil mixed with water	litre	200	0	200
6	Ink cartridge	unit	170	0	170
7	Halogen/fluorescent bulbs	unit	159	0	159
8	Empty used chemical drum/container	drum (200 L)	115	0	115
9	Empty paint and spray cans	can	97	0	97
10	Empty used oil drum/container	drum (20 L)	30	0	30
11	Empty contaminated bitumen drum/container	drum (200 L)	26	0	26
12	Lead acid batteries	unit	22	0	22
13	Contaminated textile and material	kg	17	0	17
14	Lithium-ion batteries	unit	7	0	7
15	Empty used oil drum/container	drum (200 L)	4	0	4
16	Clinic Waste	kg	4	0	4

In addition, a total of 40 m^3 of sewage sludge from toilet at the Main Powerhouse was transported and disposed of at Spoil Disposal Area No. 6 by following the NNP1PC Standard Operating Procedure (SOP) on Sewage/Black Water Disposal.

3.4 COMMUNITY WASTE MANAGEMENT

3.4.1 COMMUNITY RECYCLING PROGRAMME

In July 2019, the Community Waste Bank received 718.5 kg of recyclable waste making a total of 3,180 kg of recyclable waste remaining in the Bank.

TABLE 3-14: *TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY WASTE BANK*

Types of Waste	Unit	Remaining in June 2019	Additions in July 2019	Sold	Remaining in July 2019
Scrap metal	kg	0	0	0	0
Glass bottles	kg	2,530.5	386.5	346	2,571
Paper/cardboard	kg	565.5	225	194	596.5
Aluminium cans	kg	1.5	4	4.5	1
Plastic bottles	kg	210.5	103	302	11.5
Total	**kg**	**3,308**	**718.5**	**846.5**	**3,180**

3.4.2 COMMUNITY SOLID WASTE MANAGEMENT

In July 2019, a total of 51 m^3 of solid waste was collected from Phouhomxay, Thahuea and Hat Gniun Villages. The solid waste was transported to Houay Soup Landfill, where recyclable materials were segregated before being disposed of at the landfill.

On 19 July 2019, villagers of Hat Gnuin Villages carried out a monthly village clean-up, the solid waste was transported to and disposed of at Houay Soup landfill by the local Contractor.

3.5 WATERSHED AND BIODIVERSITY MANAGEMENT

3.5.1 WATERSHED MANAGEMENT

3.5.1.1 WATERSHED MANAGEMENT PLAN

NNP1PC continued to refine the Lao version of Watershed Management Plan (WMP) in July 2019. The plan is expected to be submitted to the Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF) in early August 2019 for approval and signing by Minister of MAF. The English version of the plan will be further refined after this approval.

3.5.1.2 IMPLEMENTATION OF ANNUAL IMPLEMENTATION PLAN (AIP) 2019

NNP1PC submitted the translated full AIP2019 of DOF-MAF and Bolikhamxay Provincial WRPO requesting for the disbursement of the fund under the CA in the amount of to ADB and IAP for review and approval on 11 July 2019. ADB asked for more clarifications from NNP1PC on 26 July 2019 regarding the budget proposal by different GOL agencies at the central and provincial level. IAP Biodiversity Specialist provided his comments on 31 July 2019. NNP1PC-EMO responded to their comments on 31 July 2019 accordingly and waiting for ADB confirmation.

Xaysomboun Provincial WRPO submitted their full AIP2019 to NNP1PC-EMO on 17 July 2019 for further review and submission to ADB. NNP1PC-EMO is reviewing the submitted AIP and the submission to ADB for review and approval is expected to be as soon as in the second week of August 2019.

NNP1PC had a discussion on fishery co-management in the NNP1 main reservoir during the meeting with Bolikhamxay Provincial Resettlement Livelihood Relocation Committee (PRLRC) on 04 July 2019. The committee members fully supported the concept of fishery co-management and suggested NNP1PC to conduct detailed study and provide recommendations to the Committee on the issuance of exclusive fishing rights in Bolikhamxay Province. NNP1PC is in progress of recruiting a local consultant that will support the development of fishery co-management plan in close collaboration with Xaysomboun and Bolikhamxay Provincial WRPO and supervision by NNP1PC-EMO. The Plan is expected to be ready in December 2019.

3.5.2 BIODIVERSITY OFFSET MANAGEMENT

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

NNP1PC submitted the refined version of Biodiversity Offset Management Plan (BOMP) to DOF-MAF on 17 July 2019 for approval and signing by the Director General of DOF-MAF. The English language version of the Plan will be further refined after this approval.

3.5.2.2 IMPLEMENTATION OF BOMP ANNUAL IMPLEMENTATION PLAN (AIP) 2019

Bolikhamxay Provincial BOMU submitted the request to NNP1PC on 11 July 2019 for a second quarter fund disbursement totalling USD 83,933 that will cover the implementation period from July to September 2019. NNP1PC forwarded the request to DOF-MAF on 17 July 2019 after the discussion with BOMU for some clarification on the details of the intermediary bank for fund transfer. This was resolved and NNP1PC completed the fund transfer to DOF-MAF on 26 July 2019. The DOF-MAF is processing the fund transfer to BOMU by end of July 2019

Component 1 - Spatial planning and regulation

A consultation meeting at the District Level to discuss and agree on the boundary of the Total Protection Zone (TPZ) with its priority zones, CUZ and village land uses was organized on 11 July 2019 at the BOMU Office in Viengthong District, Bolikhamxay Province.

The participants from Viengthong and Xaychamphone Districts included Head of District Forestry Section, District Land Office, District Administration Office, Head of DAFO, Head of Chuan Village Cluster, Head of Mueangcham Village Cluster.

The key conclusion from the meeting:

1. The meeting generally agreed with the proposed TPZ and its priority zones, CUZ, and the updated information on village land use.
2. The meeting proposed to reconsider the proposed boundary of TPZ and its priority zone wherever there are existing agriculture practices.
3. The livestock raising shall not be allowed in the TPZ.
4. Further and detailed information on the village land uses should be collected during village consultation and field visits before the actual demarcation and signs/posts installation.

BOMU and NNP1PC-EMO had further discussion on 17 July 2019 with the following key notes:

1. From the law enforcement perspective, it is important to remove the livestock from the edge of the highest priority area of the TPZ in the northern part of Vangphieng Village. There are around three families releasing/raising 20 heads of livestock in this forest land without letter of recognition from village authority. The spatial planning team should provide proper explanation to the village authorities at the target villages especially on the compliance with land use regulation.
2. The expanded agriculture land on the edge of TPZ on the side of Sopkhone Village is a permanent activity that has been undertaken for a long time. Therefore, the patrol team proposed to exclude this area from the TPZ and allow people to continue their farming with certain rules/regulations to be in place and enforced to ensure that no further expansion in the future.
3. In order to address the concerns and requests raised during District consultations on 11 July 2019, the spatial planning team was recommended to revisit all land use data collected during the land use mapping exercise in 2017 to identify and give detailed figures of each land use type especially for the expanded land uses within TPZ and CUZ. These figures and information would significantly help to explain to villagers that their current land use is not in compliant

with the Land Use Plan completed by the Government during 2011-2012. This means that the Project is not limiting their access to or grabbing their land. Instead, the Project is supporting them to legalize the status of their current land use and to improve their productivity later on through livelihood support scheme.

4. The team will continue improving the data, maps of each village land use, and presentation for the consultation workshop in the village level which is expected to be conducted in the middle of August 2019.

Component 2 – Enforcement.

The two patrolling teams patrolled the highest priority area of TPZ from 22 June - 11 July 2019. The main objectives of the work include: 1) to collect information, observe, and understand the physical characteristics, accessibility, biodiversity and threats within and the surrounding the highest priority area, 2) to collect snares and where possible to address illegal activities through onsite enforcement, and 3) to deal with illegal wildlife trade in the target communities.

The first team covered the area along the border of the upper part of the proposed highest priority area and along the road track from Nam Si to Nam San of around 79 km by 14 days on foot patrolling. The second team spent 13 days foot patrolling in the forest that covered 59 km distance. Heavy rainstorms and hilly terrain prevented the team to reach the target of the patrolling days.

Generally, the northern part of the highest priority area is hilly terrain with dense secondary forest making it difficult to access. The team observed that some part of the forest area is dead forest because of the extreme cold weather in past years. Threats, saltlick, and wildlife were observed and recorded. The terrain at the lower part of the proposed highest priority area is more or less similar to the upper part but richer in terms of forest and wildlife.

The teams spotted four hunting camps, two fishing camps, and two fishing bombs hidden in one of the fishing camps. The first team encountered and detained one hunter (village militia from Natanh Village) for carrying one automatic gun and around 43 kg of wild pig. The gun was confiscated and handed over to district military for further prosecution and the wild pig was burned witnessed by village authorities. The second team also found and recorded 105 small wire snares which is about 2-3 years old hidden under a big tree.

The first team made a total of 10 direct observations and 18 indirect observations of wildlife signs/tracks of the following: serow, civet, Muntjac, sambar Deer, wild pig, White-Cheek Gibbon, Large Cat. The second team made a total of 16 direct observations and 16 indirect wildlife signs/tracks of the followings: serow, Otter, Douc Langur, Silvered Langur, Muntjac.

A Monthly Patrolling Meeting was organized on 17 July 2019 at BOMU Office in Viengthong District, Bolikhamxay Province with the following key notes:

1. BOMU patrolling teams were advised to further work with BOMU GIS Team to include more information such as the different characteristic of the areas, forest types, access points to the area, as well as saltlick locations into the maps. BOMU SMART Team should recheck with the patrolling team prior to entering the data into the system.
2. BOMU patrolling team reported that the local authorities and the majority of villagers are supportive on the operation of patrolling activity through their co-operations in providing information of suspected illegal activities/groups of people who might harm the NC-NX offset site.
3. Two BOMU patrol team will continue the activity scheduled from 19 July-07 August 2019. One team will focus the efforts inside the highest priority area along Nam San and its

tributaries and along mountain range to prevent and combat illegal activities. The other team will conduct patrolling along the boundary of the high priority area adjacent to Na Gnang Village to collect data and understand general situation and physical landscape surrounding this target area. The team will also survey the suitable location for the new substation establishment.

4. The two new patrol teams that were established in the second week of July 2019 will engage in the patrolling work starting from August 2019 onward subject to the second quarter fund disbursement is completed soon.

Component 3 - Community outreach

BOMU completed the establishment of a community outreach team at Viengthong and Xaychamphone Districts in the second week of July 2019. The development of outreach strategy and detailed plan will be scheduled once the Biodiversity Service Provider (BSP) is on board.

3.6 FLOATING DEBRIS REMOVAL

There was no cutting and burning during this reporting period as the rainy season started. The work will be resumed from the middle of October or in November 2019. NNP1PC-EMO conducted regular monitoring and removal of floating materials/logs from the temporary log-boom as needed.

4. FISHERY MONITORING

Two species groups and three species dominated the fish catch by weight in June 2019 as listed in ***Table 4-1.*** Three species are classified as Least Concern (LC), two species as Not Evaluated (NE) and one Data Deficient (DD) according to the IUCN Red List of Threatened Species[2].

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN JUNE 2019

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Systomus orphoides	ปาป๊ก	193	NE
Poropuntius normani, Poropuntius laoensis,Poropuntius carinatus	ปาจาด	160.4	LC
Scaphiodonichthys acanthopterus	ปาม้อม	74.4	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาฮาอฮาย	66.1	DD, NE
Pangasius conchophilus	ปาปาๆ, ปาเผาะ	50.3	LC

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

The recorded catch of Threatened and Near Threatened species (IUCN Red List classification) in June 2019 is presented in ***Table 4-2***. The list includes four species that are classified as Vulnerable (VU) species and four Near Threatened (NT) species.

TABLE 4-2: THREATENED SPECIES OF JUNE 2019 FISH CATCH

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Bangana behri	ปาอ่า	4	VU
Cirrhinus cirrhosus	ปาแกง/ปามอมจัม	1	VU
Cirrhinus molitorella	ปาแกง	2	NT
Neolissochilus stracheyi	ปาสอง	0.6	NT
Onychostoma gerlachi	ปาถิง	1	NT
Scaphognathops bandanensis	ปาอวมไฟ/ปาป่วม	19.9	VU
Tor sinensis	ปาแดง	7.2	VU
Wallago attu	ปาค้าว	0.5	NT

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 June 2019 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 RECORDED MONTHLY FISH CATCH JULY 2015- JUNE 2019

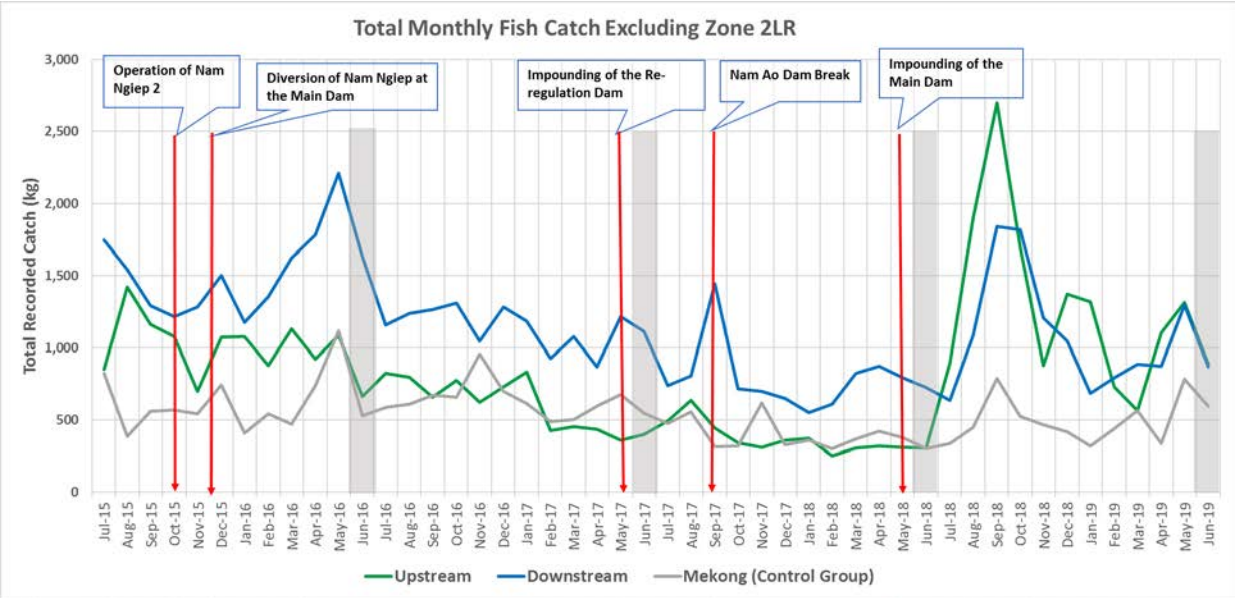
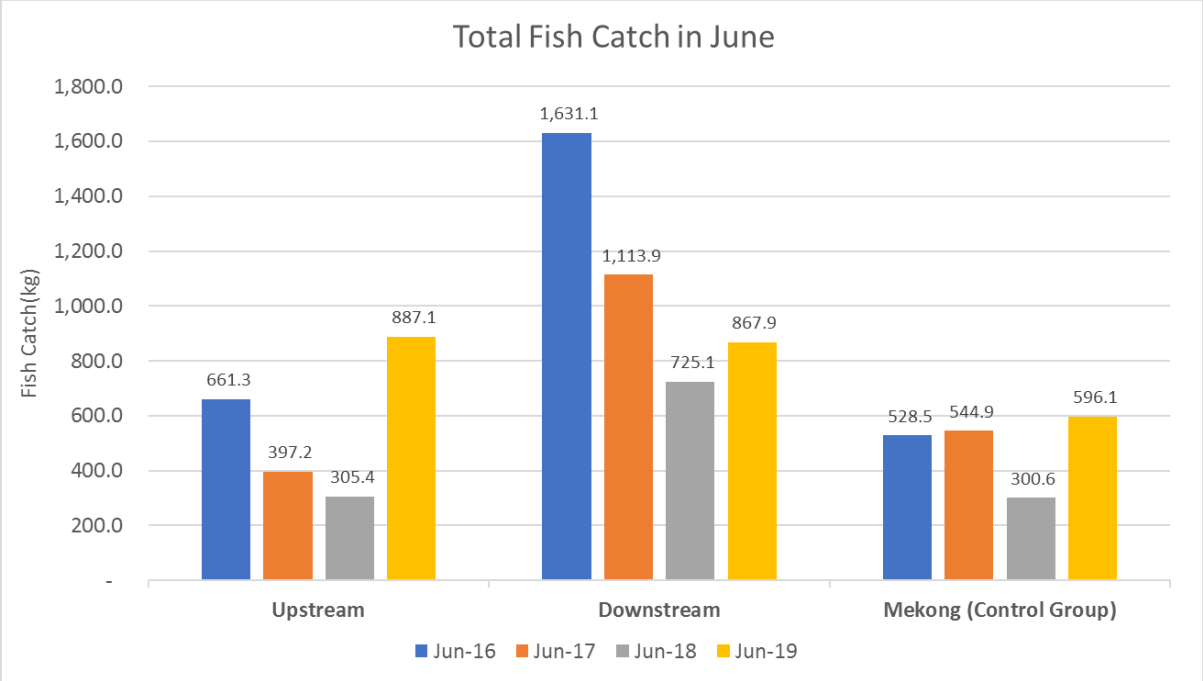


Table 4-3 and ***Figure 4-2*** show the total recorded fish catch for June 2016, June 2017, June 2018 and June 2019 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group. The total fish catch data represents the total fish supply provided by the involved fishing households.

TABLE 4-3: TOTAL RECORDED FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS IN JUNE 2016, JUNE 2017, JUNE 2018 AND JUNE 2019

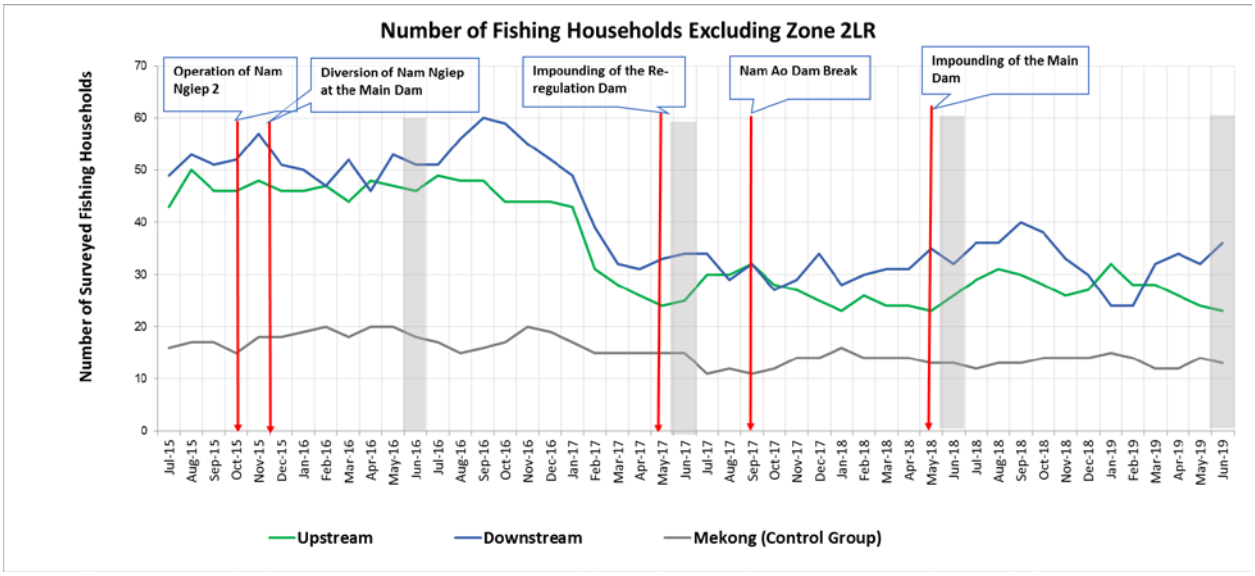
Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)
Upstream	661.3	397.2	305.4	887.1
Downstream	1,631.1	1,113.9	725.1	867.9
Mekong Control Group	528.5	544.9	300.6	596.1

FIGURE 4-2: TOTAL RECORDED FISH CATCH BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS IN JUNE 2016, JUNE 2017, JUNE 2018 AND JUNE 2019



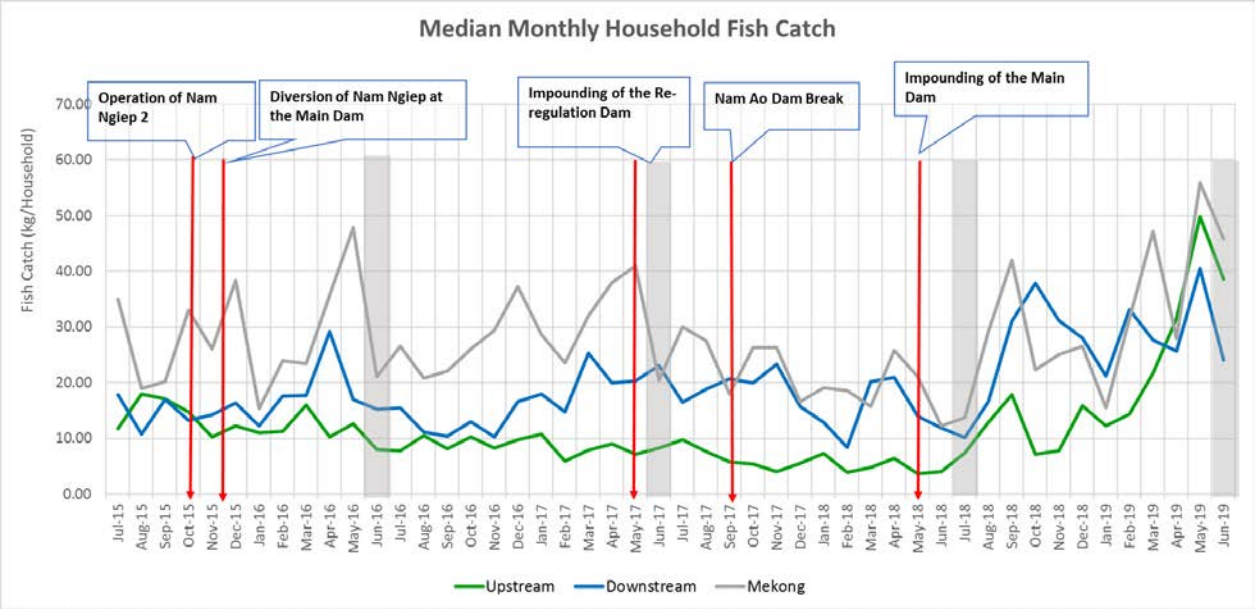
The numbers of fishing households involved in the fish catch monitoring programme are displayed in ***Figure 4-3***.

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



The median monthly household fish catch from July 2015 to June 2019 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 June 2016, June 2017, June 2018 and June 2019 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

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019(kg)
Upstream	8.1	8.3	4.1	38.6
Downstream	15.2	23.0	11.9	24.1
Mekong Control Group	21.1	20.4	12.2	45.9

The median daily fish catch per household are displayed in ***Figure 4-5***, and the median fish catch per household per fishing day in June 2016, June 2017, June 2018 and June 2019 are shown in ***Table 4-5.***

FIGURE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD

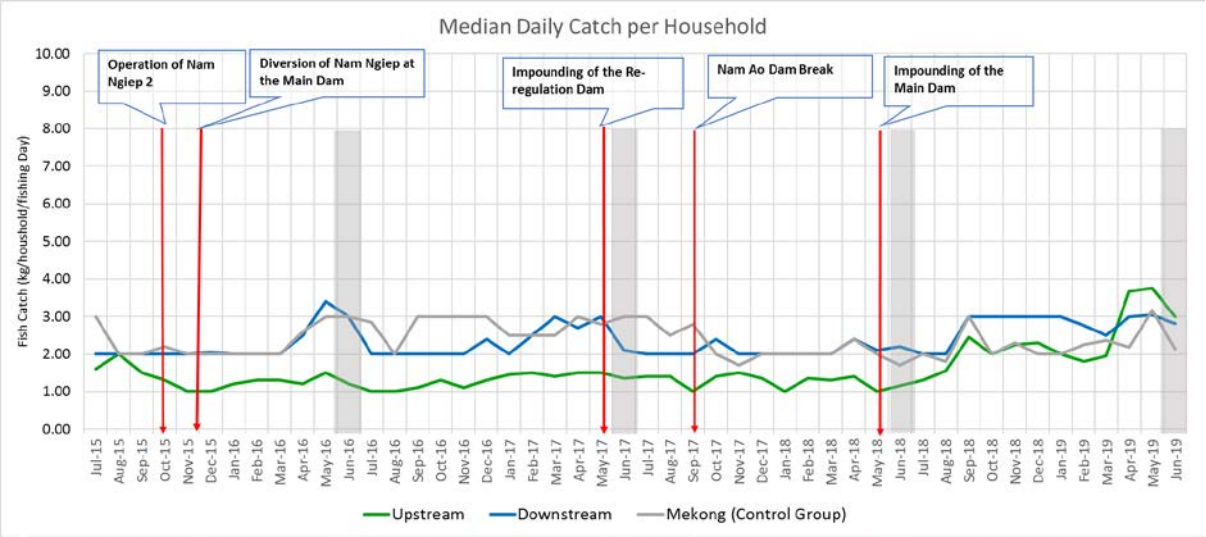


TABLE 4-5: MEDIAN DAILY FISH CATCH PER HOUSEHOLD IN JUNE

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)
Upstream	1.20	1.35	1.15	3.00
Downstream	3.00	2.10	2.20	2.81
Mekong (Control Group)	3.00	3.00	1.70	2.14

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***

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	**Parameters (Unit)**	**Guideline**												
2-Jul-19	pH	5.0 - 9.0		8.18	8.25	7.99	8.05							
3-Jul-19	pH	5.0 - 9.0						8.15	7.84	7.97	8.12	7.16	6.56	6.46
5-Jul-19	pH	5.0 - 9.0						8.14	7.9	7.94	7.86	8.03		
6-Jul-19	pH	5.0 - 9.0						8.04	7.96		8.15			
8-Jul-19	pH	5.0 - 9.0	8.36											
9-Jul-19	pH	5.0 - 9.0		8.4	8.16	8.84	8.39							
10-Jul-19	pH	5.0 - 9.0						8.25	7.89	7.86	7.96	8.04	8.28	8.69
12-Jul-19	pH	5.0 - 9.0						8.36	7.94	7.97	7.98	7.28	6.26	6.2
13-Jul-19	pH	5.0 - 9.0						8.25	8.13	7.94	7.75	7.48	6.4	6.65
16-Jul-19	pH	5.0 - 9.0		8.21	8.1	8.2	8.06							
17-Jul-19	pH	5.0 - 9.0						8.21	7.98	8.08	8.61	7.35	6.51	6.25
19-Jul-19	pH	5.0 - 9.0						7.91	7.87	8.03	8.2	8.38		
20-Jul-19	pH	5.0 - 9.0						8.35	8.02		8.06			
24-Jul-19	pH	5.0 - 9.0						8.13	7.92	7.91	7.96	7.37	8.28	8.58
25-Jul-19	pH	5.0 - 9.0		8.38	8.52	8.46	8.17							
26-Jul-19	pH	5.0 - 9.0						8.52	7.88	7.95	8.01	8.14		
27-Jul-19	pH	5.0 - 9.0						8.31	7.94		8.03			
29-Jul-19	pH	5.0 - 9.0	7.91											
30-Jul-19	pH	5.0 - 9.0		8.41	8.09	8.42	8.26							
31-Jul-19	pH	5.0 - 9.0						7.85	7.83	7.96	7.96	7.27	6.33	6.37
2-Jul-19	Sat. DO (%)			104.9	97.8	98.1	96.4							
3-Jul-19	Sat. DO (%)							94.8	49.6	60.4	87.6	87.1	91.8	93.5
5-Jul-19	Sat. DO (%)							81.6	18.9	20.4	42.8	46.8		
6-Jul-19	Sat. DO (%)							70.6	42.9		93.1			
8-Jul-19	Sat. DO (%)		108.6											
9-Jul-19	Sat. DO (%)			112.7	104.2	108.4	99.1							
10-Jul-19	Sat. DO (%)							95	19.4	31	33.8	35.2	82.5	81.9
12-Jul-19	Sat. DO (%)							95.2	30.2	44.6	97.7	84.9	92.5	92.7
13-Jul-19	Sat. DO (%)							94.7	40.6	41.4	89.4	83.7	97.9	94
16-Jul-19	Sat. DO (%)			94.9	94.5	104	97.9							
17-Jul-19	Sat. DO (%)							86.1	23.2	45.2	89.7	87.9	102	85.3
19-Jul-19	Sat. DO (%)							89.2	26.9	52	41.2	76.1		
20-Jul-19	Sat. DO (%)							83.5	45.7		40.4			
24-Jul-19	Sat. DO (%)							86.2	5	7.8	25.9	32.8	70.5	77.6
25-Jul-19	Sat. DO (%)			100.5	84	86.4	87.5							
26-Jul-19	Sat. DO (%)							69.8	4.4	11.5	28.4	35.2		
27-Jul-19	Sat. DO (%)							62.31	9.2		32.1			
29-Jul-19	Sat. DO (%)		99											
30-Jul-19	Sat. DO (%)			103	94.4	97.5	94.9							
31-Jul-19	Sat. DO (%)							88.8	9.7	30.8	100.3	89.8	72.6	78.1
2-Jul-19	DO (mg/L)	>6.0		7.79	7.29	7.35	7.28							

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	**Parameters (Unit)**	**Guideline**											
3-Jul-19	DO (mg/L)	>6.0						7.22	4.22	4.78	6.8	6.71	7.16	7.31
5-Jul-19	DO (mg/L)	>6.0						6.28	1.62	1.7	3.69			
6-Jul-19	DO (mg/L)	>6.0						5.45	3.26		7.47			
8-Jul-19	DO (mg/L)	>6.0	7.94											
9-Jul-19	DO (mg/L)	>6.0		8.4	7.84	8.08	7.46							
10-Jul-19	DO (mg/L)	>6.0						7.25	1.62	2.68	2.87	2.93	6.38	6.3
12-Jul-19	DO (mg/L)	>6.0						7.29	2.62	3.45	6.63	6.28	6.65	
13-Jul-19	DO (mg/L)	>6.0						7.24	3.13	3.3	6.91	6.43	7.39	6.82
16-Jul-19	DO (mg/L)	>6.0		6.84	7	7.65	7.3							
17-Jul-19	DO (mg/L)	>6.0						6.54	1.88	3.45	6.81	6.82	7.52	6.21
19-Jul-19	DO (mg/L)	>6.0						6.73	2.11	3.84	3.54	6.09		
20-Jul-19	DO (mg/L)	>6.0						6.26	3.64		3.28			
24-Jul-19	DO (mg/L)	>6.0						6.61	0.43	0.66	2.22	2.63	5.83	6.45
25-Jul-19	DO (mg/L)	>6.0		7.54	6.42	6.49	6.63							
26-Jul-19	DO (mg/L)	>6.0						5.38	4.4	0.92	2.41	2.92		
27-Jul-19	DO (mg/L)	>6.0						4.85	0.94		2.69			
29-Jul-19	DO (mg/L)	>6.0	7.22											
30-Jul-19	DO (mg/L)	>6.0		7.53	7.09	7.32	7.15							
31-Jul-19	DO (mg/L)	>6.0						6.78	0.88	2.48	7.3	6.95	6.68	6.48
2-Jul-19	Conductivity (µs/cm)			115	91	76	72							
3-Jul-19	Conductivity (µs/cm)							71	100	81	57.1	63.8	48.2	45.1
5-Jul-19	Conductivity (µs/cm)							69	100	93	94	92		
6-Jul-19	Conductivity (µs/cm)							68	72		84			
8-Jul-19	Conductivity (µs/cm)		82.9											
9-Jul-19	Conductivity (µs/cm)			107	96	78	73							
10-Jul-19	Conductivity (µs/cm)							70	86	87	90	90	48.7	41.9
12-Jul-19	Conductivity (µs/cm)							69	103	74	62.5	76.5	54.9	42.3
13-Jul-19	Conductivity (µs/cm)							70	84	79	78.4	72.3	56.3	45.2
16-Jul-19	Conductivity (µs/cm)			104	95	76	72							
17-Jul-19	Conductivity (µs/cm)							70	88	86	62.8	65.6	54.5	45.8
19-Jul-19	Conductivity (µs/cm)							71	87	84	90	91		
20-Jul-19	Conductivity (µs/cm)							71	85		87			
24-Jul-19	Conductivity (µs/cm)							70	101	95	95	66.8	60.3	53.3
25-Jul-19	Conductivity (µs/cm)			100	91	77	72							
26-Jul-19	Conductivity (µs/cm)							69	102	85	95	94		
27-Jul-19	Conductivity (µs/cm)							70	100		89			

	Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	**Parameters (Unit)**	**Guideline**											
29-Jul-19	Conductivity (µs/cm)		55										
30-Jul-19	Conductivity (µs/cm)			98	95	76	72						
31-Jul-19	Conductivity (µs/cm)							69	100	80	60.1	61.6	56.6	53.8
2-Jul-19	TDS (mg/L)			57.5	45.5	38	36							
3-Jul-19	TDS (mg/L)							35.5	50	40.5	28.6	31.9	24.1	22.5
5-Jul-19	TDS (mg/L)							34.5	50	46.5	47	46		
6-Jul-19	TDS (mg/L)							34	36	42				
8-Jul-19	TDS (mg/L)		41.45											
9-Jul-19	TDS (mg/L)			53.5	48	39	36.5							
10-Jul-19	TDS (mg/L)							35	43	43.5	45	45	24.3	21
12-Jul-19	TDS (mg/L)							34.5	51.5	37	31.3	38.2	27.3	21.1
13-Jul-19	TDS (mg/L)							35	42	39.5	39.2	36.1	28.1	22.5
16-Jul-19	TDS (mg/L)			52	47.5	38	36							
17-Jul-19	TDS (mg/L)							35	44	43	31.4	32.8	27.3	22.9
19-Jul-19	TDS (mg/L)							35.5	43.5	42	45	45.5		
20-Jul-19	TDS (mg/L)							35.5	42.5		43.5			
24-Jul-19	TDS (mg/L)							35	50.5	47.5	47.5	38.4	30.2	26.7
25-Jul-19	TDS (mg/L)			50	45.5	38.5	36							
26-Jul-19	TDS (mg/L)													
27-Jul-19	TDS (mg/L)							34.5	51	42.5	47.25	47		
29-Jul-19	TDS (mg/L)		27.5					35	50		44.5			
30-Jul-19	TDS (mg/L)			49	47.5	38	36							
31-Jul-19	TDS (mg/L)							34.5	50	40	30	30.9	28.3	26.9
2-Jul-19	Temperature (°C)			31.01	30.79	30.55	30.09							
3-Jul-19	Temperature (°C)							29.19	23.49	27.39	26.6	26.9	26.3	
5-Jul-19	Temperature (°C)							28.86	23.59	24.95	24.03	24.69		
6-Jul-19	Temperature (°C)							27.7	29.86		26.67			
8-Jul-19	Temperature (°C)		29.1											
9-Jul-19	Temperature (°C)			30.52	30.09	30.82	30.22							
10-Jul-19	Temperature (°C)							29.27	26.18	25.79	24.71	24.88	27.2	27.3
12-Jul-19	Temperature (°C)							29.16	24.03	30.08	28.8	29.5	31.2	30.1
13-Jul-19	Temperature (°C)							29.21	28.96	28.9	27.5	27.4	28.4	30.3
16-Jul-19	Temperature (°C)			32.62	31.08	31.55	30.53							
17-Jul-19	Temperature (°C)							29.61	27.43	28.67	30.6	29.7	29.2	30.1
19-Jul-19	Temperature (°C)							30.1	28.07	31.38	25.03	26.71		
20-Jul-19	Temperature (°C)							30.5	27.33		25.94			
24-Jul-19	Temperature (°C)							29.41	23.52	24.22	23.97	24.9	25.3	25.4
25-Jul-19	Temperature (°C)			30.5	30.01	30.27	29.97							
26-Jul-19	Temperature (°C)							28.98	23.54	25.27	23.82	24.15		
27-Jul-19	Temperature (°C)							29.15	24.39		24.08			
29-Jul-19	Temperature (°C)		28.3											
30-Jul-19	Temperature (°C)			32.14	30.33	30.44	30.17							
31-Jul-19	Temperature (°C)							29.9	23.65	26.79	25.8	26.2	26.6	27
2-Jul-19	Turbidity (NTU)			2.22	3.24	2.03	1.86							
3-Jul-19	Turbidity (NTU)							2.03	4.04	6.53	9.09	10.17	10.1	12.4
5-Jul-19	Turbidity (NTU)							1.86	3.4	10.06	11.8	15.1		

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	Parameters (Unit)	Guideline												
6-Jul-19	Turbidity (NTU)							1.55	3.98		5.5			
8-Jul-19	Turbidity (NTU)		11.67											
9-Jul-19	Turbidity (NTU)			1.67	1.46	1.54	1.32							
10-Jul-19	Turbidity (NTU)							1.2	8.72	7.7	7.51	9.79	25	10.9
12-Jul-19	Turbidity (NTU)							1.15	5.18	5.31	8.53	8.21	7.94	7.33
13-Jul-19	Turbidity (NTU)													
16-Jul-19	Turbidity (NTU)			1.45	1.55	1.41	1.06							
17-Jul-19	Turbidity (NTU)							1.14	7.56	5.52	8.95	25.62	6.44	14.5
19-Jul-19	Turbidity (NTU)							1.08	5.82	1.25	27.21	25.46		
20-Jul-19	Turbidity (NTU)							1.27	6.23		9.19			
24-Jul-19	Turbidity (NTU)							2	3.27	7.79	6.75	12.27	18.1	24.1
25-Jul-19	Turbidity (NTU)			2.92	2.71	2.63	3.79							
26-Jul-19	Turbidity (NTU)							2.39	2.15	13.72	7.75	13.26		
27-Jul-19	Turbidity (NTU)							2.5	5.8		12.17			
29-Jul-19	Turbidity (NTU)		625											
30-Jul-19	Turbidity (NTU)			2.46	2.55	2.52	2.21							
31-Jul-19	Turbidity (NTU)							2.6	2.84	8.33	9.42	12.92	15.9	14.7
3-Jul-19	TSS (mg/L)							<5	10.28	<5				
8-Jul-19	TSS (mg/L)		17.2											
9-Jul-19	TSS (mg/L)			<5	<5	<5	<5							
10-Jul-19	TSS (mg/L)							<5	6.88	8.18	7.64	8.13	46.9	9.76
17-Jul-19	TSS (mg/L)							<5	7.09	<5	<5			
24-Jul-19	TSS (mg/L)							<5	9.66	7.66	12			
8-Jul-19	BOD_5 (mg/L)	<1.5	1.06											
9-Jul-19	BOD_5 (mg/L)	<1.5		1.77	1.32	1.02	<1.0							
10-Jul-19	BOD_5 (mg/L)	<1.5						<1.0	6.32	2.04	2.55	2.61	<1.0	<1.0
24-Jul-19	BOD_5 (mg/L)	<1.5						1.34	6.66	5.46	5.96			
8-Jul-19	COD (mg/L)	<5.0	6											
9-Jul-19	COD (mg/L)	<5.0		7.4	12.4	13.8	8.4							
10-Jul-19	COD (mg/L)	<5.0						8.9	7	7.2	8.4	7	11.4	6.4
8-Jul-19	NH_3-N (mg/L)	<0.2	<0.2											
9-Jul-19	NH_3-N (mg/L)	<0.2		<0.2	<0.2	<0.2	<0.2							
10-Jul-19	NH_3-N (mg/L)	<0.2						<0.2	0.35	0.25	0.4	0.4	<0.2	<0.2
8-Jul-19	NO_3-N (mg/L)	<5.0	0.04											
9-Jul-19	NO_3-N (mg/L)	<5.0		<0.02	<0.02	<0.02	<0.02							
10-Jul-19	NO_3-N (mg/L)	<5.0						<0.02	<0.02	<0.02	<0.02	0.09	0.03	<0.02
8-Jul-19	Faecal coliform (MPN/100 ml)	<1,000	350											
9-Jul-19	Faecal coliform (MPN/100 ml)	<1,000		0	0	0	0							
10-Jul-19	Faecal coliform (MPN/100 ml)	<1,000						0	8	17	5	220	1,600	350
8-Jul-19	Total Coliform (MPN/100 ml)	<5,000												
9-Jul-19	Total Coliform (MPN/100 ml)	<5,000		79	22	2	14							
10-Jul-19	Total Coliform (MPN/100 ml)	<5,000						240	540	540	220	920	1,600	920
9-Jul-19	TOC (mg/L)			1.9	2.31	2.25	1.71							

		Station Code	NNG01	R1	R2	R3	R4	R5	R6	R7	NNG05	NNG06	NNG07	NNG08
Date	**Parameters (Unit)**	**Guideline**												
10-Jul-19	TOC (mg/L)							1.67	1.46	1.44				
9-Jul-19	Phytoplankton Biomass (g dry wt/m³)			2.2	3.2	1.6	1.8							
10-Jul-19	Phytoplankton Biomass (g dry wt/m³)							1.4	6.8	9.4				
9-Jul-19	Total Phosphorus (mg/L)			<0.01	<0.01	<0.01	<0.01							
10-Jul-19	Total Phosphorus (mg/L)							<0.01	<0.01	<0.01				
9-Jul-19	Total Dissolved Phosphorus (mg/L)			<0.01	<0.01	<0.01	<0.01							
10-Jul-19	Total Dissolved Phosphorus (mg/L)							<0.01	<0.01	<0.01				
10-Jul-19	Hydrogen Sulfide (mg/L)							<0.02		<0.02				

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

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**				
2-Jul-19	pH	5.0 - 9.0		8.01		
3-Jul-19	pH	5.0 - 9.0			7.21	7.18
5-Jul-19	pH	5.0 - 9.0			8.32	
8-Jul-19	pH	5.0 - 9.0	7.97			
9-Jul-19	pH	5.0 - 9.0		8.37		
10-Jul-19	pH	5.0 - 9.0			8.18	8.16
12-Jul-19	pH	5.0 - 9.0			7.33	7.15
13-Jul-19	pH	5.0 - 9.0			7.85	7.26
16-Jul-19	pH	5.0 - 9.0		8.19		
17-Jul-19	pH	5.0 - 9.0			7.68	7.08
19-Jul-19	pH	5.0 - 9.0			8.42	
24-Jul-19	pH	5.0 - 9.0			7.67	7.32
25-Jul-19	pH	5.0 - 9.0		8.4		
26-Jul-19	pH	5.0 - 9.0			8.28	
29-Jul-19	pH	5.0 - 9.0	7.57			
30-Jul-19	pH	5.0 - 9.0		8.02		
31-Jul-19	pH	5.0 - 9.0			7.75	6.72
2-Jul-19	Sat. DO (%)			104.3		
3-Jul-19	Sat. DO (%)				94.3	90.9
5-Jul-19	Sat. DO (%)				111.3	
8-Jul-19	Sat. DO (%)		105.3			
9-Jul-19	Sat. DO (%)			97.7		
10-Jul-19	Sat. DO (%)				86.6	98.6
12-Jul-19	Sat. DO (%)				99.1	91.3
13-Jul-19	Sat. DO (%)				87.7	93.1
16-Jul-19	Sat. DO (%)			88.9		
17-Jul-19	Sat. DO (%)				97.4	95.7
19-Jul-19	Sat. DO (%)				83	
24-Jul-19	Sat. DO (%)				90	88.6
25-Jul-19	Sat. DO (%)			87.6		
26-Jul-19	Sat. DO (%)				78.62	
29-Jul-19	Sat. DO (%)		101.9			
30-Jul-19	Sat. DO (%)			99.6		
31-Jul-19	Sat. DO (%)				94.6	92.2
2-Jul-19	DO (mg/L)	>6.0		8.4		
3-Jul-19	DO (mg/L)	>6.0			7.2	7.05
5-Jul-19	DO (mg/L)	>6.0				
8-Jul-19	DO (mg/L)	>6.0	8.07			
9-Jul-19	DO (mg/L)	>6.0		7.76		
10-Jul-19	DO (mg/L)	>6.0			6.53	7.89
12-Jul-19	DO (mg/L)	>6.0			7.25	6.79
13-Jul-19	DO (mg/L)	>6.0			6.95	7.2
16-Jul-19	DO (mg/L)	>6.0		7.14		
17-Jul-19	DO (mg/L)	>6.0			7.02	7.08

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
19-Jul-19	DO (mg/L)	>6.0			6.14	
24-Jul-19	DO (mg/L)	>6.0			6.98	7.02
25-Jul-19	DO (mg/L)	>6.0		7.21		
26-Jul-19	DO (mg/L)	>6.0			6.12	
29-Jul-19	DO (mg/L)	>6.0	7.78			
30-Jul-19	DO (mg/L)	>6.0		7.85		
31-Jul-19	DO (mg/L)	>6.0			7.22	7.7
2-Jul-19	Conductivity (µs/cm)			60		
3-Jul-19	Conductivity (µs/cm)				94.4	14.1
5-Jul-19	Conductivity (µs/cm)				102	
8-Jul-19	Conductivity (µs/cm)		26.8			
9-Jul-19	Conductivity (µs/cm)			91		
10-Jul-19	Conductivity (µs/cm)				140	21
12-Jul-19	Conductivity (µs/cm)				106.7	15.87
13-Jul-19	Conductivity (µs/cm)				99.6	17.45
16-Jul-19	Conductivity (µs/cm)			106		
17-Jul-19	Conductivity (µs/cm)				86.2	16.67
19-Jul-19	Conductivity (µs/cm)				131	
24-Jul-19	Conductivity (µs/cm)				74.8	13.56
25-Jul-19	Conductivity (µs/cm)			103		
26-Jul-19	Conductivity (µs/cm)				120	
29-Jul-19	Conductivity (µs/cm)		22			
30-Jul-19	Conductivity (µs/cm)			119		
31-Jul-19	Conductivity (µs/cm)				75.4	14.45
2-Jul-19	TDS (mg/L)			30		
3-Jul-19	TDS (mg/L)				47.2	7
5-Jul-19	TDS (mg/L)				56	
8-Jul-19	TDS (mg/L)		13.4			
9-Jul-19	TDS (mg/L)			45.5		
10-Jul-19	TDS (mg/L)				70	10.5
12-Jul-19	TDS (mg/L)				53.3	7.9
13-Jul-19	TDS (mg/L)				49.3	8.7
16-Jul-19	TDS (mg/L)			53		
17-Jul-19	TDS (mg/L)				43.1	8.33
19-Jul-19	TDS (mg/L)				65.5	
24-Jul-19	TDS (mg/L)				37.4	6.78
25-Jul-19	TDS (mg/L)			50.15		
26-Jul-19	TDS (mg/L)					
29-Jul-19	TDS (mg/L)		11			
30-Jul-19	TDS (mg/L)			59.5		
31-Jul-19	TDS (mg/L)				37.8	7.2
2-Jul-19	Temperature (°C)			25.32		
3-Jul-19	Temperature (°C)				27.4	26
5-Jul-19	Temperature (°C)				27	
8-Jul-19	Temperature (°C)		26.2			
9-Jul-19	Temperature (°C)			26.81		
10-Jul-19	Temperature (°C)				29.69	27.35
12-Jul-19	Temperature (°C)				30.1	29.1

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
13-Jul-19	Temperature (°C)			27.2	28.6	
16-Jul-19	Temperature (°C)			25.88		
17-Jul-19	Temperature (°C)				30.6	29.1
19-Jul-19	Temperature (°C)				29.02	
24-Jul-19	Temperature (°C)				25.5	29.7
25-Jul-19	Temperature (°C)			25.15		
26-Jul-19	Temperature (°C)				27.57	
29-Jul-19	Temperature (°C)		25.8			
30-Jul-19	Temperature (°C)			24.93		
31-Jul-19	Temperature (°C)				29.4	25.6
2-Jul-19	Turbidity (NTU)			41.5		
3-Jul-19	Turbidity (NTU)				15.25	14.48
5-Jul-19	Turbidity (NTU)				40.41	
8-Jul-19	Turbidity (NTU)		17.48			
9-Jul-19	Turbidity (NTU)			3.32		
10-Jul-19	Turbidity (NTU)				12.11	16.42
12-Jul-19	Turbidity (NTU)				9.58	9.68
13-Jul-19	Turbidity (NTU)					
16-Jul-19	Turbidity (NTU)			13.64		
17-Jul-19	Turbidity (NTU)				27.01	20.79
19-Jul-19	Turbidity (NTU)				16.13	
24-Jul-19	Turbidity (NTU)				43.36	6.11
25-Jul-19	Turbidity (NTU)			13.63		
26-Jul-19	Turbidity (NTU)				40.78	
29-Jul-19	Turbidity (NTU)		28.54			
30-Jul-19	Turbidity (NTU)			25.06		
31-Jul-19	Turbidity (NTU)				34.1	4.32
3-Jul-19	TSS (mg/L)					
8-Jul-19	TSS (mg/L)		18.77			
9-Jul-19	TSS (mg/L)			9.36		
10-Jul-19	TSS (mg/L)				14.31	21.25
17-Jul-19	TSS (mg/L)					
24-Jul-19	TSS (mg/L)					
8-Jul-19	BOD_5 (mg/L)	<1.5	1.13			
9-Jul-19	BOD_5 (mg/L)	<1.5		<1.0		
10-Jul-19	BOD_5 (mg/L)	<1.5			<1.0	<1.0
24-Jul-19	BOD_5 (mg/L)	<1.5				
8-Jul-19	COD (mg/L)	<5.0	8.6			
9-Jul-19	COD (mg/L)	<5.0		6.4		
10-Jul-19	COD (mg/L)	<5.0			10.4	10
8-Jul-19	NH_3-N (mg/L)	<0.2	<0.2			
9-Jul-19	NH_3-N (mg/L)	<0.2		<0.2		
10-Jul-19	NH_3-N (mg/L)	<0.2			<0.2	<0.2
8-Jul-19	NO_3-N (mg/L)	<5.0	<0.02			
9-Jul-19	NO_3-N (mg/L)	<5.0		<0.02		
10-Jul-19	NO_3-N (mg/L)	<5.0			0.03	<0.02
8-Jul-19	Faecal coliform (MPN/100 ml)	<1,000	79			
9-Jul-19	Faecal coliform (MPN/100 ml)	<1,000		79		

		Station Code	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**				
10-Jul-19	Faecal coliform (MPN/100 ml)	<1,000			350	240
8-Jul-19	Total Coliform (MPN/100 ml)	<5,000	920			
9-Jul-19	Total Coliform (MPN/100 ml)	<5,000		170		
10-Jul-19	Total Coliform (MPN/100 ml)	<5,000			1,600	1,600

ANNEX B: RESULTS OF EFFLUENT ANALYSES

TABLE B-1: *RESULTS OF CAMP EFFLUENTS IN JULY 2019*

	Site Name	Owner's Site Office and Village		Obayashi Camp		SongDa5 Camp No.1	
	Station Code	EF01		EF02		EF07	
	Date	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	7.67	6.84	7.71	7.22	7.61	7.31
Sat. DO (%)		53.9	51.6	64.5	56.7	90.7	93.3
DO (mg/l)		4.09	3.79	4.86	4.03	7.06	6.76
Conductivity (µs/cm)		331	331	327	342	706	879
TDS (mg/l)		160.5	165.5	163.5	171	353	439.5
Temperature (°C)		27.5	29.4	26.7	31.4	26.4	30.4
Turbidity (NTU)		1.12	0.7	1.79	1.58	5.79	3.89
TSS (mg/l)	<50	<5	<5	<5	<5	7.3	<5
BOD5 (mg/l)	<30	<6	8.01	33.9	14.16	<6	<6
COD (mg/l)	<125	<25	<25	<25	<25	30	26.2
NH3-N (mg/l)	<10.0	6.2	5.8	6.4	4.7	11.8	10.4
Total Nitrogen (mg/l)	<10.0	14.2	11.5	13.4	7.01	17.8	12.6
Total Phosphorus (mg/l)	<2	0.63	0.71	0.85	0.71	0.9	0.84
Oil & Grease (mg/l)	<10.0	<1		<1		<1	
Total coliform (MPN/100ml)	<400	350	110	1,600	1,600	0	0
Faecal Coliform (MPN/100ml)	<400	220	11	1,600	350	0	0
Effluent Discharge Volume (L/mn)		12	12	12	20	4	3
Chlorination Dosing Rate (ml/mn)		n/a	n/a	45	80	28	20
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.05	0.15	0.62	1.77

	Site Name	V&K Camp		HM Main Camp		ESD Camp		Lilama10 Camp	
	Station Code	EF10		EF13		EF14		EF17	
	Date	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19
Parameters (Unit)	**Guideline**								
pH	6.0 - 9.0	7.31	7.15	7.35	6.93	7.16	7.01	There is no outflow from the wetland into chlorination treatment pond. Therefore, no sampling for this site.	
Sat. DO (%)		56.8	71.5	90.2	50.3	37.6	71.5		
DO (mg/l)		4.35	5.28	7.05	3.66	2.78	5.18		
Conductivity (µs/cm)		308	322	344	542	231	979		
TDS (mg/l)		154	161	172	271	115.5	489.5		

	Site Name	V&K Camp		HM Main Camp		ESD Camp		Lilama10 Camp	
	Station Code	EF10		EF13		EF14		EF17	
	Date	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19	04-Jul-19	18-Jul-19
Parameters (Unit)	**Guideline**								
Temperature (°C)		27.3	29.3	26	30	27.7	30.3		
Turbidity (NTU)		4.67	2.95	18.58	20.83	8.25	7.26		
TSS (mg/l)	<50	6.5	5.4	16.4	28.2	13.2	12.9		
BOD5 (mg/l)	<30	<6	6.3	<6	45.43	44	<6		
COD (mg/l)	<125	<25	<25	146	118	52.3	37.8		
NH3-N (mg/l)	<10.0	5.1	3.5	12.2	15	4.4	4.8		
Total Nitrogen (mg/l)	<10.0	6.27	5.3	13	16.9	6.14	6.67		
Total Phosphorus (mg/l)	<2	0.55	0.38	0.9	0.86	0.32	0.65		
Oil & Grease (mg/l)	<10.0	<1		<1	0.86	<1			
Total coliform (MPN/100ml)	<400	0	130	0	0	54,000	0		
Faecal Coliform (MPN/100ml)	<400	0	34	0	0	16,000	0		
Effluent Discharge Volume (L/mn)		3	4	12	12		0		
Chlorination Dosing Rate (ml/mn)		25	5	14	12		2		
Residual Chlorine (mg/l)	<1.0	0.09	0.12	0.98	0.72	0.00	0.76		

TABLE B-2: *RESULTS OF THE CONSTRUCTION AREA DISCHARGE IN JULY 2019*

	Site Name	Upstream Spoil Disposal Area No.2			
	Station Code	DS04 - US			
	Date	04-Jul-19	10-Jul-19	18-Jul-19	25-Jul-19
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	7.93	7.34	7.72	7.86
Sat. DO (%)		96.6	96.7	91	85
DO (mg/L)		7.48	7.49	7.05	6.7
Conductivity (µs/cm)		9.09	6.77	12.51	11.74
TDS (mg/l)		4.54	3.3	6.25	5.87
Temperature (°C)		26.5	26.6	26.6	25.7
Turbidity (NTU)		3.87	1.37	2.84	4.39
TSS (mg/L)	<50	1.16	1.33	1.99	10.5
Oil & Grease (mg/L)	<10		<1		

	Site Name	Spoil Disposal Area No.2			
	Station Code	DS04			
	Date	04-Jul-19	10-Jul-19	18-Jul-19	25-Jul-19
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	6.97	6.82	7.44	6.95
Sat. DO (%)		62.6	69.6	51.7	49.9
DO (mg/L)		4.84	5.42	4.03	3.89
Conductivity (µs/cm)		24.7	25.3	27.3	32.7
TDS (mg/l)		12.35	12.7	13.65	16.35
Temperature (°C)		26.1	26.4	26.2	26.3
Turbidity (NTU)		11.46	5.25	3.83	13
TSS (mg/L)	<50	17.67	6.42	5.91	19
Oil & Grease (mg/L)	<10		<1		

ANNEX C: AMBIENT DUST QUALITY

TABLE C-1: 24-HOUR AVERAGE DUST CONCENTRATIONS MEASURED IN HAT GNIUN VILLAGE

Hat Gnuin Village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	15-Jul-19 18:00	16-Jul-19 18:00	17-Jul-19 18:54
End Time	16-Jul-19 18:00	17-Jul-19 18:00	18-Jul-19 18:00
Average Data Record in 24h (mg/m^3)	0.040	0.046	0.067
Guideline Average in 24h (mg/m^3)	***0.12***	***0.12***	***0.12***

TABLE C-2: 24-HOUR AVERAGE DUST CONCENTRATIONS MEASURED IN PHOUHOMXAY VILLAGE

Phouhomxay Village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	01-Jul-19 18:00	02-Jul-19 18:00	03-Jul-19 18:00
End Time	02-Jul-19 18:00	03-Jul-19 18:00	04-Jul-19 18:00
Average Data Record in 24h (mg/m^3)	0.021	0.031	0.028
Guideline Average in 24h (mg/m^3)	***0.12***	***0.12***	***0.12***

TABLE C-3 AND TABLE C-4: AVERAGE RESULTS OF DUST MONITORING AT SONG DA5 CAMP NO. 2 AND LILAMA10 CAMP IN JULY 2019

Song Da5 Camp No.2 - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	19-Jul-19 18:00
End Time	20-Jul-19 18:00
Average Data Record -24h	0.035
Guideline	***0.12***

Lilama10 Camp - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	30-Jul-19 18:00
End Time	31-Jul-19 18:00
Average Data Record -24h	0.029
Guideline	***0.12***

TABLE C-5 AND TABLE C-6: AVERAGE RESULTS OF DUST MONITORING AT MAIN DAM AND MAIN POWERHOUSE IN JULY 2019

Main Dam - Dust Emission Average in 24 hours	
Period	**24 Hours**
Start Time	**24-Jul-19 18:30**
End Time	**25-Jul-19 18:00**
Average Data Record (mg/m³) -24h	**0.026**
Guideline Average (mg/m³) - 24h	***0.12***

Main Powerhouse - Dust Emission Average in 24 hours	
Period	24 Hours
Start Time	23-Jul-19 18:00
End Time	24-Jul-19 18:00
Average Data Record -24h	0.028
Guideline Average - 24h	***0.12***

ANNEX D: AMBIENT NOISE DATA

TABLE D-1: AVERAGE RESULTS OF NOISE MONITORING AT HAT GNIUN VILLAGE IN JULY 2019

Noise Level (dB)	15-16/July/19			16-17/July/19			17-18/July/19		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	61.60	47.00	67.10	59.90	67.10	63.60	63.60	65.20	63.60
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	38.60	35.52	38.92	46.28	42.67	42.31	42.97	41.98	41.57
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

TABLE D-2: AVERAGE RESULTS OF NOISE MONITORING AT PHOUHOMXAY VILLAGE IN JULY 2019

Noise Level (dB)	01-02/July/19			02-03/July/19			03-04/July/19		
	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00	18:00-22:00	22:01 – 06:00	06:01 – 18:00
Maximum Value Recorded	71.60	78.40	79.40	59.90	71.60	73.00	63.60	6.00	65.20
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	49.44	46.99	41.84	46.38	49.49	46.99	42.97	42.31	42.02
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

TABLE D-3 AND TABLE D-4: AVERAGE RESULTS OF NOISE MONITORING AT SONG DA5 CAMP NO. 2 AND LILAMA10 CAMP IN JULY 2019

Song Da5 Camp No.2

Noise Level (dB)	19-20/July/19		20/July/19
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	42.9	48.4	61.2
Guideline Max	***115***	***115***	***115***
Average Data Recorded	35.97	36.39	42.06
Guideline Averaged	***70***	***50***	***70***

Lilama10 Camp

Noise Level (dB)	30-31/July/2019		31/July/2019
	18:00 – 22:00	22:01 – 06:00	06:00-18:00
Maximum Value Recorded	67.9	71.2	67.3
Guideline Max	***115***	***115***	***115***
Average Data Recorded	44.72	41.30	42.72
Guideline Averaged	***70***	***50***	***70***

TABLE D-5 AND TABLE D-6: AVERAGE RESULTS OF NOISE MONITORING AT MAIN DAM AND MAIN POWERHOUSE IN JULY 2019

Main Dam

Noise Level (dB)	24-25/July/19		25/July/19
	18:30 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	69.8	79.4	86.5
Guideline Max	***115***	***115***	***115***
Data Record Average	60.93	67.91	65.62
Guideline Averaged	***70***	***70***	***70***

Main Powerhouse

Noise Level (dB)	23-24/July/19		24/July/19
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	68	65.2	77.9
Guideline Max	***115***	***115***	***115***
Data Record Average	62.85	60.31	56.71
Guideline Averaged	***70***	***70***	***70***