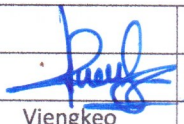
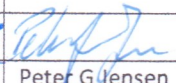
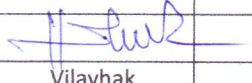
NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

April 2018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BBREVIATIONS / 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

During April 2018, EMO did not receive any new SS-ESMMP for review. One site decommissioning plan was cleared, three SS-ESMMP that were received in February and March 2018 were on hold waiting for additional information and are expected to be cleared in May 2018.

The effluent monitoring results for camps in April 2018 indicate that all key parameters (BOD5, total coliform and faecal coliform) are in compliance with the relevant effluent standards, except at Zhefu Camp (EF09), HMH Camp (EF13) and IHI Camp (EF14).

Surface water samples were collected and analysed during the reported month at 10 stations in Nam Ngiep and four stations in the main tributaries including the lower Nam Chian, Nam Phouane, Nam Xao and Houay Soup. The surface water quality data for April 2018 are all within the normal range compared with previous data.

In April 2018, a total of 168.9 m3 solid waste was disposed at the NNP1 Project Landfill, an increase of 5.6 m3 compared to March 2018. Spot checks were conducted for the waste bags in a daily basis before disposal at the landfill. A total of 536.5 kg of recyclable waste was sold by the contractor to Khounmixay Processing Factory. A total of 39.5 m3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was collected and disposed of at the Houay Soup Landfill.

The reconstitution of the Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) is expected to be delayed. Therefore, in agreement with the two Provinces the meeting for NNP1 Watershed Management Plan (WMP) approval was tentatively re-scheduled to the end of May 2018. The draft Provincial Regulation was submitted to Xaysomboun Provincial Justice Department for further review before submission to the Provincial Assembly for approval.

Several studies/surveys have been undertaken since January 2018 as part of the preparation of biodiversity mitigation and offset Plans. The last survey was herpetology in the NNP1 sub-catchment, which was completed in April 2018.

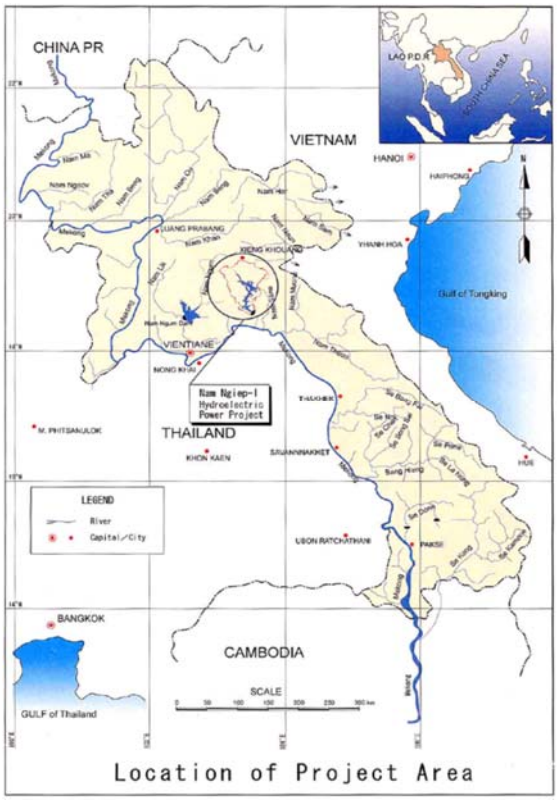
The biomass clearance work was completed. A total of 1,640.75 ha is accepted as fully cleared and the completion work was inspected and accepted by Department of Natural Resources and Environmental Monitoring (DNREM) of the Ministry of Natural Resource and Environment (MONRE) after a joint inspection conducted with NNP1PC in April 2018. DNREM will submit an approval by certified letter to the Department of Energy Business (DEB) of the Ministry of Energy and Mince (MEM) for issuance of the certificate that permits impounding the main reservoir.

The fishery monitoring programme has continued according to the plan. The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 1.7 kg/household/day in March 2018. The estimated total fish catch in Nam Ngiep basin for March 2018 is 43,800 kg. Around 36 % of the catch was sold, 54% was consumed fresh, 8% processed and approximately 2% was used for other purposes.

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.

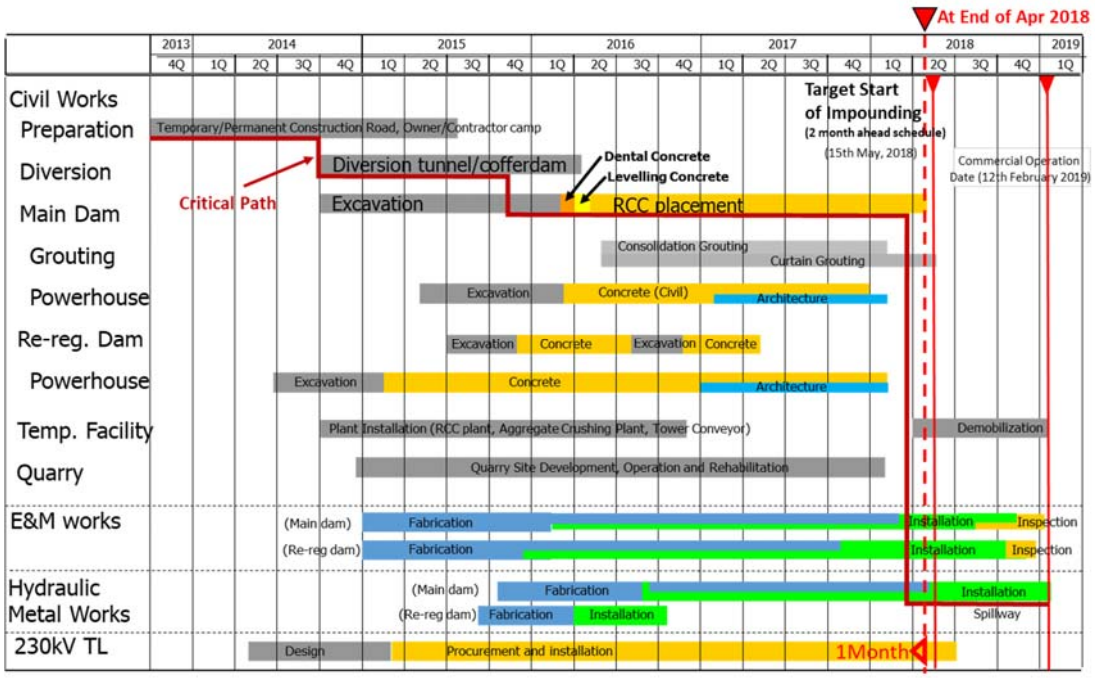
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

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. Actual overall

cumulative work progress until the end of April 2018 was 94.7 %[1] (compared to planned progress of 96.1 %), based on achieved Interim Milestone Payments for all Contracts excluding the value of Advance Payments, varied works and other adjustments allowed under each Contract. In terms of the value of actual work done the percentage is understated since work completed, but not paid, is not included.

The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in *Error! Reference source not found.*.

Figure 2-1: Overall Construction Schedule



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 NTP was issued on 03 October 2014. Excavation works of the main dam, the diversion tunnel and the re-regulation dam

[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)

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 April 2018 was 96.1 % (compared to planned progress of 96.8 %) calculated in the same manner as described above for the value of achieved Interim Milestone Payments excluding advance payment.

2.1.1 Main dam and power house

After starting the main dam excavation works in October 2014 on the left bank, the 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 than expected and part of this additional work is necessary to construct a 'shear key' structure due to the weak layers of rock encountered in the dam foundation. Following the efforts on Site, the additional excavation work was completed at the end of February 2016.

Figure 2-2: Main Dam and Powerhouse from Overhead Looking Upstream

The consolidation drilling and grouting for the main dam started in May 2016 and is ongoing. The progress is 99 % by achievement of total anticipated drilled length as of the end of April 2018 as a proportion of the total expected drilling

Table 2-1: Progress of consolidation and curtain drilling for grouting at the end of April 2018

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	17,738	99
Curtain Grouting	Original Design Quantity	27,945	52,060	186
	Anticipated Final Quantity	58,400	52,060	89

*The linear metres 'completed' are drilled and grouted.

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 and Progress of the powerhouse concreting works is shown in **Error! Reference source not found.** below. Dam Control Centre works is ngoing in April 2018

Table 2-2: Progress of Main Powerhouse Sub-Structure Concrete Works to as of the end of April 2018.

Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	34,800	34,500	99
Penstock Embedment	11,885	11,885	100
Spillway	35,500	23,980	68

2.1.2 Re-regulation dam and powerhouse

The re-regulation powerhouse excavation and cofferdam works for 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 structural concrete works is shown in ***Figure 2-3*** below

Figure 2-3: Progress of Re-regulation Dam Powerhouse Works to 31 March 2018

The powerhouse concreting has advanced well and secondary concrete embedment for the draft tube liner was completed at the end of April 2016. The left bank structure was re-designed as roller compacted concrete (RCC) and was completed on 18 March 2016. Installation of the re-regulation waterway gate and stop log and re-regulation intake gate and structural concrete works for the retaining wall to support the substation yard were

completed in October 2016. Building superstructure work continued for the powerhouse with the commencement of construction of concrete columns.

2.1.3 Temporary work facility

2.1.3.1 DIVERSION TUNNEL INLET AND OUTLET

The diversion tunnel works which is over 600 m in length and 10 m in diameter were commenced in October 2014 by drill and blast techniques and completed in late September 2015. The river diversion took place on 31 October 2015 together with construction of earth-fill cofferdams upstream and downstream.

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 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.

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 area on the right bank has been available for operation since January 2015, as was the adjacent waste disposal area. The Disposal Area No.9 along Road P1 near the entrance of Road T5 started operation in April 2015. Unsuitable material from the quarry continues to be hauled to Disposal Area No.6 and Disposal Area No.9 is being developed by the E&M Contractor as stated above.

2.2 Electrical and Mechanical Works

The EMWC was executed between Hitachi-Mitsubishi Hydro Corporation and NNP1PC on 13 June 2014 and the NTP was issued on 03 October 2014. The cumulative work progress of the Electrical and Mechanical Works by value at the end of April 2018 was 97.0 % (compared to planned progress of 98.3 %).

Figure 2-4: Preparation for installation of stay ring of Stay Cone at the re-regulation powerhouse

Figure 4.2-1: Current status of rotor for Unit 1

Figure 4.2-2: Coupling of lower shaft and turbine shaft for Unit 1

Figure 4.2-3: Adjusting of lower guide bearing for Unit 1

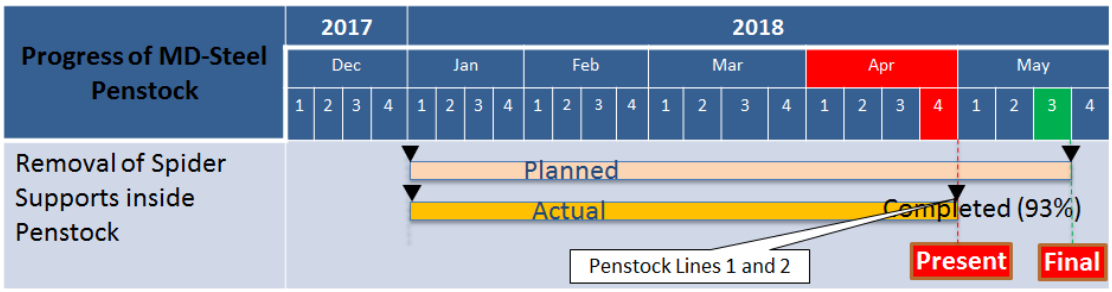
Figure 4.2-4: Installation of generator air cooler for Unit 1

2.3 Hydro-Mechanical Works

The HMWC 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 April 2018 was 66.9 % (compared to planned progress of 77.1 %).

The latest progress of penstock pipe fabrication at IHI field shop and erection at main dam as of the end of November 2017 ***in Figure 2-5*** below:

Figure 2-5: Progress of the penstock pipe fabrication at the IHI field shop as at the end of April 2018



2.4 230kV Transmission Line Works

The TLW Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and the NTP was issued to the 230 kV TL Contractor on 03 October 2014. The

cumulative work progress of the Transmission Line Works until the end of March 2018 was 98.8 % (compared to planned progress of 99.0 %).

In respect of the delay to commencement of most works the Contractor is studying its programme to ensure that sufficient resources are committed as the works progress to ensure that completion is achieved in good time. Onset of daily rains has made access to all areas difficult but the Contractor follows its revised acceleration schedule, after the progress for the construction of tower foundations slowed after May, 2016 (See ***Figure 2-6*** below)

Figure 2-6: Cumulative Work Progress of Tower Foundation (Original, Revised Planned and Actual)

Figure 2-7: Revised Cumulative Work Progress of Tower Erection (Planned and Actual)

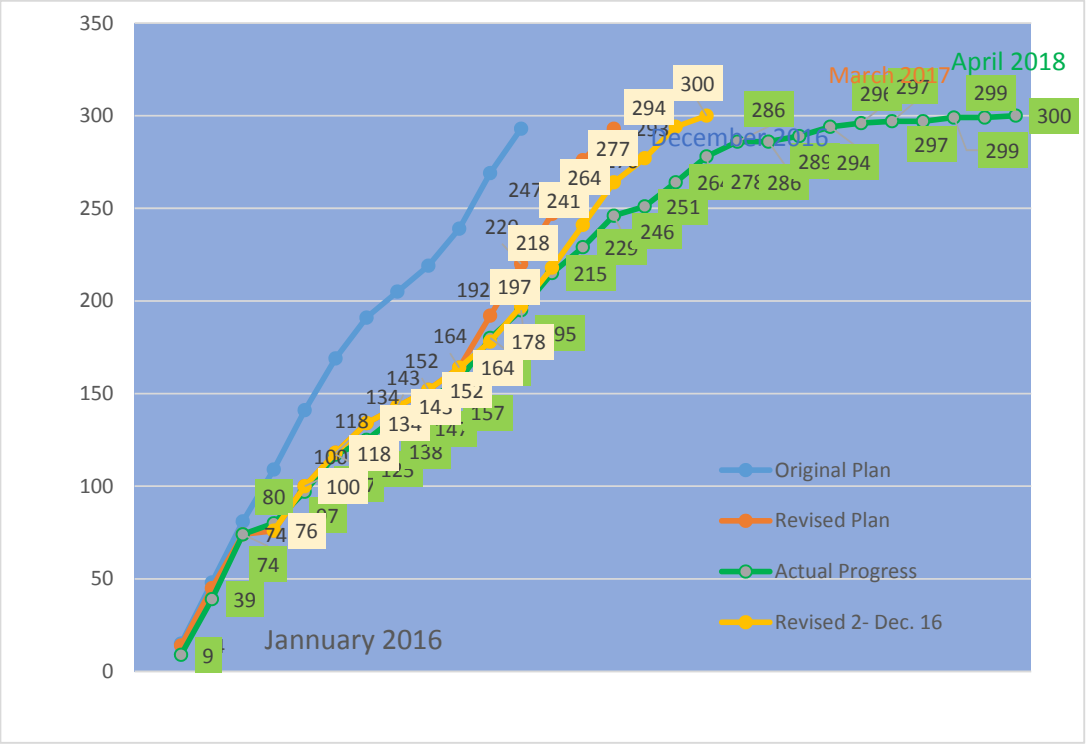


Figure 2-8: Cumulative Progress of Stringing Works (Planned & Actual)

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

During April 2018, the EMO did not receive any SS-ESMMP for review. One site decommissioning plan was cleared, three SS-ESMMP that were received in February and March 2018 were on hold waiting for additional information.

Table 3-1: SS-ESMMP review status in April 2018

Title	Date Received	Status
SS-ESMMP for Construction of Quarry Site	17 March 2018 (Version A6)	On hold for additional information.
TCM Camp Decommissioning Plan	22 March 2018 (1st submission)	Cleared with conditions (additional comment) on 05 April 2018
SS-ESMMP for Closing of the Dyke at Borrow Pit No.7	03 February 2018 (Reply to Owner's comment)	On hold for additional information.
SS-ESMMP–RRPS for Closing of Borrow Pit at the Corner of Road P1 & P1A	03 February 2018 (Reply to Owner's comment)	On hold for additional information.

3.1.2 Compliance Report

The Observation of Non-Compliance (ONC) and Non-Compliance Report (NCR) are summarized in ***Table 3-2***, ***Table 3-3*** and ***Table 3-3*** below.

Table 3-2: Summary of ONC and NCR

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from March 2018	6	1	0	0
Newly Opened in April 2018	0	0	1	0
Total in April 2018	**6**	**1**	**1**	**0**
Resolved in April 2018	1	0	0	0
Carried over into May 2018	5	1	1	0
Unsolved Exceeding Deadlines	**5**	**1**	**0**	**0**

Figure 3-1: Summary of ONC and NCR

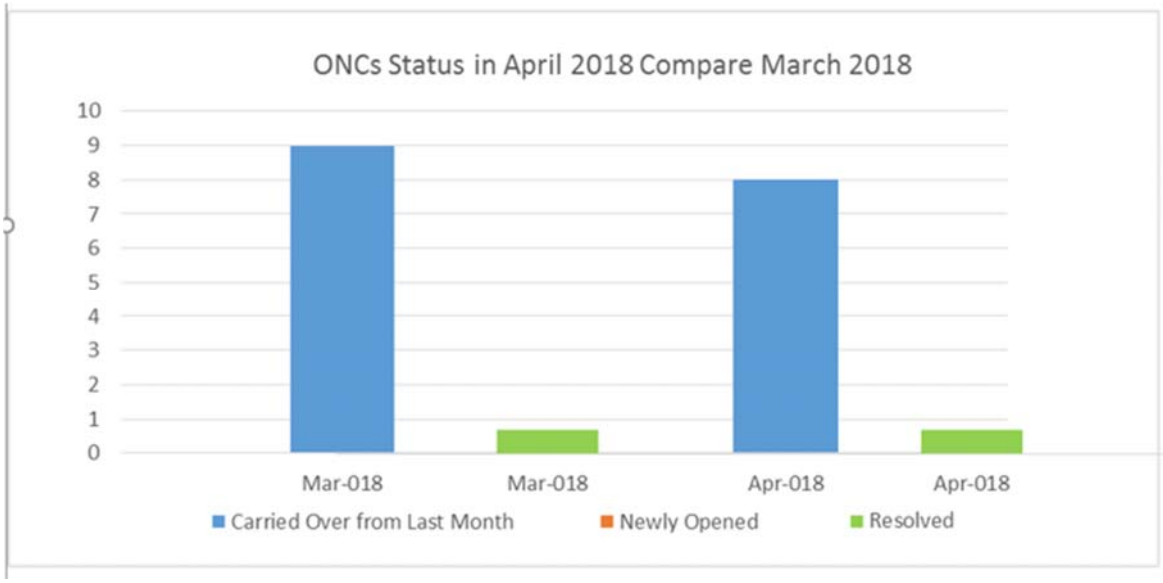


Table 3-3: Carried-Over ONC and NCR from April 2018 into May 2018

Site ID	Issues	Reporting	Actions
Re-regulation Dam (Borrow Pit Area at Corner of P1 & P1A Road)	The borrow pit slopes had no berm and cut-off drains. Lack of closure plan for the borrow pit. First inspection: 30 August 2016 Latest inspection: 15 February 2018	ONC (Closure Pending)	A Response to Owner's comment was submitted on 03 March 2018 and the actual work did not properly reflect the Owner's comments. This reply was therefore, on hold for additional information on site closure. It is expected to be reviewed by middle of June 2018 by referring to the site decommissioning plan.
Main Quarry Site	Waste rock had been pushed down the slope towards Nam Ngiep. The operation has damaged riparian vegetation. (ONC_OC-0273) First inspection: 13 February 2018 Latest inspection: 10 April 2018	ONC (Closure Pending)	Contractor should implement the following corrective action by the middle of June 2018 - Clean up and remove discarded rocks to designated spoil disposal No. 6; - Conduct mitigation measures for erosion and sediment control at the main quarry to restore and prevent further damage to riparian vegetation;

Site ID	Issues	Reporting	Actions
			- Address EMO's comment provided on 17 March 2018 to the revised DWP and SS-ESMMP; - The revised DWP & SSESMMP submitted on 16 March 2018 was hold for additional information on site closure. It is expected to be reviewed by middle of June 2018 by referring to the site decommissioning plan.
KCP Camp	No waste bins were provided at the camp site for daily waste collection resulting in scattering of garbage, burning of plastic waste was also observed. (ONC_KCP-0004) First inspection: 20 February 2018 Latest inspection: 24 April 2018	ONC (Closure pending)	A site decommissioning plan was provided, the contractor should implement accordingly by the middle of May 2018. EMO will closely monitor to ensure that demolition activities are implemented in line with an approved site decommissioning plan.
Main Dam and Powerhouse	Improper operation and maintenance of electricity generators and air compressors at the main dam left and right banks causing oil spillage and soil contamination (NCR_OC-0022) First inspection: 06 March 2018 Latest inspection: 23 April 2018	NCR Level 1 (Closure pending)	There was no corrective action implemented by the agreed deadline, the second extension was granted until 15 May 2018.
Main Dam and Powerhouse	NCR1 was 12 days overdue and there was no implementation of promised corrective action and no response was submitted. Furthermore, during the visit on 24 April 2018, EMO observed that oil spillage from air compressor	NCR Level 2 (New)	The contractors were required to take the following actions **by 28 April 2018** and the response to this NCR level 2 **by 30 April 2018:** - Repair / fix the sources of oil spillage; - Refuelling of the electricity generator and air compressor shall be

Site ID	Issues	Reporting	Actions
	entered into the Nam Ngiep river at the upstream of the Main Dam. The investigation concluded that this recklessness practice was due to lack of supervision and proper induction (NCR_OC-0023) Latest inspection: 24 April 2018.		undertaken with appropriate protection measures to prevent oil spillage or contamination; - Provide spill clean-up materials such as absorbent pads and dry sand on site If spills or leaks occur, undertake immediate clean up; - Clean up any the disposed oil contaminated soil for proper elimination by authorized vendor (Khounmixay Factory); - Provide induction/training on the management of machinery, hazardous material and waste management including spill response procedures on regular basis.
Top Abutments of Main Dam (Right and Left Banks)	No mobile toilet provided for an approximate of 50 workers of Song Da 5 and Kenber Subcontractors (ONC_OC-0274) First inspection: 06 March 2018 Latest inspection: 23 April 2018	ONC (Closure pending)	A temporary toilet was installed at top main dam left bank but not at the right bank. The contractor needs to install such temporary toilet by 30 April 2018.
Sino Hydro Workers' Camp	Poor hygiene in cooking and washing areas; a total of 50 workers are staying in the camp, but only two toilet rooms are usable, other seven toilet rooms were blocked due to poor or no maintenance. (ONC_OC-0275) First inspection: 06 March 2018 Latest inspection: 10 April 2018	ONC (Closure pending)	The contractor was required to accomplished the following action by 24 April 2018: - Provide daily cleaning at cooking and washing areas to keep the location tidy in orderly. - Repair the clogged toilet rooms, wall and door for proper use. In addition, water sink, bowl and water tap need to be

Site ID	Issues	Reporting	Actions
			provided in each toilet room.
HM Hydro Labour Camp No. 1 (ZHEFU Camp)	Wastewater was discharged into the outside environment without proper treatment, a chlorination container was not properly maintained and currently is out of services. (ONC_HM-0014) First inspection: 27 March 2018 Latest inspection: 10 April 2018	ONC (Closure pending)	The contractor needs to improve the WWTS by end of April 2018: Chlorine container has to be installed in a secure stand with proper roof to prevent sun light, heat and evaporation.
IHI's Labour Camp No.2 (276 Camp)	The WWTS design proposed in the DWP & SS-ESMMP Ref no.: 0-0065 submitted on 23 January 2018 has not been constructed. Instead, the chlorine contact tank and monitoring tank were set up and no chlorination was performed. (ONC_OC-0275) First inspection: 27 March 2018 Latest inspection: 10 April 2018	ONC (Closure pending)	- The contractor is required to clarify why the actual construction of the Waste Water Treatment System is not consistent with the proposed design which was approved by NNP1PC? - There was no water discharge during April, EMO will continue to monitor in May 2018 and; - Renovation/improvement work will be required in case of noncompliance with effluent standards.

Figure 3-2: Site Inspection Locations

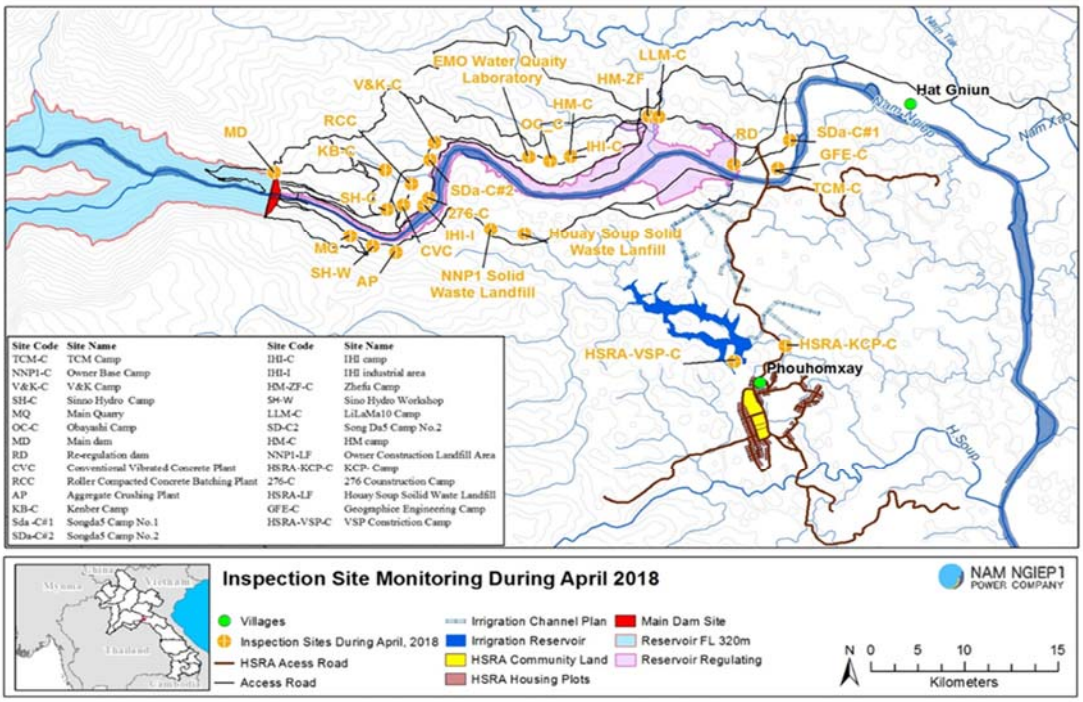
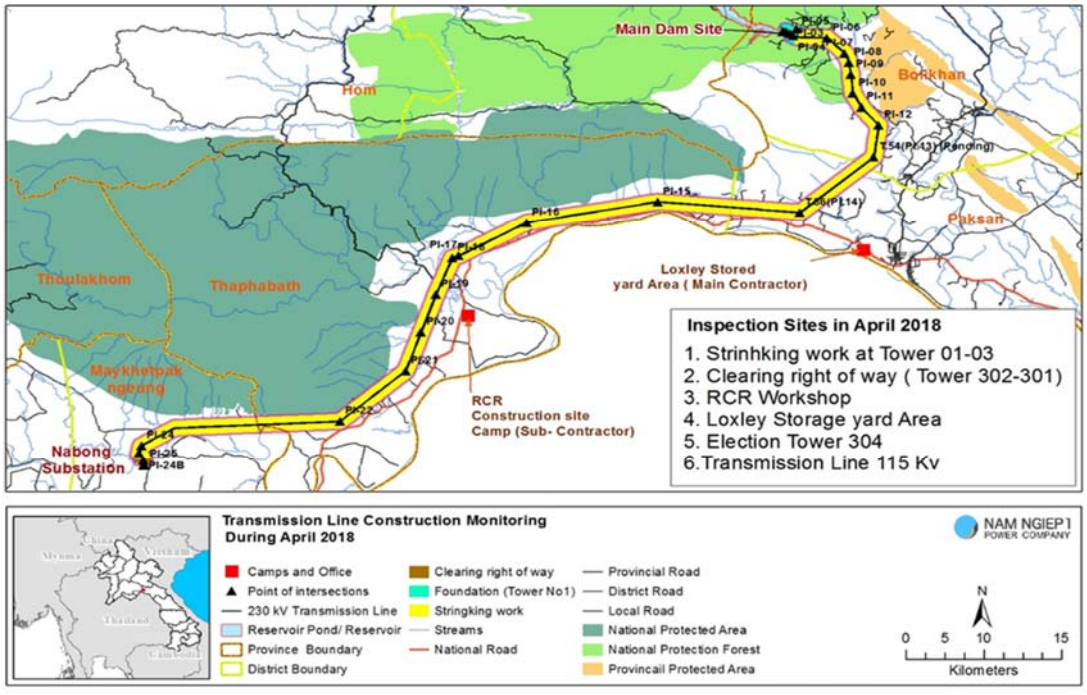


Figure 3-3: 230 kV Transmission Line Construction Monitoring



3.1.3 Inspection by Environment Management Unit

There was no EMU visit during the reporting period.

3.2 Environmental Quality Monitoring

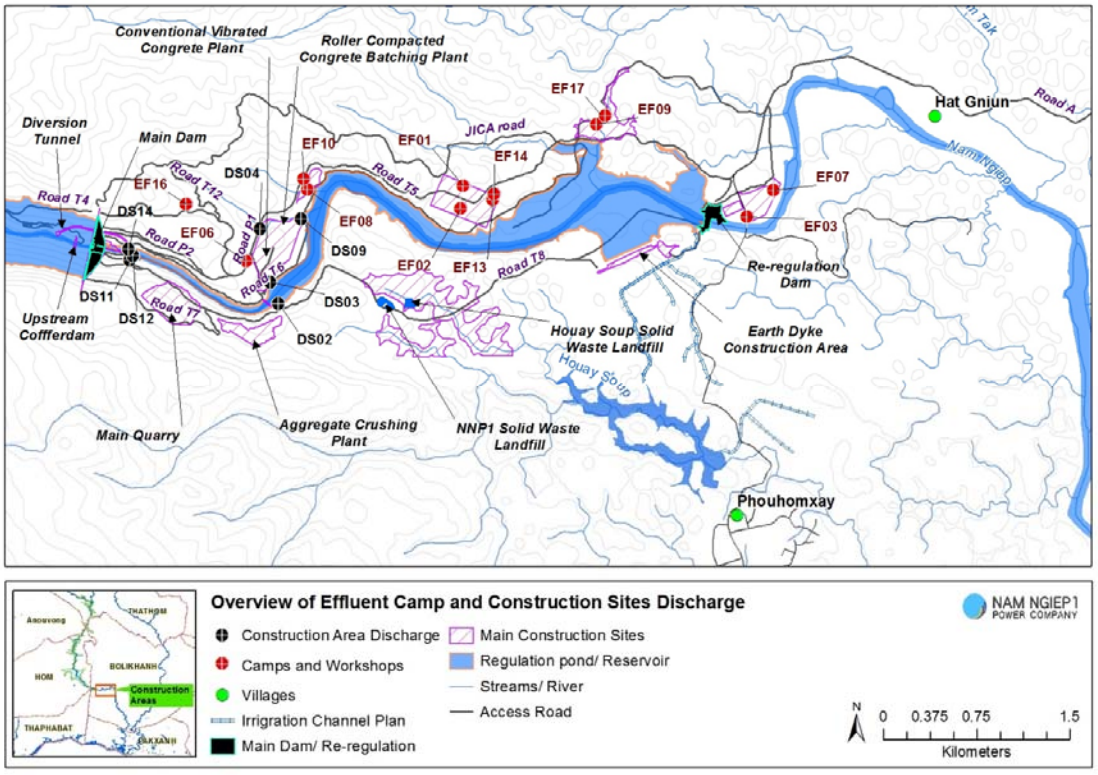
The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD5), faecal coliform, E. Coli bacteria and total coliform have been carried out by NNP1PC Environmental Laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) and the Project Lenders on a monthly and quarterly basis and published on the Company website https://namngiep1.com/resources/monitoring-reports/.

3.2.1 Effluent Discharge from Camps and Construction Sites

During April 2018, all camp effluents were monitored. Results of effluent monitoring from the camps and construction sites are presented and the monitoring locations are displayed in *Error! Reference source not found.*.

Figure 3-4: Map of Effluent Discharge Monitoring Locations



Detailed monitoring results are provided in ***Annex 1*** of this Report. The camps' effluent monitoring results for April 2018 indicate that all key parameters (BOD5, total coliform and faecal coliform) are in compliance with the relevant effluent standards, except at Zhefu Camp (EF09), HMH Camp (EF13) and IHI Camp (EF14).

The sediment control at the Aggregate Crushing Plant and RCC Plant continues to improve by application of a coagulant (Ammonium aluminium sulphate.

Table 3-4: Status of Corrective Actions at Camps and Construction Sites

Site	Sampling ID	Status	Corrective Actions
Owner's Site Office and Village (OSOV)	EF01	Non-compliance for ammonia-nitrogen NH_3-N) and total nitrogen.	The effluent monitoring result is being shared with Contractor to improve the operation of the WWTS.
Obayashi Corporation Camp	EF02	Non-compliance for ammonia nitrogen and total nitrogen.	As above.
Sino Hydro Camp	EF06	Non-compliances for COD and total nitrogen.	As above.
Song Da5 Camp No. 1	EF07	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen.	As above.
Song Da5 Camp No. 2	EF08	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen.	As above.
Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)	EF09	Non-compliances for TSS, COD, BOD5, ammonia nitrogen (NH_3-N), total nitrogen and total coliform.	As above.
V&K Camp	EF10	Non-compliances for BOD5.	As above.
H-MH Main Camp (WWTS)	EF13	Non-compliances for COD, BOD5, ammonia nitrogen (NH_3-N), total nitrogen and total coliform.	As above.
IHI Main Camp	EF14	Non-compliances for COD, BOD5, ammonia nitrogen (NH_3-N), total nitrogen and total coliform.	As above.
Kenber Camp	EF16	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen.	As above.

Site	Sampling ID	Status	Corrective Actions
Main Dam Construction Area (Waste Water Treatment Plant No.1)	DS11	No discharged	
Main Dam Construction Area (Waste Water Treatment Plant No.2)	DS12	Non-compliance for TSS	As above.
Main Dam Construction Area (Waste Water Treatment Plant No.3)	DS14	Non-compliance for TSS on 19 April 2018	As above.
Spoil Disposal Area No.2 (Song Da 5 Workshop)	DS04	Non-compliance for TSS	As above.
CVC Plant	DS03	No discharge during the missions.	
RCC Plant (discharge point at the weirs)	DS09	Non-compliance for TSS	As above.
Aggregate Crushing Plant	DS02	Full compliance.	

3.2.2 Ambient Surface Water Quality Monitoring

The surface water quality monitoring programme comprises 14 monitoring stations. The April 2018 programme is summarized in ***Table 3-5*** and the location of the monitoring stations are shown in *Table 3-5*: *Monitoring Frequency for Surface Water Quality Parameters*

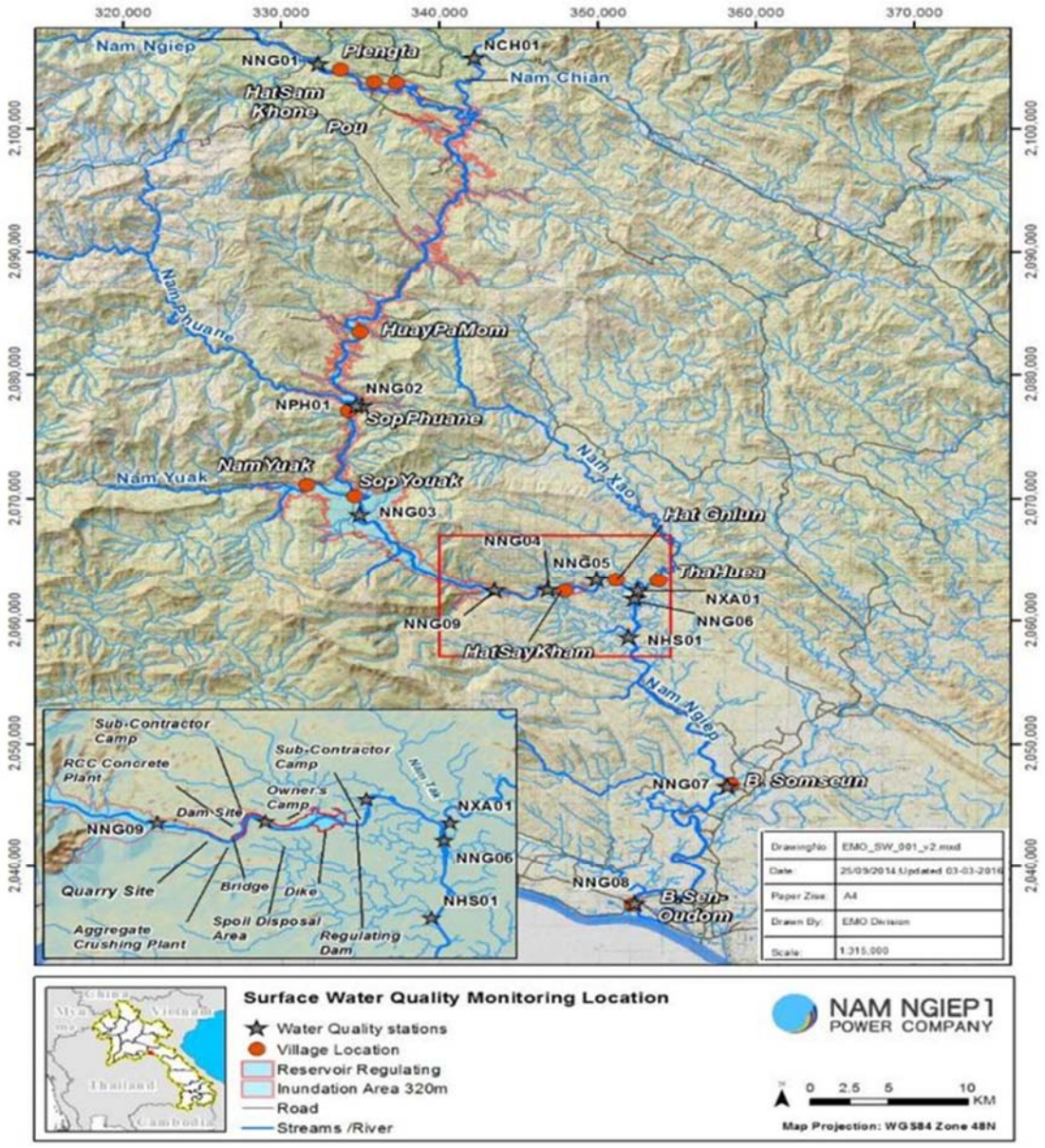
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l), BOD5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- NNG09, Nam Ngiep Upstream Main Dam (NNG09), - R6, Re-regulation Reservoir - R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All 14 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)	All 14 stations

Figure 3-5 below.

Table 3-5: Monitoring Frequency for Surface Water Quality Parameters

Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), TSS (mg/l), BOD5 (mg/l), Faecal coliform (MPN/100 ml) and Total coliform (MPN/100 ml)	- NNG09, Nam Ngiep Upstream Main Dam (NNG09), - R6, Re-regulation Reservoir - R7, Re-regulation Reservoir 0.3 km Upstream the Re-Regulation Dam - NNG05, Nam Ngiep Downstream the Re-regulation Dam at Ban Hat Gniun
Fortnightly	pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU)	All 14 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)	All 14 stations

Figure 3-5: Surface Water and Re-Regulation Reservoir Water Quality Monitoring Stations



Key findings for surface water quality monitoring (including the re-regulation reservoir) in April 2018. The surface water quality data for April 2018 are within the normal ranges as compared with previous data.

Table 3-6: Results of the Physical and Chemical Parameters of Nam Ngiep Surface Water Quality Monitoring

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within / Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	03-April-18	04-April-18	04-April-18	05-April-18	05-April-18	05-April-18	05-April-18	05-April-18	05-April-18	05-April-18
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.88	7.5	7.87	7.86	7.87	7.99	7.94	7.98	7.68	7.61
Sat. DO (%)		94.9	98.7	103.4	105	98.9	101.2	106.5	105.2	96.5	95.2
DO (mg/l)	>6.0	7.97	7.88	8.1	8.14	7.55	7.71	8.33	8.2	7.66	7.5
Conductivity (µs/cm)		77.9	78.4	75.8	75.1	69.8	70.4	75.3	76	77.9	78.7
TDS (mg/l)		39	39.2	36	37.5	35	35	37.5	38	38.5	39
Temperature (°C)		22.1	25.1	25.5	26.8	27.9	28	26.8	26.8	25.9	26.3
Turbidity (NTU)		12.77	12.87	10.91	13.34	10.76	9.65	9.15	9.42	11.75	13.75
TSS (mg/l)		35.75	33.03	27.61	36.16	11	10.14	15.95	17.28	19.39	26.83
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2	0.02	0.2	<0.2	<0.2	<0.2	<0.2
NO_3-N (mg/l)	<5	0.09	<0.02	0.02	0.05	0.02	0.02	0.02	0.03	0.04	0.04
Faecal coliform (MPN/100ml)	<1,000	280	280	33	130	130	27	41	12	41	11
Total Coliform (MPN/100ml)	<5,000	1,600	1,600	280	920	540	540	540	540	1,600	1,600

Table 3-7: Results of Nam Ngiep Surface Water Quality Monitoring

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	12-April-18	12-April-18	12-April-18	12-April-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.84	7.95	8	7.95
Sat. DO (%)		102.8	104.5	109.8	104.2
DO (mg/l)	>6.0	7.8	7.82	8.21	7.74
Conductivity (µs/cm)		78	76.7	75.8	75.5
TDS (mg/l)		39	38.35	37.54	37
Temperature (°C)		28.1	29	29	29.4
Turbidity (NTU)		12.18	10.06	10.93	13.86

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	12-April-18	12-April-18	12-April-18	12-April-18
Parameters (Unit)	**Guideline**				
TSS (mg/l)		21.27	14.16	4.93	10.57
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	79	79	27	130
Total Coliform (MPN/100ml)	<5,000	350	170	170	350

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	19-April-18	19-April-18	19-April-18	19-April-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.92	7.74	7.47	7.98
Sat. DO (%)		102.8	101.1	98	100
DO (mg/l)	>6.0	8.22	7.88	7.57	7.92
Conductivity (µs/cm)		64.9	66.9	73.8	66.4
TDS (mg/l)		32.4	33.4	36.9	33.2
Temperature (°C)		25.5	27.1	27.5	26.8
Turbidity (NTU)		38.7	65.2	8.55	52.6
TSS (mg/l)		179.52	124.38	9.36	122.64
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	1,100	350	33	350
Total Coliform (MPN/100ml)	<5,000	2,200	400	49	1,600

	River Name	Nam Ngiep									
	Zone	Location Refer to Construction Sites									
		Upstream				Within / Re-regulation Reservoir		Downstream			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04 / R6	R7	NNG05	NNG06	NNG07	NNG08
	Date	24-April-18			26-April-18	26-April-18	26-April-18	26-April-18	26-April-18	26-April-18	26-April-18
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	8.08			7.66	7.03	7.77	7.88	8.01	8.01	7..78
Sat. DO (%)		102.1			102.4	95.9	94.8	103	100.8	99.3	98
DO (mg/l)	>6.0	8.24			8.13	7.48	7.25	8.05	7.78	7.74	7.58
Conductivity (µs/cm)		31.1			73.4	69.3	74.3	74.3	73.2	75.9	77.5
TDS (mg/l)		15.55			36	34	37	37.15	36.6	37.95	38.75
Temperature (°C)		23.7			25.9	26.9	28	27	27.6	27	28
Turbidity (NTU)		15.5			32.7	14.12	8.14	12.1	14.3	12.1	15.5
TSS (mg/l)					72.36	24.66	8.54	14.24			
BOD_5 (mg/l)	<1.5				Pending	Pending	Pending	Pending			
Faecal coliform (MPN/100ml)	<1,000				Pending	Pending	Pending	Pending			
Total Coliform (MPN/100ml)	<5,000				Pending	Pending	Pending	Pending			

Table 3-8 *Results of Physical and Chemical Parameters of Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup*

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	06-March-18	07-March-18	08-March-18	08-March-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.27	7.17	7.29	7.25
Sat. DO (%)		100.4	7.17	87.4	97.1

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	06-March-18	07-March-18	08-March-18	08-March-18
Parameters (Unit)	**Guideline**				
DO (mg/l)	>6.0	8.9	8.48	6.83	7.81
Conductivity (µs/cm)		48.4	59	144	44.9
TDS (mg/l)		24.2	29	72	22.45
Temperature (°C)		19.2	22.6	27.2	25.5
Turbidity (NTU)		3.04	2.24	2.74	4.82
TSS (mg/l)		1.34	3.26	4.06	6.25
BOD_5 (mg/l)	<1.5	1.35	1.88	2.12	1.89
COD (mg/l)	<5	<5.0	7.5	5.9	11.6
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.05	<0.02	0.06	0.08
Faecal coliform (MPN/100ml)	<1,000	350	79	350	33
Total Coliform (MPN/100ml)	<5,000	2,400	79	350	240
Manganese (mg/l)	<1	0.019	<0.005	0.06	<0.005
Potassium (mg/l)		0.01	0.03	0.03	0.02
Total Iron (mg/l)		0.211	0.151	0.251	0.536
TOC (mg/l)		0.61	0.62	1.68	1.59

Table 3-9: Physical Parameters Results of Surface Water Quality – Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup (measured Every Fortnight)

	River Name	Nam Chain	Nam Phouane	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites			
		Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	24-April-18		26-April-18	26-April-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.98		7.59	7.5
Sat. DO (%)		97.9		74.7	75.5
DO (mg/l)	>6.0	7.82		5.63	5.95
Conductivity (µs/cm)		82.1		122.7	61.2
TDS (mg/l)		41.05		61.35	30.6
Temperature (°C)		24.5		29	26.5
Turbidity (NTU)		56.9		4.21	13.49

3.2.3 Groundwater Quality Monitoring

During April 2018, there was no water sampling from the well number GHSP03 of the originally six water wells installed for Phouhomxay Village due to a broken hand pump. The other five community water wells have been taken out of use and replaced by the permanent water supply system based on water from the headwaters of Houay Soup. Groundwater sampling were carried out on water from two boreholes at Somseun Village, one at Nam Pa Village, and one at Thong Noi Village.

All water wells (except Thong Noi Village) complied with the groundwater quality standards for water supply purposes. The groundwater monitoring results for Somseun, Nam Pa and Thong Noi Villages are being communicated to villagers who are using those boreholes.

Figure 3-6: Groundwater Quality Monitoring Locations

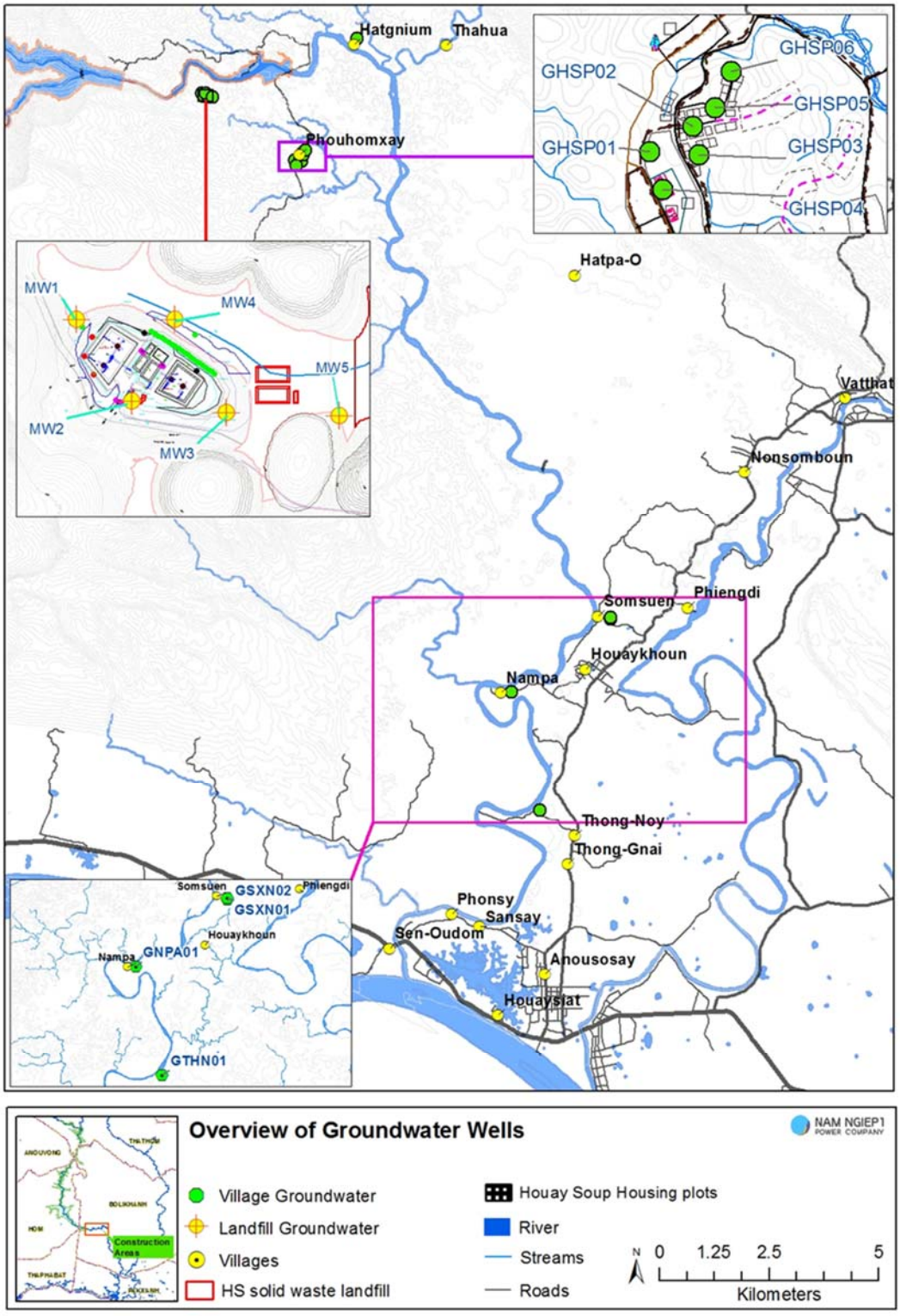


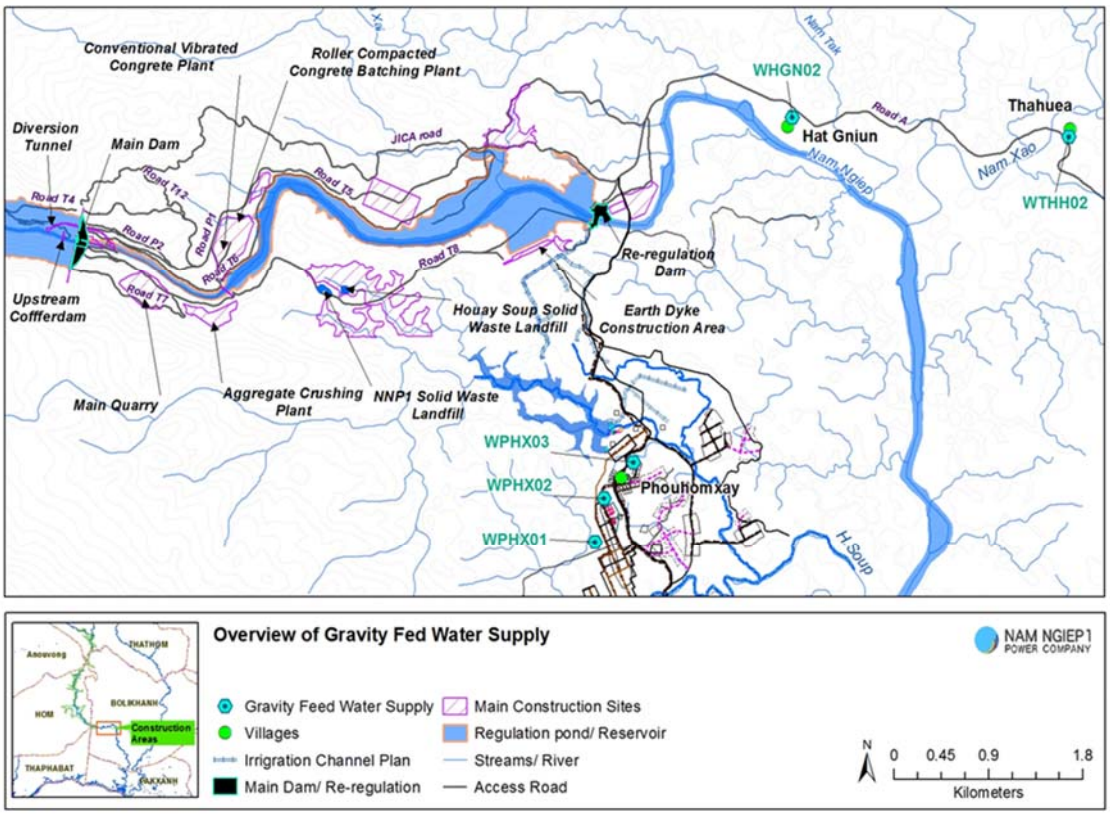
Table 3-10: Groundwater Quality Monitoring Results in Phouhomxay Village, Somsuen, Nam Pa and Songkhone Villages

	Village Name	Phouhomxay	Somseun		NamPa	ThongNoi
	Station	GHSP03	GSXN01	GSXN02	GNPA01	GTHN01
	Date	25-April-18	25-April-18	25-April-18	25-April-18	25-April-18
Parameter (Unit)	Guideline					
pH	6.5 - 8.6		6.99	6.87	6.94	7.02
Sat. DO (%)			50.4	29.5	38	18.5
DO (mg/l)			3.78	2.21	2.84	1.38
Conductivity (µS/cm)	<1,000		156.3	288	214.8	325
TDS (mg/l)	<600		78	144	107	162
Temperature (°C)	<35		29.1	29.2	29.3	29.2
Turbidity (NTU)	<10		1.66	3.47	1.8	9.18
Faecal Coliform (MPN/100ml)	0		0	0	0	4.5
E.coli Bacteria (MPN/100ml)	0		0	0	0	4.5

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Landfill ground is monitored in a quarterly basis, next monitoring result will be reported in June 2018 monthly progress report.

Figure 3-7 Gravity Fed Monitoring Locations



All parameters complied with the National Drinking Water Standards for Thahuea, Hat Gniun and Phouhomxay villages except for faecal coliforms and E.Coli. Presence of E.Coli in the GFWS system is a normal situation and it should be noted that according to the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, domestic water supply for daily use is not required to be readily drinkable, but would normally have to be boiled or otherwise treated before drinking. The local villagers were informed about the results and encouraged to boil the water before drinking.

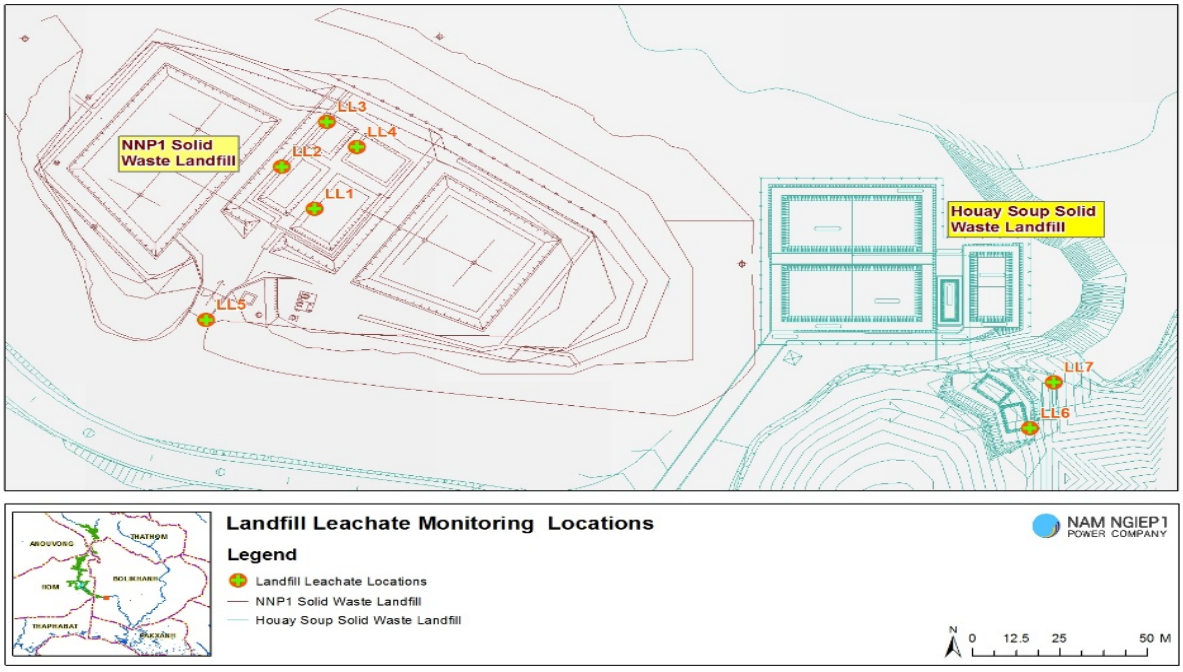
Table 3-11: Result Gravity Fed Water Supply (GFWS) Quality Monitoring

	Village Name	Thahuea	Hat Gniun	Phouhomxay		
	Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
	Date	25-April-18	25-April-18	25-April-18	25-April-18	25-April-18
Parameter (Unit)	Guideline					
pH	6.5 - 8.6	7.59	7.6	8.1	7.94	7.95
Sat. DO (%)		91.3	99.9	94	91.7	94.7
DO (mg/l)		6.81	7.39	7.54	7.04	7.11
Conductivity (µS/cm)	<1,000	57.3	79.2	20.72	23.6	23.34
TDS (mg/l)	<600	28	39	11	12	11
Temperature (°C)	<35	29.3	29.9	25.1	27.6	28.8
Turbidity (NTU)	<10	12.2	4.82	0.91	1.17	1.54
Faecal Coliform (MPN/100ml)	0	9.3	79	33	79	33
E.coli Bacteria (MPN/100ml)	0	9.3	79	33	49	33

3.2.5 Landfill Groundwater Monitoring

During April 2018, there was no leachate monitoring was conducted for both NNP1 Houay Soup Solid Waste Landfills due to no leachate from the pits andno discharged.

Figure 3-8 Landfill Leachate Monitoring Location



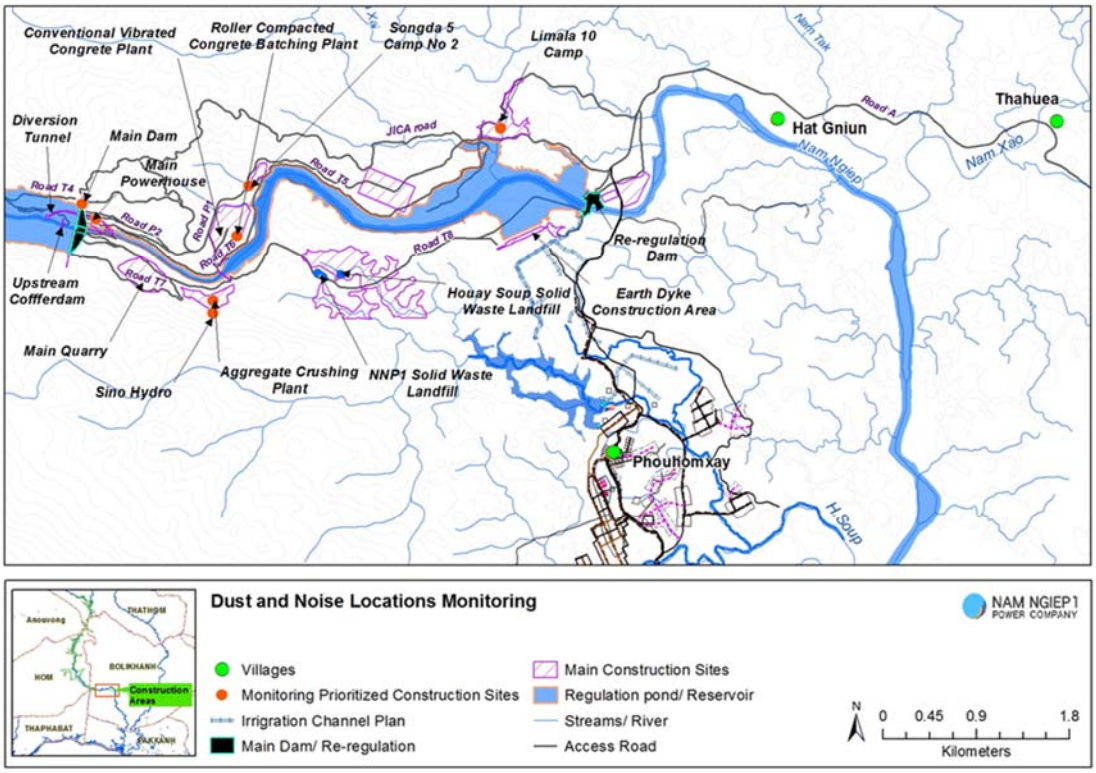
3.2.6 Dust Monitoring

The monitoring points are indicated on the map in ***Figure 1-9.*** The results indicated non-compliance with the National Standard at the Sino Hydro Camp, Hat Gniun and Phouhomxay villages. The elevated ambient dust concentrations at Sino Hydro Camp, Phouhomxay and Hat Gniun Villages are caused by slash-and-burn activities in surrounded agriculture areas. The results are presented in ***Annex 2***.

3.2.7 Noise Monitoring

During April 2018, noise monitoring was conducted for 72 consecutive hours at Hat Gniun; and 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Main Camp, Sino Hydro Temporary Worker Camp, Main Dam, Lilama 10 Camp, and Main Powerhouse.

Figure 3-9: Noise and Dust Emission Monitoring Locations



The results at all stations indicated compliance with National Standard.

3.3 PROJECT WASTE MANAGEMENT

3.3.1 Solid Waste Management

During April 2018, noise monitoring was conducted for 72 consecutive hours at Hat Gniun; and 24 consecutive hours at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Main Camp, Sino Hydro Temporary Worker Camp, Main Dam, Lilama 10 Camp, and Main Powerhouseas shown in ***Table 3-12.***

Table 3-12*: Amounts of Recyclable Waste Sold*

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by 30 April 2018
Construction activity				
1	Scrap metal	kg	251	64,267
Sub-Total 1		**kg**	**251**	**64,267**
Operation camp				
2	Glass bottles	kg	161	2,500
3	Plastic bottles	kg	78	140
4	Paper/Cardboard	kg	38	191.8
5	Aluminium can	kg	8.5	87.5
Sub-Total 2		**kg**	**285.5**	**2,919.3**
Grand Total 1+2		**kg**	**536.5**	**67,186.3**

total of 6,846 kg food waste was collected in April 2018 from selected camps by villagers of Phouhomxay for animal feeding, it was increased by 81 kg compared to March 2018.

Table 3-13 Amounts of Food Waste Collected by Villagers

NO.	SITE NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	2,550
2	Song Da 5 Camp No. 1	kg	2,217
3	Obayashi Corporation Camp	kg	1,054
4	Owner's Village and Site Office (OSOV)	kg	610
5	LILAMA 10 Camp	kg	205
6	Kenber Camp	kg	210
Total		**kg**	**6,846**

3.3.2 Hazardous Materials and Waste Management

The types and amounts of hazardous waste collected and transported for offsite treatment and final disposal at Khounmixay processing factory are shown in ***Table 3-14***

Table 3-14: Results of Hazardous Material Inventory

No.	Hazardous Waste Type	Unit	Total in April 2018 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	9,340	300	9,040
2	Contaminated soil, sawdust and concrete	kg	730	0	730
3	Used oil filters	No.	322	0	322
4	Used tire	No.	330	9	321
5	Empty used chemical drum/container	Drum (20 litre)	180	0	180
6	Empty paint and spray cans	can	162	17	145
7	Halogen/fluorescent bulbs	No.	138	0	138
8	Ink cartridge	No.	116	23	93
9	Empty used oil drum/container	drum (20 l)	130	53	77

No.	Hazardous Waste Type	Unit	Total in April 2018 (A)	Disposed (B)	Remainder (A - B)
10	Empty used chemical drum/container	drum (200 l)	73	0	73
11	Empty used oil drum/container	drum (200 l)	130	58	72
12	Contaminated textile and material	kg	31	0	31
13	Clinical waste	kg	20	10	30
14	Empty contaminated bitumen drum/container	drum (200 l)	27	2	25
15	Lead acid batteries	No.	22	0	22
16	Lithium-ion batteries	No.	7	0	7
17	Acid and caustic cleaners	Bottle	0	0	0
18	Cement bag	bag	0	0	0
19	Used oil mixed with water	litre (l)	0	0	0

3.4 Community Waste Management

3.4.1 Community Recycling Programme

In April 2018, a total of 185.5 kg of recyclable waste was recorded at the Community Waste Bank, a decreased of 255.5 kg compare to March 2018 show in ***Table 3-15***.

Table 3-15: Types and Amounts of Recyclable Waste Traded at the Community Waste Bank

Types of Waste	Unit	Remaining in March 2018	Additions in April 2018	Sold	Remaining in April 2018
Scrap metal	kg	16	0	0	16
Glass bottles	kg	1,570	81.5	0	1,652
Paper/cardboard	kg	83	64.5	0	147.5
Aluminium cans	kg	23	8.5	0	31.5
Plastic bottles	kg	88.5	31	0	119.5
Total	**kg**	**1,780.5**	**185.5**	**0**	**1,966.5**

3.4.2 Houay Soup Resettlement Area Waste Management

In April 2018, approximate of 39.5 m3 of solid waste was collected from Phouhomxay, Thahuea and Hat Gniun Villages. The solid waste was collected and transported from Phouhomxay, Thahuea, Hat Gniun Villages to Houay Soup Landfill three days per week on Mondays, Wednesdays and Fridays, and segregated before disposing at the Houay Soup Landfill.

3.4.3 Waste Clean-up in Four Villages at 2LR

Waste clean-up was completed on 11 April 2018 in four villages at 2LR. On 12 April 2018, NNP1PC-EMO, EMU, RMU and the local contractor carried out a final joint inspection of

activity, where after, the EMU and RMU issued a letter to approve the work completion for the reference of NNP1PC.

3.5 Watershed and Biodiversity Management

3.5.1 Watershed Management

The reconstitution of the Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) is expected to be delayed, therefore, the meeting for NNP1 Watershed Management Plan (WMP) approval was discussed with the two provinces. It was agreed between the two Provinces that the WMP should be approved by the Chairman of WRPC to allow the activity implementation. The approval of WMP was tentatively re-scheduled to the end of May 2018.

3.5.1.1 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT

The draft Provincial Regulation was submitted to Xaysomboun Provincial Justice Department for further review before submission to Provincial Assembly for approval.

3.5.2 Biodiversity Offset Management

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

Several studies/surveys have been undertaken since January 2018 as part of preparation of biodiversity mitigation and offset management plans. The last survey was herpetology in NNP1 sub-catchment and it was completed in April 2018.

3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN

NNP1PC has disbursed funds on 16 March 2018 for the implementation of the second pre-BOMP until June 2018. Patrolling activity continues in April 2018 including the SMART data entry and monthly reporting related to the findings. Conservation awareness activity was started from the end of April and expected to complete by the second week of May 2018.

3.5.3 Biomass Clearance

As of 30 April 2018, the biomass clearance work was completed. A total of 1,640.75 ha is accepted as fully cleared and the completion work was inspected and accepted by Department of Natural Resources and Environmental Monitoring (DNREM) of the Ministry of Natural Resource and Environment (MONRE) after a join inspection was conducted with NNP1PC in April 2018. DNREM will submit an approval (a certificate) letter to the Department of Energy Business (DEB) of the Ministry of Energy and Mince (MEM) for issuance of certificate for main reservoir impoundment.

Table 3-16 *Biomass Clearance Progress in Each Priority Area as of April 2018.*

Target Area		Progress as of 30 April 2018	
Block	**Total area to be cleared (Ha)**	**Total area in progress (Ha)**	**100% completed within the total area in progress (Ha)**
B1	109.24	109.24	105.00
B2	158.63	158.63	152.19
B3	80.35	80.35	80.35
B4	163.74	163.74	163.74

Target Area		Progress as of 30 April 2018	
Block	**Total area to be cleared (Ha)**	**Total area in progress (Ha)**	**100% completed within the total area in progress (Ha)**
B5	340.14	340.14	333.22
B6	31.92	31.92	31.92
B7	39.65	39.65	39.65
B8	37.61	37.61	37.61
B9	52.75	52.75	48.58
B10	269.10	269.10	269.10
B11	89.98	89.98	89.98
B12	64.11	64.11	64.11
B13	101.24	101.24	101.24
B14	43.33	43.33	43.33
B15	43.73	43.73	43.73
B16	3.32	3.32	3.32
B17	7.96	7.96	7.96
B18	3.95	3.95	3.95
Total	**1,640.75**	**1,640.75**	**1,640.75**

4. FISHERY MONITORING

The fishery monitoring programme is a continuous activity by daily fish catch logbook monitoring and gillnet survey. However, only daily catch logbook was conducted for April 2018. The gathered information is being put into the database system.

The data from the daily fish catch logbook monitoring indicates that the mean daily fish catch in Nam Ngiep River was 1.7 kg/household/day in March 2018. The estimated total fish catch in Nam Ngiep basin for March 2018 is 43,800 kg. Around 36 % of the catch was sold, 54% was consumed fresh, 8% processed and approximately 2% was used for other purposes.

ANNEXES

ANNEX A: RESULTS OF EFFLUENT ANALYSES

Table A- 1: Results of Camp Effluents in April 2018

Site Name		Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
Station Code		EF01		EF02		EF06	
Parameter (Unit)	Date / Guideline in the CA	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18
pH	6.0-9.0	6.94	7.03	7.61	7.48	7.55	7.58
Sat. DO (%)		59.8	52.6	85.5	82.2	109.8	135
DO (mg/l)		4.61	3.86	6.49	5.87	8.6	10.08
Conductivity (µS/cm)		412	375	672	652	508	475
TDS (mg/l)		206	187.5	336	326	254	237.5
Temperature (°C)		27.1	29.5	29.1	31.3	26.5	28.7
Turbidity (NTU)		0.57	1.01	9.18	14.4	8.88	9.19
TSS (mg/l)	<50	<5	<5	6.03	5.24	14.61	23.65
BOD_5 (mg/l)	<30	6.48	7.2	<6	<6	<6	17.46
COD (mg/l)	<125	<25	Pending	39.4	Pending	42.4	Pending
NH_3-N (mg/l)	<10	11.1	Pending	10.5	Pending	6.5	Pending
Total Nitrogen (mg/l)	<10	15.9	Pending	13	Pending	11.5	Pending
Total Phosphorus (mg/l)	<2.0	0.96	Pending	0.61	Pending	0.82	Pending
Faecal Coliform (MPN/100 ml)		27	2	0	0	0	0
Total Coliform (MPN/100 ml)	<400	79	110	0	0	0	11
Oil & Grease (mg/l)	<10	<1.0		<1.0		<1.0	
Residual Chlorine (mg/l)		n/a	n/a	1.22	1.58	1.99	0.18
Chlorination Dosing Rate (ml/mn)		n/a	n/a	230	370	98	80
Effluent Discharge Volume (l/mn)		12	12	20	20	2.4	4

Site Name		Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
Station Code		EF07		EF08		EF10	
Parameter (Unit)	Date / Guideline in the CA	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18
pH	6.0-9.0	7.44	7.25	7.52	7.44	7.46	6.99
Sat. DO (%)		77.8	57.9	50.8	41	65.4	72.3
DO (mg/l)		5.67	4.13	3.98	3.07	5.08	5.26
Conductivity (µS/cm)		1,998	1,935	850	774	350	276
TDS (mg/l)		999	967.5	425	387	175	138
Temperature (°C)		30.6	31.7	26.6	28.8	27	30.3
Turbidity (NTU)		11.5	26.8	35.9	54.1	3.59	7.66
TSS (mg/l)	<50	33.15	35.25	25.88	25.76	<5	<5
BOD_5 (mg/l)	<30	<6	<6	<6	18.72	<6	48
COD (mg/l)	<125	102	Pending	116	Pending	<25	Pending
NH_3-N (mg/l)	<10	29.8	Pending	45.9	Pending	5.9	Pending
Total Nitrogen (mg/l)	<10	30.8	Pending	46.6	Pending	6.18	Pending
Total Phosphorus (mg/l)	<2.0	0.5	Pending	0.8	Pending	0.53	Pending
Faecal Coliform (MPN/100 ml)		0	0	0	4.5	0	0

	Site Name	Song Da5 Camp No.1		Song Da5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
	Date	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18
Parameter (Unit)	Guideline in the CA						
Total Coliform (MPN/100 ml)	<400	0	0	0	23	0	0
Oil & Grease (mg/l)	<10	<1		<1		<1	
Residual Chlorine (mg/l)		1.22	1.98	0.64	0.6	0.25	0.5
Chlorination Dosing Rate (ml/mn)		150	360	320	130	320	40
Effluent Discharge Volume (l/mn)		30	20	60	60	12	6

	Site Name	HM Main Camp		IHI Camp		Kenber Camp	
	Station Code	EF13		EF14		EF16	
	Date	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18	09-Apr-18	23-Apr-18
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.12	6.91	7.15	6.84	7.97	7.18
Sat. DO (%)		61.6	15.3	58.8	80.9	91.1	87.5
DO (mg/l)		4.7	1.11	4.42	5.89	7.17	6.37
Conductivity (µS/cm)		765	496	502	912	441	508
TDS (mg/l)		382.5	248	251	456	220.5	254
Temperature (°C)		27.8	30.1	28.3	30.1	25.9	29.8
Turbidity (NTU)		17	33	14	15.4	8.63	5.66
TSS (mg/l)	<50	38.75	23.48	23.22	30	19.1	7.78
BOD_5 (mg/l)	<30	156.3	124.8	79.65	<6	<6	<6
COD (mg/l)	<125	290	Pending	139	Pending	50.8	Pending
NH_3-N (mg/l)	<10	24.5	Pending	25	Pending	12.6	Pending
Total Nitrogen (mg/l)	<10	25.3	Pending	25.5	Pending	13.5	Pending
Total Phosphorus (mg/l)	<2.0	0.58	Pending	0.46	Pending	0.74	Pending
Faecal Coliform (MPN/100 ml)		5,400	16,000	14,000	0	0	2
Total Coliform (MPN/100 ml)	<400	16,000	16,000	22,000	0	0	4.5
Oil & Grease (mg/l)	<10	6		<1		<1.0	
Residual Chlorine (mg/l)		0	0	0	0.92	1.71	0.24
Chlorination Dosing Rate (ml/mn)		3.1	3.1				45
Effluent Discharge Volume (l/mn)		4.2	4.2	2	12		1

	Site Name	Zhefu Camp	
	Station Code	EF09	
	Date	09-Apr-18	23-Apr-18
Parameter (Unit)	Guideline in the CA		
pH	6.0-9.0	7.47	7.27

	Site Name	Zhefu Camp	
	Station Code	EF09	
	Date	09-Apr-18	23-Apr-18
Parameter (Unit)	Guideline in the CA		
Sat. DO (%)		59.5	54.2
DO (mg/l)		4.36	3.76
Conductivity (µS/cm)		649	347
TDS (mg/l)		324.5	173.5
Temperature (°C)		30.2	32.9
Turbidity (NTU)		21.4	21.5
TSS (mg/l)	<50	79.34	68.61
BOD_5 (mg/l)	<30	<6	43.05
COD (mg/l)	<125	163	Pending
NH_3-N (mg/l)	<10	27.1	Pending
Total Nitrogen (mg/l)	<10	27.5	Pending
Total Phosphorus (mg/l)	<2.0	0.79	Pending
Faecal Coliform (MPN/100 ml)		0	1,600
Total Coliform (MPN/100 ml)	<400	0	1,600
Oil & Grease (mg/l)	<10	<1	
Residual Chlorine (mg/l)		0	0
Chlorination Dosing Rate (ml/mn)		3.1	3.1
Effluent Discharge Volume (l/mn)		4.2	4.2

Table A- 2: Results of the Construction Area Discharge in April 2018

	Site Name	**Spoil Disposal No.2**			
	Station Code	**DS04**			
	Date	**06-Apr-18**	**12-Apr-18**	**19-Apr-18**	**26-Apr-18**
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	6.31	6.9	6.31	6.25
Sat. DO (%)		62.7	69.3	63.1	48.6
DO (mg/l)		4.92	5.22	4.93	3.6
Conductivity (µs/cm)		93.3	70.2	117.3	86.2
TDS (mg/l)		46.5	35	57.5	43
Temperature (°C)		26.7	28.1	26.4	29.1
Turbidity (NTU)		25.5	13.6	89	19.1
TSS (mg/l)	<50	51.68	9.3	536.25	26.29
Oil & Grease (mg/l)	<10	<1			

	Site Name	RCC Plant Discharge at lower ponds			
	Station Code	DS09			
	Date	06-Apr-18	12-Apr-18	19-Apr-18	26-Apr-18
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	6.5		7.54	7.7
Sat. DO (%)		59		80.5	92.9
DO (mg/l)		4.6		6.08	7.15
Conductivity (µs/cm)		287		277	379
TDS (mg/l)		148.5		138	189.5
Temperature (°C)		26.9		28.5	27.4
Turbidity (NTU)		54.3		17.9	19.5
TSS (mg/l)	<50	109.62		50.25	38.49
Oil & Grease (mg/l)	<10	<1			

	Site Name	Aggregate Crushing Plant			
	Station Code	DS02			
	Date	06-Apr-18	12-Apr-18	19-Apr-18	26-Apr-18
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	8.46			
Sat. DO (%)		100			
DO (mg/l)		7.53			
Conductivity (µs/cm)		123			
TDS (mg/l)		62			
Temperature (°C)		28.3			
Turbidity (NTU)		12.54			
TSS (mg/l)	<50	38.73			
Oil & Grease (mg/l)	<10	<1			

	Site Name	Main Dam Treatment Plant No.2 (DS12)			
	Station Code	DS12			
	Date	06-Apr-18	12-Apr-18	19-Apr-18	26-Apr-18
Parameter (Unit)	Guideline				
pH	6.0 - 9.0	6.79	7.42	6.97	8.73
Sat. DO (%)		99.4	100.1	99.2	101.5
DO (mg/l)		7.28	7.28	7.31	7.3
Conductivity (µs/cm)		948	1188	2620	439
TDS (mg/l)		474	594	1310	219
Temperature (°C)		30.3	30.2	29.7	31.1
Turbidity (NTU)		12.3	2.6	8	10.13
TSS (mg/l)	<50	44.5	24.71	167.65	95.55
Oil & Grease (mg/l)	<10	<1			

	Site Name	Main Dam's Waste Water Treatment Plant No.3			
	Station Code	DS14			
	Date	06-Apr-18	12-Apr-18	19-Apr-18	26-Apr-18
Parameter (Unit)	Guideline				
pH	6.0 - 9.0		7.59	8.03	7.38
Sat. DO (%)			100.4	94.6	97.9
DO (mg/l)			7.39	7.03	7.12
Conductivity (µs/cm)			504	846	1,124
TDS (mg/l)			252	423	562
Temperature (°C)			29.6	29.3	30.5
Turbidity (NTU)			13.5	27.5	1.76
TSS (mg/l)	<50		29.8	69.94	6.34
Oil & Grease (mg/l)	<10				

ANNEX B: AMBIENT DUST QUALITY

Table B- 1: 24-hour Average Dust Concentrations Measured in Hat Gniun Village

Ban Hat Gnuin - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	02/04/2018 18:00	03/04/2018 18:01	04/04/2018 18:01
End Time	03/04/2018 18:00	04/04/2018 18:00	05/04/2018 18:00
Average Data Record in 24h (mg/m3)	0.139	0.191	0.175
Guideline Average in 24h (mg/m3)	***0.12***	***0.12***	***0.12***

Figure B- 1: Dust Monitoring Results at Ban Hat Gniun in April 2018

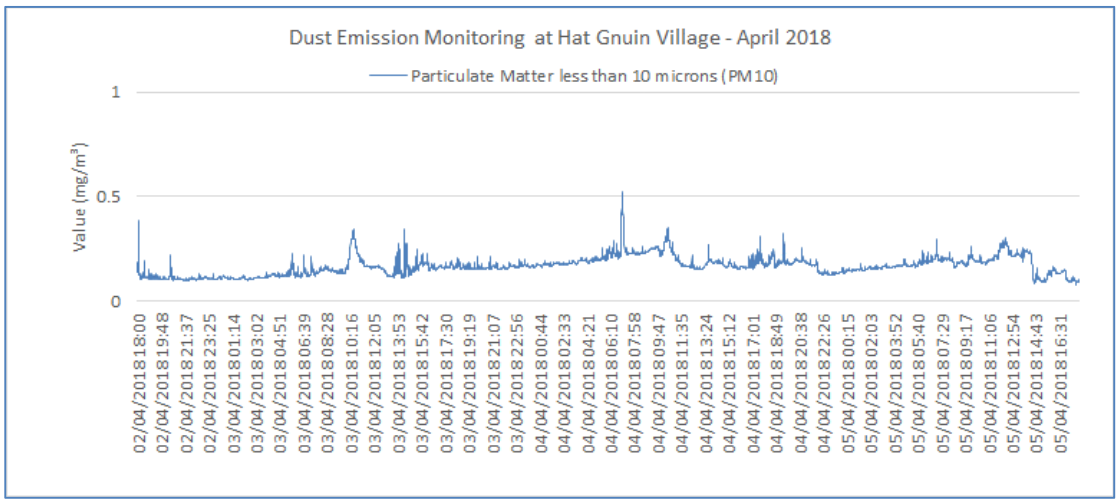


Table B- 2: 24-hour Average Dust Concentrations Measured in Phouhomxay Village

Phouhomxay village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	23-04-18 18:00	24-04-18 18:00	25-04-18 18:00
End Time	24-04-18 18:00	25-04-18 18:00	26-04-18 18:00
Average Data Record in 24h (mg/m3)	0.173	0.099	0.056
Guideline Average in 24h (mg/m3)	***0.12***	***0.12***	***0.12***

Figure B- 2: Dust Monitoring at Phouhomxay Village in April 2018

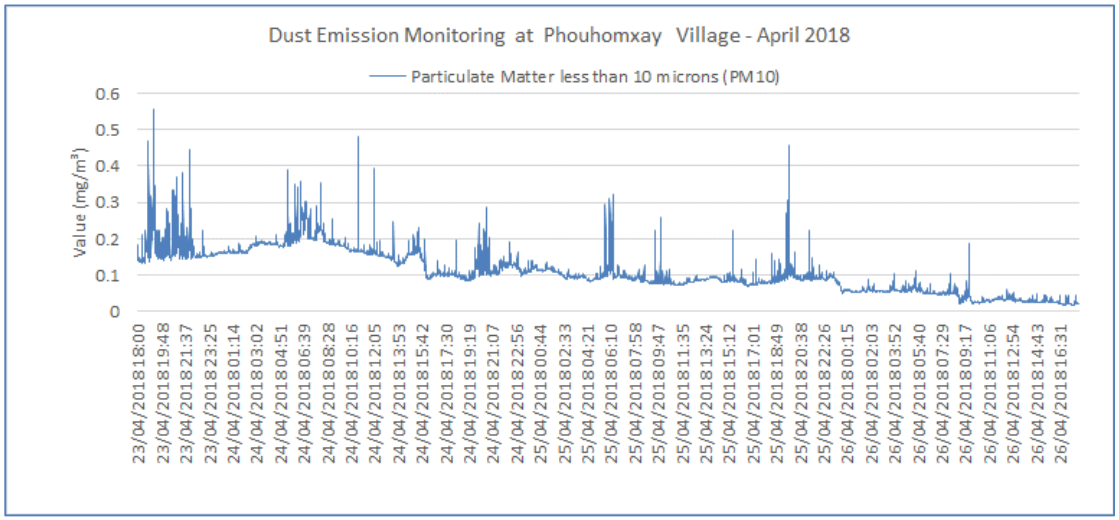


Figure B- 3: Dust Monitoring Results at the Aggregate Crushing Plant in April 2018

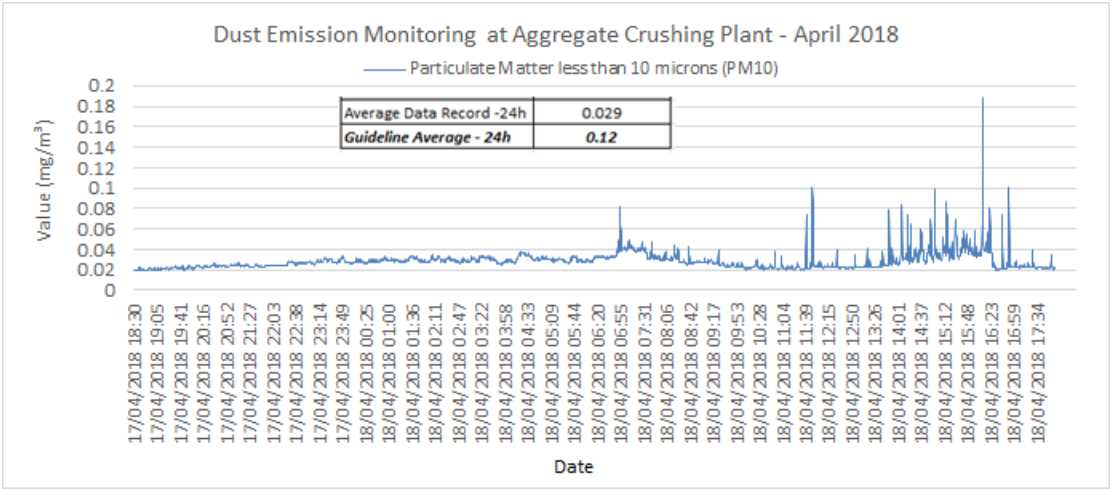


Figure B- 4: Dust Monitoring Results at the RCC Plant in April 2018

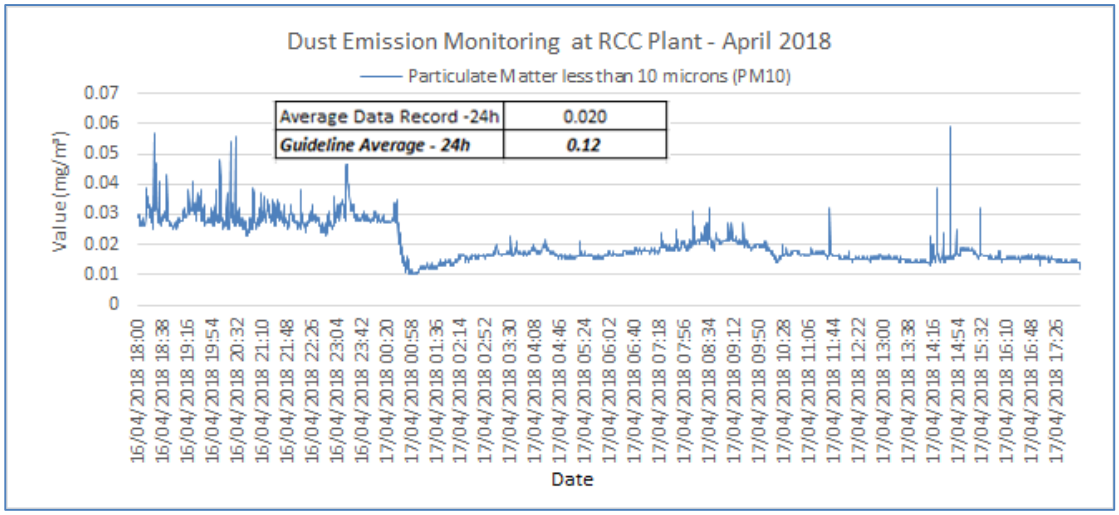


Figure B- 5: Dust Monitoring Results at the Sino Hydro Temporary Camp in April 2018

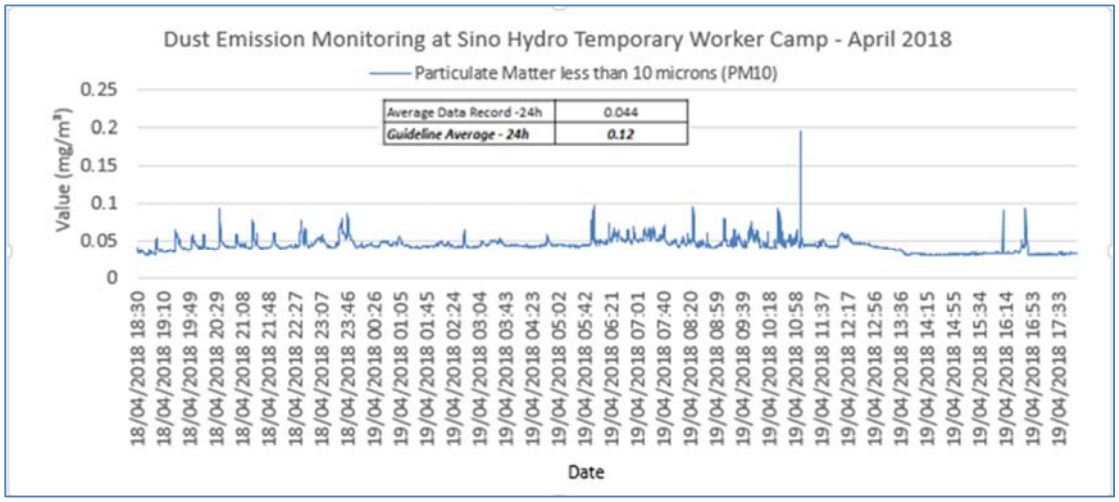


Figure B- 6: Dust Monitoring Results at the SongDa5 No.2 Camp in April *2018*

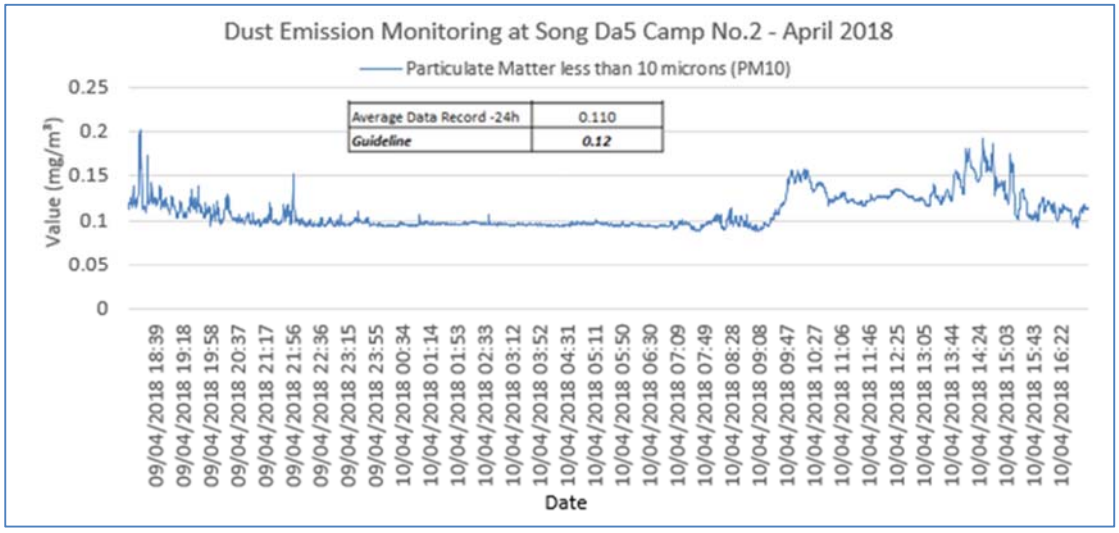


Figure B- 7: Dust Monitoring Results at Main Dam (Top View Left Bank) in 20 April 2018

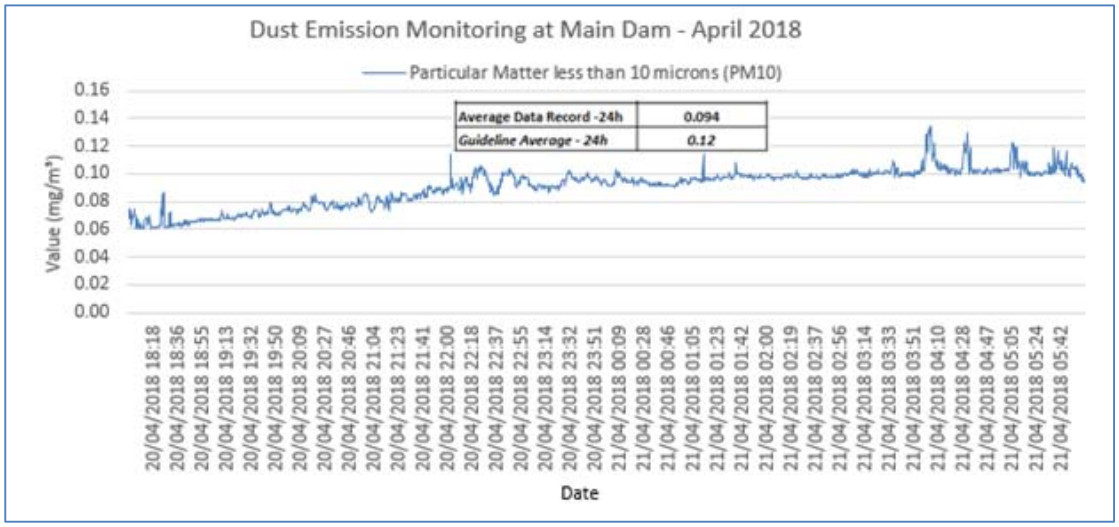


Figure B-8: Dust Monitoring Results at the Lilama10 Camp in April 2018

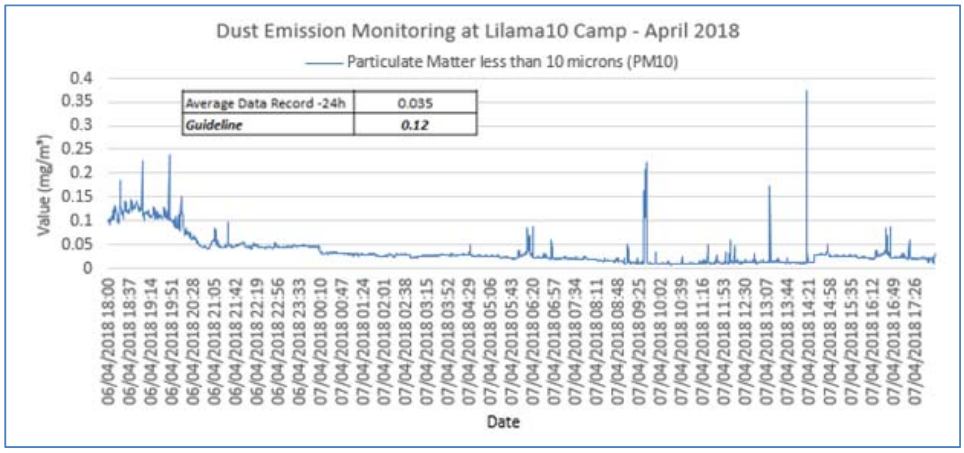


Figure B- 9: Dust Monitoring Results at the Main Powerhouse in April 2018

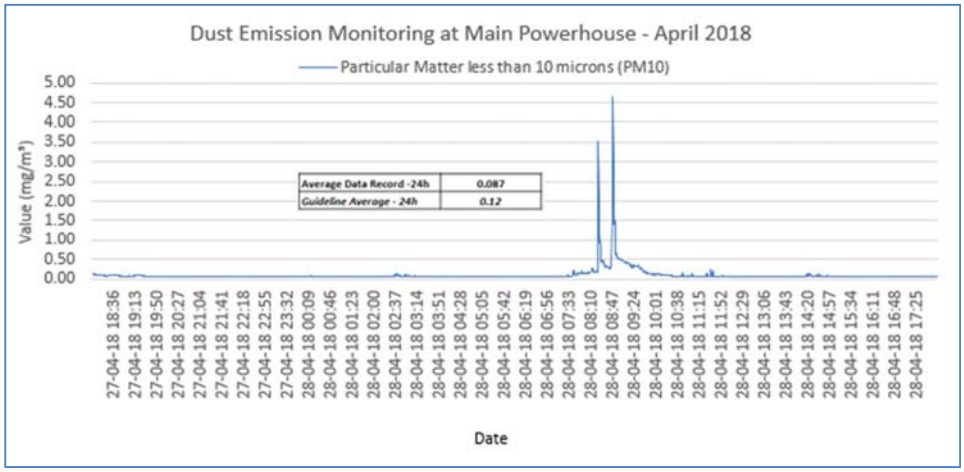
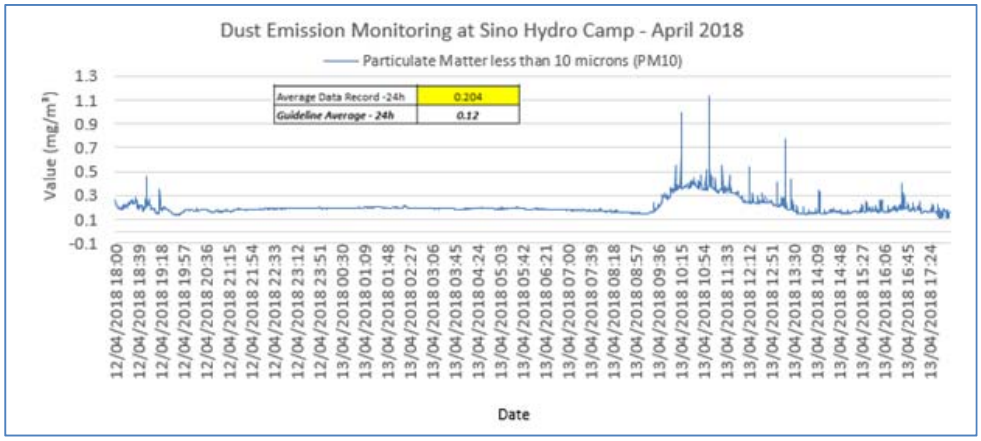


Figure B-10: Dust Monitoring Results at the Sino Hydro Camp in April 2018



ANNEX C: AMBIENT NOISE DATA

Table C- 1: Average Results of Noise Monitoring at Ban Hat Gniun in April 2018

Noise Level (dB)	02-03/April/18			03-04/April/18			04-05/April/18		
	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	58.50	54.20	66.60	59.70	73.40	74.10	50.20	62.00	62.60
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	44.23	37.49	43.38	42.84	42.69	47.67	39.03	38.15	44.33
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Figure C- 1: Result of Noise Level Monitoring at Ban Hat Gniun in April 2018

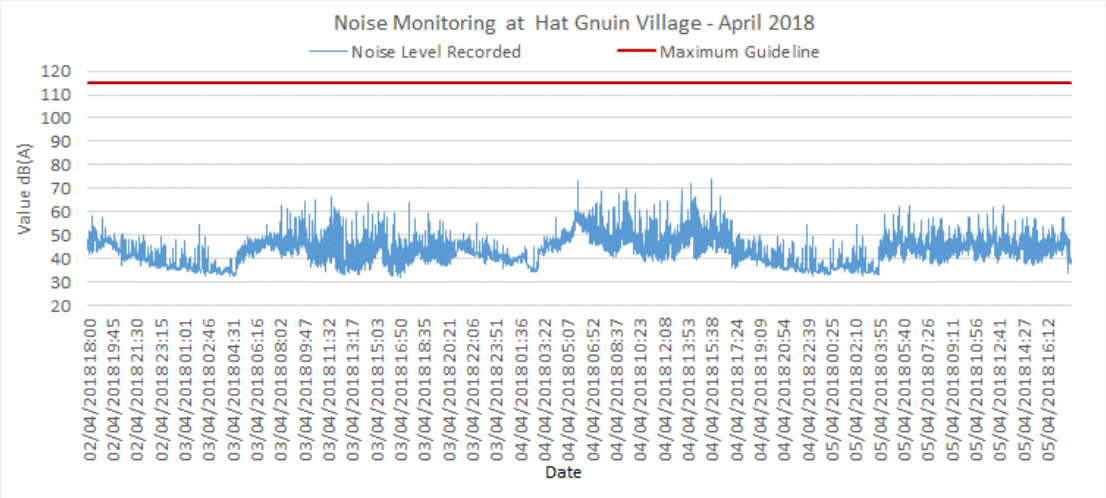


Table C- 2 Average Results of Noise Monitoring at Phouhomxay Village in April 2018

Noise Level (dB)	23-24/April/18			24-25/April/18			25-26/April/18		
	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	53.00	73.60	62.40	58.50	75.20	75.60	59.70	67.80	67.80
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	41.77	39.61	40.66	39.73	52.69	40.59	40.34	45.88	43.56
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

Figure C- 2: Result of Noise Level Monitoring at Phouhomxay Village in April 2018

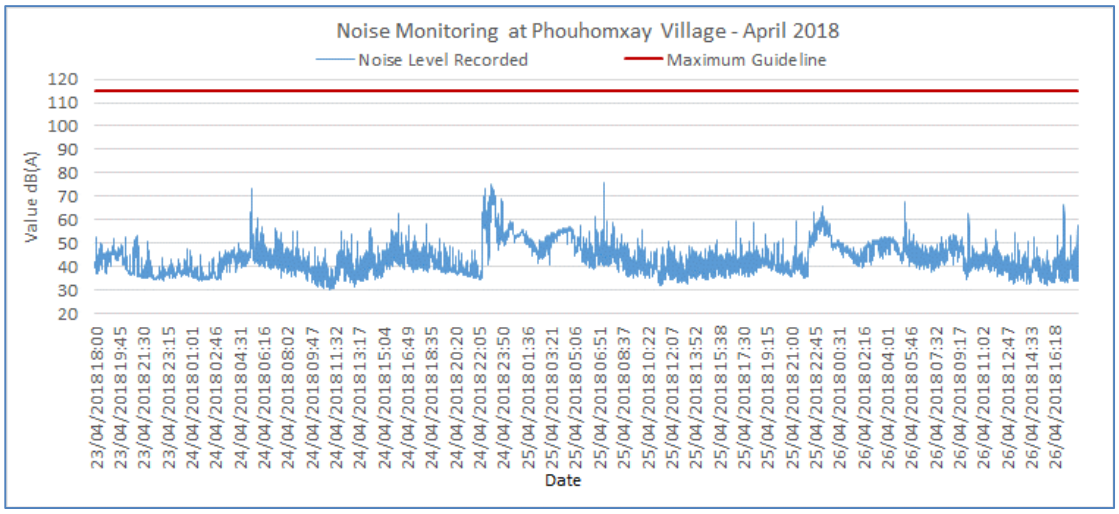


Table C-3 and Table C-4: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in April 2018

Aggregate Crushing Plant

Noise Level (dB)	17-18/April/18		18/April/18
	18:30 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	60.1	47	66.1
Guideline Max	***115***	***115***	***115***
Average Data Recorded	43.30	39.77	40.25
Guideline Averaged	***70***	***70***	***70***

RCC Plant

Noise Level (dB)	16-17/April/18		17/April/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	56.8	84.7	74.9
Guideline Max	***115***	***115***	***115***
Average Data Recorded	49.89	54.20	47.91
Guideline Averaged	***70***	***70***	***70***

Figure C- *3*: Results of Noise Level Monitoring at the Aggregate Crushing Plant in April 2018

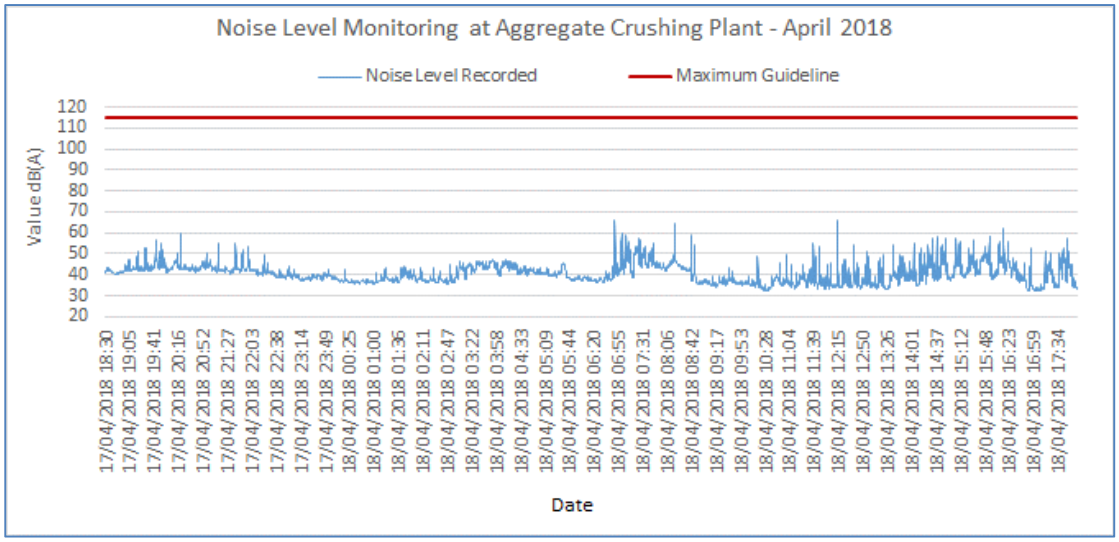


Figure C- *4*: Results of Noise Level Monitoring at the RCC Plant in April 2018

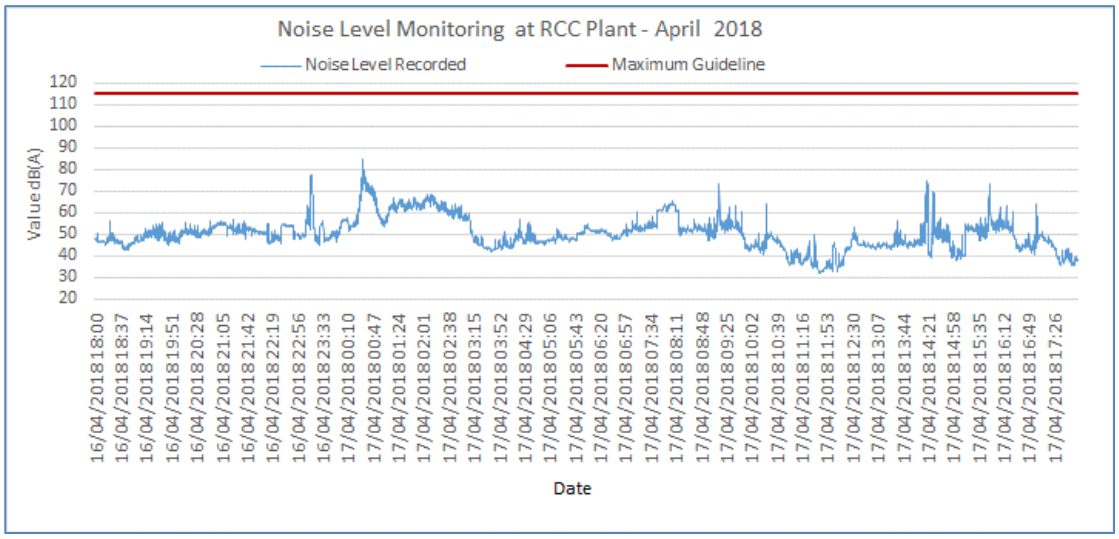


Table C- 5 and Table C- 6: Average Results of Noise Monitoring at Song Da5 Camp No. 2 and Sino Hydro Camp in April 2018

Song Da5 Camp No.2

Noise Level (dB)	09-10/April/18		10/April/18
	18:30 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	77.9	64	66.3
Guideline Max	***115***	***115***	***115***
Average Data Recorded	56.20	54.64	49.24
Guideline Averaged	***70***	***50***	***70***

Sino Hydro Temporary Worker Camp

Noise Level (dB)	18-19/April/18		19/April/18
	18:30 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	52.4	50.9	74.5
Guideline Max	***115***	***115***	***115***
Average Data Recorded	46.91	44.53	37.13
Guideline Averaged	***70***	***50***	***70***

Figure C- 5: Results of Noise Level Monitoring at Song Da5 Camp No.2 in April 2018

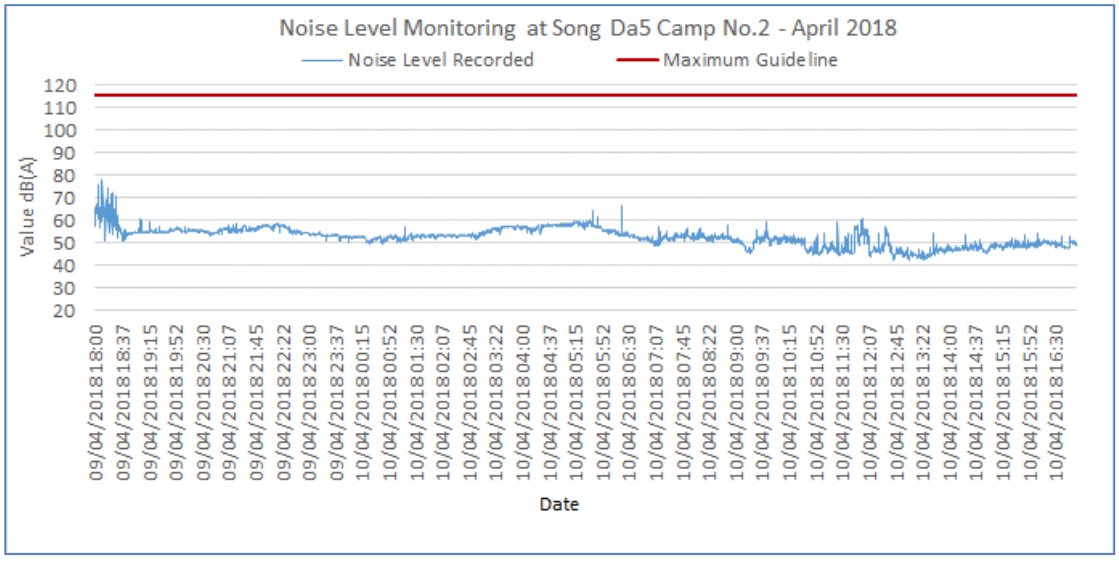


Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in April 2018

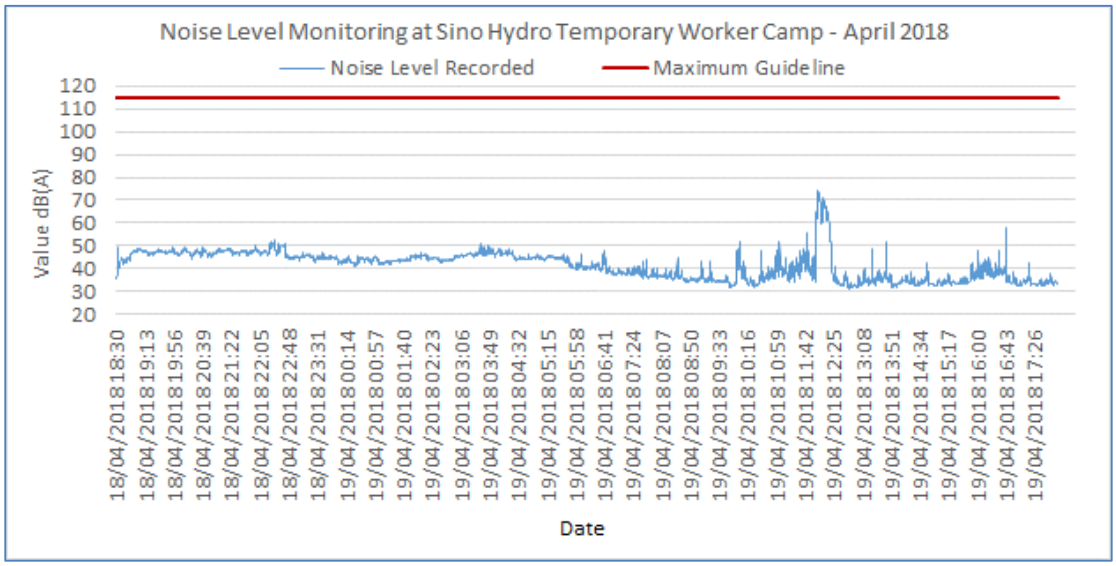


Table C- 8 and Table C- *9: Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in April 2018*

Main Dam

Noise Level (dB)	20-21/April/18		21/April/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	66.2	65.8	68.7
Guideline Max	***115***	***115***	***115***
Data Record Average	52.87	52.64	51.70
Guideline Averaged	***70***	***70***	***70***

Lilama 10 Camp

Noise Level (dB)	06-07/April/2018		07/April/2018
	18:00 – 22:00	22:01 – 06:00	06:00-18:00
Maximum Value Recorded	69.4	63.8	92.5
Guideline Max	***115***	***115***	***115***
Average Data Recorded	55.41	58.89	42.43
Guideline Averaged	***70***	***50***	***70***

Figure C-7: Results of Noise Level Monitoring at Main Dam (Top View Left Bank) in April 2018

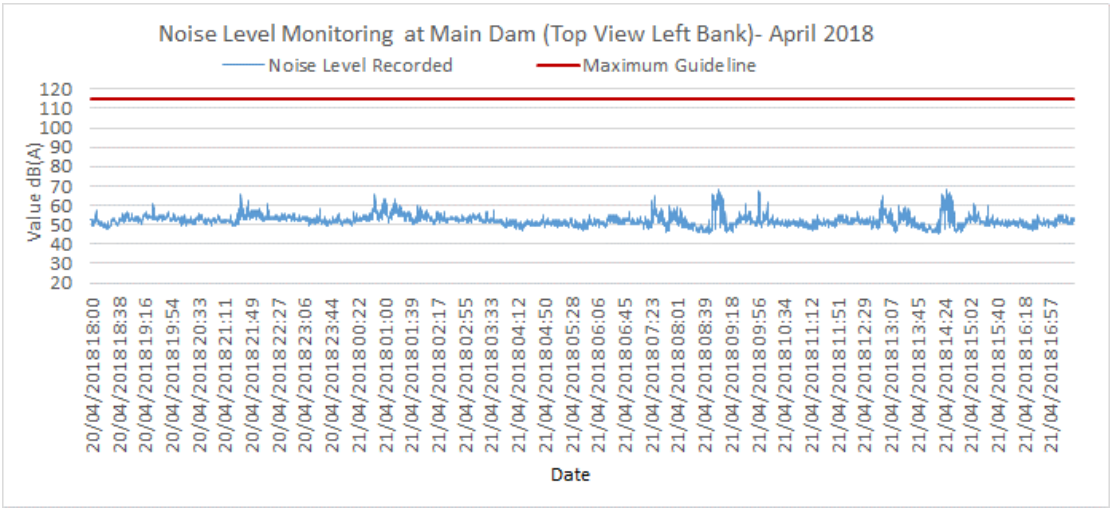


Figure C- 8: Results of Noise Level Monitoring at Lilama10 Camp* in *April 2018

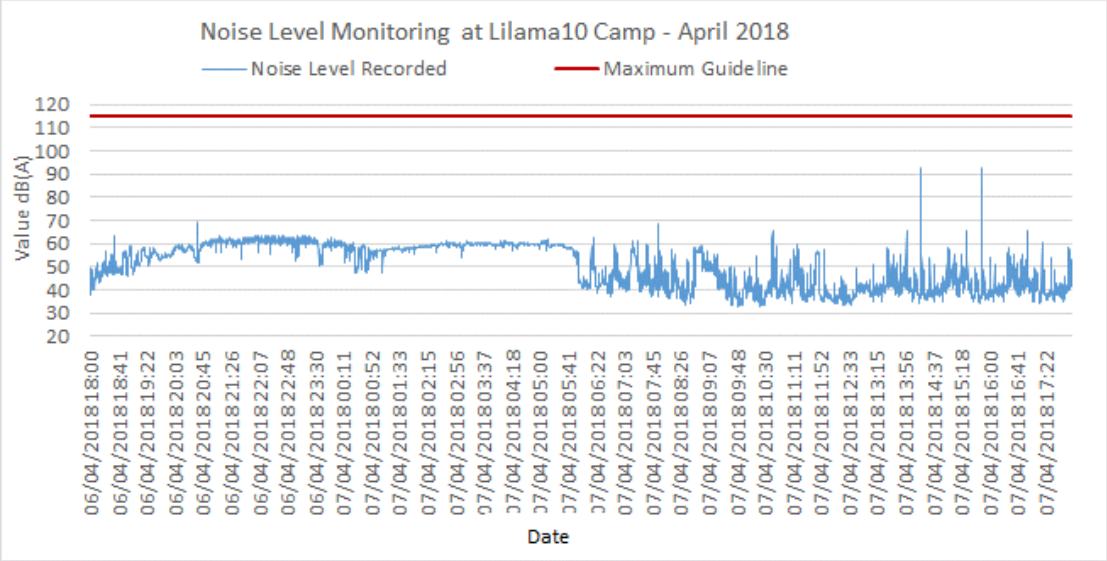


Table C-9 and Table C-10: Average Results of Noise Monitoring at Main Powerhouse, and Sino Hydro Camp in April 2018

Main Powerhouse

Noise Level (dB)	27-28/April/18		28/April/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	83.9	59.7	91.1
Guideline Max	***115***	***115***	***115***
Data Record Average	64.55	53.31	62.61
Guideline Averaged	***70***	***70***	***70***

Sino Hydro Camp

Noise Level (dB)	12-13/April/18		13/April/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	63.2	64.2	69.6
Guideline Max	***115***	***115***	***115***
Average Data Recorded	46.47	48.62	46.60
Guideline Averaged	***70***	***50***	***70***

Figure C- 9: Results of Noise Level Monitoring at Main Powerhouse in April 2018

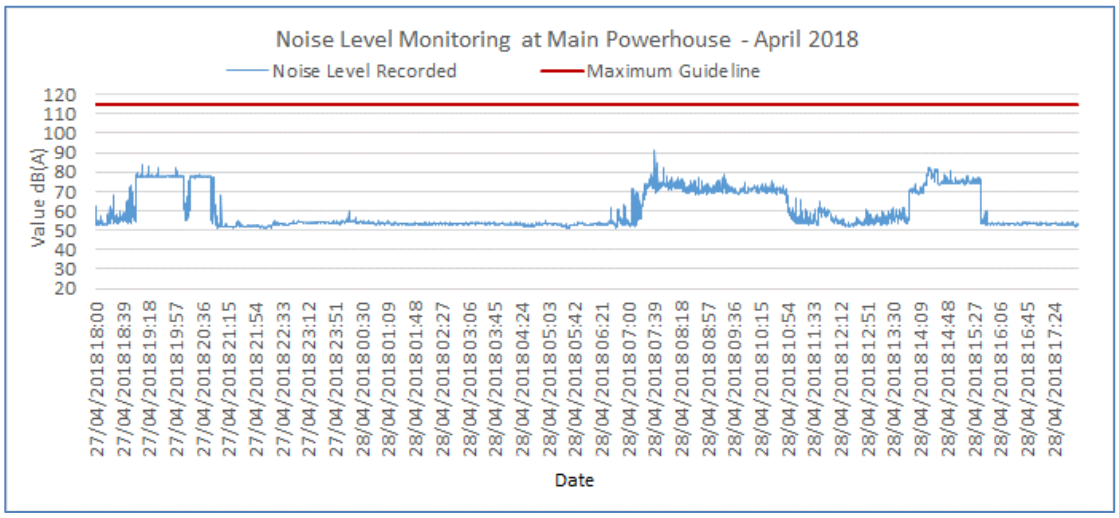


Figure C-10: Results of Noise Level Monitoring at Sino Hydro Camp in April 2018