NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

February 2018

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TABLE OF CONTENTS

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 February 2018, five Detailed Work Programmes and Site Specific Environmental and Social Monitoring Plans (DWP and SS-ESMMP) and three replies to the Owner's comments were active for EMO review. Out of these, three SS-ESMMPs were cleared, one SS-ESMMP was returned with comments, and one SS-ESMMP and the three replies are under review and will be carried over to March 2018.

The Environmental Management Unit (EMU) of Bolikhamxay Province visited the NNP1 Project site on 31 January and 22 February 2018. Detailed discussions and findings of the January 2018 mission are incorporated in this monthly report and the findings of February 2018 will be incorporated in the next monthly report.

The effluent of all the camps was monitored fortnightly and the results for February 2018 indicate that all key parameters (BOD5, total coliform and faecal coliform) are in compliance with the relevant effluent standards. That is, except at the Other Contractors Camp built as part of the Civil Works Contract being the HMH Camp on 08 February 2018 and IHI Camp on 22 February 2018. The discharge from the sediment control facilities at the Aggregate Crushing Plant and RCC Plant continue to be in compliance with the relevant standards.

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 results for February 2018 are all within the normal ranges compared with previous data and there are no unusual results.

In February 2018, an approximate 156.9 m3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 25.8 m3 compared to January 2018. Spot checks of waste bags were conducted on a daily basis before the disposal. A total of 468.5 kg of recyclable waste was sold to the Khounmixay Processing Factory by the Contractors.

The PKC Contractor started the operation of Houay Soup Landfill on 01 December 2017. In February 2018, approximate of 74 m3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was transported for disposal at the landfill.

The Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) are expected to be reconstituted and the meeting for NNP1 Watershed Management Plan (WMP) approval has been postponed until such time as this takes place. The final draft of Provincial Regulation was further improved at a workshop on 20-22 February 2018.

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) was presented to the Vice Governor of Bolikhamxay, the Vice Governor of Xaysomboun Province, NNP1 Watershed and Reservoir Protection Committee (WRPC), and NNP1 Biodiversity Offset Management Committee (BOMC). The Vice-Governor of both provinces and the committees (WRPC and BOMC) all agreed with the proposal.

The preparation of NNP1 Biodiversity Offset Management Plan (BOMP) continues with several studies/surveys started since January 2018. The land use and natural resources survey and the threat assessment survey in Nam Chouane – Nam Xang (NCNX) offset site were completed by the

end of February 2018. The Totally Protected Zone (TPZ) survey, aquatic biodiversity survey, and herpetology survey in the NNP1 Watershed will be started in March 2018 in parallel with Forest Classification and Habitat Mapping in the NCNX offset site.

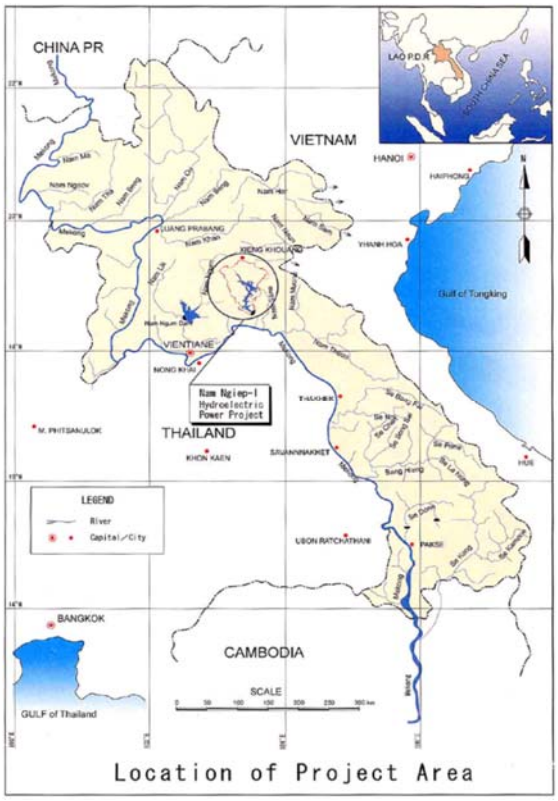
The biomass clearance continues to progress and, as of 28 February 2018, a total of 1,097.04 ha out of 1,640 ha, is accepted as fully cleared and another 543.71 ha remain to be fully completed.

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 1.6 kg/household/day in January 2018. The estimated total fish catch in Nam Ngiep basin for January 2018 is 39,000 kg. Around 38% of the catch was sold, 52% 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.

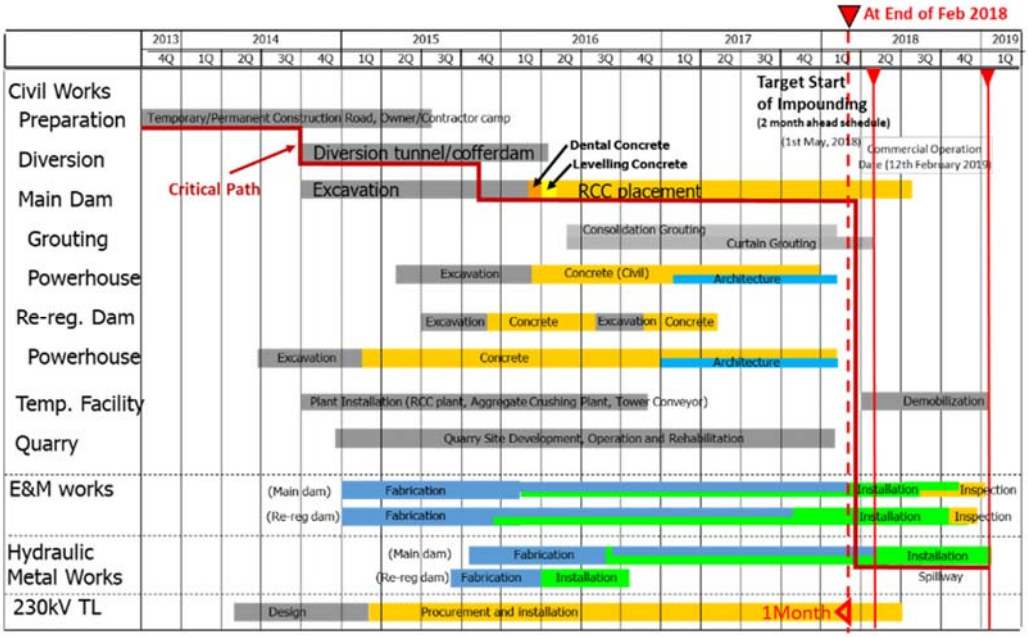
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS

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 February 2018 was 92.6 %[1] (compared to planned progress of 93.2 %), 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 were commenced in October 2014 and completed in February 2016, following which the concreting works were commenced.

[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)

The cumulative actual work progress of the Civil Works until the end of February 2018 was 94.0 % (compared to planned progress of 94.6 %) 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 January 2018 as a proportion of the total expected drilling

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

Item	Description	Total Drilling (m)	Completed (m)	Progress (%)
Consolidation Grouting	Anticipated Quantity	17,769	17,643	99
Curtain Grouting	Original Design Quantity	27,945	39,450	141
	Anticipated Final Quantity	58,400	39,450	67

*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 ongoing in February 2018

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

Location	Total Anticipated Volume (m^3)	Completed (m^3)	Progress (%)
Main Powerhouse	34,800	34,500	99
Penstock Embedment	11,885	10,045	84
Spillway	35,500	17,130	48

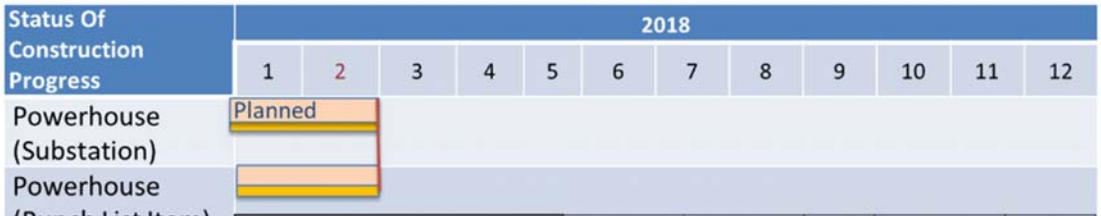
2.1.2 Re-regulation dam and powerhouse

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 28 February 2017

General View on 27 February 2018



Powerhouse Building Works	Painting Inside and Outside (m^2)	Lighting Fixtures (Unit)	Water Supply (%)	Electrical Conduit and Wire (m)	Fence (m)
Designed	6,135	311	100	2,510	117
Completed	6,135	311	98	2,510	117
Progress	100 %	100 %	98 %	100 %	100 %

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 February 2018 was 96.5 % (compared to planned progress of 96.5 %).

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

Figure 4.2-1: Current Progress of Stator for Unit 2 at the Main Power Station

Figure 4.2-2: Stacking of Rotor Rim Plates for Unit 1 at the Main Power Station

Figure 4.2-3: Assembly of Arms and Operating Ring of Guide Vane for Unit 2 at the Main Power Station

Figure 4.2-4: Installation of Inlet Valve for Unit 2 at the Main Power Station

Figure 4.2-5: Installation of Main Transformer for Unit 2 at the Main Power Station

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 February 2018 was 56.5 % (compared to planned progress of 60.4 %).

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 February 2018

Progress of MD-Steel Penstock	2017			2018										
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Remove The Spider Support at Main Dam															

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 February 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)

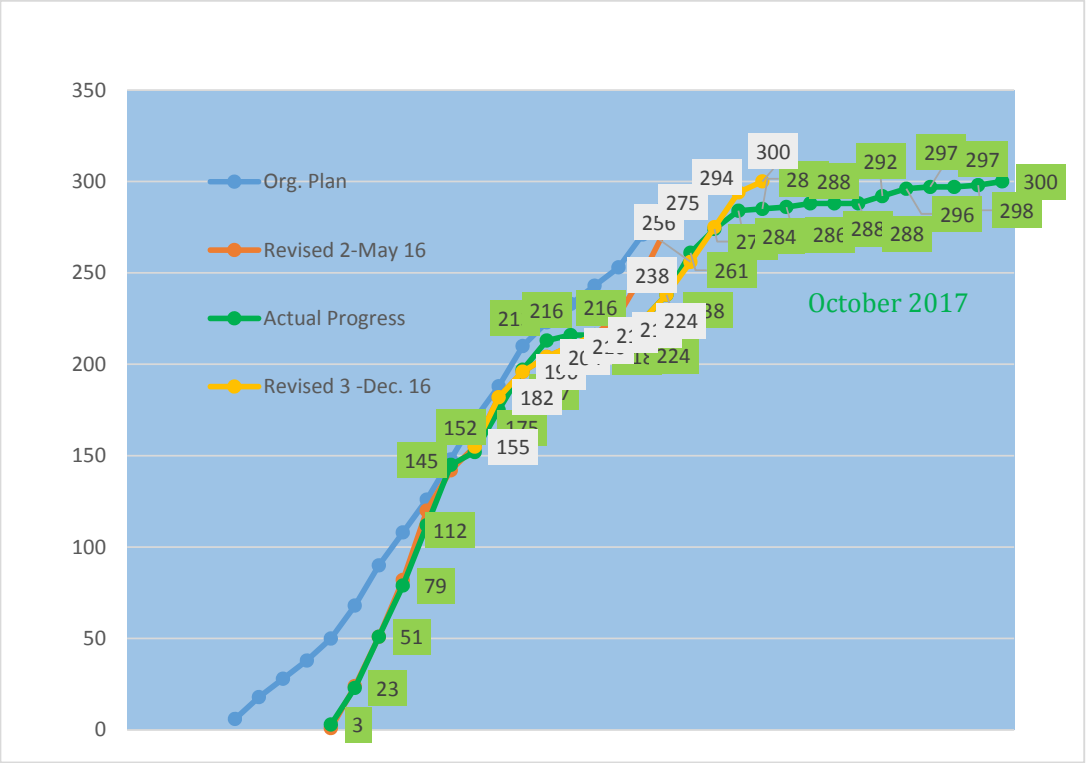


Figure 2-7: Revised Cumulative Work Progress of Tower Erection (Planned and Actual)

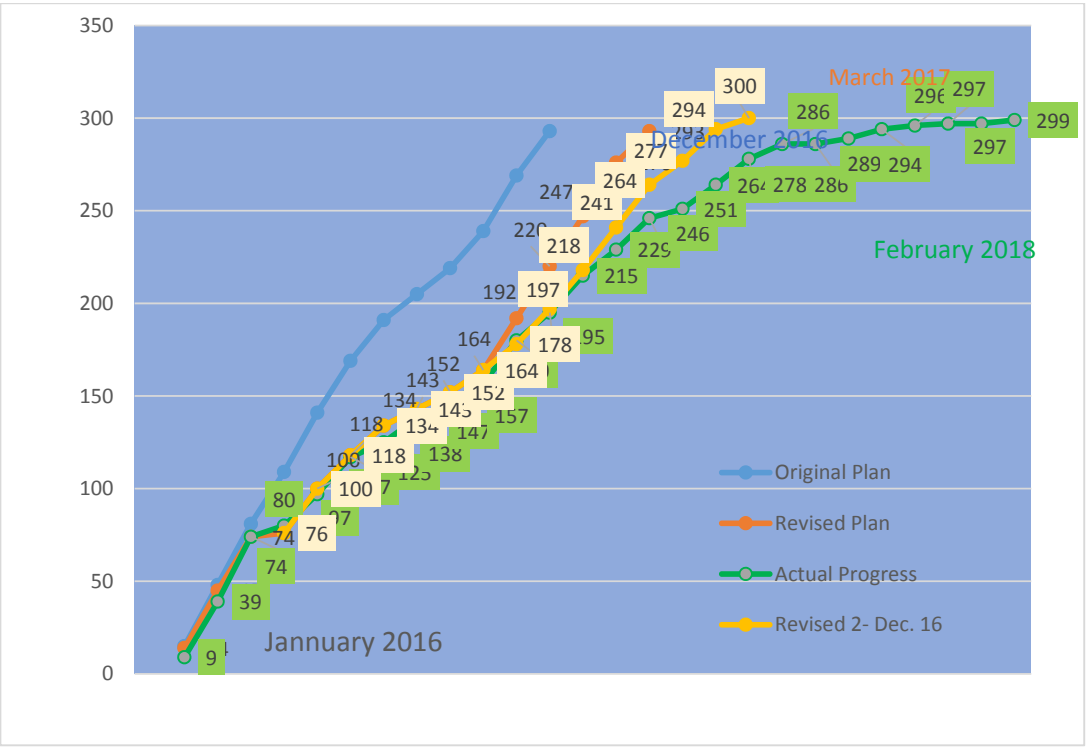


Figure 2-8: Cumulative Progress of Stringing Works (Planned & Actual)

3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 Site Specific Environmental and Social Management and Monitoring Plans

During February 2018, EMO received five Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) and three replies to the Owner's comments from the contractors for review. Out of these, three SS-ESMMPs were cleared, one SS-ESMMP was returned with comments, and one SS-ESMMP and three replies are under EMO review.

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

Title	Date Received	Status
DWP & SS-ESMMP for 2nd River Diversion & Diversion Tunnel Closure	25 December 2017 (1st submission)	No further comments on 01 February 2018
DWP and SS-ESMMP for the sub-contractor worker camp (276 Camp)	04 February 2018 (3rd submission)	No objection with comments on 15 February 2018

Title	Date Received	Status
DWP & SSESMMP for Monitoring Equipment Installation for Main Dam	24 January 2018 (1st submission)	No further comments on 01 February 2018
DWP and SS-ESMMP for 115kV transmission line	05 February 2018 (1st submission)	Returned with comments on 14 February 2018
DWP and SS-ESMMP for Re-regulation Powerhouse Building	03 February 2018 (4th submission)	Under review
SS-ESMMP for construction of the Main Dam	02 February 2018 (Reply to the Owner's comments)	Under review
SS-ESMMP for closing of the dyke at borrow pit No.7	03 February 2018 (Reply to the Owner's comments)	Under review
SS-ESMMP–RRPS for closing of borrow pit at the corner of road P1 &P1A	03 February 2018 (Reply to the Owner's comments)	Under review

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 ***Figure 3-1*** below.

Table 3-2: Summary of ONC and NCR

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from January 2018	07	0	0	0
Newly Opened in February 2018	06	1	0	0
Total in February 2018	**13**	**1**	**0**	**0**
Resolved in February 2018	04	0	0	0
Carried over into March 2018	09	1	0	0
Unsolved Exceeding Deadlines	**07**	**1**	**0**	**0**

Figure 3-1: Summary of ONC and NCR

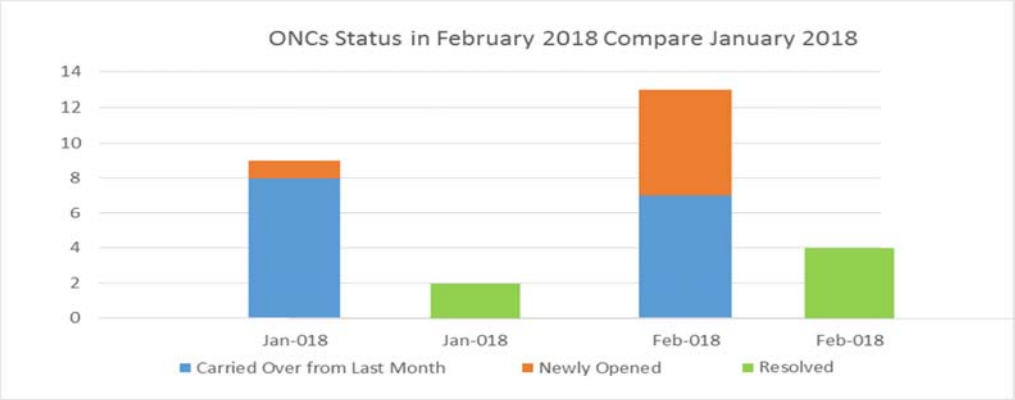


Table 3-3: Carried-Over ONC and NCR from February 2018 into March 2018

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)	
Temporary Accommodation for 44 HH from Zone 2LR at Phouhomxay Village	Incomplete decommissioning of the temporary accommodation at HSRA. (ON_INFRA-0001). First inspection: 07 September 2017 Latest inspection: 20 February 2018	ONC (Closure pending)	Decommissioning and clean-up work is expected to be completed in March 2018
SXN Camp	- Improper camp facilities; - Improper wastewater discharge and lack of waste collections. (ONC_SXN-0001) First inspection: 10 November 2017 Latest inspection: 28 February 2018	ONC (Closure pending)	Corrective actions by 15 March 2018: - Collect and segregate the waste properly; - Improve the camp facilities as per the DWP & SSESMMP; and - Move cooking and washing areas at least 30 m away from the Nam Ngiep River bank, and discharge wastewater to the wastewater pond.
VSP Camp	Poor housekeeping and littering was observed. (ONC_VSP-0007)	ONC (Closure pending)	Corrective actions by 15 March 2018:

Site ID	Issues	Reporting	Actions
	First inspection: 28 November 2017 Latest inspection: 20 February 2018		- Daily clean-up of the camp premises; and - Dispose of general waste at Houay Soup Landfill on a regular basis. - prepare site decommissioning plan.
Main powerhouse	Non-compliance with pH and TSS effluent limit values. The WWTS is operated manually which likely cause fluctuation of pH and TSS. The WWTS is not equipped with a sediment retention pond. (ONC_OC-0271) First inspection: 13 February 2018 Latest inspection: 27 February 2018	ONC (New)	Corrective actions: - Automatic pH adjustment; - Temporarily improve sediment retention by creating small ponds along the drainage before discharge
Sino Hydro labour camp	Poor waste management hygiene and sanitation. (ONC_OC-0272) First inspection: 13 February 2018 Latest inspection: 27 February 2018	ONC (New)	Improve toilet and washing areas by providing sufficient water supply, regular clean up and fix the sanitary structures.
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: 27 February 2018	ONC (New)	- Clean up and remove discarded rocks to designated spoil disposal No. 6; - Carry out mitigation measures for erosion and sediment control at the main quarry site area to restore and prevent further damage to riparian vegetation.
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:	ONC (New)	- Provide sufficient waste bins on site for daily waste collection; - Regularly remove / transport general waste to Houay Soup Landfill, and construction waste to spoil disposal No: 6 - Stop burning of plastic and non-segregate waste.

Site ID	Issues	Reporting	Actions
	20 February 2018		
KCP camp	Lack of proper storing of hazardous material, oily equipment and fuel drums were left on the bare ground. This resulted in oil spillage causing oil contaminated soil. (ONC_KCP-0005) First inspection: 20 February 2018	ONC (New)	- Contain and clean up oil contaminated soil for proper incineration by Khounmysay steel factory (an approved vendor) and; - Install a secure hazardous material storage on site with a proper spill response kits including steel tray and dry sand)
Pyramid's Sub-contractor	Reference to ONC Ref. ONC_PRMC-0001 dated 28 November 2017 and reminder of 23 January 2018: - Lack of a camp management and decommissioning plan. - Lack of waste bins, toilet and other necessary camp facilities; First inspection: 01 February 2018 Latest inspection: 20 February 2018	NCR1 (New)	Provide appropriate camp facility, submit the camp management and decommissioning plan for EMO review by 14 March 2018.

Figure 3-2: Site Inspection Locations

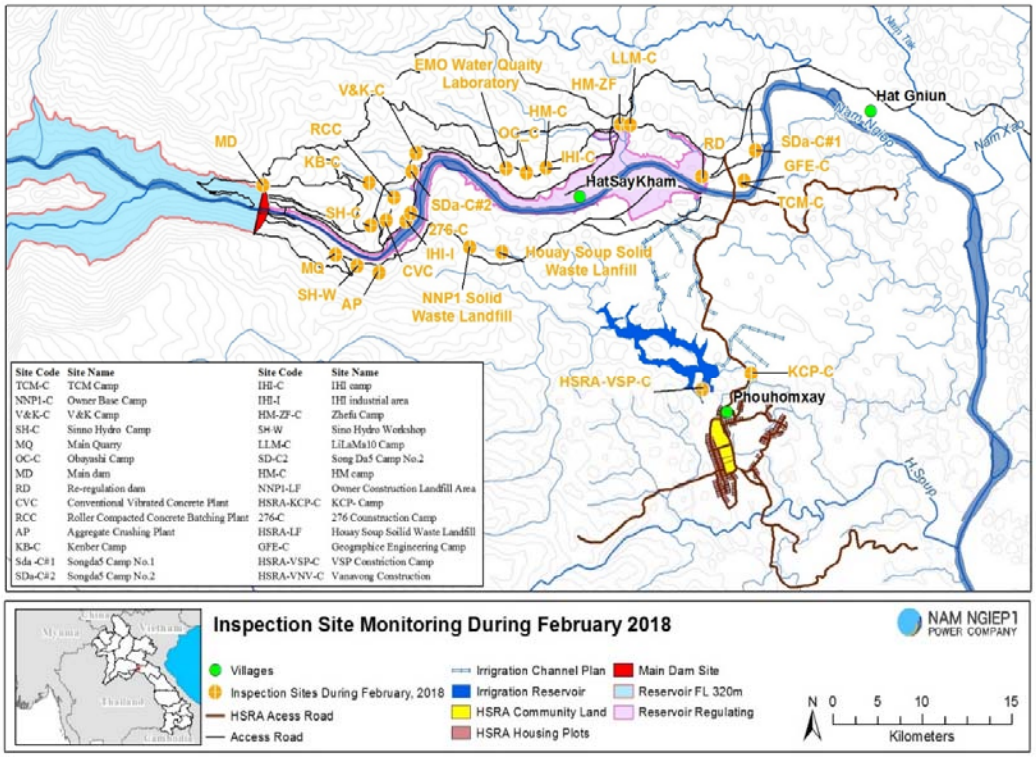
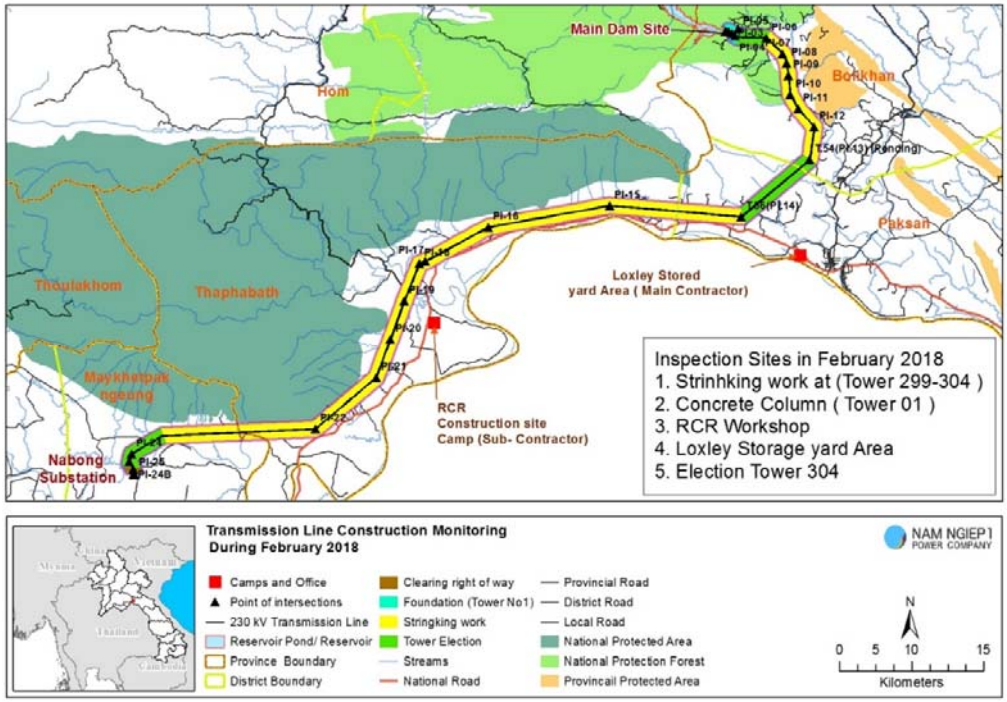


Figure 3-3: 230 kV Transmission Line Construction Monitoring



3.1.3 Inspection by Environment Management Unit

On 22 February 2018 the Environmental Management Unit (EMU) of Bolikhamxay Province carried out a site visit to NNP1. The findings including follow-up on of previous site

inspection findings. These were discussed and the EMU will issue a draft mission report for EMO comments by early March 2018.

3.2 Environmental Quality Monitoring

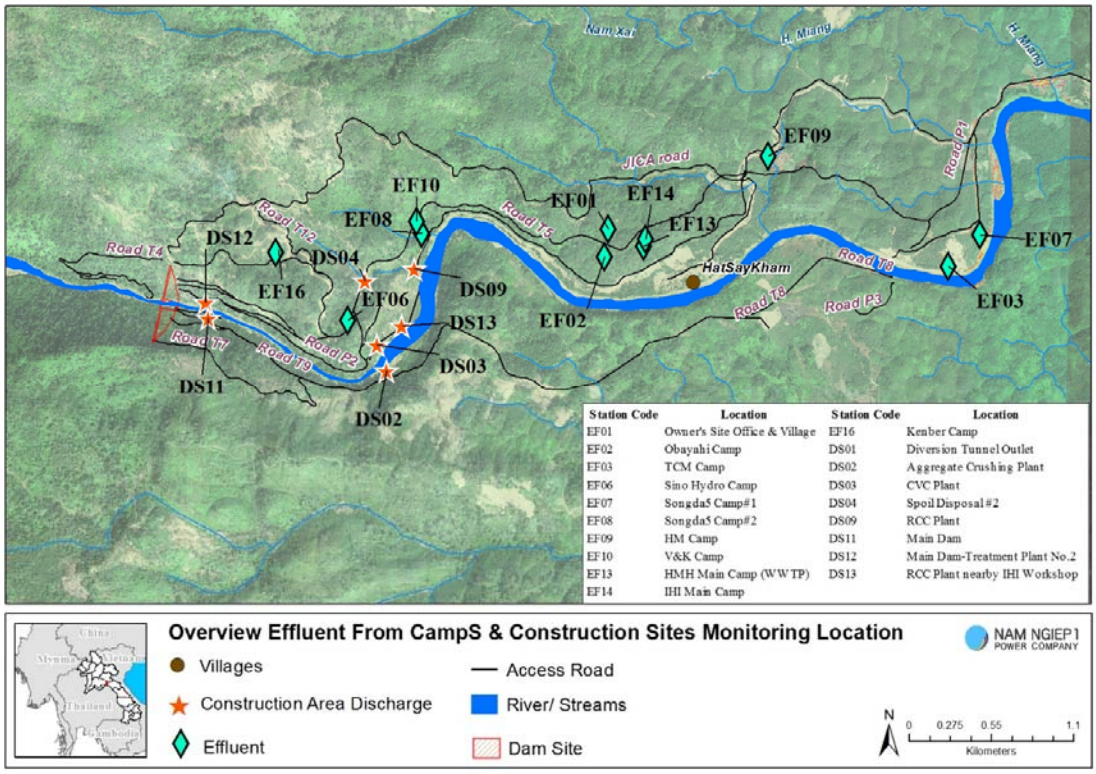
The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD5), faecal coliform, E. Coli bacteria and total coliform have been carried out by NNP1PC Environmental Laboratory since August 2017.

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 February 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 December 2017 indicate that all key parameters (BOD_5, total coliform and faecal coliform) are compliance with the relevant effluent standards, except at HMH Main Camp (for 08 January 2018) and at IHI Main Camp (for 22 January 2018).

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 total nitrogen for the first fortnightly sampling. Fully complied with the Effluent Standards in second fortnightly	No corrective action is required
Obayashi Corporation Camp	EF02	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen in the first fortnightly sampling. Fully complied with the Effluent Standards in second fortnightly	No corrective action is required
Sino Hydro Camp	EF06	Non-compliances 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
Song Da 5 Camp No. 1	EF07	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen	As above
Song Da 5 Camp No. 2	EF08	Non-compliance for COD, ammonia nitrogen, total nitrogen	As above
Zhefu Camp (Subcontractor of Hitachi-Mitsubishi Hydro)	EF09	Non-compliance for TSS, BOD_5, COD, ammonia nitrogen, total nitrogen, and total coliform	As above
V&K Camp	EF10		As above
H-MH Main Camp (WWTS)	EF13	Non-compliance for COD, NH_3-N, total nitrogen and Oil & grease	As above
IHI Main Camp	EF14	Non-compliance for BOD_5, TSS, residual chlorine, COD, NH_3-N, total nitrogen and Oil & grease	As above
Kenber Camp	EF16	Non-compliances for ammonia nitrogen (NH_3-N) and total nitrogen	As above
Main Dam Construction Area (Waste Water Treatment Plant No.1)	DS11	Full compliance	
Main Dam Construction Area (Waste Water Treatment Plant No.2)	DS12	No discharge during the missions	

Site	Sampling ID	Status	Corrective Actions
Main Dam Construction Area (Waste Water Treatment Plant No.3)	DS14	Non-compliance for pH and TSS	
Spoil Disposal Area No.2 (Song Da 5 Workshop)	DS04	Minor non-compliance for pH	
CVC Plant	DS03	No discharge during the sampling missions	
RCC Plant (discharge point at the weirs)	DS09	Full compliance	
RCC Plant (Discharge point nearby IHI Workshop)	DS13	No sampling at this point. The DS13 was joined with DS09	
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 February 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), BOD5 (mg/l), COD (mg/l), NH3-N (mg/l), NO3-N (mg/l), total coliform	All 14 stations

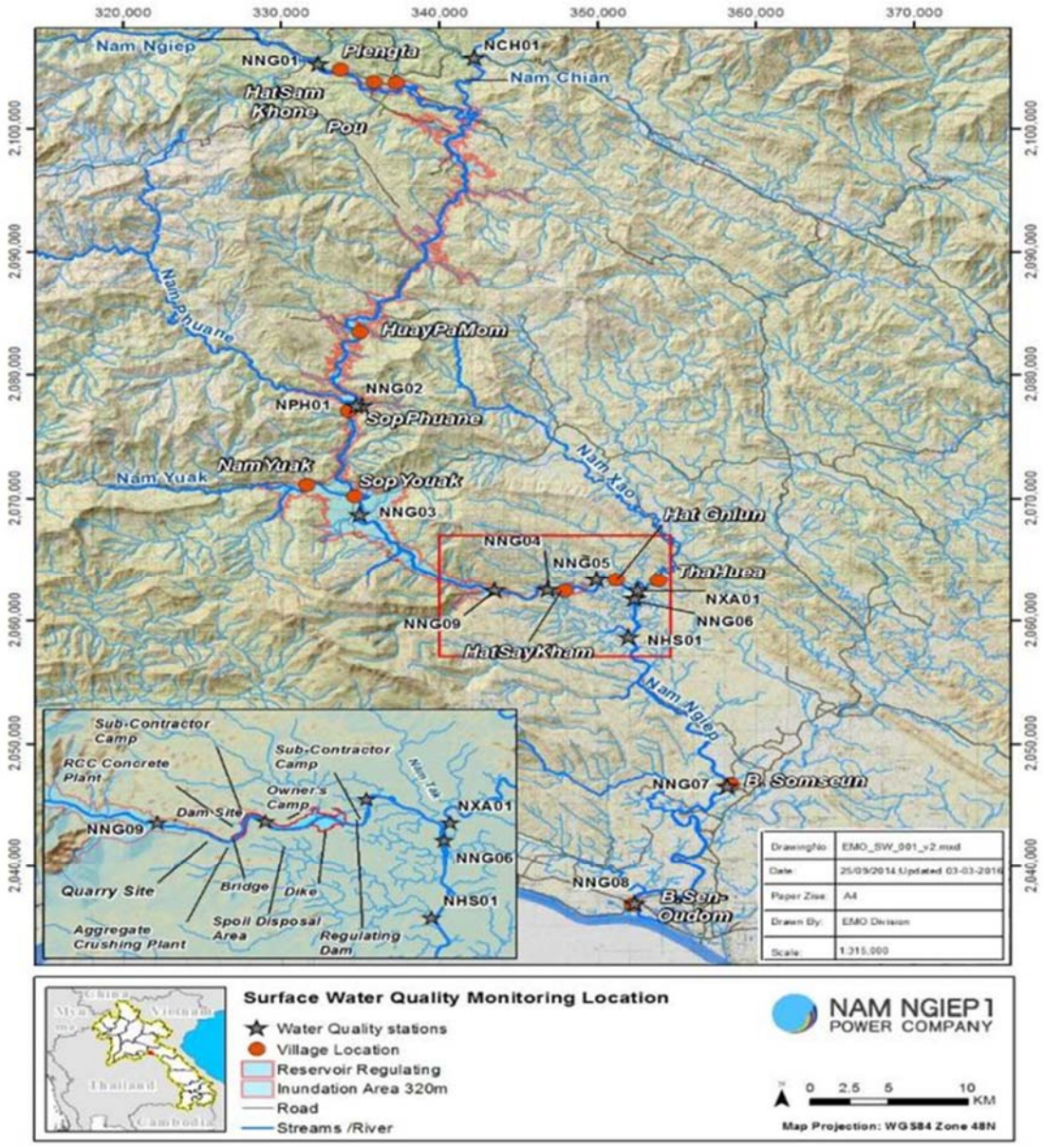
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
	(MPN/100 ml), faecal coliform (MPN/100 ml)	

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



The surface water quality data for February 2018 are all within the normal ranges as compared with previous data and there are no unusual results. Key findings for surface water quality monitoring (including the re-regulation reservoir) in February 2018.

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	06-Feb-18	07-Feb-18	07-Feb-18	08-Feb-18	08-Feb-18	08-Feb-18	08-Feb-18	08-Feb-18	08-Feb-18	08-Feb-18
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.01	7.14	7.18	7.01	7.03	7.06	7.07	7.1	7.01	6.84
Sat. DO (%)		96.9	100.3	103.1	102.5	99.2	100.5	104.4	105.5	98.9	98.8
DO (mg/l)	>6.0	9.21	9.25	9.3	8.79	9.11	9.14	9.45	9.45	9.21	9.02
Conductivity (µs/cm)		79.5	71.9	68.7	66.6	107	112	70.4	71.2	72.4	72.7
TDS (mg/l)		39	36	34.5	33.3	53	56	35.2	35.6	36	36
Temperature (°C)		16.2	18.2	20	23.2	18.56	20.06	19.5	20.4	18.5	19.1
Turbidity (NTU)		4.42	6.35	5.7	5.02	4.43	3.05	4.46	4.05	4.49	10.2
TSS (mg/l)		6.26	12.06	10.88	9.31	5.69	<5	<5	<5	6.26	28.19
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	9.9	<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	<0.2	0.69	<0.2	<0.2	<0.2	<0.2
NO_3-N (mg/l)	<5	0.07	0.07	0.06	0.06	0.06	0.02	0.04	0.04	0.05	0.04
Faecal coliform (MPN/100ml)	<1,000	350	79	79	170	47	79	79	49	33	79
Total Coliform (MPN/100ml)	<5,000	350	220	110	540	540	79	130	79	79	170

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	02-Feb-18	02-Feb-18	02-Feb-18	02-Feb-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	8.24	8.82	8.88	8.75
Sat. DO (%)		104.2	106.6	108.8	103.4
DO (mg/l)	>6.0	9.3	9.43	9.31	8.84
Conductivity (µs/cm)		73.5	105	114	75.8
TDS (mg/l)		36.5	56	57	37

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	02-Feb-18	02-Feb-18	02-Feb-18	02-Feb-18
Parameters (Unit)	**Guideline**				
Temperature (°C)		19.9	21.37	22.08	21.8
Turbidity (NTU)		4.95	3.28	3.16	5.3
TSS (mg/l)		7.47	6.04	3.76	3.36
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	130	4.5	2	22
Total Coliform (MPN/100ml)	<5,000	240	7.8	4.5	130

	River Name	Nam Ngiep			
	Zone	Location Refer to Construction Sites			
		Upstream	Within / Re-regulation Reservoir		Downstream
	Station Code	NNG09	NNG04 / R6	R7	NNG05
	Date	15-Feb-18	15-Feb-18	15-Feb-18	15-Feb-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.28	7.12	7.08	7.58
Sat. DO (%)		103.9	108.4	127.8	109.9
DO (mg/l)	>6.0	8.85	9.59	10.8	9.2
Conductivity (µs/cm)		75.6	115	111	73.8
TDS (mg/l)		37.5	57	56	36.5
Temperature (°C)		22.3	22.57	23.11	23.4
Turbidity (NTU)		4.6	4.13	2.66	3.77
TSS (mg/l)		7.87	4.76	2.7	5.26
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
Faecal coliform (MPN/100ml)	<1,000	34	23	34	40
Total Coliform (MPN/100ml)	<5,000	130	49	47	110

	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	20-Feb-18	21-Feb-18	21-Feb-18	22-Feb-18	22-Feb-18	22-Feb-18	22-Feb-18	22-Feb-18	22-Feb-18	22-Feb-18
Parameters (Unit)	**Guideline**										
pH	5.0 - 9.0	7.48	6.83	7.3	7.37	7.89	7.76	7.35	7.58	7.41	7.19
Sat. DO (%)		100	103.6	105.5	104.6	97.3	98.5	107.1	105.9	99.1	99.6
DO (mg/l)	>6.0	8.67	8.58	8.68	8.74	7.84	7.79	8.85	8.64	8.22	8.25
Conductivity (µs/cm)		81.6	80.9	77.3	77	76.9	76.4	77.7	77.3	79.9	77.8
TDS (mg/l)		40	40	38	38	38.45	38.2	38.85	38.65	39.95	38.9
Temperature (°C)		20.5	23.2	23.7	23.3	25.2	25.4	24	24.6	23.6	23.9
Turbidity (NTU)		3.34	3.79	3.53	6.62	8.7	2.25	5.25	5.45	4.74	9.27
TSS (mg/l)					13.5	13.85	2.62	8.47			
BOD_5 (mg/l)	<1.5				<1.0	<1.0	<1.0	<1.0			
Faecal coliform (MPN/100ml)	<1,000				140	94	0	70			
Total Coliform (MPN/100ml)	<5,000				920	920	9	170			

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-Feb-18	07-Feb-18	08-Feb-18	08-Feb-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.06	7.21	7.03	7
Sat. DO (%)		101.8	103.8	104.1	90.3
DO (mg/l)	>6.0	9.79	9.69	9.15	8.39
Conductivity (µs/cm)		36	55	121.7	55.1

	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-Feb-18	07-Feb-18	08-Feb-18	08-Feb-18
Parameters (Unit)	**Guideline**				
TDS (mg/l)		18	27.5	60.85	27.5
Temperature (°C)		15.5	17.5	21.3	18.1
Turbidity (NTU)		3.89	1.72	1.76	7.23
TSS (mg/l)		10.56	<5	<1	<5
BOD_5 (mg/l)	<1.5	<1.0	<1.0	<1.0	<1.0
COD (mg/l)	<5	<5.0	6.5	<5.0	<5.0
NH_3-N (mg/l)	<0.2	<0.2	<0.2	<0.2	<0.2
NO3-N (mg/l)	<5	0.13	0.03	<0.02	0.06
Faecal coliform (MPN/100ml)	<1,000	40	27	49	34
Total Coliform (MPN/100ml)	<5,000	350	130	130	140

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	20-Feb-18	21-Feb-18	22-Feb-18	22-Feb-18
Parameters (Unit)	**Guideline**				
pH	5.0 - 9.0	7.49	7.05	7.4	6.9
Sat. DO (%)		104.3	104.8	98.5	88.1
DO (mg/l)	>6.0	8.67	8.69	7.85	7.24
Conductivity (µs/cm)		41.3	58.7	134.3	52.3
TDS (mg/l)		41.3	29	67.15	26.15
Temperature (°C)		18.8	23.1	25.9	24.3

	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	20-Feb-18	21-Feb-18	22-Feb-18	22-Feb-18
Parameters (Unit)	**Guideline**				
Turbidity (NTU)		2.13	1.95	2.38	5.81

3.2.3 Groundwater Quality Monitoring

During February 2018, groundwater quality was monitored at two (GHSP03 and GHSP06) of the originally six water wells installed for Phouhomxay Village. The other four 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. In addition, analyses were carried out on water from two new boreholes at Somsuen Village, one at Nam Pa Village, and one at Thong Noi Village.

All water wells complied with the groundwater quality standards for water supply purposes. The results of Phouhomxay groundwater were communicated to villagers and the local health centre as part of public health programme, whilst the groundwater monitoring results for Somsuen, NamPa and ThongNoi villages will be communicated to villagers using those new boreholes.

Figure 3-6: Groundwater Quality Monitoring Locations

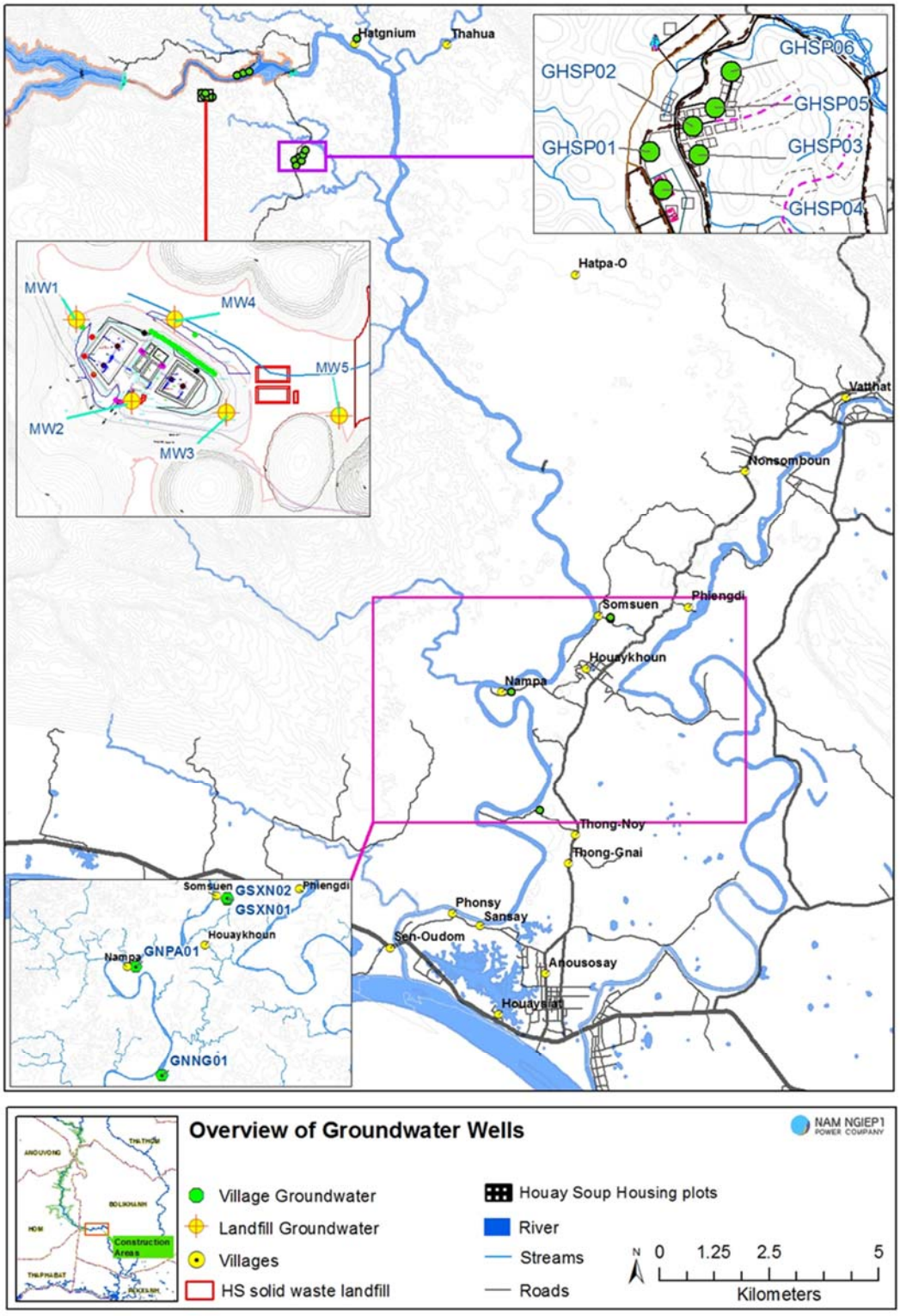


Table 3-10: Groundwater Quality Monitoring Results in Phouhomxay Village, Somsuen, Nam Pa and Songkhone Villages

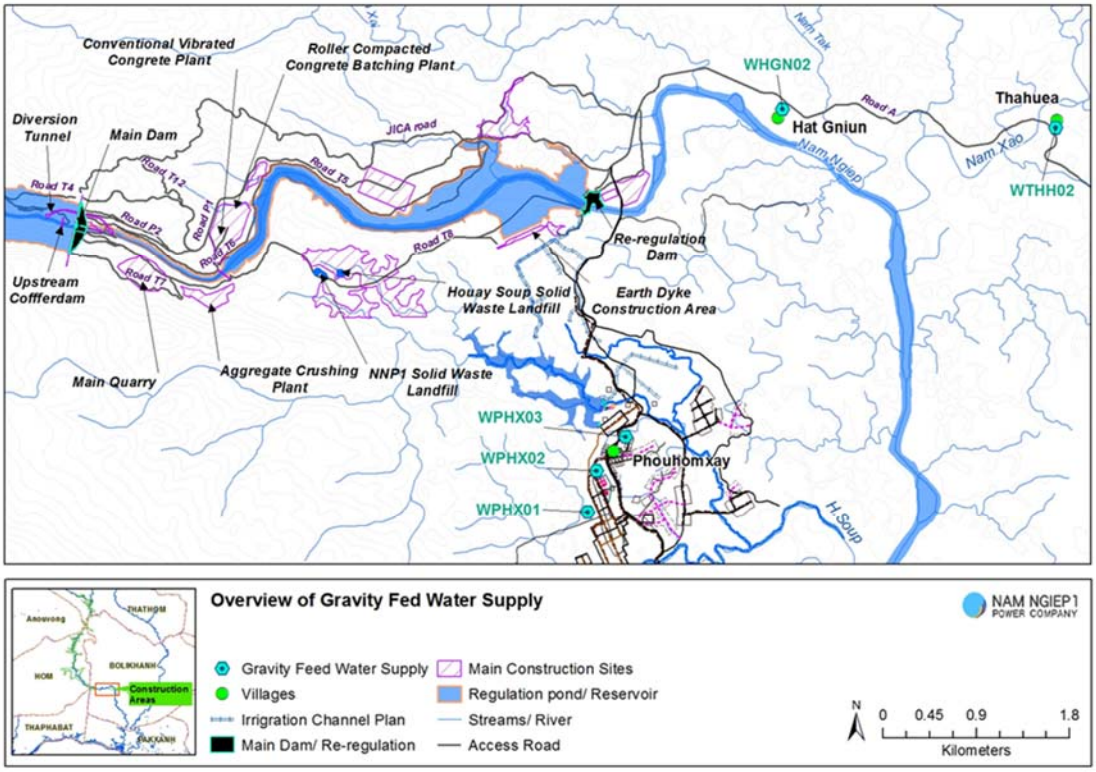
Parameter (Unit)	Guideline	GHSP03 Phouhomxay	GHSP06 Phouhomxay
		13-Feb-18	13-Feb-18
pH	6.5 - 9.2	6.65	7.16
Sat. DO (%)		73.7	85.6
DO (mg/l)		6.11	6.97
Conductivity (µS/cm)		379	357
TDS (mg/l)	1200	189	178
Temperature (°C)		24.2	25
Turbidity (NTU)	<20	0.71	0.76
Fecal coliform (MPN/100ml)	0	0	0
E.coli Bacteria (MPN/100ml)	0	0	0

	Village Name	Somseun Village		Nam Pa Village	Thong Noi Village
	Station	GSXN01	GSXN02	GNPA01	GTHN01
	Date	13-Feb-18	13-Feb-18	13-Feb-18	13-Feb-18
Parameter (Unit)	Guideline				
pH	6.5 - 8.6	6.7	6.8	6.69	6.57
Sat. DO (%)		53.6	43.6	32.7	28.2
DO (mg/l)		4.22	3.38	2.52	1.4
Conductivity (µS/cm)	<1,000	153.6	260	317	336
TDS (mg/l)	<600	76.5	130	158	168
Temperature (°C)	<35	21	21.6	21.7	25.1
Turbidity (NTU)	<10	7.62	1.88	1.29	1.65
Faecal Coliform (MPN/100ml)	0	0	0	0	0
E.coli Bacteria (MPN/100ml)	0	0	0	0	0

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

During January 2018, water samples were taken from the taps at Thahuea, Hat Gniun and Phouhomxay villages.

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, however, local villagers were informed about the results and encouraged to boil the water before drinking.

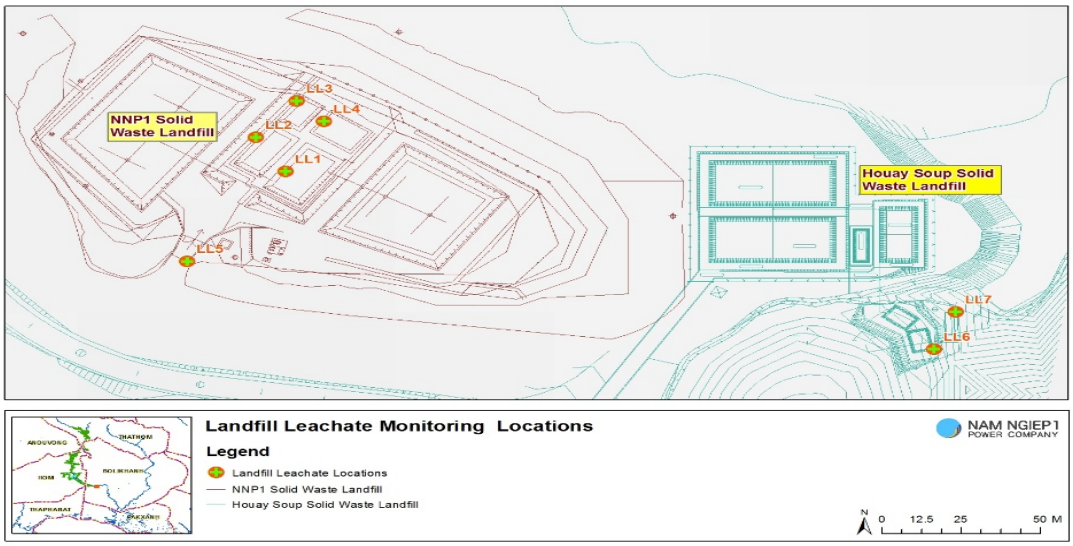
Table 3-11: Result Gravity Fed Water Supply (GFWS) Quality Monitoring

	Village Name	Thahuea	Hat Gniun	Phouhomxay		
	Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
	Date	13-Feb-18	13-Feb-18	13-Feb-18	13-Feb-18	13-Feb-18
Parameter (Unit)	Guideline					
pH	6.5 - 8.6	7.27	7.63	7.53	6.23	There was no water at the tap during the mission
Sat. DO (%)		101.8	119.4	95.1	108.3	
DO (mg/l)		8.71	10.27	8.17	8.28	
Conductivity (µS/cm)	<1,000	53.5	79.3	21.5	18.45	
TDS (mg/l)	<600	26.5	39.5	10.5	9.2	
Temperature (°C)	<35	22.6	22.5	22.2	22.4	
Turbidity (NTU)	<10	0.95	2.48	2.87	2.23	
Faecal Coliform (MPN/100ml)	0	34	11	34	41	
E.coli Bacteria (MPN/100ml)	0	34	11	34	41	

3.2.5 Landfill Groundwater Monitoring

During February 2018, no landfill leachate monitoring was conducted for NNP1 Solid Waste Landfill and Houay Soup Solid Waste Landfill due to no generation of leachate from the pits and no discharge.

Figure 3-8 Landfill Leachate Monitoring Location



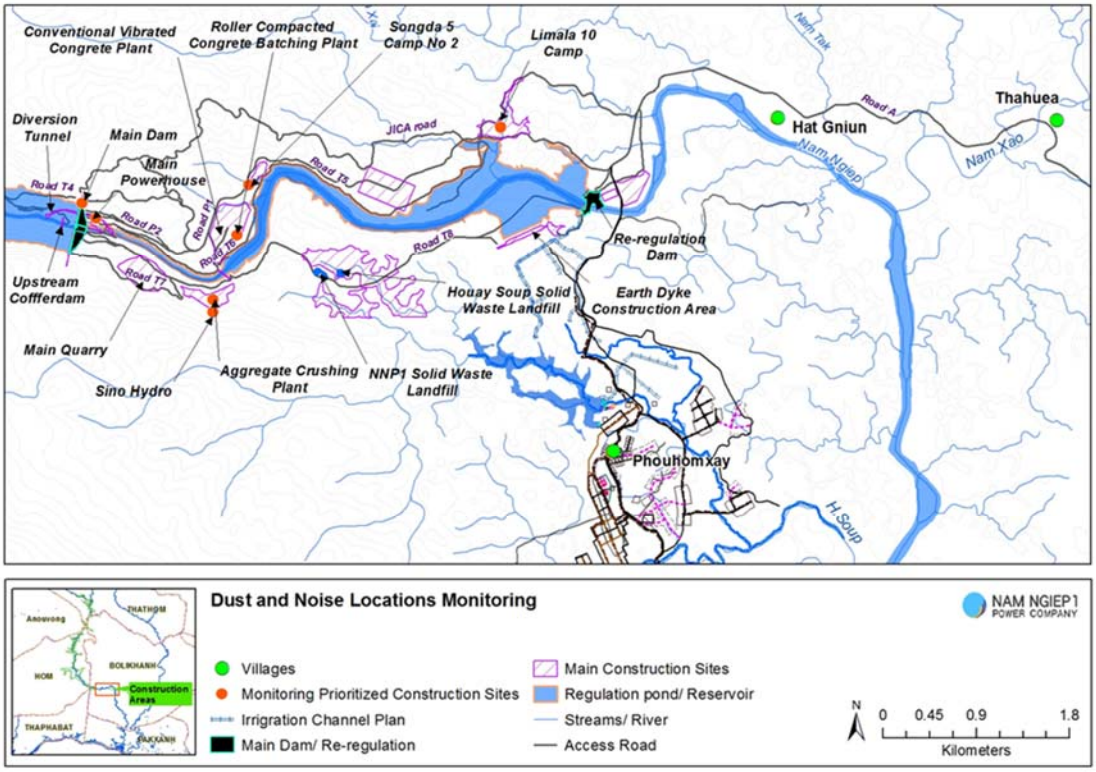
3.2.6 Dust Monitoring

The monitoring points are indicated on the map in ***Figure 1-9***. The results indicate compliance with the National Standard at all monitored stations, except at the main powerhouse and Phouhomxay Village. All staff were advised to wear dust masks while working in the area of the main powerhouse. In addition, the elevated ambient dust concentrations at Phouhomxay Village is likely caused by slash-and-burn activities in the agriculture area. The results are presented in ***Annex 2***.

3.2.7 Noise Monitoring

During February 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 the main powerhouse.

Figure 3-9: Noise and Dust Emission Monitoring Locations



The results at all stations (except Hat Gniun Village and Main Powerhouse) indicated compliance with National Standard for the period of 06:01-22:00. The noise levels during 06:01-18:00 were higher than the Standard at the Main Powerhouse.

3.3 PROJECT WASTE MANAGEMENT

3.3.1 Solid Waste Management

In February 2018, an approximate 156.9 m3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 25.8 m3 compared to January 2018. Spot checks of waste bags were conducted on a daily basis before the disposal.

A total of 468.5 kg of recyclable waste was sold to Khounmixay processing factory by the Contractors as shown in ***Table 3-12.***

Table 3-12: Amounts of Recyclable Waste Sold

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by February 2018
Construction activity				
1	Scrap metal	kg	123	38,403
	Sub-Total 1	**kg**	**303**	**38,403**
Operation camp				
2	Glass bottles	kg	208	2,406
3	Plastic bottles	kg	33	217.5
4	Paper/Cardboard	kg	76	146
5	Aluminium can	kg	28.5	39.5
	Sub-Total 2	**kg**	**345.5**	**2,809**
	Grand Total 1+2	**kg**	**468.5**	**41,212**

A total of 8,476 kg food waste was collected in February 2018 from selected camps by villagers of Phouhomxay for use as animal feed – an increase of 1,712 kg compared to January 2018.

Table 3-13 Amounts of Food Waste Collected by Villagers

NO.	SITE NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	3,252
2	Song Da 5 Camp No. 1	kg	2,696
3	Obayashi Corporation Camp	kg	1,444
4	Owner's Village and Site Office (OSOV)	kg	697
5	LILAMA 10 Camp	kg	215
6	Kenber Camp	kg	172
Total		**kg**	**8,476**

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 February 2018 (A)	Disposed (B)	Remainder (A - B)
1	Used hydraulic and engine oil	litre (l)	5,320	270	5,050
2	Contaminated soil, sawdust and concrete	kg	545	0	545
3	Used tire	No.	326	17	309
4	Used oil filters	No.	255	6	249
5	Empty contaminated bitumen drum/container	drum (200 l)	243	12	231
6	Empty used chemical drum/container	Drum (20 litre)	211	0	211
7	Empty paint and spray cans	can	196	0	196
8	Empty used oil drum/container	drum (20 l)	167	12	155
9	Ink cartridge	No.	99	0	99
10	Halogen/fluorescent bulbs	No.	81	0	81
11	Empty used oil drum/container	drum (200 l)	96	28	68
12	Empty used chemical drum/container	drum (200 l)	78	17	61
13	Contaminated textile and material	kg	28	0	28
14	Lead acid batteries	No.	22	0	22
15	Clinical waste	kg	14	0	14
16	Lithium-ion batteries	No.	7	0	7
17	Acid and caustic cleaners	Bottle	3	0	3

No.	Hazardous Waste Type	Unit	Total in February 2018 (A)	Disposed (B)	Remainder (A - B)
18	Cement bag	bag	0	0	0
19	Used oil mixed with water	litre (l)	0	0	0

On 08 February 2018, EMO and administration staff from OSOV produced a total of 250 kg compost made from grass, cow dung, rice husks, molasses, bio-effect (BE) and discarded vegetables and fruits from the canteens of OSOV and contractors and subcontractors.

3.4 Community Waste Management

3.4.1 Community Recycling Programme

In February 2018, a total of 266.5 kg of recyclable waste was recorded at the Community Waste Bank, an increasing of 2 kg compared to January 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 January 2018	Additions in February 2018	Sold	Remaining in February 2018
Scrap metal	kg	410	4	414	0
Glass bottles	kg	1,206.5	128.5	0	1,335
Paper/cardboard	kg	256	83	339	0
Aluminium cans	kg	152.2	5.5	158	0
Plastic bottles	kg	497	45.5	542.5	0
Total	**kg**	**2,260**	**266.5**		**1,335**

3.4.2 Houay Soup Resettlement Area Waste Management

In December 2017, the Phoukham Chanvong (PKC Co. Ltd) started operation of Houay Soup Landfill under a one-year contract. The works include solid waste collection and transportation from Phouhomxay, Thahuea, Hat Gniun villages to Houay Soup Landfill for three days/week (Mondays, Wednesdays and Fridays), waste segregation, waste compaction and waste covering at the Houay Soup Landfill.

In February 2018, approximate of 74 m3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed at the Houay Soup Landfill.

3.4.3 Waste Clean-up in Four Villages at 2LR

The waste clean-up in four villages at zone 2LR namely Houaypamom, Sopphouane, Sopyouk (Nong) and Namyouak villages, Hom Ddistrict, Xaysomboun Province was commenced on 29 November 2017, the work progress was 76 % as of 28 February 2018. The waste clean-up activities including combustible waste collection and stockpiling before burning, waste segregation, and toilet waste treatment using lime 15 kg/m3 – 20 kg/m3.

3.5 Watershed and Biodiversity Management

3.5.1 Watershed Management

The Nam Ngiep 1 Watershed and Reservoir Protection Committee (WRPC) and its secretariat (WRPO) are expected to be reconstituted and the meeting for plan approval will be decided once the reconstituted organization is in place.

3.5.1.1 PREPARATION OF PROVINCIAL REGULATION FOR THE WATERSHED MANAGEMENT

The final draft of Provincial watershed management regulations was further improved through a workshop on 20-22 February 2018. During the discussions with the Provincial Vice Governor of Xaysomboun Province in late January 2018, the approval process was suggested to be concluded at National level; however, this still needs to be determined and the finalization of the regulations has therefore been postponed.

3.5.2 Biodiversity Offset Management

3.5.2.1 PREPARATION OF BIODIVERSITY OFFSET MANAGEMENT PLAN

The Biodiversity Impact Mitigation and Offset Proposal (No Net Loss Forecast) was presented to the Vice-Governor of Bolikhamxay, the Vice-Governor of Xaysomboun Province, NNP1 Watershed and Reservoir Protection Committee (WRPC), and NNP1 Biodiversity Offset Management Committee (BOMC). The Vice-Governors of both provinces and the committees (WRPC and BOMC) agreed with the proposal.

The preparation of NNP1 Biodiversity Offset Management Plan (BOMP) continues with several studies/surveys started since January 2018. At the end of February 2018, the land use and natural resources survey and the threat assessment survey in Nam Chouane – Nam Xang (NCNX) offset site were completed. The Totally Protected Zone (TPZ) survey, aquatic biodiversity survey, and herpetology survey in NNP1 Watershed will be started in parallel with the Forest Classification and Habitat Mapping in NCNX offset site starting from March 2018.

3.5.2.2 IMPLEMENTATION OF PRE-BIODIVERSITY OFFSET MANAGEMENT PLAN

The second pre-BOMP was reviewed by NNP1PC, IAP and BAC in December 2017, and further improvements were made by BOMC in cooperation with NNP1PC and submitted to ADB for approval. ADB provided the comments in the third week of January 2018 and approved the proposal on 13 February 2018. NNP1PC is processing the fund disbursement which will cover 6 months of implementation until the BOMP is ready.

3.5.3 Biomass Clearance

As of 28 February 2018, a total of 1,097.04 ha out of 1,640 ha, is accepted as fully cleared and another 543.71 ha remain to be fully completed.

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

Target Area		Progress as of 28 February 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	63.25
B2	158.63	158.63	103.98
B3	80.35	80.35	80.35
B4	163.74	1 63.74	163.74
B5	340.14	340.14	221.18
B6	31.92	31.92	31.92
B7	39.65	39.65	29.41
B8	37.61	37.61	34.76
B9	52.75	52.75	14.24
B10	269.10	269.10	111.72
B11	89.98	89.98	89.98
B12	64.11	64.11	10.00
B13	101.24	101.24	44.16
B14	43.33	43.33	43.33
B15	43.73	43.73	43.74
B16	3.32	3.32	3.32
B17	7.96	7.96	7.96
B18	3.95	3.95	0.00
Total	**1,640.75**	**1,640.75**	**1,097.04**

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 February 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 1.6 kg/household/day in January 2018. The estimated total fish catch in Nam Ngiep basin for January 2018 is 39,000 kg. Around 38 % of the catch was sold, 52% 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 February 2018

	Site Name	Owner's Site Office and Village		Obayashi Camp		Sino Hydro Camp	
	Station Code	EF01		EF02		EF06	
		05-Feb-18	**19-Feb-18**	**05-Feb-18**	**19-Feb-18**	**05-Feb-18**	**19-Feb-18**
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	6.71	6.97	7.4	6.99	7.49	7.38
Sat. DO (%)		42.5	54.9	73.2	85.7	71.8	71.7
DO (mg/l)		3.56	4.39	6.04	6.49	6.17	5.77
Conductivity (µS/cm)		414	395	687	478	632	679
TDS (mg/l)		207	197	343	239	316	339
Temperature (°C)		23.1	25.2	24.4	28.3	22.1	25
Turbidity (NTU)		0.93	0.82	17.6	5.79	9.66	11.3
TSS (mg/l)	<50	<5	<5	6.5	10.68	<5	5.53
BOD_5 (mg/l)	<30	6.33	9.9	<6	<6	<6	29.1
COD (mg/l)	<125	<25	<25	76.3	41.6	36.8	47.2
NH_3-N (mg/l)	<10	3.2	8.8	24.3	8	<1.5	37.3
Total Nitrogen (mg/l)	<10	14.2	9.7	25.2	9.39	26.7	38.4
Total Phosphorus (mg/l)	<2.0	0.86	1.37	1.49	0.51	1.83	1.79
Faecal Coliform (MPN/100 ml)		2	2	0	0	0	33
Total Coliform (MPN/100 ml)	<400	2	2	0	0	0	33
Oil & Grease (mg/l)	<10	<1	n/a	<1	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	n/a	n/a	0.34	0.84	0.13	0.04
Chlorination Dosing Rate (ml/mn)		n/a	n/a	310	420	460	320
Effluent Discharge Volume (l/mn)		6	6		12	2	12

	Site Name	Song Da 5 Camp No.1		Song Da 5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.47	7.59	7.63	7.52	6.66	7.25
Sat. DO (%)		79.4	84.7	72.8	72.6	88.6	50.7
DO (mg/l)		6.84	6.42	6.38	5.89	7.49	4.06
Conductivity (µS/cm)		1,656	1,676	797	793	188	296
TDS (mg/l)		828	838	398	396	94	148
Temperature (°C)		22.4	30.3	21.3	24.7	24.2	25.4
Turbidity (NTU)		14.1	13.5	31.4	30.7	5.89	2.54
TSS (mg/l)	<50	25.42	29.91	34.8	33.33	8.83	<5
BOD_5 (mg/l)	<30	<6	18.42	<6	<6	<6	<6
COD (mg/l)	<125	82.1	110	177	132	<25	30.1
NH_3-N (mg/l)	<10	22.4	32.6	44.9	43.9	<2	4.7
Total Nitrogen (mg/l)	<10	25.4	33	45.3	44.2	1.37	5.36
Total Phosphorus (mg/l)	<2.0	1.19	1.28	1.71	1.7	0.17	0.39
Faecal Coliform (MPN/100 ml)		0	0	0	0	0	7.8
Total Coliform (MPN/100 ml)	<400	0	0	0	0	0	7.8

	Site Name	Song Da 5 Camp No.1		Song Da 5 Camp No.2		V & K Camp	
	Station Code	EF07		EF08		EF10	
		05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18
Parameter (Unit)	Guideline in the CA						
Oil & Grease (mg/l)	<10	<1	n/a	3	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	0.28	0.36	1.15	1.6	4.9	0.08
Chlorination Dosing Rate (ml/mn)		255	65	1,100	360	22	40
Effluent Discharge Volume (l/mn)		12	60	12	60		6

	Site Name	HM Main Camp		IHI Camp		Kenber Camp	
	Station Code	EF13		EF14		EF16	
		05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18	05-Feb-18	19-Feb-18
Parameter (Unit)	Guideline in the CA						
pH	6.0-9.0	7.54	7.07	7.11	7.79	7.65	8.3
Sat. DO (%)		67.7	76.7	47	27	99.6	82.1
DO (mg/l)		5.72	58.9	3.96	5.1	8.57	6.66
Conductivity (µS/cm)		872	709	732	1,050	226	506
TDS (mg/l)		436	354	366	525	113	253
Temperature (°C)		22.8	29	22.9	27.1	20.8	24.1
Turbidity (NTU)		15.8	17.5	25.7	24	5.88	4.85
TSS (mg/l)	<50	34.49	31.95	37.98	20.06	7.77	10.54
BOD_5 (mg/l)	<30	<6	<6	47.28	<6	<6	<6
COD (mg/l)	<125	264	147	298	160	<25	45.4
NH_3-N (mg/l)	<10	24.2	14.6	16.2	29	2.5	13.7
Total Nitrogen (mg/l)	<10	24.8	15.2	17.5	29.6	6.03	14.4
Total Phosphorus (mg/l)	<2.0	1.56	1.45	1.5	1.52	0.62	1.06
Faecal Coliform (MPN/100 ml)		0	0	0	0	0	0
Total Coliform (MPN/100 ml)	<400	0	0	0	0	0	0
Oil & Grease (mg/l)	<10	13	n/a	11	n/a	<1	n/a
Residual Chlorine (mg/l)	<1.0	0.43	0.65	0.16	2.25	0.45	0.9
Chlorination Dosing Rate (ml/mn)		3.1	3.1	0	0	20	52
Effluent Discharge Volume (l/mn)		4.2	4.2	12	0		3

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

	Site Name	Spoil Disposal No.2			
	Station Code	DS04			
	Date	02-Feb-18	08-Feb-18	15-Feb-18	22-Feb-18
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	7.84	6.06	5.9	5.67
Sat. DO (%)		76.5	77	68	52.5
DO (mg/l)		6.29	6.22	5.27	4.18
Conductivity (µs/cm)		45.9	41.5	53.4	54.4
TDS (mg/l)		23	20.5	26.8	27
Temperature (°C)		24	24.8	26.9	25.5
Turbidity (NTU)		4.16	4.83	5.11	8.06
TSS (mg/l)	<50	6.08	2.63	5.45	5.69
Oil & Grease (mg/l)	<10		<1		

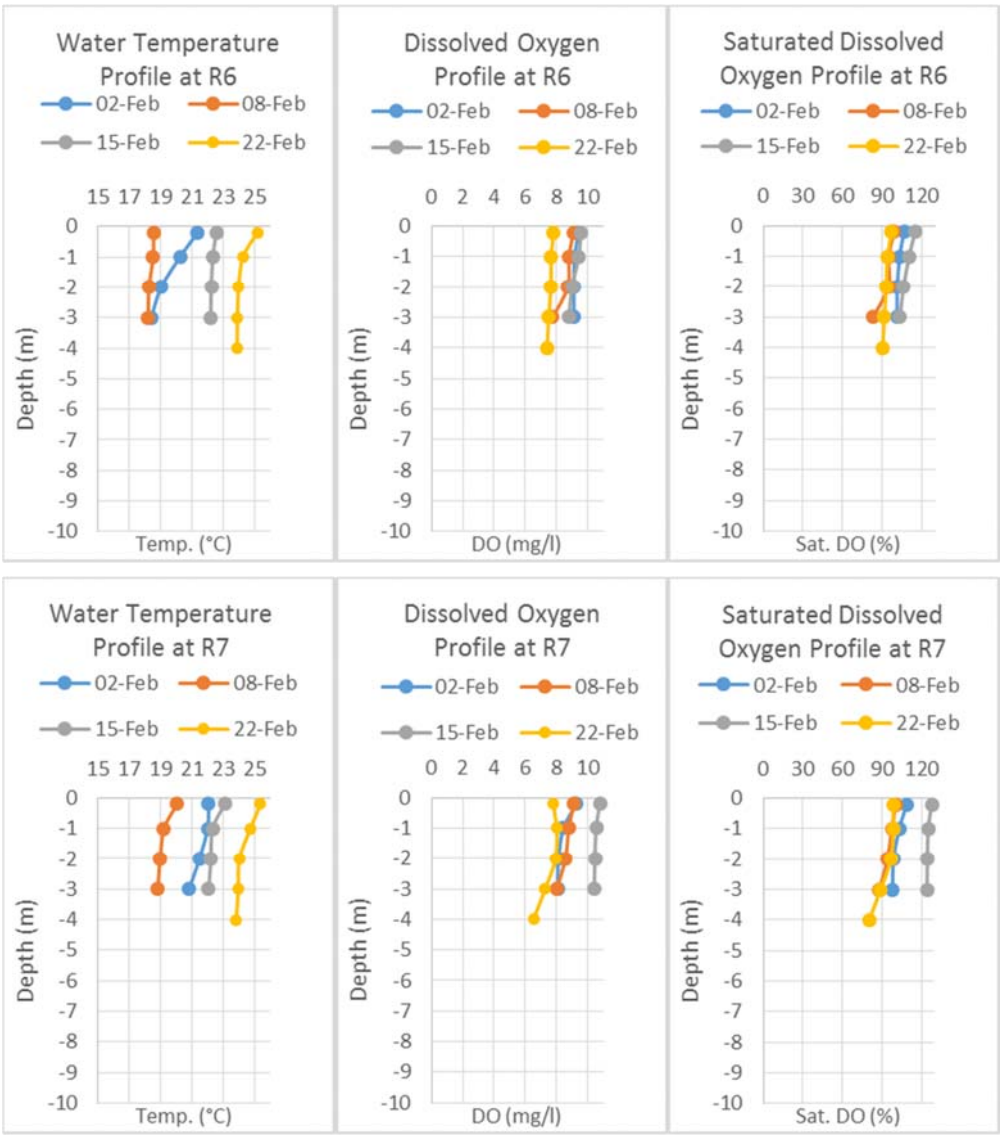
	Site Name	RCC Plant Discharge at lower ponds			
	Station Code	DS09			
	Date	02-Feb-18	08-Feb-18	15-Feb-18	22-Feb-18
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	8.32	6.9	7	7.05
Sat. DO (%)		89.9	87.6	98.2	95.8
DO (mg/l)		7.46	7.4	7.53	7.71
Conductivity (µs/cm)		295	307	287	303
TDS (mg/l)		147	153	143.5	151.5
Temperature (°C)		23.6	23	27.7	25
Turbidity (NTU)		11.4	18.7	9.5	12.2
TSS (mg/l)	<50	22.72	42.16	16.71	26.33
Oil & Grease (mg/l)	<10		<1		

	Site Name	Aggregate Crushing Plant			
	Station Code	DS02			
	Date	02-Feb-18	08-Feb-18	15-Feb-18	22-Feb-18
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0	No Discharge	No Discharge	No Discharge	7.09
Sat. DO (%)					113.5
DO (mg/l)					8.93
Conductivity (µs/cm)					166.8
TDS (mg/l)					83
Temperature (°C)					26.3
Turbidity (NTU)					12.3
TSS (mg/l)	<50				20.96
Oil & Grease (mg/l)	<10				<1.0

	Site Name	Main Dam's Waste Water Treatment Plant No.1				Main Dam's Waste Water Treatment Plant No.2
	Station Code	DS11				DS12
	Date	02-Feb-18	08-Feb-18	15-Feb-18	22-Feb-18	
Parameter (Unit)	**Guideline**					
pH	6.0 - 9.0	8.53		6.64	6.93	
Sat. DO (%)		106.6		105.9	104.2	
DO (mg/l)		9.02		8.2	8.21	
Conductivity (µs/cm)		2.22		930	543	
TDS (mg/l)		1		465	271	
Temperature (°C)		22.5		27.2	26.1	
Turbidity (NTU)		3.81		1.65	1.63	
TSS (mg/l)	<50	9.18		6.36	8.7	
Oil & Grease (mg/l)	<10	<1.0				No Discharge

	Site Name	Main Dam's Waste Water Treatment Plant No.3			
	Station Code	DS14			
	Date	02-Feb-18	08-Feb-18	15-Feb-18	22-Feb-18
Parameter (Unit)	**Guideline**				
pH	6.0 - 9.0		9.99	10.84	4.72
Sat. DO (%)			101.4	104	104.3
DO (mg/l)			8.52	7.91	8.16
Conductivity (µs/cm)			4290	746	3.11
TDS (mg/l)			2145	373	1
Temperature (°C)			23.1	28.1	26.4
Turbidity (NTU)			6,720	9.13	23.3
TSS (mg/l)	<50		8,272	43.9	110.48
Oil & Grease (mg/l)	<10		<1		

Table A- 3: ***Temperature and Dissolved Oxygen Depth Profile Results of the Re-regulation Reservoir Monitoring in*** **February 2018**



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	05/02/2018 18:00	06/02/2018 18:01	07/02/2018 18:01
End Time	06/02/2018 18:00	07/02/2018 18:00	08/02/2018 18:00
Average Data Record in 24h (mg/m3)	0.029	0.030	0.025
Guideline Average in 24h (mg/m3)	***0.12***	***0.12***	***0.12***

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

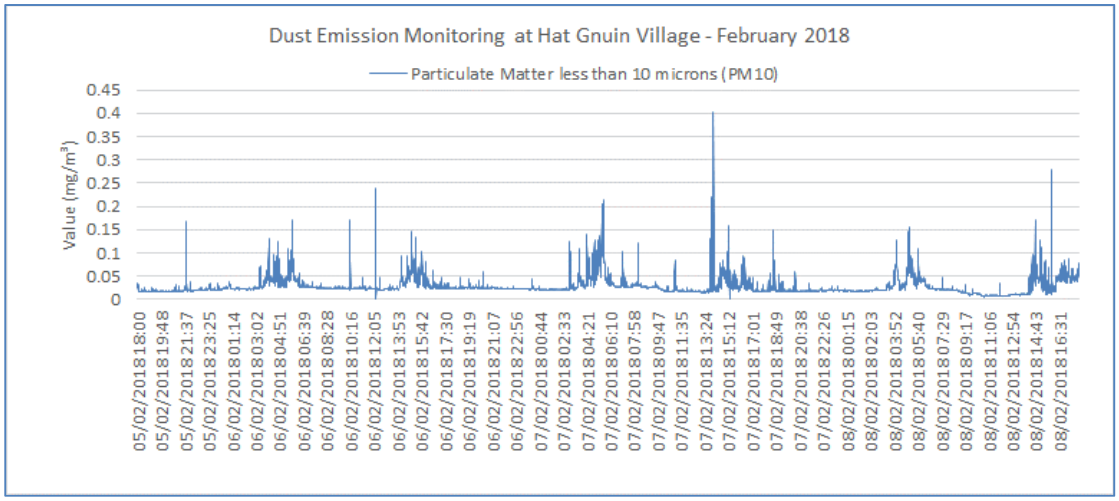


Table B- 2: 24-hour Average Dust Concentrations Measured in Phouhomxay Village

Phouhomxay village - 24 Hours Average Particulate Matter (PM10) Concentration			
Period	00 to 24 Hours	24 to 48 Hours	48 to 72 Hours
Start Time	19/02/2018 18:00	20/02/2018 18:00	21/02/2018 18:00
End Time	20/02/2018 18:00	21/02/2018 18:00	22/02/2018 18:00
Average Data Record in 24h (mg/m3)	0.171	0.155	0.061
Guideline Average in 24h (mg/m3)	***0.12***	***0.12***	***0.12***

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

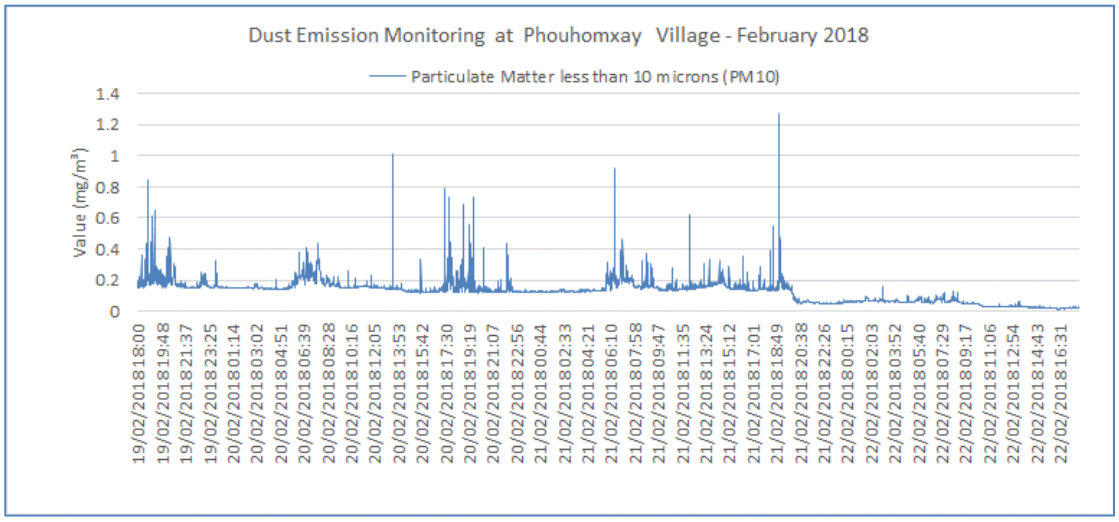


Figure B- 3: Dust Monitoring Results at the Aggregate Crushing Plant in February 2018

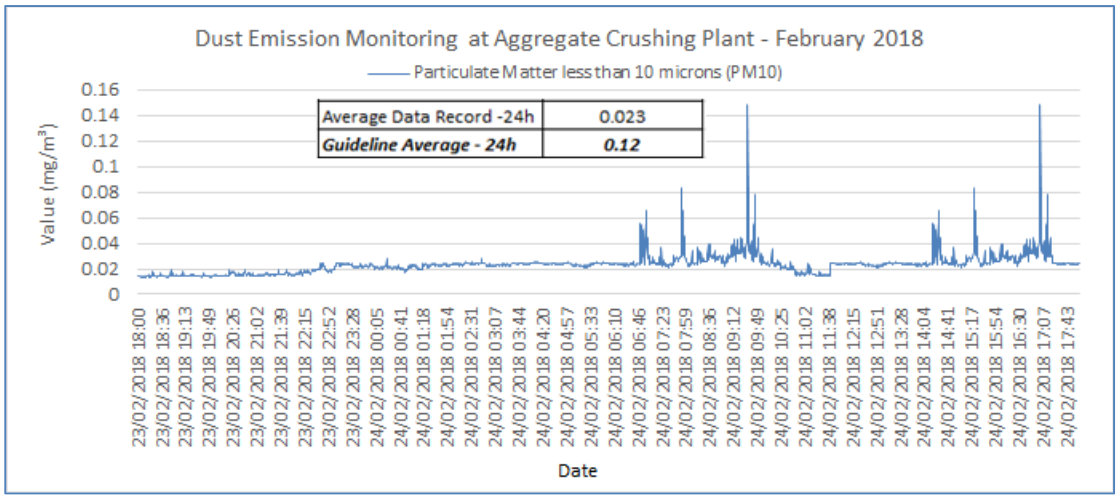


Figure B- 4: Dust Monitoring Results at the RCC Plant in February 2018

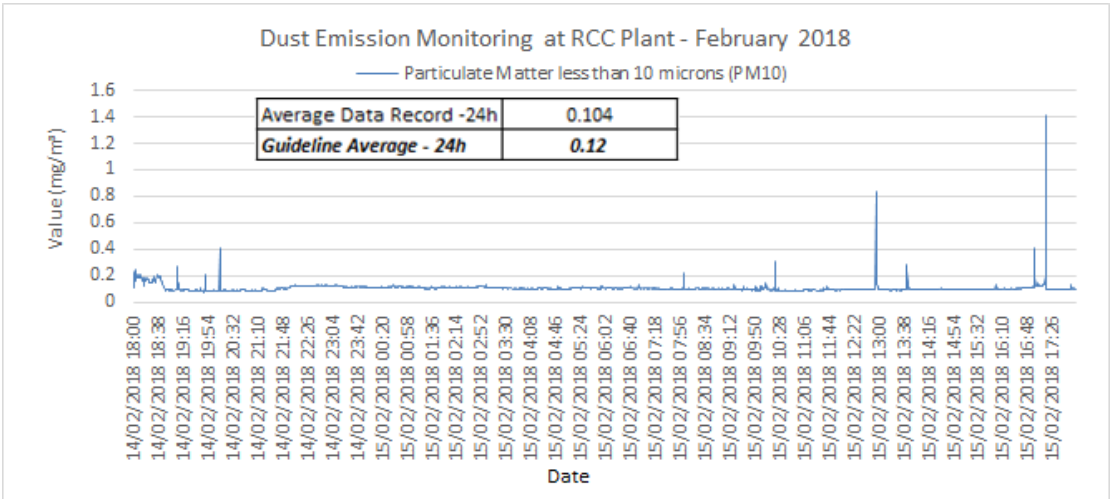


Figure B- 5: Dust Monitoring Results at the Sino Hydro Temporary Camp in February 2018

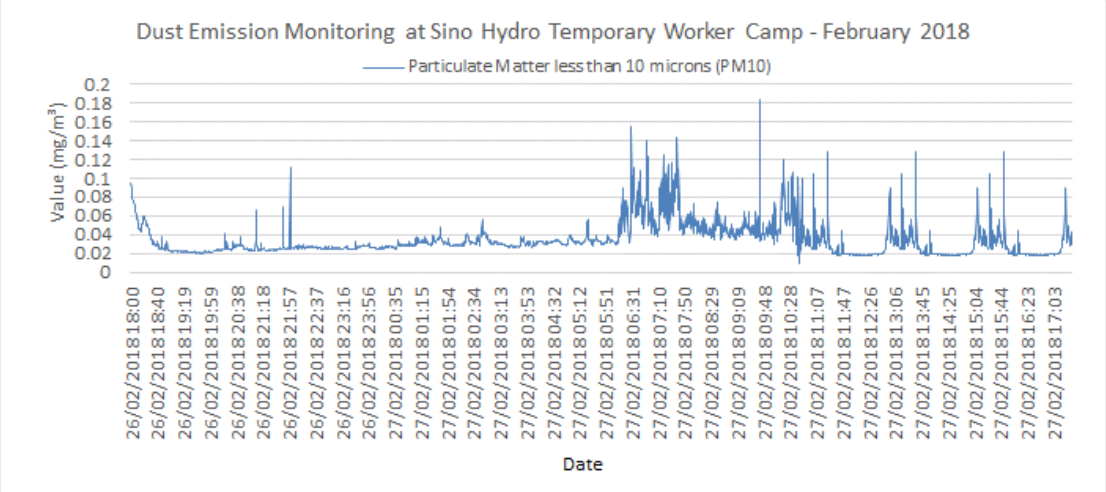


Figure B- 6: Dust Monitoring Results at the SongDa5 No.2 Camp in February *2018*

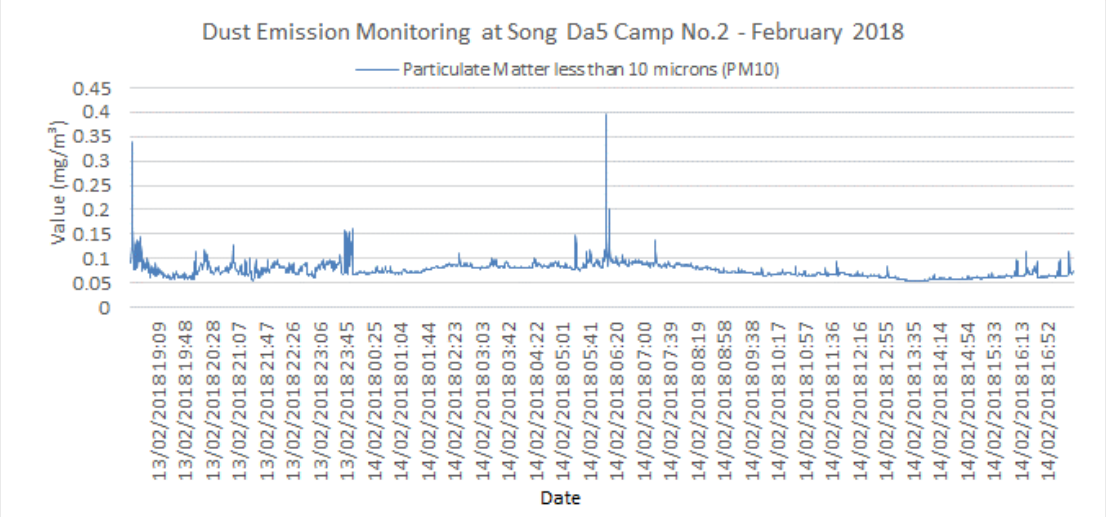


Figure B- 7: Dust Monitoring Results at Main Dam (Top View Left Bank) in January 2018

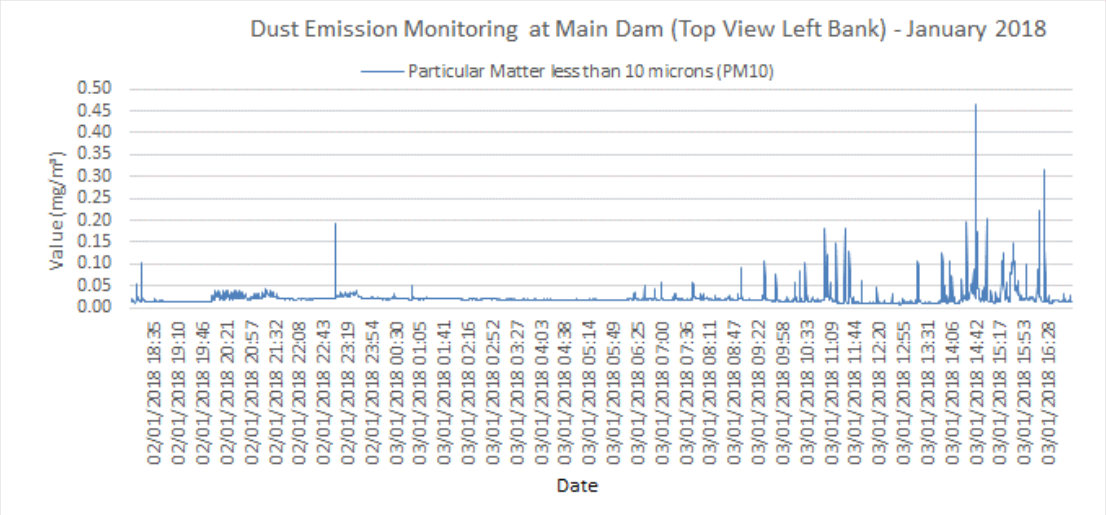


Figure B- 8: Dust Monitoring Results at the Lilama10 Camp in February 2018

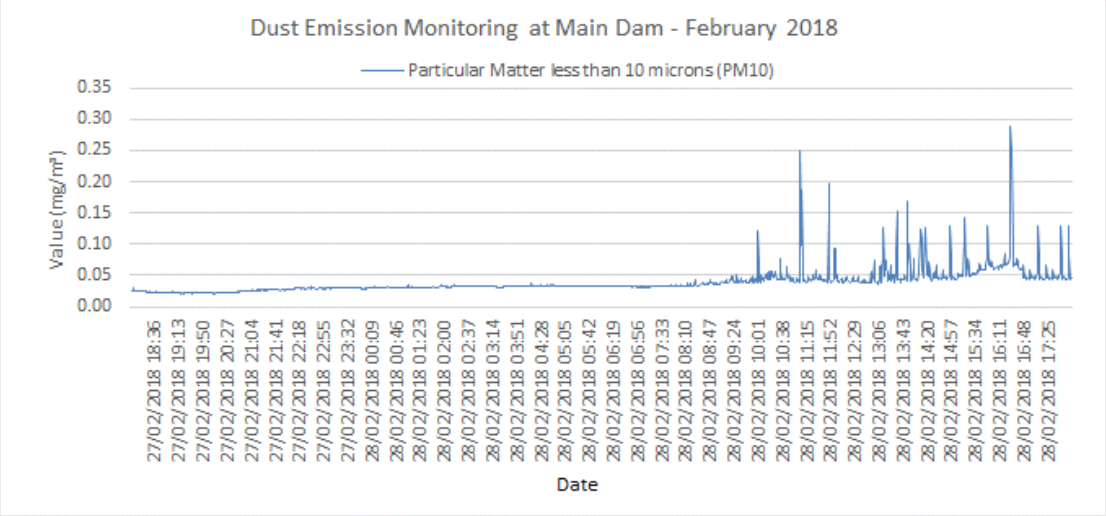


Figure B- 9: Dust Monitoring Results at the Main Powerhouse in February 2018

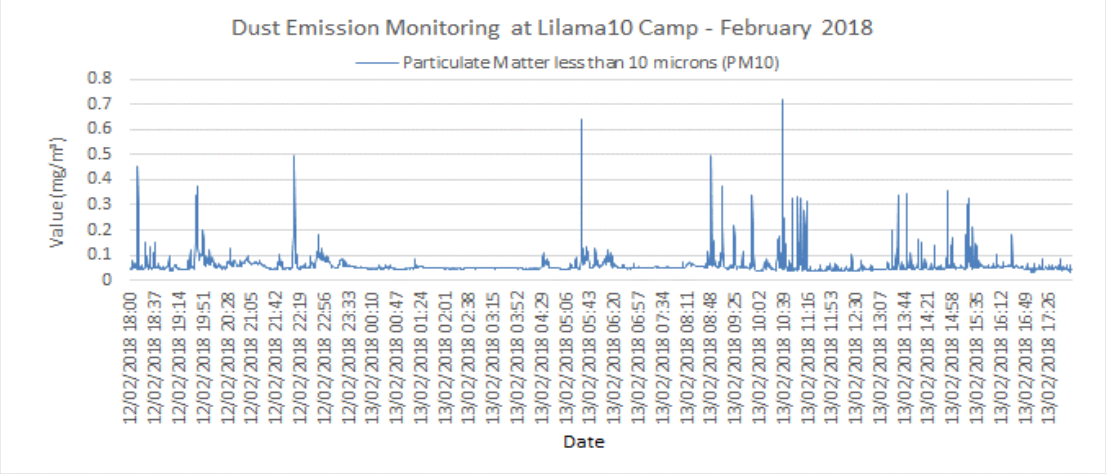
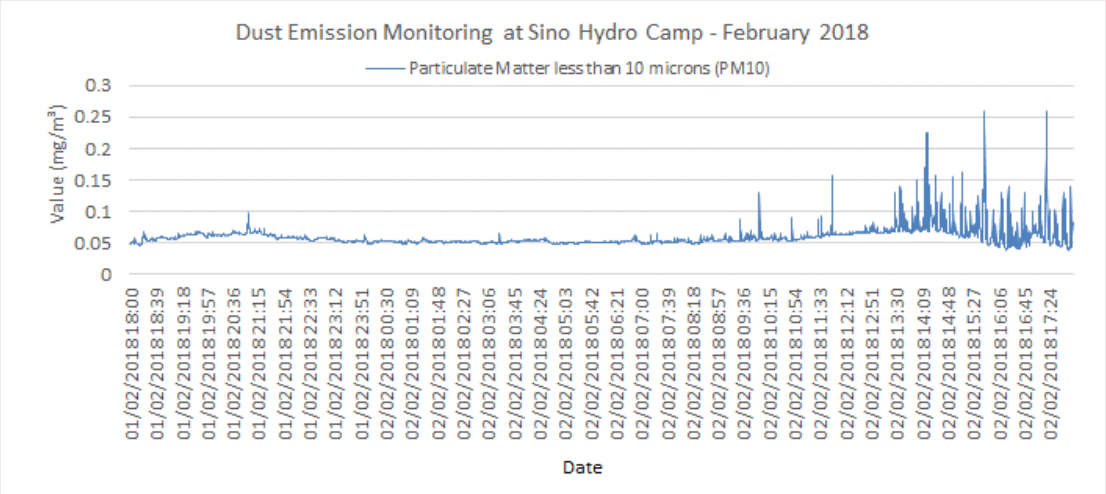


Figure B-10: Dust Monitoring Results at the Sino Hydro Camp in February 2018



ANNEX C: AMBIENT NOISE DATA

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

Noise Level (dB)	05-06/February/18			06-07/February/18			07-08/February/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	70.20	62.40	67.10	60.10	54.50	66.30	65.70	63.20	70.20
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	41.46	35.32	45.18	41.62	37.65	43.92	40.55	41.06	43.34
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

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

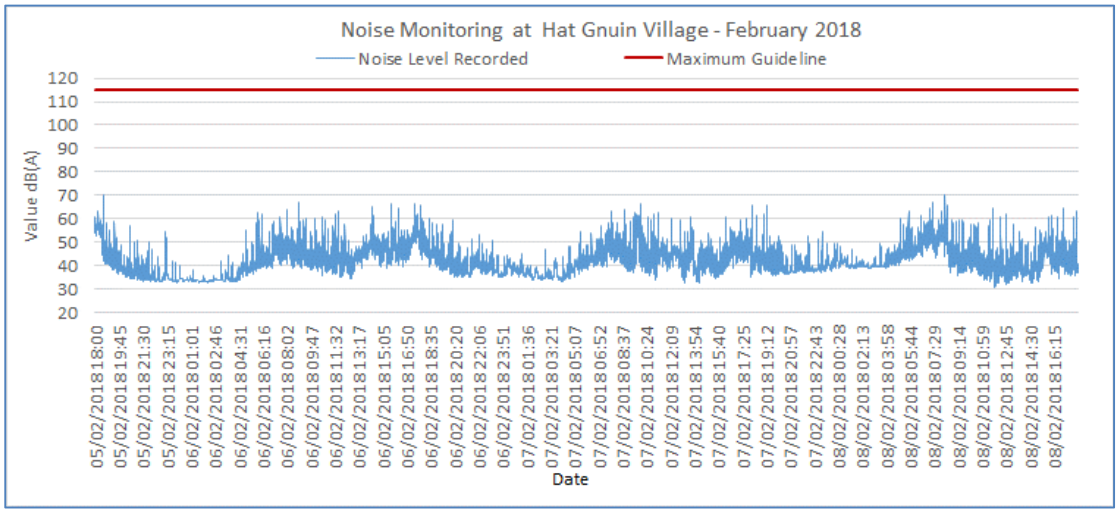


Table C- 2 Average Results of Noise Monitoring at Phouhomxay Village in February 2018

Noise Level (dB)	19-20/February/18			20-21/February/18			21-22/February/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	52.70	52.70	63.60	66.90	67.30	71.20	56.60	56.80	62.20
Guideline Max	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***	***115***
Average Data Recorded	40.35	37.80	40.58	45.33	40.30	43.02	41.68	40.87	41.86
Guideline Averaged	***55***	***45***	***55***	***55***	***45***	***55***	***55***	***45***	***55***

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

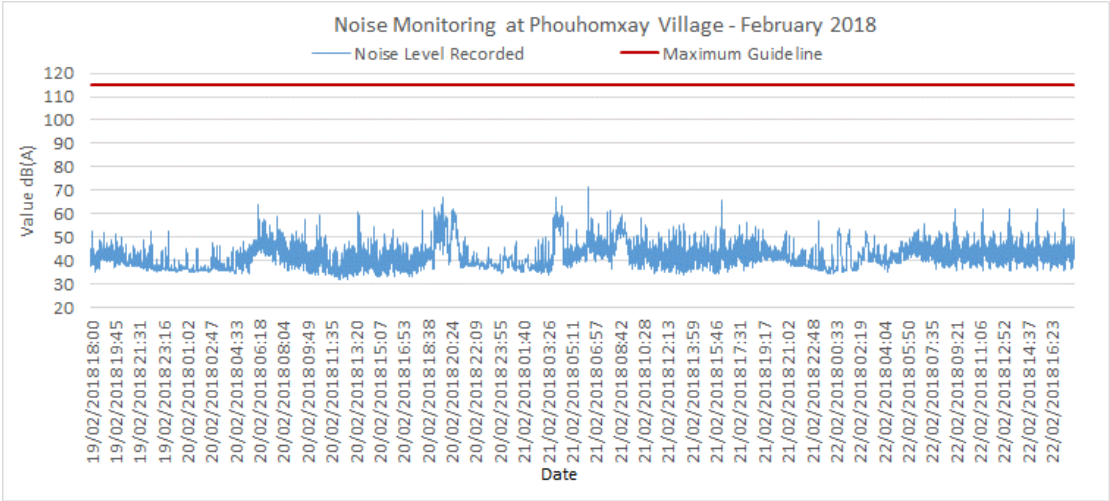


Table C-3 and Table C-4: Average Results of Noise Monitoring at Aggregate Crushing Plant and RCC Plant in February 2018

Aggregate Crushing Plant ***RCC Plant***

Noise Level (dB)	23-24/February/18		24/February/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	55.3	48.2	69.5
Guideline Max	*115*	*115*	*115*
Average Data Recorded	41.24	39.79	50.86
Guideline Averaged	*70*	*70*	*70*

Noise Level (dB)	14-15/February/18		15/February/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Maximum Value Recorded	66.5	56.4	74.5
Guideline Max	*115*	*115*	*115*
Average Data Recorded	48.72	43.50	40.78
Guideline Averaged	*70*	*70*	*70*

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

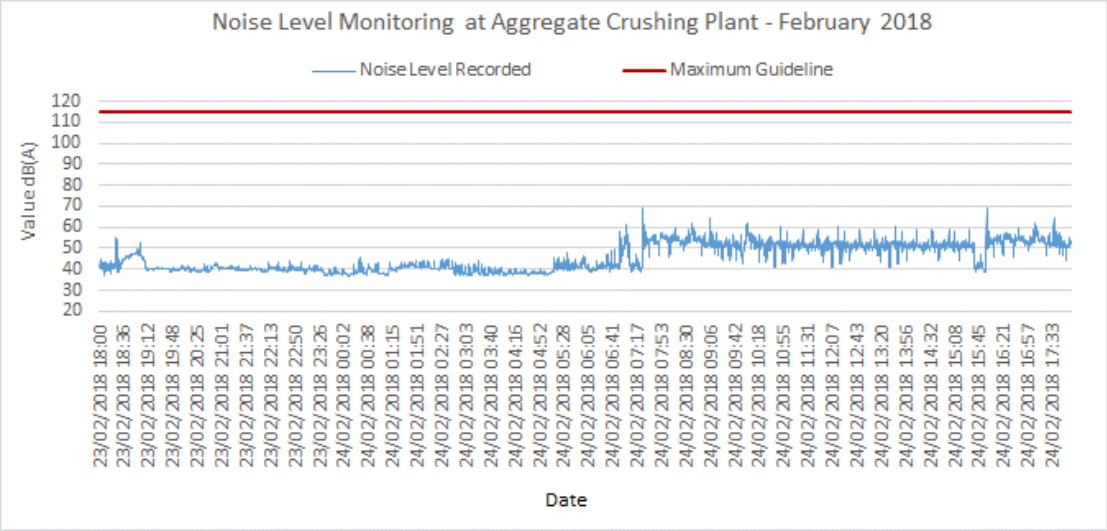


Figure C-*4*: Results of Noise Level Monitoring at the RCC Plant in February 2018

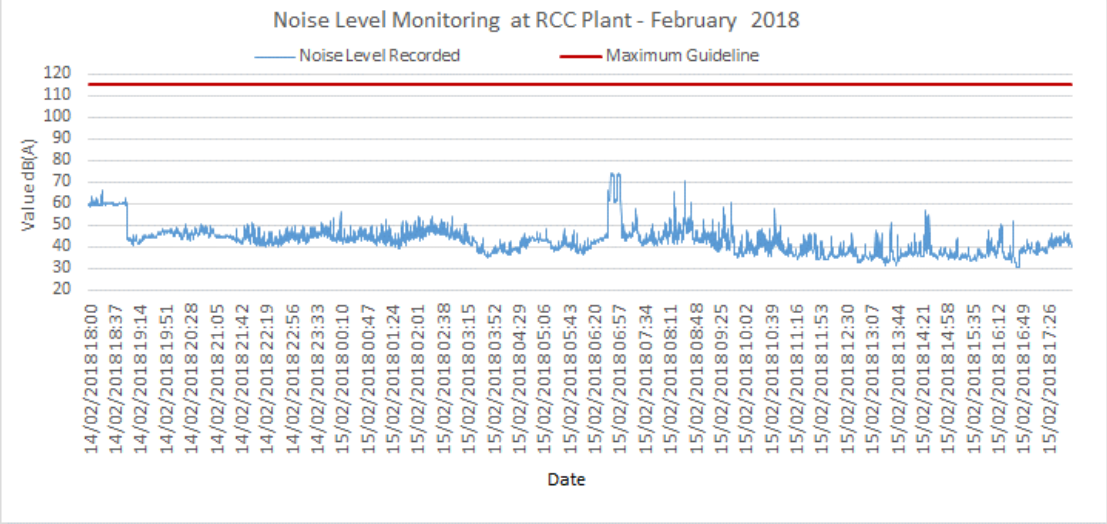


Table C- 5 and Table C- 6: Average Results of Noise Monitoring at Song Da5 Camp No. 2 and Sino Hydro Camp in February 2018

Song Da5 Camp No.2 ***Sino Hydro Temporary Worker Camp***

Noise Level (dB)	13-14/February/18		14/February/18	Noise Level (dB)	26-27/February/18		27/February/1
	18:30 – 22:00	22:01 – 06:00	06:01-17:		18:00 – 22:00	22:01 – 06:00	06:01-17:30
Maximum Value Recorded	54	59	67	Maximum Value Recorded	59.7	51.1	68.
Guideline Max	*115*	*115*	*11*	*Guideline Max*	*115*	*115*	*11*
Average Data Recorded	50.97	45.70	44.(	Average Data Recorded	46.21	41.85	52.6
Guideline Averaged	*70*	*50*	*7*	*Guideline Averaged*	*70*	*50*	*7*

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

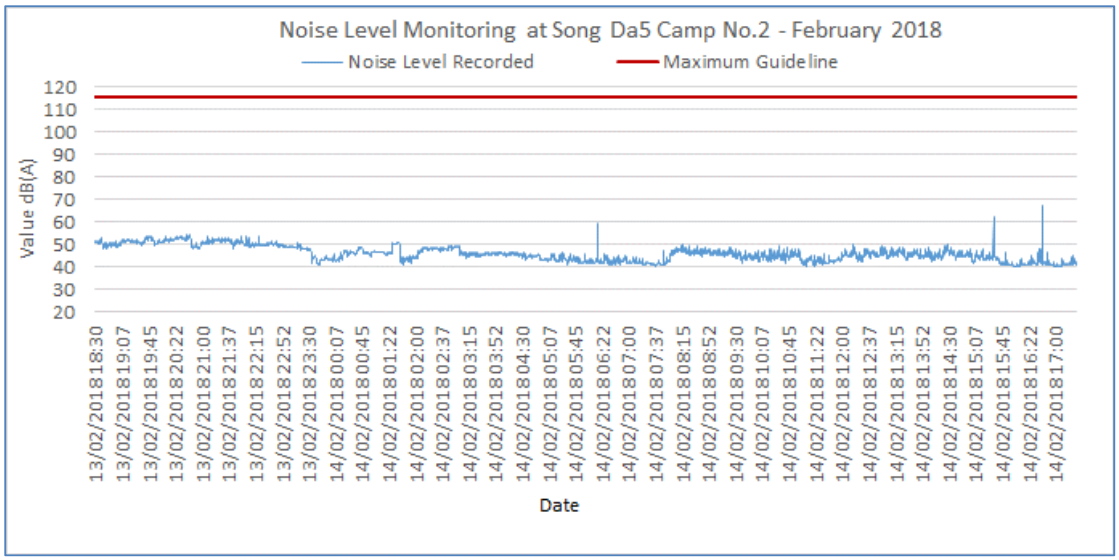


Figure C- 6: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp in February 2018

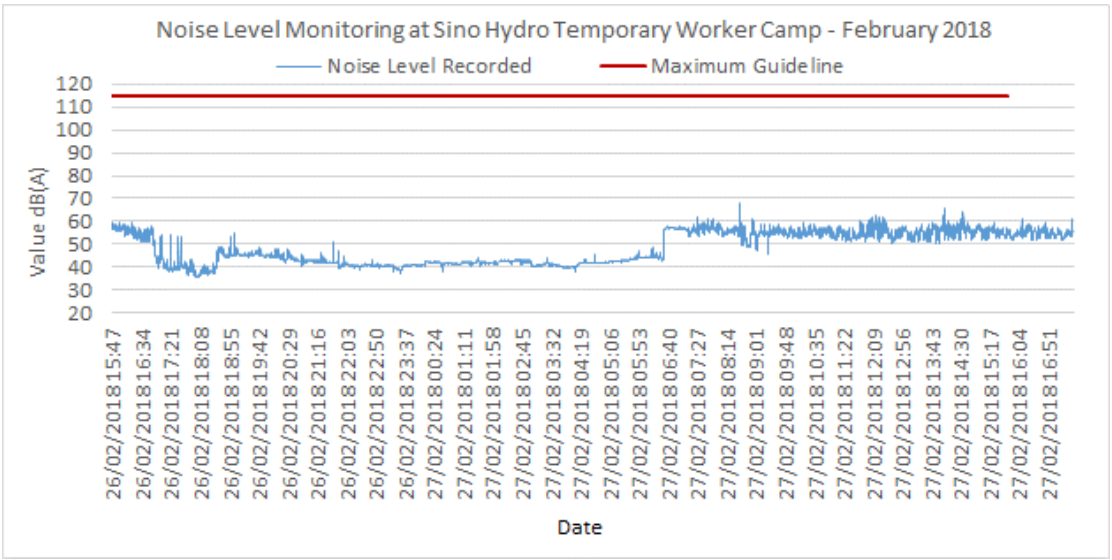


Table C- 8 and Table C- *9: Average Results of Noise Monitoring at Main Dam, and Lilama 10 Camp in February 2018*

Main Dam

Noise Level (dB)	27-28/February/18		28/February/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	68.1	67.7	63.9
Guideline Max	*115*	*115*	*115*
Data Record Average	55.52	55.21	54.27
Guideline Averaged	*70*	*70*	*70*

Lilama 10 Camp

Noise Level (dB)	12-13/February/2018		13/February/2018
	18:00 – 22:00	22:01 – 06:00	06:00-18:00
Maximum Value Recorded	64.4	62.2	69.4
Guideline Max	*115*	*115*	*115*
Average Data Recorded	47.19	37.54	46.41
Guideline Averaged	*70*	*50*	*70*

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

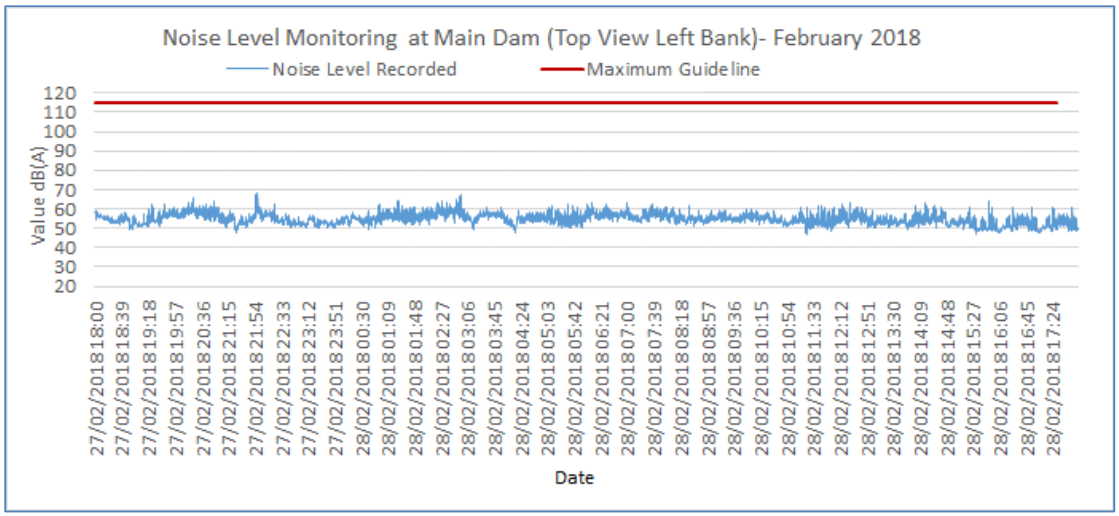


Figure C- 8: Results of Noise Level Monitoring at Lilama10 Camp* in *February 2018

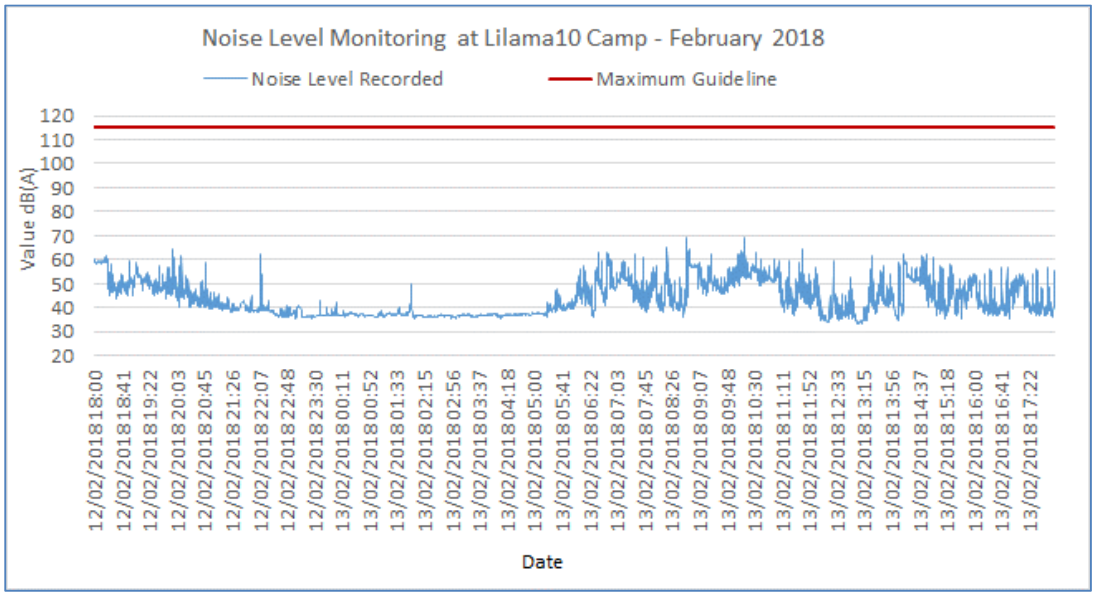


Table C-9 and Table C-10: Average Results of Noise Monitoring at Main Powerhouse, and Sino Hydro Camp in February 2018

Main Powerhouse

Noise Level (dB)	09-10/February/18		10/February/18
	18:00 – 22:00	22:01 – 06:00	06:01-18:00
Data Record Max	77.2	83.5	84.7
Guideline Max	***115***	***115***	***115***
Data Record Average	67.90	73.17	73.84
Guideline Averaged	***70***	***70***	***70***

Sino Hydro Camp

Noise Level (dB)	01-02/February/18		02/February/18
	18:00 – 22:00	22:01 – 06:00	06:01-17:30
Maximum Value Recorded	58.9	60.2	61.4
Guideline Max	***115***	***115***	***115***
Average Data Recorded	42.24	42.60	45.11
Guideline Averaged	***70***	***70***	***70***

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

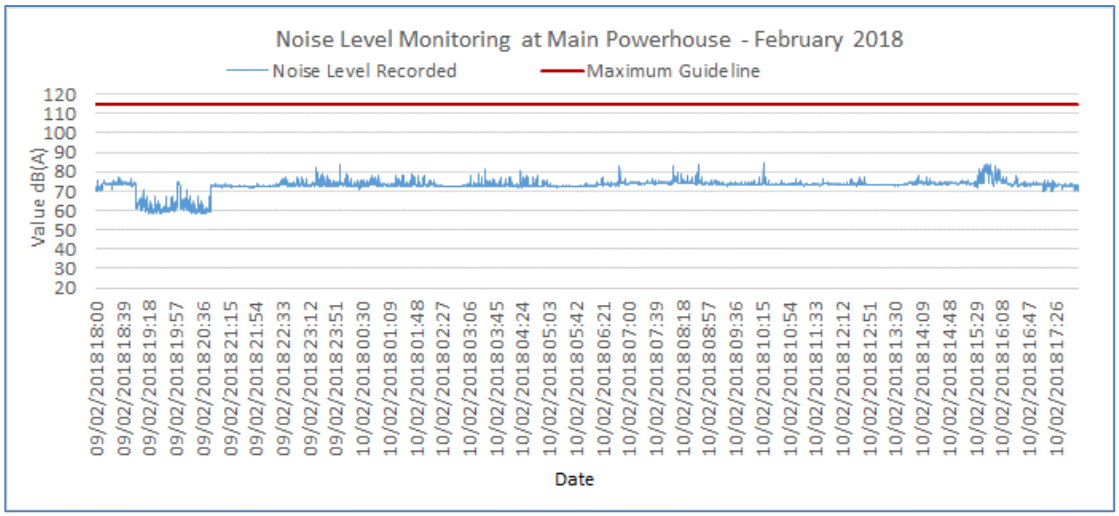


Figure C-10: Results of Noise Level Monitoring at Sino Hydro Camp in February 2018