

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

September 2016


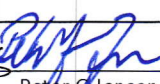
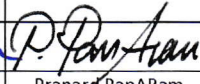
					
A	24 October 2016	Viengkeo Phetavongxay	Peter G. Jensen	Prapard PanARam	
REV	DATE	AUTHOR	CHECKED	APPROVED	MODIFICATION DETAILS
<u>Accessibility</u>		Document No. NNP1-C-J0904-RP-021-A			
<input checked="" type="checkbox"/>	Public				
<input type="checkbox"/>	Internal				
<input type="checkbox"/>	Confidential				
This document is NNP1 property and shall not be used, reproduced, transmitted and/or disclosed without prior permission.					

TABLE OF CONTENTS

EXECUTIVE SUMMARY	- 1 -
1. INTRODUCTION	- 2 -
2. WORK PROGRESS OF PRINCIPAL CONTRACTORS	- 2 -
2.1 Civil Work	- 3 -
2.1.1 Main dam and power house	- 4 -
2.1.2 Re-regulation dam and powerhouse	- 5 -
2.1.3 Temporary work facility	- 5 -
2.2 Electrical and Mechanical Works	- 6 -
2.3 Hydro-Mechanical Works	- 6 -
2.4 230kV Transmission Line Works	- 8 -
3. ENVIRONMENTAL MANAGEMENT MONITORING	- 9 -
3.1 Compliance Management	- 9 -
3.1.1 ESMMP-CP Update 2016	- 9 -
3.1.2 Site Specific Environmental and Social Management and Monitoring Plans	- 9 -
3.1.3 Compliance Report	- 10 -
3.1.4 Monitoring by the Environmental Monitoring Unit of the Government	- 16 -
3.2 Environmental Quality Monitoring	- 16 -
3.2.1 Effluent Discharge from Camps and Construction Sites	- 17 -
3.2.2 Surface (Ambient) Water Quality Monitoring	- 21 -
3.2.3 Groundwater Quality Monitoring	- 25 -
3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring	- 28 -
3.2.5 Landfill Leachate Monitoring	- 29 -
3.2.6 Dust Monitoring	- 31 -
3.2.7 Noise Monitoring	- 31 -
3.3 Construction Site Waste Management	- 32 -
3.3.1 Solid Waste Management at the Construction Site	- 32 -
3.3.2 Hazardous Materials and Waste Management	- 32 -
3.4 Community Waste Management Support	- 34 -
3.4.1 Community Recycling Programme	- 34 -
3.5 Watershed and Biodiversity Management	- 36 -
3.5.1 Preparation of the Nam Ngiep 1 Watershed Management Plan	- 36 -

3.5.2	Biodiversity Offset Management	- 38 -
3.5.3	Biomass Clearance	- 39 -
3.6	Other Obligations and Support Programmes	- 42 -
3.6.1	Environmental Protection Fund (EPF)	- 42 -
3.6.2	115 kV Transmission Line IEE Due Diligence Assessment	- 42 -
3.6.3	Nabong Substation Upgrade Due Diligence Assessment	- 42 -
3.7	External Monitoring	- 42 -
3.7.1	Independent Monitoring Agency	- 42 -
3.7.2	Biodiversity Advisory Committee	- 43 -
ANNEX A: RESULTS OF EFFLUENT ANALYSES		- 45 -
ANNEX B: AMBIENT NOISE DATA		- 48 -

BBREVIATIONS / ACRONYMS

AD	Administration Division of NNP1PC
AIP	Annual Implementation Plan
ADB	Asian Development Bank
ARCAP	Audit Report and Corrective Action Plan
BBS	Biodiversity Baseline Survey
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BODM	Board of Directors Meeting
BOMC	Biodiversity Offset Management Committee
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
DCC	District Coordination Committees
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
DGC	District Grievance Committee
DLA	Department of Land Administration, MONRE
DSRP	Dam Safety Review Panel
EC	Electrolytic Conductivity
EC OCD	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
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
FAD	Finance and Accounting Division
FC	Financial Close
FCD	Financial Close Date (as defined in the EGAT PPA)
FI	Fire Incident
FY	Fiscal Year
GOL	Government of Lao PDR
GIS	Geographic Information Systems
GRM	Grievance Redress Mechanism
HH	Household
HIV	Human Immunodeficiency Virus
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IFC	International Finance Corporation
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
KANSAI	The Kansai Electric Power Company Incorporated
km	kilometre
KPN	KPIC Netherlands B.V.
kV	kilo-Volt
LAK	Lao Kip
LEPTS	Lao Electric Power Technical Standard
LHSE	Lao Holding State Enterprise
LMP	Labour Management Plan
LNTP	Limited Notice to proceed (under each construction Contract)
LTA	Lender's Technical Advisor

LTI	Lost Time Incident
M	million
m	metre
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
MUSD	Millions of US Dollars
MVI	Motor Vehicle Incident
NA	National Assembly of the Lao PDR
NASC	Standing Committee of National Assembly
NBCA	National Biodiversity Conservation Area
NCI	Non-Compliance Issue
NCR	Non-Compliance Report
NM	Near Miss
NN2	Nam Ngum 2 Power Company Limited
NNP1PC	Nam Ngiep 1 Power Company Limited
NPA	Non-Profit Association
NPF	National Protection Forest
NTFP	Non-Timber Forest Products
NT2	Nam Theun 2 Hydropower Project
NTP	Notice to Proceed (under each construction contract)
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
PAP	Project Affected People
PD	Property Damage
PO	Purchase Order
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PPA	Power Purchase Agreement (between NNP1PC and EGAT)
PRLRC	Provincial Resettlement and Livelihood Restoration Committee
PvPA	Provincial Protection Area
RCC	Roller Compacted Concrete
REDP	Resettlement and Ethnic Development Plan

RFP	Request for Proposal
RI	Recordable Injury
RMU	Resettlement Management Unit
ROW	Right of Way
SBLC	Stand-by Letter of Credit
SCOD	Scheduled Commercial Operation Date (as defined in EGAT PPA)
SFCD	Scheduled Financial Close Date (as defined in EGAT PPA)
SHM	Shareholders Meeting
SIR	Site Inspection Report
SLBMP	Salvage Logging Biomass Management Plan
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
STD	Sexually Transmitted Disease
TD	Technical Division of NNP1PC
THB	Thai Baht
TOR	Terms of Reference
TSS	Total Suspended Solids
USD	US Dollar
UXO	Unexploded Ordinance
VGC	Village Grievance Committee
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Waste Water Treatment System

EXECUTIVE SUMMARY

In early September 2016, NNP1PC completed the draft updated Environmental and Social Management and Monitoring Plan for the Construction Phase (ESMMP-CP) and submitted it to the Department of Environmental and Social Impact Assessment (DESIA), Ministry of Natural Resources and Environment (MONRE) as well as to the Independent Monitoring Agency (IMA), Lender's Technical Adviser and ADB for their review. A consultation workshop was organised in Vientiane on 14 September 2016 with the Government of Lao PDR. Official comments will be submitted to NNP1PC in October 2016 for further revisions and finalisation.

During September 2016, NNP1PC- EMO received a total of seven SS-ESMMPs. Out of these, one SS-ESMMP was accepted with conditions, two SS-ESMMPs were accepted with no conditions and four SS-ESMMPs are under review and carried over into October 2016. A total of six Observations of Non-Compliances (ONCs) were issued which is a significant decrease from 16 ONCs issued in August 2016. With a carry-over from August 2016, a total of 21 ONCs and one NCR were active in September 2016. Out of these, eight ONCs were resolved, 13 ONCs and one NCR will be carried over into October 2016.

On 13 September 2016, the Central, Provincial and District EMUs conducted a joint environmental monitoring mission with NNP1PC covering the main construction sites and camps, NNP1 Project Landfill and Houay Soup Resettlement Area. A mission report will be submitted to NNP1PC in October 2016.

A second revision of an SS-ESMMP for building a laboratory was submitted by the Contractor and is being reviewed by NNP1PC. Once it is cleared the construction can be started and it is expected to be commenced in October 2016 and scheduled to be completed by December 2016. The procurement of the laboratory equipment with a supplier in Thailand was ongoing in September 2016. It is expected that the equipment will arrive by the end of October 2016.

During September 2016, all construction camps except the Owner's Village and Site Office had higher concentrations of total coliforms than the effluent standard. On 07 September 2016, NNP1PC-TD and EMO agreed to require all NNP1 contractors' and subcontractors' to install chlorination tanks at their camps to kill faecal coliform bacteria present in the wastewater. In addition, the wetland systems will be modified into a sub-surface flow type with impermeable lining. NNP1PC-TD is revising the Waste Water Treatment Systems improvement designs as per the Thai expert's recommendations. Chlorination will be initiated at Song Da 5 Camp No. 1 and No. 2 as well as IHI and HM Hydro Camps by December 2016.

Approximately 170.5 m³ of solid waste was disposed at the NNP1 Project Landfill during September 2016, an increase of 67.5 m³ compared with August 2016. The temporary waste pit of Houay Soup Landfill started operation and will be open every Tuesday and Thursday from 09:30 to 10:30 am through arrangement with NNP1PC-EMO staff. A total of 0.2 m³ of solid waste from HSRA's Contractors has been disposed at the temporary waste pit. With respect to the landfill itself, the construction of the waste pit and the wetland ponds are nearly completed.

The development of the NNP1 Watershed Management Plan (WMP) continues to progress. The international watershed consultant together with NNP1PC team focus on improving the interim plan which was submitted to ADB on 01 September 2016. The key issues being addressed in the revision include: data and problem analysis including analysing the trends in land use change from 2000 to 2015, improvement of biodiversity and fishery management plan, and prioritizing watershed management measures.

The Boundary Confirmation Baseline Survey of the Nam Chouane-Nam Xang Offset Site was officially started from 20 September 2016 after modifying the survey schedule and route due to difficult access as result of long week of rain. The draft Terms of Reference for preparation of the Biodiversity Offset Management Plan (BOMP) was reviewed by the Biodiversity Advisory Committee (BAC) in the first week of September 2016 and then submitted to ADB on 15 September 2016. The Biodiversity Offset Management Committee (BOMC) submitted a proposal for pre-BOMP activities to NNP1 on 19 September 2016. BAC is currently reviewing the proposal.

The biomass removal activities have been temporarily put on hold during the rainy season.

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 Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province (Fig. 1).

The project will consist of two dams. The main dam which is located 9.0 km upstream of Hat Gnuin Village in Bolikhamxay 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.

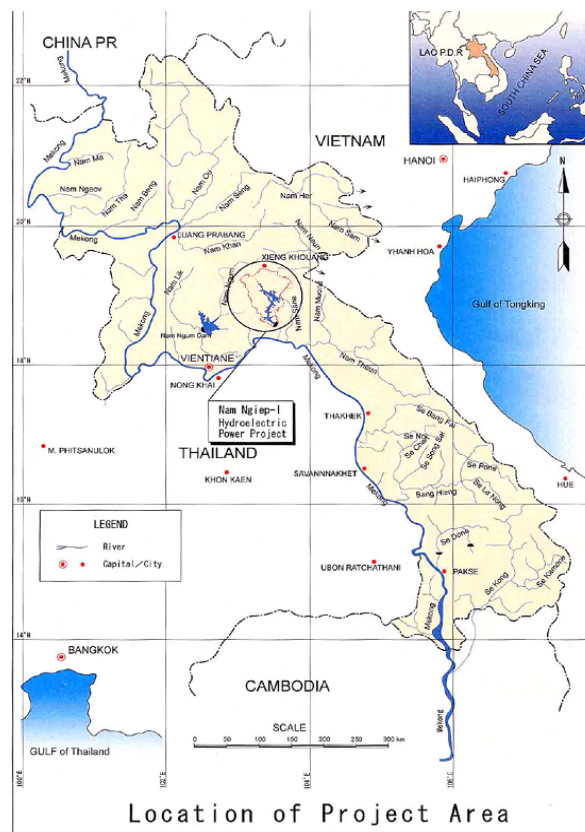
This Environmental Monthly Monitoring Report (EMMR) provides a summary of environmental monitoring activities and mitigation actions in February 2016. The EMMR was prepared by the Project's Environmental Management Office (EMO). It has been internally reviewed and cleared by EMO senior technical staff 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 publically 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 September

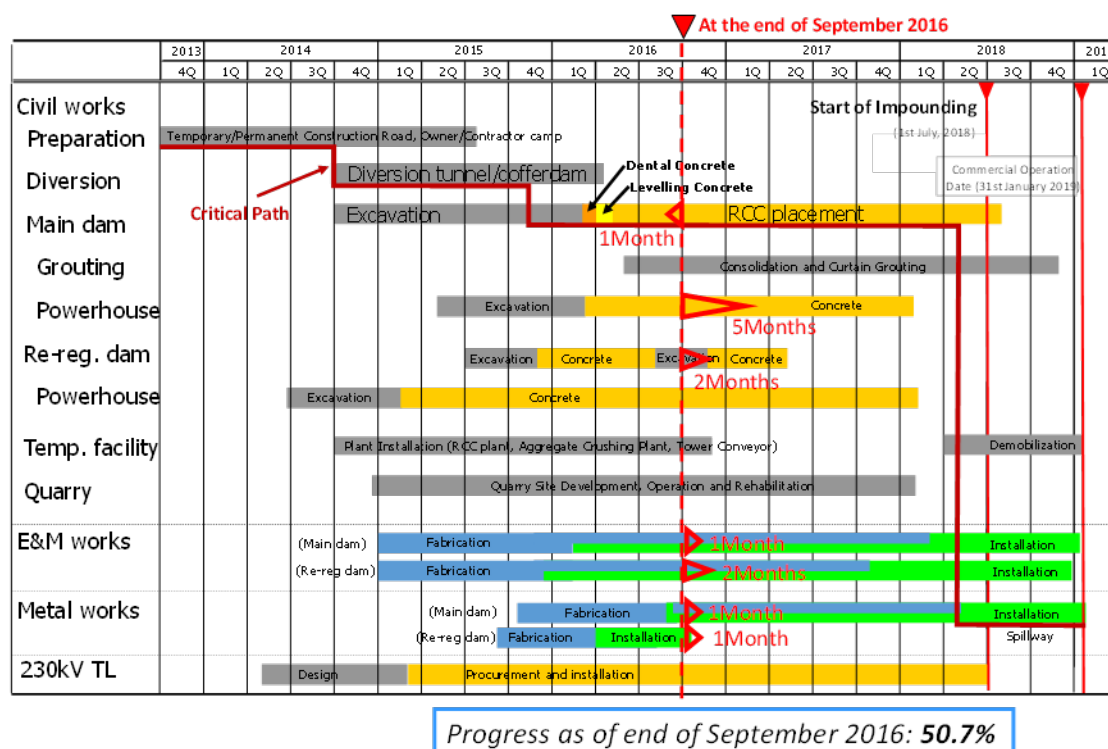
Figure 1-1: Location Map



2016 was 50.7%¹ (compared to planned progress of 49.8%), 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 slightly understated since work completed, but not paid, is not included.

The overall construction schedule and progress curve (by achieved Milestone Payments) are shown in Figure 2-1.

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 September 2016 was 52.1% (compared to planned progress of 49.4 %) 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 Installation of precast concrete lintels for Diversion Conduit at El.189.7 m



The consolidation drilling and grouting for the main dam started in May 2016 and is ongoing. The progress is 47.9 % by achievement of total drilled length at the end of September 2016 as a proportion of the total expected drilling

Table 2-1: Progress of Consolidation drilling and grouting at 29 September 2016

Total Anticipated Drilling (m)	Completed (m)	Progress (%)
16,420	7,867	48

Powerhouse excavation works was completed in January 2016 and levelling concreting works was started in coordination with installation of the grounding system accordingly. Progress of the concreting works is proceeding well and is shown in Table 2-2 below

Table 2-2: Progress of Main Powerhouse Structural Concrete Works to 31 September 2016.

Total Anticipated Volume (m ³)	Completed (m ³)	Progress (%)
32,600	17,015	52

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 Table 2-3 below

Table 2-3: Progress of Re-regulation Dam Left Bank Structural Concrete Works to 31 September 2016

	Concrete Volume (m ³) Placed by the End of September 2016						
Structure	Intake	Powerhouse	Tailrace	Retaining Wall	Spillway	Left Bank RCC Structure	Overall Total
Anticipated Quantity	26,549			508	23,500	13,228	63,785
Completed Quantity	11,722	11,169	1,681	508	3,758	13,228	42,066
Progress	93%			100%	16%	100%	66%

The concrete volume placed already for both powerhouse and dam is 40,980m³ being 64% of the revised total estimate of 63,757 m³ for all structures. 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. Following installation of guide frames for re-regulation waterway gate and stop log and re-regulation intake gate in April 2016, secondary concrete embedment of the guide frames was completed in May 2016 and structural concrete works for the retaining wall to support the substation yard was completed in September 2016.

The Dyke (saddle dam) embankment works on the right bank near the Houay Soup Resettlement Area were also started in November 2015 and was completed on 30 April 2016.

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 until the end of September 2016 was 53.0% (compared to planned progress of 53.0%).

Figure 2-3: Embedded piping installation (Main powerhouse)



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 cumulative work progress of the Hydraulic Metal Works until the end of September 2016 was 25.1% (compared to planned progress of 30.1%).

The latest progress of penstock pipes fabrication at IHI field shop as of the end of September 2016 is shown *in Table 2-4* below

Table. 2-4: Progress of the penstock pipe fabrication at the IHI field shop as at the end of June 2016

Item No.	Work Activity	Fabrication Progress (%)	Remarks
1.1	Assembly & Welding	36 %	
1.1	Painting	29 %	
1.1	Delivery to Main Dam Laydown Area	10 %	
1.1	Site Erection at Main Dam	10 %	

Latest progress of steel gate installation for each work item at the end of September 2016 is shown in **Table 2-5** below.

Table. 2-5: progress of steel gate installation for each work item at the end of September 2016

Item No.	Work Item Description	Progress (%)	Remarks
2.1	Re-regulation Waterway Gate and Hoist	92 %	Breakdown of the remaining progress % is as follows: Permanent electrical cable installation for hoist is 2%; Rubber seal installation is 2%; Dry test witness inspection is 2%; Wet test witness inspection is 2%.
2.2	Re-regulation Waterway Stop Log	98 %	The remaining 2% of the progress will be confirmed after the Owner's Engineer acceptance by the final witness inspection "wet test" functional test under water conditions.
2.3.1	Re-regulation Intake Gate and Hoist	94 %	Breakdown of the remaining progress % is as follows: Permanent electrical cable installation for hoist is 2%, Dry test witness inspection is 2%; Wet test witness inspection is 2%
2.3.2	Re-regulation Intake Trash Rack	100 %	Installation of trash rack is completed and approved by the Owner's Engineer.
2.4	Re-regulation Draft Gate	98 %	"Leakage Test in no water condition", which as part of Witness inspection for Functional Test before initial filling of reservoir was concluded "Approved". Remaining inspection items for the dry test are the loading test and the testing condition of rotary parts. The schedule of these two remaining inspection items is on 01 October 2016. The remaining 2% of the progress will be confirmed after the Owner's Engineer acceptance on the final witness inspection wet test

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 September 2016 was 52.6% (compared to planned progress of 63.2 %).

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 April, 2016 (See Figure 2-4 below)

Figure 2-4 Cumulative Work Progress of Tower Installation (Plan and Actual)

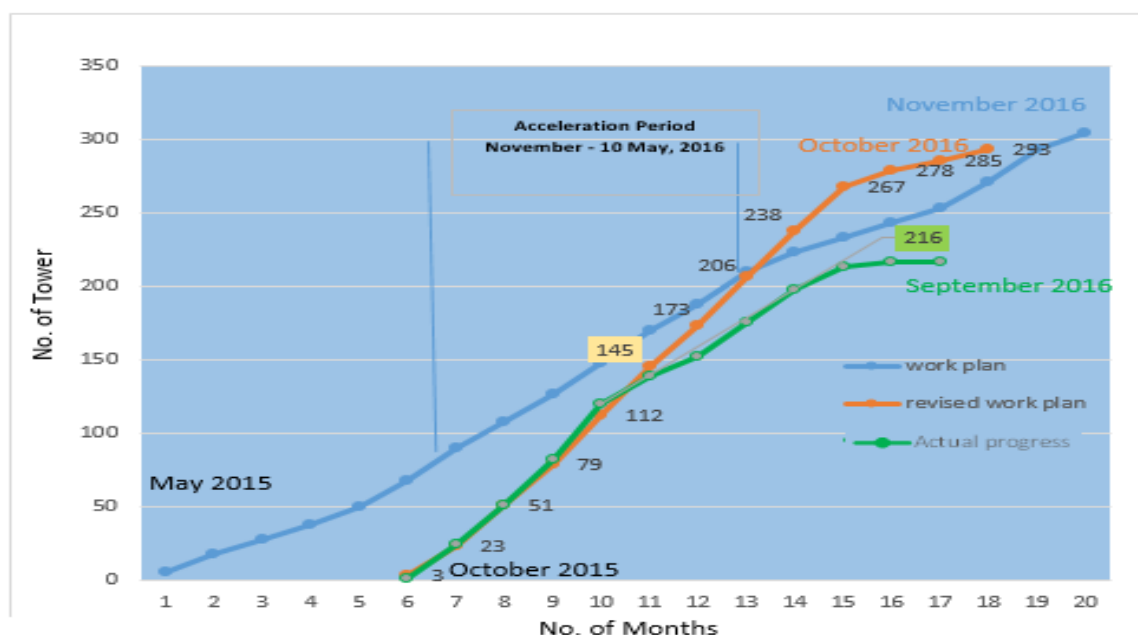


Figure 2-5: Cumulative Works Progress (Revised Planned & Actual)



3. ENVIRONMENTAL MANAGEMENT MONITORING

3.1 Compliance Management

3.1.1 ESMMP-CP Update 2016

In early September 2016, NNP1PC completed the draft updated Environmental and Social Management and Monitoring Plan for the Construction Phase (ESMMP-CP) and submitted it to the Department of Environmental and Social Impact Assessment (DESIA), Ministry of Natural Resources and Environment (MONRE) as well as to the Independent Monitoring Agency (IMA), the Lender's Technical Adviser and ADB for their review. A consultation workshop on the draft updated ESMMP-CP was organised in Vientiane on 14 September 2016 with the Government of Lao PDR. The workshop was attended by representatives of DESIA, Department of Energy Business (DEB, Ministry of Energy and Mines), IMA and Provincial Department of Natural Resources and Environment (PONRE) from Xaysomboun and Bolikhamxay Provinces. Official comments will be submitted to NNP1PC in October 2016 for further revisions and finalisation.

3.1.2 Site Specific Environmental and Social Management and Monitoring Plans

During September 2016, the Environmental Management Office (EMO) of NNP1PC received a total of seven SS-ESMMPs. Out of these, one SS-ESMMP was accepted with conditions, two SS-ESMMPs were accepted with no conditions and, four SS-ESMMPs are under review and carried over into October 2016.

Figure 3-1: SS-ESMMPs received and review status in September 2016

Title	Date Received	Status	Comments
SS-ESMMP for Building Construction at the Main Powerhouse	30 July 2016 (1 st revision)	Under review	
SS-ESMMP for Grouting Works for Regulating Power Station	17 August 2016 (1 st submission)	08 September 2016: No objections with conditions	Provide information on the test procedures of grouting work and a list of hazardous materials
SS-ESMMP for Embedded Part of Stay Cone (Preliminary Work) for Regulating Station	23 August 2016 (2 nd submission)	08 September 2016: No objections	No comments
SS-ESMMP for Construction of the EMO Water Quality Laboratory	05 September 2016 (2 nd submission)	Under Review	
SS-ESMMP for Operation and Maintenance Works of RCC Plant	16 September 2016 (2 nd submission)	Under Review	
SS-ESMMP for Installation work of Draft Tube Liner for Main Power Station	15 September 2016 (1 st submission)	23 September 2016: No objections	No comments
SS-ESMMP for Curtain Grouting Works at the Main Dam	26 September 2016 (2 nd submission)	Under review	

3.1.3 Compliance Report

In September 2016, NNP1PC- EMO issued a total of six Observations of Non-Compliances (ONCs) which is a significant decrease from 16 ONCs issued in August 2016. With a carry-over from August 2016, a total of 21 ONCs and one NCR were active in September 2016. Out of these, eight ONCs were resolved, 13 ONCs and one NCR will be carried over into October 2016, in which eight ONCs and one NCR carried over were not resolved by the agreed deadlines. NNP1PC-EMO will follow up with the Contractors to resolve the remaining issues in October 2016.

The carry-over of ONCs from September 2016 into October 2016 is summarized in Table 3-2 below

Figure 3-2 Carryover ONCs from September 2016 to October 2016

Site ID	Issues	Reporting	Actions
Song Da 5 Camp No.2	<p>The WWTS construction was not consistent with the proposed design (ON_OC-0085).</p> <p>1st inspection date: 02 June 2015</p> <p>Latest follow up: 28 September 2016</p>	1 ONC (Pending)	<p>As agreed during the internal meeting between NNP1PC-TD and EMO on 07 September 2016, chlorination will be used to treat total and faecal coliforms by building a 1 to 2 m³ chlorine contact tank and a 1 to 2 m³ monitoring tank in all the contractors' and subcontractors' Camps. NNP1PC-TD will revise the WWTS improvement designs as per the Thai expert's recommendations. Chlorination will be initiated at Song Da 5 Camp No. 1 and No. 2 as well as IHI and HM Hydro Camps by December 2016.</p>
V&K Camp	<p>Insufficient capacity of waste water treatment ponds to handle the operation of the V&K camp (ON_OC-0087).</p> <p>1st inspection date: 02 June 2015</p> <p>Latest follow up: 28 September 2016</p>	1 ONC (Pending)	<p>The existing wetland ponds should be properly lined and sealed with concrete; the seepage of grey water at the first wetland pond where the treatment process starts should be stopped.</p> <p>The improvement should follow the Thai expert's recommendations.</p>
H-M Hydro Subcontract Worker Camp (LALIMA 10 Camp)	<p>1. The contractor has commenced the construction of the WWTS without submitting revised detailed designs and updated SS-ESMMP responding the owner's comments (ON_HM-0004).</p> <p>1st inspection date: 25 May 2016</p> <p>Latest follow up: 28 September 2016</p>	1 ONC (Pending)	<p>1. Submit the revised detailed designs and updated SS-ESMMP, improvement requirements should be incorporated in the 3rd revision of SS-ESMMP according to Owner's Comment Sheet.</p>

Site ID	Issues	Reporting	Actions
	<p>2. Improper design of the oil and grease traps for kitchen and bathing areas (ON-HM-0010)</p> <p>1st inspection date: 03 August 2016</p> <p>Latest follow up: 28 September 2016</p>	1 ONC (Pending)	<p>2. Instruction for oil/grease trap improvement was provided during the joint bi-weekly inspection on 31 August 2016. However, during the latest follow-up mission EMO found that the required improvements had not been completed. Corrective actions plan need to be completed by 12 October 2016.</p>
	<p>3. The LILAMA10 Camp has been accommodated with 11 workers, but the construction of the Waste Water Treatment System (WWTS) remained incomplete (ONC_HM-0011)</p> <p>1st inspection date: 14 September 2016</p> <p>Latest follow up: 27 September 2016</p>	1 ONC (New)	<p>The contractor should complete the construction of WWTS as per EMO's recommendations in the SIR Reference No.: NNP1-ESD-EMO-SIR-HM-0003 and 0007 and the 3rd revision of a SS-ESMMP for HM Hydro Workers' Camp No.2 (LALIMA10 Camp).</p>
RCC Plant Yard	<p>Lack of proper sedimentation facilities to improve the turbid water quality generated from the site (ONC_OC-0217)</p> <p>1st inspection date: 28 June 2016</p> <p>Latest follow up: 27 September 2016</p>	1 ONC (Pending)	<ul style="list-style-type: none"> - The information on the turbid water generation from RCC production and the capacity of existing sediment ponds should be provided as required by EMO in the conditions issued to the 2nd submission of the SS-ESMMP for Operation and Maintenance of the RCC Plant. - The Contractor is required to follow the agreed actions specified in previous issued Site Inspection Report. The contractor is required to frequently clean-up the sediment ponds when observed at 60% full, and regularly remove the dried sediment from drying yards to keep space for incoming sediment from the clean-up of the ponds.

Site ID	Issues	Reporting	Actions
Borrow Pit for HSRA Irrigation Canal	<p>A borrow pit was operated about 10 m from Houay Soup Noi (a small stream) for irrigation construction without environmental protection measures as per the approved SS-ESMMP dated 11 May 2016 (ON_VSP-0001).</p> <p>1st inspection date: 25 May 2016</p> <p>Latest follow up: 27 September 2016</p>	1 ONC (Pending)	<p>A 9 m³ sediment pond was installed. However, the agreed corrective action was not fully implemented as per the Owner's requirements, particularly, the installation of erosion and sediment control measures.</p> <p>NNP1PC is following up on the implementation of corrective action plan provided in the revised SS-ESMMP for Irrigation canal construction.</p>
SECC Camp (Access Bridge Contractor)	<p>SECC Contractor would finish its construction activities by the end of September 2016. To ensure that SECC's site demolition is done properly, the Contractor was instructed to prepare and submit a Site Decommissioning Plan to EMO for review and approval at least 7 days prior to the commencement of decommissioning work (ON_SECC-0039)</p> <p>1st inspection date: 06 September 2016</p> <p>Latest follow up: 20 September 2016</p>	1 ONC (New)	The Contractor should prepare and submit a Site Decommissioning Plan covering all SECC's sites (SECC Camp, Temporary Waste Pit, SECC's Workshop and SECC Batching Plant) at least 2 months prior to site decommissioning for NNP1PC-EMO review and approval.
Borrow Pit for HSRA Main Road	<p>The Contractor operated a borrow pit at the area adjacent to the Houay Soup Noi River without appropriate environmental management plan and/or mitigation measures (ON_VRC-0004)</p> <p>1st inspection date: 12 July 2016</p> <p>Latest follow up: 20 September 2016</p>	1 ONC (Pending)	Provide erosion and sediment control for the borrow pit including a silt fence and/or a similar means by 05 September 2016. There was no further action made by 20 September 2016. A final follow up will be made before issuing a NCR1.
VRC camp	Mixed disposal of recyclable waste and non-recyclable waste was observed during the joint site inspection (ON_VRC-0005)	1 ONC (Pending)	The Contractor was instructed to recover recyclable waste from the pit and sell it to the Recycle Bank located at Hat Gniun Village.

Site ID	Issues	Reporting	Actions
	1 st inspection date: 12 July 2016 Latest follow up: 20 September 2016		NNP1 will follow up on this issue by early October 2016.
SECC Workshop & Industrial Area	Inadequate Hazardous Waste Management. About 15-20 kg of oil-contaminated sand was disposed of on the side slope of the SECC working platform which is close to the Nam Ngiep River (NCR_SECC-0001) 1 st inspection date: 09 August 2016 Latest follow up: 28 August 2016	1 NCR (Pending)	The corrective actions were implemented, however, an official response to NNP1 comments should be provided. The contractor is required to respond to the NCR by 03 September 2016. A follow up will be made in early October before issuing a NCR2.
PKC Camp (HSRA Landfill Contractor)	Poor hazardous waste management was observed at the temporary workers' camp. The designated storage area for petrol/engine oil did not have proper impermeable surface and earth bund. As a result, used oil was spilled on the ground inside the storage area. Some used engine oil was found to be poured onto the ground outside the storage area and there was some diesel spill located less than 5 m from the natural drainage (ON_PKC-0001) 1 st inspection date: 25 August 2016 Latest follow up: 27 September 2016	1 ONC (Pending)	The following corrective actions need to be completed by 06 October 2016: <ul style="list-style-type: none"> - Clean up the spills and dispose used engine oil properly; - Provide steel or thick plastic trays or sheets to cover the surface of the designated storage area for petrol and engine oil. Place and display "hazardous waste material poster" in local language for awareness by the workers as well as providing some spill response kits.
Re-Regulation Dam Borrow Pit Area	The Contractor started operating a borrow pit with inadequate environmental management practices as indicated below: <ul style="list-style-type: none"> - Topsoil was stockpiled at sensitive erosion area; - The cut slope area had no berm and cut-off drains; - Spoil was disposed and stockpiled on the access road to the SECC waste disposal pit. <p>No information and management measures on the excavation of this borrow pit was included in the two (02) approved SS-ESMMPs for the Re-Regulation Dam (i.e. the Re-</p>	1 ONC (Pending)	The contractor needs to take immediate actions by as following: <ul style="list-style-type: none"> - Designate topsoil stockpile to minimise soil erosion and to preserve for borrow pit recovery; - Install borrow pit berms, cut-off drains and sediment pond where feasible to prevent landslide and retain sediment <p>Submit a revised SS-ESMMP to include this borrow pit and provide the following information by 11 October 2016:</p>

Site ID	Issues	Reporting	Actions
	<p>Regulation Dam Left Bank Excavation and Re-Regulation Dam Power Station (ON_OC-0232).</p> <p>1st inspection date: 30 August 2016</p> <p>Latest follow up: 27 September 2016</p>		<ul style="list-style-type: none"> - Estimated quantity of materials to be used; - Biomass clearing and topsoil management; - Spoil management and disposal (stockpiling, excavation, etc.); - Detail design of slope stabilization including cut-off drains and berm; - Site environmental rehabilitation and site closure plan. - Clean up the spoil was pushed into a heap such that it blocked access to the SECC temporary disposal pit.
TL 230 KV (Temporary Worker Camp – Thaphabath District)	<p>There was no secure storage for hazardous waste generated from workshop operation. Used oil drums were stored on the ground and exposed to the rain, oil filters, machinery spare parts and tools were left on the concrete floor with no proper protective bund. Oil spills and contaminated soil were found around the workshop area (ONC_LS-0015)</p> <p>1st inspection date: 15 September 2016</p> <p>Latest follow up: Not applicable</p>	1 ONC (New)	<ul style="list-style-type: none"> - Improve the workshop housekeeping including cleaning up the contaminated soil around the workshop, storing oil contaminated sand in the storage area with concrete floor, bund and rain protection roof; - Provide oil spill trays for truck maintenance related activities and dry sand/soil at the workshop for use as spill response kits by 02 October 2016.

Figure 3-3: Site Inspection Locations

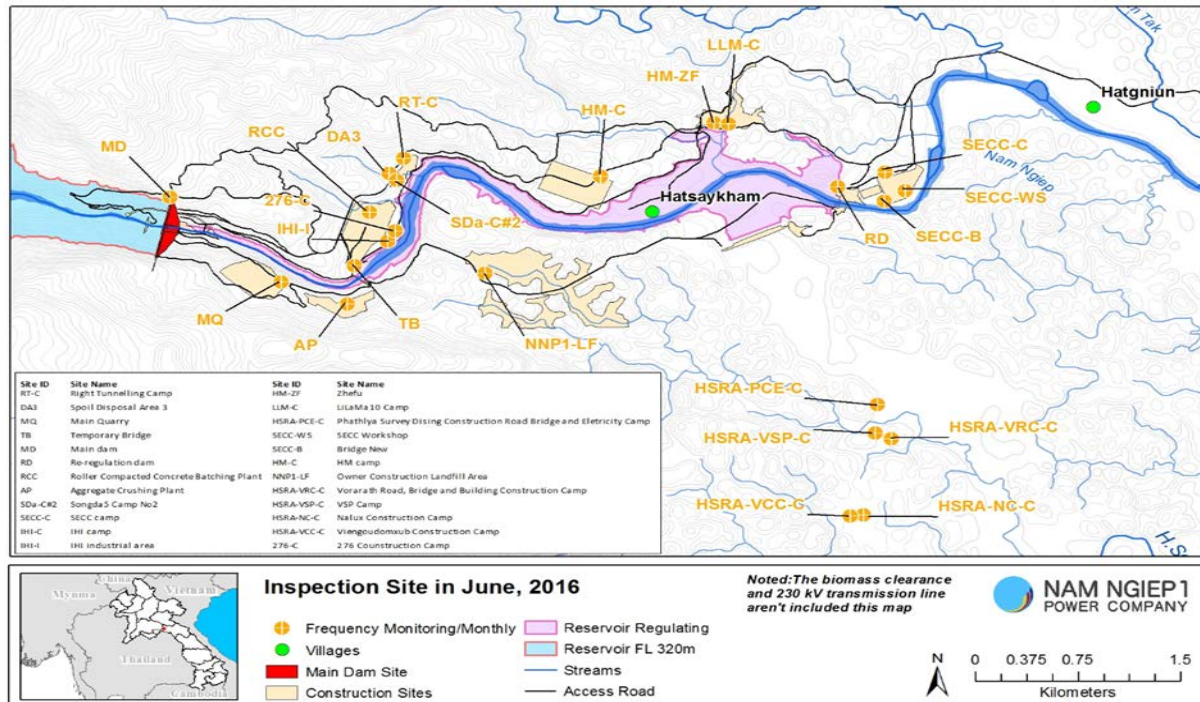


Figure 3-4: 230 kV Transmission Line Construction Monitoring

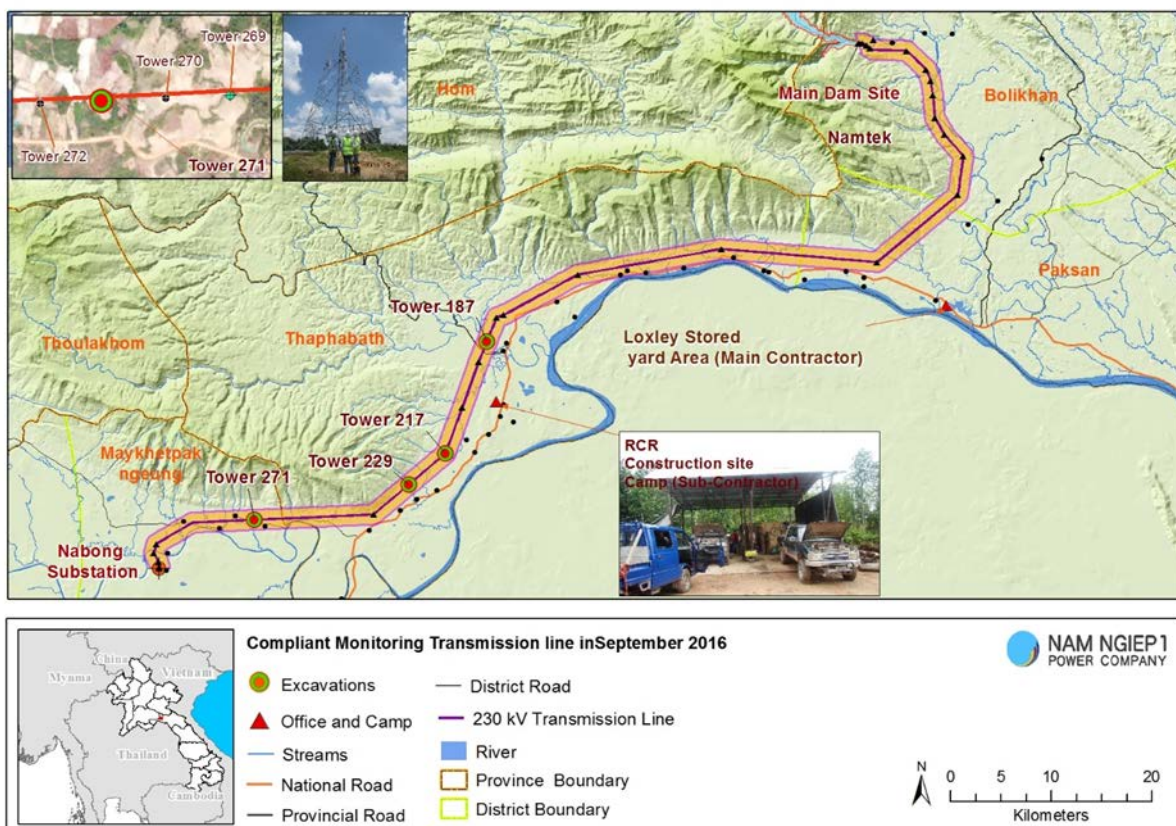
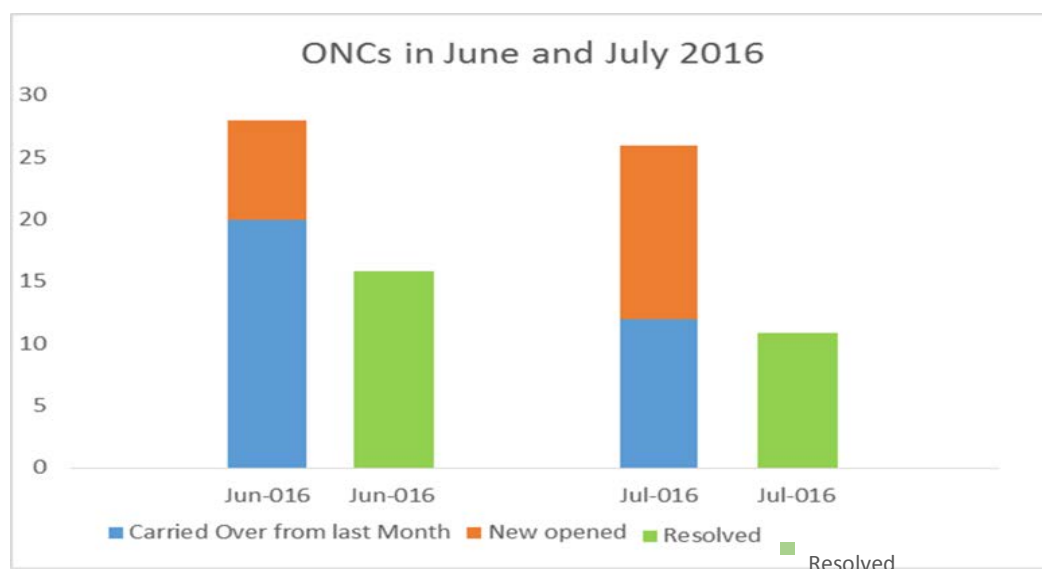


Table 3-3 Summary of ONCs and NCRs

Reporting Period (01-30 September 2016)	ONC	NCR-1	NCR-2	NCR-3
Carried over from August 2016	15	1	0	0
New issues this month	6	0	0	0
Resolved this month	8	0	0	0
Carried forward into October 2016	13	1	0	0
Unresolved exceeding deadline	8	1	0	0

Figure 3-5: Observations of non-compliance (ONCs) this September 2016 Compared with August 2016



3.1.4 Monitoring by the Environmental Monitoring Unit of the Government

On 13 September 2016, the Central, Provincial and District EMUs conducted a joint environmental monitoring mission with NNP1PC covering the main construction sites and camps, NNP1 Project Landfill and Houay Soup Resettlement Area. A mission report will be submitted to NNP1PC in October 2016.

3.2 Environmental Quality Monitoring

A second revision of an SS-ESMMP for building a laboratory was submitted by the Contractor and being reviewed by NNP1PC. Once cleared, the construction will be started. It is expected to be commenced in October 2016 and scheduled to be completed by December 2016. The procurement of the laboratory equipment with a supplier in Thailand was ongoing in September 2016. It is expected that the equipment will arrive by the end of October 2016.

The environmental quality monitoring undertaken has followed the recommended environmental quality monitoring programme presented in the ESMMP-CP Volume III. The recommended programme consists of the following components:

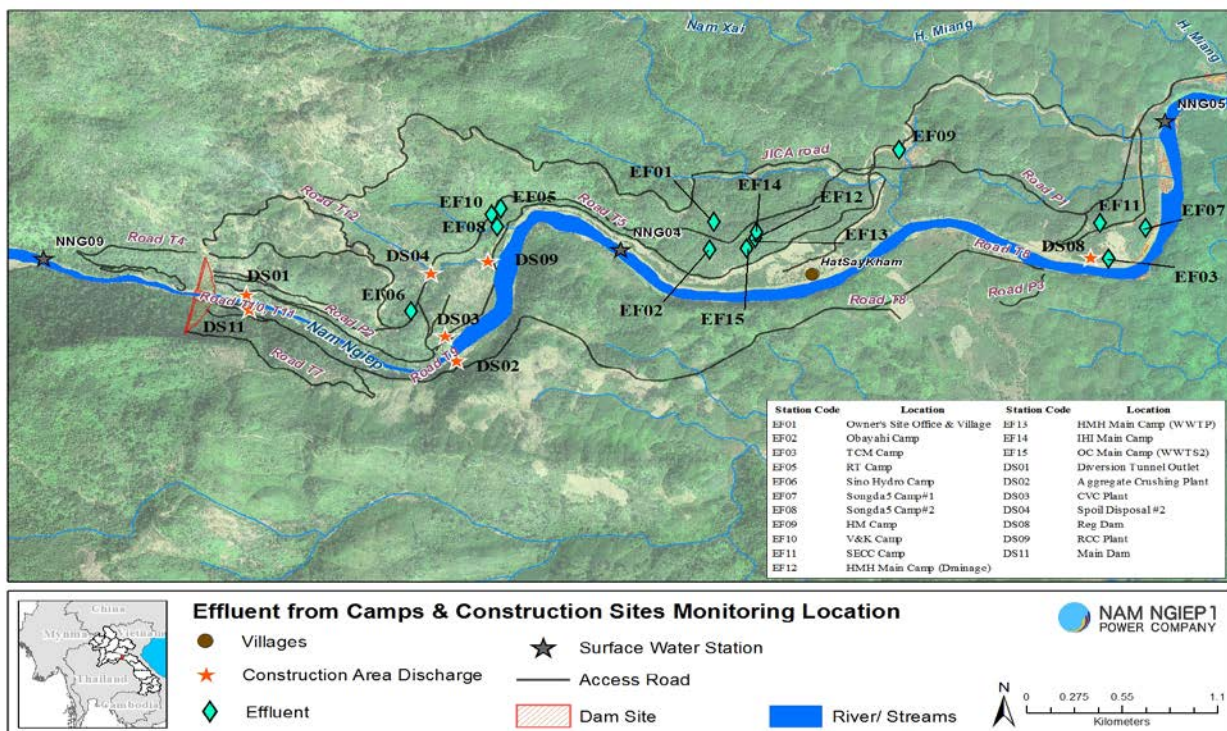
- a) Effluent discharge from camps and construction sites;
- b) Ambient surface water quality monitoring;
- c) Groundwater and community water supply;
- d) Landfill leachate;
- e) Ambient noise and noise emission monitoring.

All Environmental Quality Monitoring data are routinely reported to the Ministry of Natural Resources and Environment (MONRE) in the Monthly Environmental Management and Monitoring Reports (EMMR) and the Asian Development Bank (ADB) in the Quarterly Monitoring Reports

3.2.1 Effluent Discharge from Camps and Construction Sites

Since July 2016, the frequency of effluent monitoring has increased from monthly to fortnightly at all the camps, and from fortnightly to weekly at the construction sites. Results of the monitoring of effluents from the camps and construction sites.

Figure 3-6: Map of Effluent Discharge Monitoring Locations



All parameters were assessed with reference to the Effluent Standards specified in the Project's Concession Agreement Annex C, Appendix 2 Clause 1.13. During September 2016, all construction camps had higher concentrations of total coliforms than the effluent standard except the Owner's Village and Site Office.

Detailed monitoring results are included in the Annex A and the assessment of compliance and corrective actions are summarized below.

Table 3-4: Compliance assessment of the effluent discharge from the camps and construction sites

Site	Sampling ID	Non-Compliance	Corrective Actions
	EF01	All parameters complied with the standards.	No corrective actions required
	EF02	Biochemical Oxygen Demand (BOD ₅), Ammonia nitrogen (NH ₃ -N) and total coliforms exceeded the Standards for both sampling missions.	On 07 September 2016, NNP1PC-TD and EMO agreed to require all NNP1 contractors' and subcontractors' to install chlorination tanks (1-2 m ³) and monitoring tanks (1-2 m ³) at their camps to treat faecal coliform bacteria present in the wastewater. . The wetland systems will be modified to be sub-surface flow (SSF) type with impermeable lining. NNP1PC-TD is revising the WWTS improvement designs as per the Thai expert's recommendations. Chlorination will be initiated at Song Da 5 Camp No. 1 and No. 2 as well as IHI and HM Hydro Camps by December 2016.
	EF03	Total coliforms were higher than the Standard at 160,000 MPN/100 ml, and TSS slightly exceeded the standard with value recorded at 52.8 mg/l during the first mission. There was no waste water in the wetland system during the second mission.	As above
	EF06	Total coliforms were higher than the Standard at 160,000 MPN/100 ml in the first fortnight and 24,000 MPN/100 ml in the second fortnight sampling. In addition, BOD and Ammonia-nitrogen were 30.4 and 15 mg/l respectively, exceeded the standard during the second fortnight sampling.	As above
	EF07	The levels of TSS, BOD and COD exceeded the standard with values recorded at 69.1, 40.4, 169 mg/l during the second fortnight. Total	As above

Site	Sampling ID	Non-Compliance	Corrective Actions
		coliform exceeded the standard for both sampling missions.	
	EF08	NH ₃ -N and total coliforms did not comply with the Standard for both sampling missions	As above
	EF09	Total coliforms did not comply with the Standard for both missions. In addition, BOD was 31.9 mg/l, exceed the standard during the first fortnight mission	As above
	EF10	Total coliforms and TSS did not comply with the Standards for both missions. In addition, total iron was 13.5 mg/l, exceed the standard during the first fortnight mission	As above
	EF11	Total coliforms and total iron did not comply with the Standards for both sampling missions. In addition, TSS was 99.8 mg/l, exceeding the standard during the first fortnight mission	As above
	EF12	There was no wastewater flowing into the grey water ponds during the mission.	As above
	EF13	Total coliforms did not comply with the Standards for both missions. In addition, the level of TSS, BOD and COD were 70.2, 60.3 and 194 mg/l respectively, exceeded the standard during the first fortnight mission.	As above
	EF14	Biochemical Oxygen Demand (BOD ₅), COD, ammonia nitrogen and total coliforms exceeded the	As above

Site	Sampling ID	Non-Compliance	Corrective Actions
		Standards for both missions.	
	EF15	Total coliforms were higher than the Standards at 24,000 MPN/100 ml during the first fortnight mission and 7,900 MPN/100 ml during the second fortnight mission.	As above
	DS11	All parameters complied with the standard.	No corrective actions are required
	DS08	The TSS values (sampled on 07 and 26 September 2016) exceeded the standard (less than 50 mg/l) with values recorded at 372 and 581 mg/l.	NNP1PC-EMO instructed the Contractor to check the sediment ponds and ensure that the turbid water treatment system is turned on. This issue will be followed up again in October 2016.
	DS04	The TSS values (sampled on 07 and 16 September 2016) exceeded the standard (less than 50 mg/l) with values recorded of 192 and 72.8 mg/l respectively. In addition, a pH value (measured on 26 September 2016) was lower than standard range. This low pH indicated the water quality of the creek that passes through this sampling site when rain water recedes. The same happened in May this year.	Two ONCs were issued in August 2016 requiring the Contractor to pave the surface area with gravels and install the earth embankment around the site to reduce the surface run-off with high sediment content. The Contractor has paved the main workshop and laydown area with gravels. These will be followed up during the October bi-weekly inspection.
	DS09	All TSS results in September 2016 were higher than the Standard (<50 mg/l) with recorded values of 4,292 mg/l, 172 mg/l, 47,424 mg/l and 1,890 mg/l respectively. In addition, the pH value slightly exceeded the standard (between 6.0 and 9.0) with a value recorded of 9.2.	A number of ONCs were issued in the past few months requiring the Contractor to regularly clean up the sediment in the ponds and revise the SS-ESMMP for the operational stage accordingly. A second revision of the SS-ESMMP for the RCC Plant (Operational Stage) was submitted and is being reviewed by NNP1PC-EMO. EMO and TD will conduct a comprehensive audit of the runoff and wastewater treatment systems at the

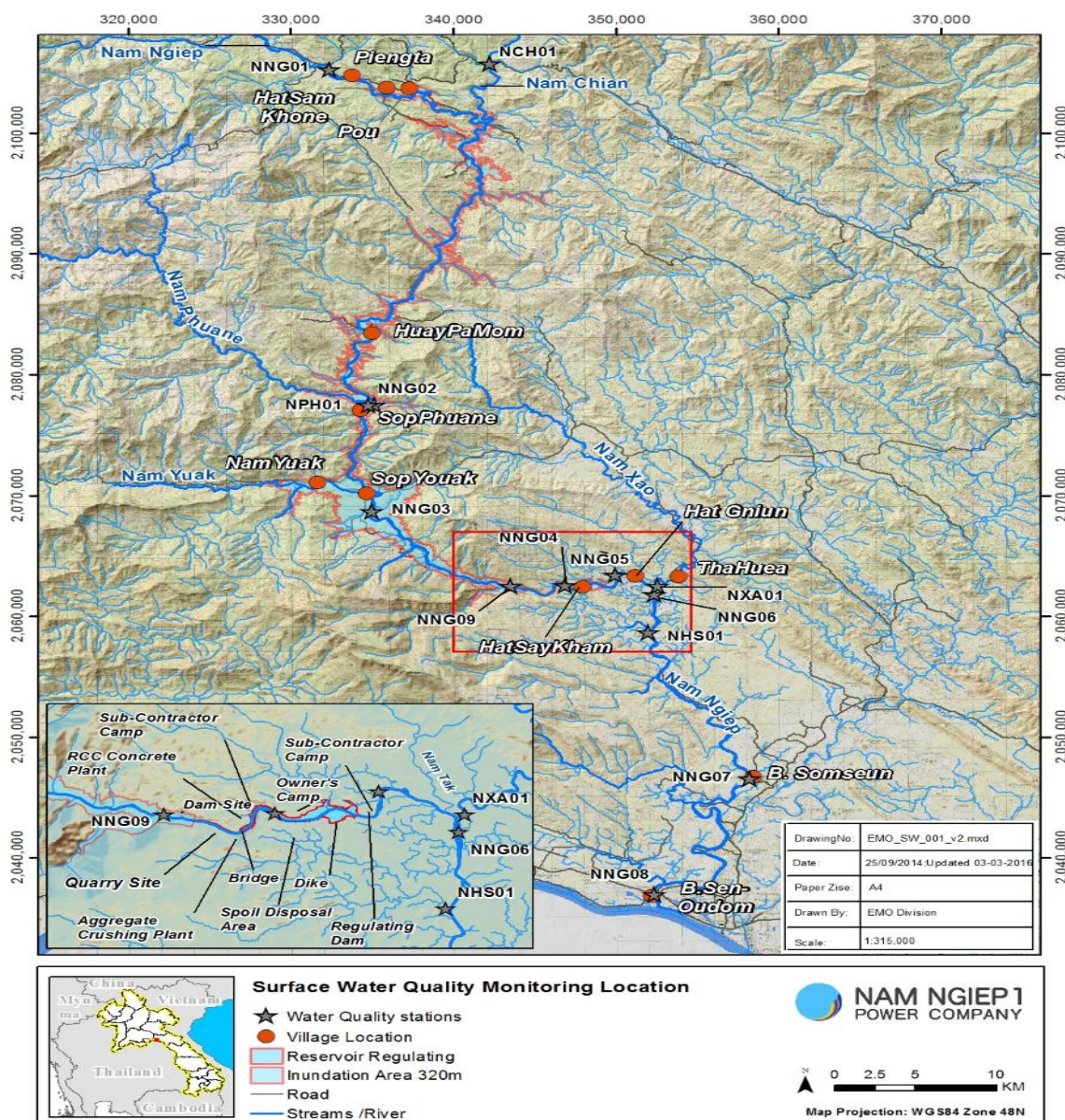
Site	Sampling ID	Non-Compliance	Corrective Actions
			RCC and CVC Plant in October 2016 to ensure that the contractor improves the systems and brings the plants back in compliance.
	DS03	A TSS and a pH result in September 2016 were higher than the Standards with recorded values of 2,476 mg/l and 10.15 respectively.	The Contractor was instructed to remove the sediment from the ponds regularly and closely monitor the waste water level in the pond for pumping to the treatment plant where needed. As mentioned above an internal audit will be carried out for this site
	DS02	All TSS values (sampled on 07, 16, and 21 September 2016) exceeded the standard with recorded values of 1,695 mg/l, 1,785 mg/l, and 2,937 mg/l respectively.	A pending ONC (ONC_OC-0223) was followed up during the bi-weekly inspection carried out on 27 September 2016 where the Contractor was instructed to: i) block the outlet pipe from a direct discharge into the river if the waste water quality does not meet the standard; ii) remove the sediment regularly; iii) repair the sediment ponds' embankments with soil. A medium to long term corrective actions were also provided and will be followed up with the Contractor during the bi-weekly site inspections.

At the time of sampling, no waste water discharge was observed at the Obayashi Corporation (OC) Camps (EF02 and EF15), TCM Camp (EF03), Sino Hydro Camp (EF06), Song Da 5 Camp No.1 (EF07), Song Da 5 Camp No. 2 (EF08), HMM Worker's Camp No.1 (EF09), V&K Camp (EF10), SECC Camp (EF11), HMM Main Camp (EF13) and IHI Main Camp (EF14). Thus, the samples were collected from the final sediment ponds. Also, no sampling was conducted during 16-26 September 2016 at the CVC Plant (DS03) as there was no waste water discharge from the sediment ponds.

3.2.2 Surface (Ambient) Water Quality Monitoring

Surface water samples are collected and analysed twice a month from nine stations in Nam Ngiep and four stations in the main tributaries including the lower Nam Chian, Nam Phouane, Nam Xao and Houay Soup (total thirteen stations). From August 2016, weekly surface water quality monitoring (physical parameters only) has been undertaken with respect to Station NNG09 located upstream of construction sites, NNG04 located within the Construction Site and NNG05 downstream of construction sites.

Figure 3-7: Surface Water Quality Monitoring Stations



Key findings for surface water quality monitoring in September 2016 are shown below.

Nam Ngiep

The Chemical Oxygen Demand (COD) concentration was found to be higher than the standard for all stations with the highest concentrations measured in the samples from NNG02 (31.1 mg/L) and NNG03 (41.6 mg/L). In addition, faecal and total coliforms were found to exceed the standard at the stations of Nam Ngiep Upstream Ban Phiengta (NNG01), Nam Ngiep Upstream Nam Phouan confluence (NNG02) and Nam Ngiep Downstream of Soup Yuak Village (NNG03 –Upstream of Construction Sites). Thus, the COD, faecal coliform, total coliform and arsenic are not likely to be influenced by the Project activities.

Since Nam Ngiep surface water quality monitoring programme commenced in September 2014, EMO has frequently found elevated levels of COD and bacteria with concentrations exceeding the surface water quality standards.

Table 3-5: Results of the Physical and Chemical Parameters of Nam Ngiep Surface Water Quality Monitoring

	River Name	Nam Ngiep								
	Zone	Upstream of Construction Sites				Within Construction Site	Downstream of Construction Sites			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08
	Date	05/09/16	06/09/16	06/09/16	07/09/16	07/09/16	07/09/16	07/09/16	07/09/16	07/09/16
Parameters (Unit)	Guideline									
pH	5.0 – 9.0	7.71	7.67	7.95	7.81	8.00	7.85	7.75	7.51	7.78
DO (%)		98.8	95.8	97.9	101.9	101.5	79.5	108.1	98.6	95.7
DO (mg/L)	>6.0	7.74	7.69	7.81	8.15	7.91	6.38	8.57	7.88	7.61
Conductivity (µs/cm)		78.1	57.6	62.8	59.6	54.5	298	100	49.3	42.2
TDS (mg/l)		39	28	31	29	27	149	50	24	20
Temperature (°C)		25.4	24.5	25	25.2	26.6	25	25.5	25.2	25.6
Turbidity (NTU)		66.8	1,052	936	31.9	29.6	57.7	48.1	27.4	26.6
TSS (mg/l)		156	928	696	100	87.3	112	100	124	79
BOD ₅ (mg/l)	<1.5	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³
COD (mg/l)	<5.0	8.8	41.6	31.1	5.4	6.8	6.6	6.6	7.0	10.5
NH ₃ -N (mg/l)	<0.2	ND ¹²	ND ¹²	ND ¹²	ND ¹²	ND ¹²	ND ¹²	ND ¹²	ND ¹²	ND ¹²
NO ₃ -N (mg/l)	<5.0	0.17	0.18	0.18	0.16	0.16	0.16	0.73	0.16	0.16
Total Kjeldahl Nitrogen (mg/l)		ND ⁹	ND ⁹	ND ⁹	ND ⁹	ND ⁹	ND ⁹	ND ⁹	ND ⁹	ND ⁹
Chloride (mg/l)		ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³	ND ¹³
Sulphate (mg/l)	<500	11.3	14.5	13	9.31	10.2	10.5	9.89	9.89	9.31
Alkalinity (mg/l)		53.4	38.8	40	41.2	39.2	40.8	33.5	33.9	32.2
Arsenic (mg/l)	<0.01	0.0021	0.0124	0.0094	0.0011	0.001	0.0006	0.0005	0.001	0.0011
Calcium (mg/l)		12	9.24	9.36	8.41	8.75	8.6	6.63	7.88	6.1
Manganese (mg/L)	<1	0.136	0.56	0.405	0.087	0.083	0.092	0.083	0.096	0.078
Mercury (mg/l)	<0.002	0.0002	ND ³	ND ³	ND ³	ND ³	ND ³	ND ³	ND ³	ND ³
Magnesium (mg/l)		2.84	4.11	3.53	1.97	2.03	2.02	1.96	1.94	1.56
Lead (mg/l)	<0.05	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰
Potassium (mg/l)		1.3	4.31	3.82	1.2	1.23	1.35	1.12	1.2	0.988
Sodium (mg/l)		2.06	2.08	1.88	1.64	1.73	1.66	1.71	1.62	1.29
Total Iron (mg/L)		8.06	35.3	31.8	3.81	3.38	4.34	3.02	3.88	3.39
Total coliform (MPN/100ml)	<5,000	17,000	22,000	17,000	1,700	1,300	1,700	4,600	4,900	3,300
Faecal coliform (MPN/100ml)	<1,000	1,100	4600	1300	94	790	130	330	490	700

ND¹ (<0.0005 mg/L) ND² (<0.0003 mg/L) ND³ (<0.0002 mg/L) ND⁴ (<0.005 mg/L) ND⁵ (<0.003 mg/L)
 ND⁶ (<0.09 mg/L) ND⁷ (<0.07 mg/L) ND⁸ (<0.04 mg/L) ND⁹ (<0.02 mg/L) ND¹⁰ (<0.01 mg/L)
 ND¹¹ (<0.3 mg/L) ND¹² (<0.2 mg/L) ND¹³ (<1.0 mg/L) ND¹⁴ (<1.5 mg/L) ND¹⁵ (<4.0 mg/L)
 ND¹⁶ (<5.0 mg/L) ND¹⁷ (<2.7 mg/L)

Table 3-6: Monitoring results of Nam Ngiep Surface Water Quality (Measured Fortnightly)

	River Name	Nam Ngiep								
	Zone	Upstream of Construction Sites				Within Construction Site	Downstream of Construction Sites			
	Station Code	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08
	Date	19/09/16	20/09/16	20/09/16	21/09/16	21/09/16	21/09/16	21/09/16	21/09/16	21/09/16
Parameters (Unit)	Guideline									
pH	5.0 – 9.0	7.89	7.46	8.15	7.96	7.82	7.42	7.32	7.72	7.85
DO (%)		97.4	96.6	101.9	101.8	102.1	93	93	97.5	94.9
DO (mg/L)	>6.0	7.38	7.7	7.79	8.17	7.83	7.49	7.4	7.49	7.27
Conductivity (µs/cm)		86.8	64	64.2	65.6	61.8	229	190	61.1	100.6
TDS (mg/l)		43	32	32	33	32	114	90	30.5	50.3
Temperature (°C)		27.1	25.1	27.2	25.3	27.6	25.5	25.79	27.7	27.1
Turbidity (NTU)		26	26	25.6	25	24.5	38.7	32.2	38.4	36

Table 3-7: Monitoring results of Nam Ngiep Surface Water Quality at the Upstream, within and Downstream of Construction Sites (Measured Weekly)

	River Name	Nam Ngiep		
	Zone	Upstream of Construction Sites	Within Construction Site	Downstream of Construction Sites
	Station Code	NNG09	NNG04	NNG05
	Date	16/09/16	16/09/16	16/09/16
Parameters (Unit)	Guideline			
pH	5.0 – 9.0	7.91	7.92	7.53
DO (%)		103.4	104.5	98.5
DO (mg/L)	>6.0	8.25	8.1	7.54
Conductivity (µs/cm)		60.7	64.2	60.5
TDS (mg/l)		30	32	30
Temperature (°C)		25.3	26.8	28
Turbidity (NTU)		38.3	37.9	38.1

	River Name	Nam Ngiep		
	Zone	Upstream of Construction Sites	Within Construction Site	Downstream of Construction Sites
	Station Code	NNG09	NNG04	NNG05
	Date	26/09/16	26/09/16	26/09/16
Parameters (Unit)	Guideline			
pH	5.0 – 9.0	7.65	6.91	8.07
DO (%)		101.5	104	102
DO (mg/L)	>6.0	7.93	8.27	7.77
Conductivity (µs/cm)		65.7	66.6	82.2
TDS (mg/l)		32.53	33.3	41.1
Temperature (°C)		26.5	25.5	27.9
Turbidity (NTU)		27.2	29.1	28.1

Tributaries upstream the main dam: Nam Chiane (NCH01), Nam Phouan (NPH01)

Nam Chiane (NCH01) is located about 66 km upstream of the NNP1 Project construction site. The COD exceeded the National Surface Water Quality Standard with recorded values of 6.8 mg/l. In addition, faecal coliform and total coliform exceeded the standard with values recorded at 1,300 MPN/100ml and 22,000 MPN/100ml.

Nam Phouan is located about 24 km upstream of NNP1 Project construction site. The COD exceeded the National Surface Water Quality Standard with recorded values of 6.2 mg/l.

Tributaries downstream the main dam: Nam Xao (NXA01), Nam Houay Soup (NHS01)

Nam Xao has a confluence with the Nam Ngiep downstream of the NNP1 Project construction site. The COD, faecal coliforms and total coliform exceeded the National Surface Water Quality Standard with recorded values of 10.3 mg/l, 17,000 MPN/100ml and 3,500 MPN/100 ml respectively.

Houay Soup Nyai has a confluence with the Nam Ngiep River downstream of NNP1 Project construction site. The COD, total coliform exceeded the National Surface Water Quality Standard with recorded values of 6.4 mg/l, and 7,900 MPN/100 ml respectively.

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

	Site Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houaysoup
	Zone	Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	05/09/16	06/09/16	07/09/16	07/09/16
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	8.06	7.98	7.93	6.86
DO (%)		101.3	98.7	90.6	85.3
DO (mg/L)	>6.0	8.13	7.98	7.11	6.65
Conductivity(μs/cm)		28	79.9	77	26
TDS (mg/L)		14	40	38	13
Temperature (°C)		23.9	24.1	25.9	24.8
Turbidity (NTU)		32	29.7	75.5	10.08
TSS (mg/l)		142	74.7	109	12.2
BOD ₅ (mg/l)	<1.5	ND ¹³	ND ¹³	ND ¹³	ND ¹³
COD (mg/l)	<5.0	6.8	6.2	10.3	6.4
NH ₃ -N (mg/l)	<0.2	ND ¹²	ND ¹²	ND ¹²	ND ¹²
NO ₃ -N (mg/l)	<5.0	0.15	0.15	0.14	0.24
Total Kjeldahl Nitrogen (mg/l)		ND ⁹	ND ⁹	ND ⁹	ND ⁹
Chloride (mg/l)		ND ¹³	ND ¹³	ND ¹³	ND ¹³
Sulphate(mg/l)	<500	9.89	9.03	10.2	19
Alkalinity (mg/l)		26.1	56.3	32	9.79
Arsenic (mg/l)	<0.01	0.0013	0.001	0.0006	0.0005
Calcium (mg/l)		3.86	14.2	5.82	1.64
Manganese (mg/L)	<1	0.133	0.142	0.12	0.04
Mercury (mg/l)	<0.002	ND ³	ND ³	ND ³	ND ³
Magnesium (mg/l)		1.08	1.62	2.24	0.417
Lead (mg/l)	<0.05	ND ¹⁰	ND ¹⁰	ND ¹⁰	ND ¹⁰
Potassium (mg/l)		1.57	1.29	1.26	0.366
Sodium (mg/l)		1.82	1.45	1.93	0.403
Total Iron (mg/L)		3.24	1.92	3.64	0.575
Total coliform (MPN/100mL)	<5,000	22,000	3,300	17,000	7,900
Faecal coliform (MPN/100mL)	<1,000	1,300	330	3,500	280

ND ¹ (<0.0005 mg/L)	ND ² (<0.0003 mg/L)	ND ³ (<0.0002 mg/L)	ND ⁴ (<0.005 mg/L)	ND ⁵ (<0.003 mg/L)
ND ⁶ (<0.09 mg/L)	ND ⁷ (<0.07 mg/L)	ND ⁸ (<0.04 mg/L)	ND ⁹ (<0.02 mg/L)	ND ¹⁰ (<0.01 mg/L)
ND ¹¹ (<0.3 mg/L)	ND ¹² (<0.2 mg/L)	ND ¹³ (<1.0 mg/L)	ND ¹⁴ (<1.5 mg/L)	ND ¹⁵ (<4.0 mg/L)
ND ¹⁶ (<5.0 mg/L)				

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

	Site Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houaysoup
	Zone	Tributaries Upstream		Tributaries Downstream	
	Station Code	NCH01	NPH01	NXA01	NHS01
	Date	19/09/16	20/09/16	21/09/16	21/09/16
Parameters (Unit)	Guideline				
pH	5.0 - 9.0	7.99	8.13	7.07	6.92
DO (%)		106.6	99.5	88.2	80.1
DO (mg/L)	>6.0	8.06	8.01	6.87	6.42
Conductivity(μs/cm)		28.5	63.7	160	59
TDS (mg/L)		14	31	80	30
Temperature (°C)		27.1	24.5	27.09	24.9
Turbidity (NTU)		12	18.4	8.22	4.62

3.2.3 Groundwater Quality Monitoring

During September 2016, NNP1PC sampled and analysed the groundwater quality in 12 boreholes. Out of these, two boreholes are community owned boreholes at Hatsaykham Village, one borehole is a private well at Hat Gniun Village, five boreholes are built by the Project for re-settlers at Houay Soup Resettlement Area, and four boreholes are built by NNP1PC at NNP1 Project Landfill.

All groundwater quality data are routinely reported to the Social Management Office of NNP1PC which then communicates the results to the village authorities and the local health centres as part of the Project's public health programme. The results are shown below.

Ban Hatsaykham

The water from the boreholes in Ban Hatsaykham is used by 42 households for drinking, bathing, washing and domestic use purposes. All of the monitored parameters complied with the standards, except pH which was lower than the Standard range between 6.50 and 9.20 with recorded values of 5.75 for the borehole number GHSK03.

Ban Hat Gnuin

The water from the well in Ban Hat Gnuin is used by 6 households for bathing and washing purposes. The faecal coliforms and E.coli bacteria contamination were 2,300 MPN/100 ml which exceeded the National Groundwater Standard. In addition, the pH level was measured at 5.80 which was slightly lower than the Standard range of between 6.50 and 9.20.

Houay Soup Resettlement Area (HSRA)

The water from the boreholes in Houay Soup Resettlement is to be used by 30 households for drinking, bathing and domestic use purpose commencing in November 2016. A small concentration of faecal coliforms and E.coli bacteria were found in one (GHSP05) out of five boreholes with recorded values of 2 MPN/100 ml respectively (non-compliant with the standard). In addition, during September 2016 confirmed that there is no faecal coliform and E.coli bacteria contamination in the borehole of GHSK03. The monitoring will be conducted again in October 2016 to confirm the contamination level prior to the arrival of the Project Affected People. The remaining parameters monitored complied with the relevant standards.

NNP1 Solid Waste Landfill

In the three (MW1, MW2 and MW4) out of four wells, lead exceeded the standard (<0.01 mg/l) with values recorded of 0.107, 0.018, and 0.081 mg/l respectively. Faecal coliforms and E. coli bacteria contamination were 21 MPN/100 ml, were detected in the groundwater samples from the monitoring well No. MW3. No faecal coliforms were found in MW1, 2 and 4. The surrounding environment, such as a temporary workers camp located at the HS Landfill which is close to the borehole (MW3), could cause the increase in bacteria contamination of the groundwater. The high lead contamination in three out of four landfill monitoring boreholes (MW1, MW2 and MW4) will be confirmed during the October 2016 sampling.

Figure 3-8: Groundwater Quality Monitoring Locations

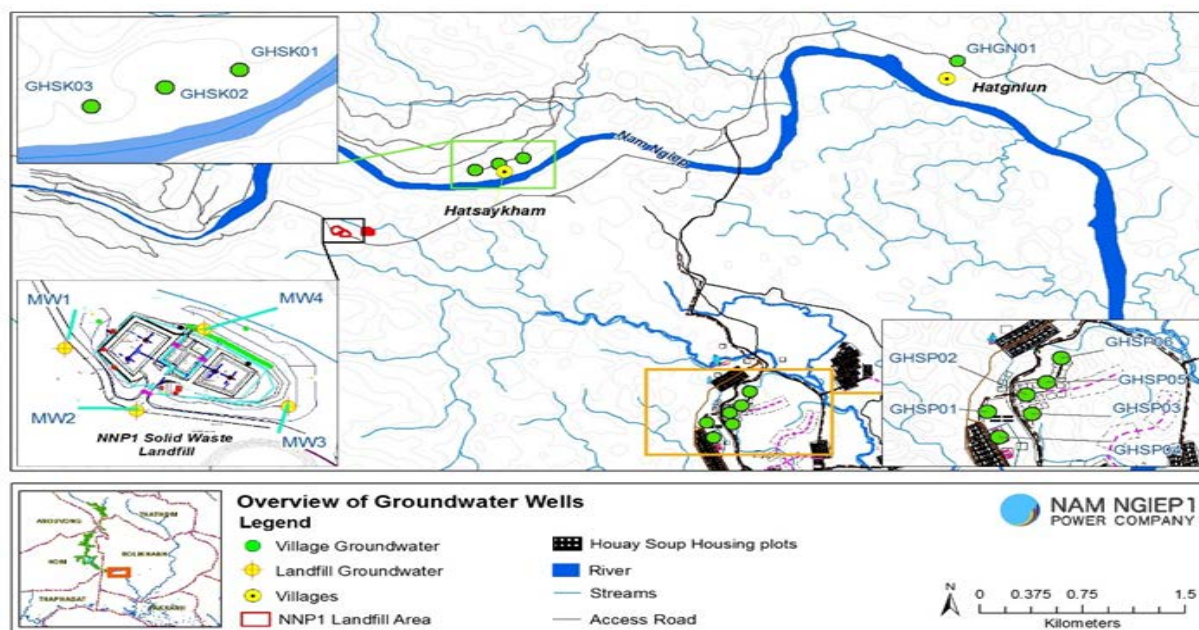


Table 3-10: Groundwater Quality Monitoring Results Hatsaykham and Hat Gniun Villages in September 2016

Parameter (Unit)	Site Name	Ban Hatsaykham		Ban Hat Gniun	
	Station Code	GHSK01	GHSK02	GHGN01	GHGN01
	Date	14/09/2016		14/09/2016	14/09/2016
	Guideline				
pH	6.5-9.2	6.54	Hand pump broken	5.75	5.8
Sat. DO (%)		45.6		56.5	34.8
DO (mg/L)		3.6		4.41	2.69
Conductivity (µs/cm)		49.8		19.63	28.9
TDS (mg/L)	<1,200	25		9	14
Temperature (°C)		26.1		26.7	26.9
Turbidity (NTU)	<20	0.4		0.33	11.8
Nitrate (mg/l)	<45	0.92		4.49	4.4
Total Hardness (mg/l)	<500	29.2		5.8	7.6
Nitrite (mg/l)		ND ⁷		ND ⁷	ND ⁷
Fluoride (mg/l)	<1	0.04		0.07	ND ⁹
Arsenic (mg/l)	<0.05	0.0008		ND ²	0.0005
Calcium (mg/l)		7.21		1.34	1.37
Manganese (mg/l)	<0.5	ND ⁴		0.223	0.126
Magnesium (mg/l)		0.83		0.387	0.619
Cadmium (mg/l)	<0.01	ND ⁵		ND ⁵	ND ⁵
Potassium (mg/l)		0.583		0.674	2.12
Sodium (mg/l)		0.841		0.711	2.08
Iron (mg/l)	<1	ND ¹⁰		0.164	0.492
Faecal coliform (MPN/100ml)	0	0		0	2,300
Ecoli Bacteria (MPN/100ml)	0	0		0	2,300

ND ¹ (<0.0005 mg/L)	ND ² (<0.0003 mg/L)	ND ³ (<0.0002 mg/L)	ND ⁴ (<0.005 mg/L)	ND ⁵ (<0.003 mg/L)
ND ⁶ (<0.09 mg/L)	ND ⁷ (<0.07 mg/L)	ND ⁸ (<0.04 mg/L)	ND ⁹ (<0.02 mg/L)	ND ¹⁰ (<0.01 mg/L)
ND ¹¹ (<0.3 mg/L)	ND ¹² (<0.2 mg/L)	ND ¹³ (<1.0 mg/L)	ND ¹⁴ (<1.5 mg/L)	ND ¹⁵ (<4.0 mg/L)
ND ¹⁶ (<5.0 mg/L)	ND ¹⁷ (<2.7 mg/L)			

Table 3-11: NNP1 Project Landfill's Baseline Groundwater Monitoring Results

Parameter (Unit)	Site Name	Houay Soup Resettlement					
	Station Code	GHSP01	GHSP02	GHSP03	GHSP04	GHSP05	GHSP06
	Date	16/09/2016	16/09/2016	16/09/2016		16/09/2016	16/09/2016
Parameter (Unit)	Guideline						
pH	6.5-9.2	7.58	7.83	7.56		7.18	6.91
Sat. DO (%)		81.1	69.9	83.9	Pump broken	87.1	84.7
DO (mg/L)		6.32	5.24	6.37		6.68	6.47
Conductivity (µs/cm)		330	178.4	337		112.3	68.7
TDS (mg/L)	<1,200	165	89	167		56	34
Temperature (°C)		26.8	28.8	28.1		27.4	27.6
Turbidity (NTU)	<20	0.79	1.55	4.55		1.07	3.74
Nitrate (mg/l)	<45	0.924	0.308	0.308		0.88	0.616
Total Hardness (mg/l)	<500	196	108	204		66.2	42.8
Nitrite (mg/l)		ND ⁷	ND ⁷	ND ⁷		ND ⁷	ND ⁷
Fluoride (mg/l)		0.05	0.08	0.04		0.06	ND ⁹
Arsenic (mg/l)	<0.05	0.0008	0.0008	0.0009		0.0005	0.0007
Calcium (mg/l)		58.5	34	64.9		19.3	11.4
Manganese (mg/l)	<0.5	ND ⁴	ND ⁴	0.038		ND ⁴	0.036
Magnesium (mg/l)		3.42	1.88	3.19		2.1	1.28
Cadmium (mg/l)	<0.01	ND ⁵	ND ⁵	ND ⁵		ND ⁵	ND ⁵
Potassium (mg/l)		0.706	0.464	0.581		0.508	0.488
Sodium (mg/l)		5.88	2.55	4.46		1.89	1.1
Iron (mg/l)	<1	ND ¹⁰	ND ¹⁰	0.052		0.034	0.094
Faecal coliform (MPN/100ml)	0	0	0	0		2	0
E.coli Bacteria (MPN/100ml)	0	0	0	0		2	0

Table 3-12: NNP1 Project Landfill's Groundwater Monitoring Results

Parameters (Unit)	Site Name	NNP1 Landfill			
	Station Code	MW1	MW2	MW3	MW4
	Date	02/09/2016	02/09/2016	02/09/2016	02/09/2016
Parameters (Unit)	Guideline				
pH		6.24	5.99	6	5.73
Sat. DO (%)		29.5	25.4	27.6	47.2
DO (mg/L)		2.25	1.94	2.22	3.62
Conductivity (µs/cm)		103	30.5	93.6	172.7
TDS (mg/L)		51	15	46.8	86
Temperature (°C)		27.4	27.4	26	27.2
Turbidity (NTU)		1.91	1.15	1.95	1.64
NO ₃ -N (mg/l)		0.11	0.1	0.11	ND ⁹
Total Hardness (mg/l)		102	21.2	54.4	105
NO ₂ -N (mg/l)		ND ⁷	ND ⁷	ND ⁷	ND ⁷
Fluoride (mg/l)		0.1	0.1	0.1	0.15
Arsenic (mg/l)	<0.01	ND ²	ND ²	ND ²	ND ²
Calcium (mg/l)		29.1	3.2	9.8	29.5
Manganese (mg/l)		0.124	0.074	ND ⁴	0.081
Magnesium (mg/l)		1.7	0.395	0.594	0.832
Cadmium (mg/l)		ND ⁵	ND ⁵	ND ⁵	ND ⁵
Lead (mg/l)	<0.01	0.107	0.018	ND ¹⁰	0.081
Potassium (mg/l)		0.341	0.205	0.133	0.231
Sodium (mg/l)		0.561	0.439	0.381	0.327
Iron (mg/l)		0.617	0.604	0.118	0.22
Faecal Coliform (MPN/100ml)		0	0	21	0
E.Coli Bacteria (MPN/100ml)		0	0	21	0

3.2.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Water quality monitoring for GFWS system is conducted on a monthly basis with the aim to alert the users in case of health risks when using the water for bathing or washing. During September 2016, water samples were taken from the taps at Thaheua Village only. There was no water flowing out from the gravity fed water supply system during the sampling schedule.

Results of the assessment for GFWS of Thaheua Village are shown and summarised as follows:

Ban Thahuea (WTHH02): Village (WTHH02): All parameters complied with the National Drinking Water Standards except for faecal coliforms and E.coli which were found to be 23 MPN/100 ml for both parameters.

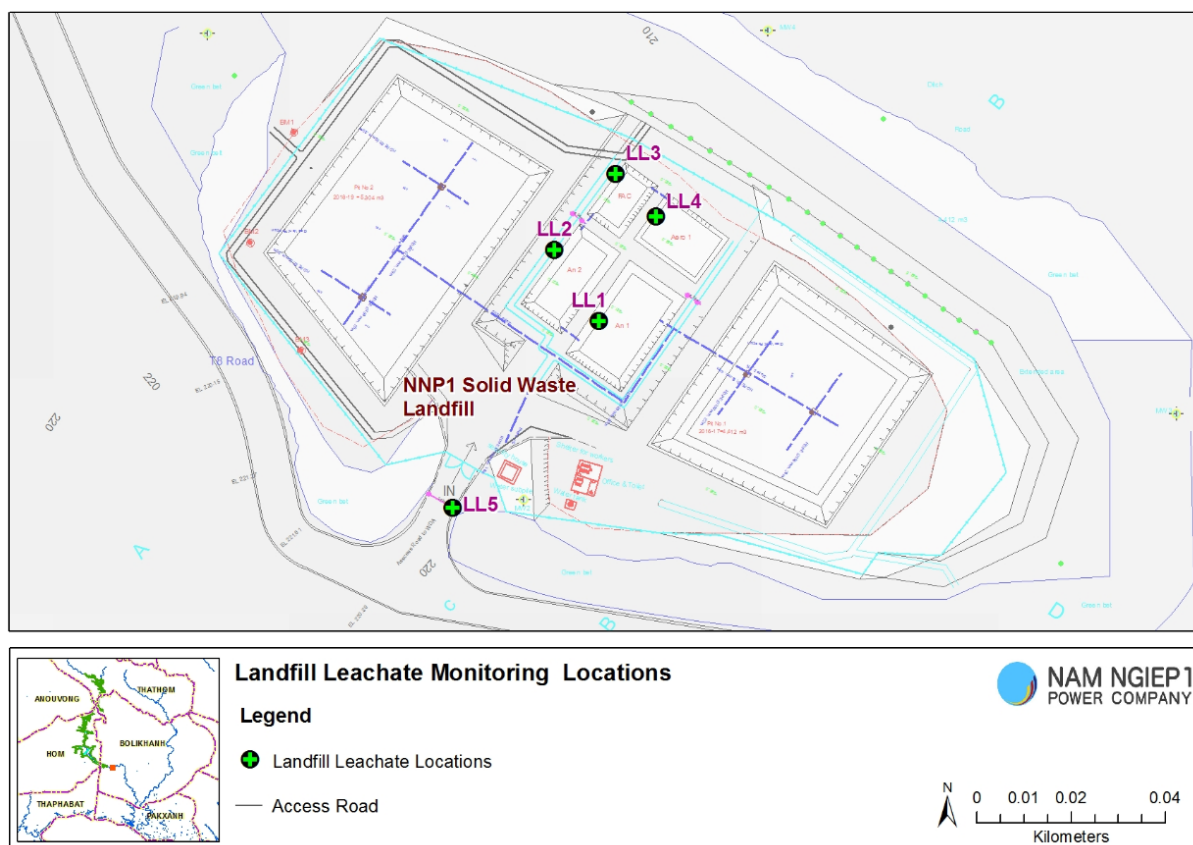
Table 3-13: Results of the Gravity Fed Water Supply Quality Monitoring

	Site Name	Ban Thaheua	Ban Hat Gnuin
	Station Code	WTHH02	WHGN02
	Date	14/09/2016	
Parameter (Unit)	Guideline		
pH	6.5-8.5	7.77	No water
Sat. DO (%)		107.7	
DO (mg/L)		8.43	
Conductivity (µs/cm)	<1,000	33.2	
TDS (mg/L)	<600	16	
Temperature (°C)	<35	26.5	
Turbidity (NTU)	<10	4.54	
Nitrate (mg/l)	<50	0.836	
Total Hardness (mg/l)		26.6	
Nitrite (mg/l)	<3	ND ⁷	
Fluoride (mg/l)	<1.5	ND ⁹	
Arsenic (mg/l)	<0.05	0.0004	
Manganese (mg/l)	<0.5	0.029	
Mercury (mg/l)	<0.001	ND ³	
Magnesium (mg/l)		1.22	
Selenium (mg/l)		ND ¹	
Cadmium (mg/l)	<0.003	ND ⁵	
Lead (mg/l)	<0.01	ND ¹⁰	
Iron (mg/l)	<1	0.146	
Faecal coliform (MPN/100ml)	0	23	
Ecoli Bacteria (MPN/100mL)	0	23	

3.2.5 Landfill Leachate Monitoring

During September 2016, water samples were taken from all four (04) landfill leachate ponds. During the mission, it was found that leachate overflowed from the ponds into the open drainage around the ponds and was discharged to the side drainage at the entrance to the landfill. A sample of the leachate was also collected (LL5) from the outlet drainage pipe to understand the potential impacts of the unscheduled discharge of untreated leachate which was caused by a number of heavy rain events. As a temporary solution to this issue, the landfill operators are recycling the leachate by pumping it from the last pond back to the waste pit.

Figure 3-9: Landfill Leachate Monitoring Location



The results of the leachate analyses indicate a gradual treatment of the key parameters although BOD and total iron are still slightly above the relevant effluent standard. It should be noted that nutrients (nitrogen and phosphorous), heavy metals and faecal coliforms are all within the relevant standards. However, the overflow happened from the intermediary ponds and the sample (LL5) exceeds the standards with respect to total iron and faecal coliform. Detailed results are presented below.

Table 3-14 Landfill Leachate Monitoring Results

	Site Name	NNP1 Landfill (Leachate Ponds)				NNP1 Leachate Discharge Point
	Station Code	LL1	LL2	LL3	LL4	LL5
	Date	02/09/16	02/09/16	02/09/16	02/09/16	08/09/16
Parameters (Unit)	Guideline					
pH	6.0 - 9.0	6.62	6.57	7	7.1	8.37
Sat. DO (%)		53.8	5.1	11.9	11.9	93.1
DO (mg/L)		4	0.37	0.85	0.85	7.3
Conductivity (µs/cm)		256	270	252	215.3	172
TDS (mg/L)		128	135	126	157	85
Temperature (°C)		30.1	30.5	31.2	30.9	26.2
Turbidity (NTU)		21.6	28.6	35.3	48.5	51
BOD (mg/L)	<30	75.4	62.4	54.6	34.8	29.3
COD (mg/L)	<125	131	127	111	89.7	66.3
NH ₃ -N (mg/L)	<10.0	5	5	5	3	3
NO ₃ -N (mg/l)		0.03	ND ⁹	ND ⁹	ND ⁹	N/A
NO ₂ -N (mg/l)		ND ⁷	ND ⁷	ND ⁷	ND ⁷	N/A
Total nitrogen (mg/l)	<10.0	9.66	9.97	9.12	7.4	N/A
Fluoride (mg/l)	<20	0.09	ND ⁹	ND ⁹	ND ⁹	N/A
Arsenic (mg/l)	<0.01	0.0007	ND ²	ND ²	0.0003	N/A
Manganese (mg/l)		2.02	1.95	1.79	1.54	1.45
Mercury (mg/l)	<0.001	ND ³	ND ³	ND ³	ND ³	N/A

	Site Name	NNP1 Landfill (Leachate Ponds)				NNP1 Leachate Discharge Point
	Station Code	LL1	LL2	LL3	LL4	LL5
	Date	02/09/16	02/09/16	02/09/16	02/09/16	08/09/16
Parameters (Unit)	Guideline					
Magnesium (mg/l)		2.17	2.32	2.31	2.01	N/A
Selenium (mg/l)	<0.1	ND ¹	ND ¹	ND ¹	ND ¹	N/A
Cadmium (mg/l)	<0.05	ND ⁵	ND ⁵	ND ⁵	ND ⁵	N/A
Copper (mg/l)	<0.3	ND	ND	ND	ND	N/A
Lead (mg/l)	<0.2	ND ¹⁰	ND ¹⁰	ND ¹⁰	0.048	N/A
Iron (mg/l)	<2	8.08	5.47	3.64	3.69	4.88
Total phosphorus (mg/l)	<2	0.03	0.03	0.02	0.05	N/A
Faecal Coliform (MPN/100ml)	<400	7,900	490	330	240	11,000

3.2.6 Dust Monitoring

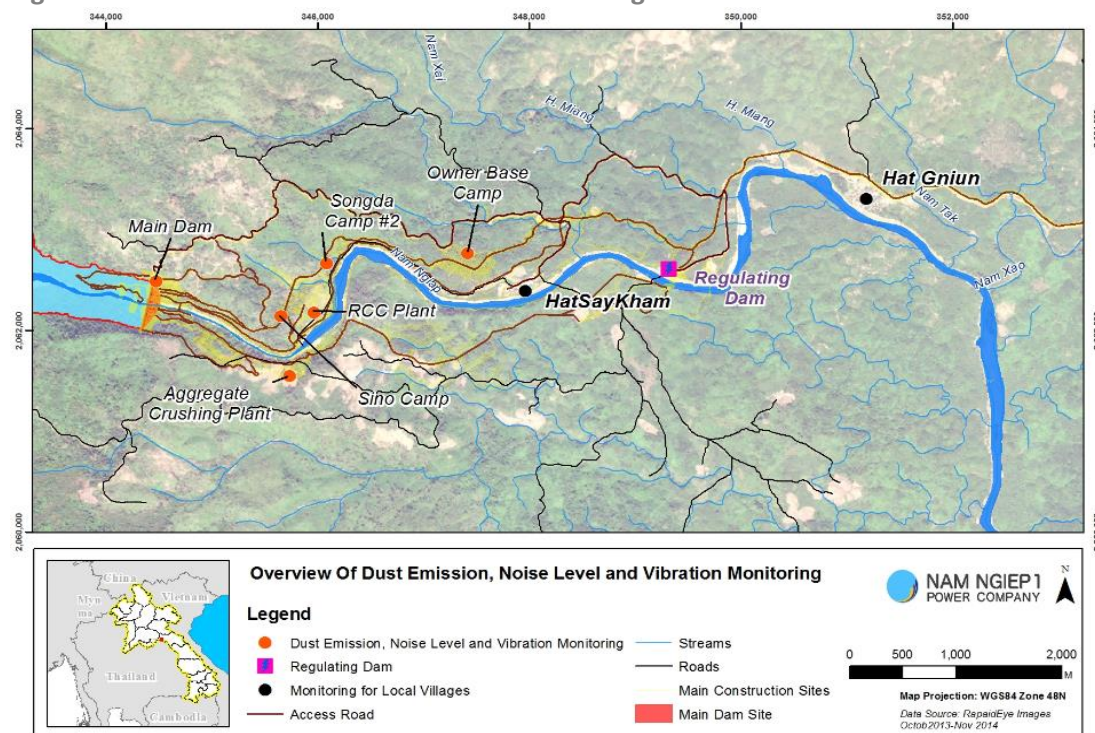
Dust monitoring for Hat Gnuin and Hatsaykham Villages, Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp, Song Da 5 Camp No. 2 and Owner's Site Office and Village was cancelled because of malfunctioning equipment. The dust aerosol monitoring equipment will be sent back to the supplier in the United States for maintenance and spare part replacement which will take approximately 2 months. This is not likely to cause major issues with dust monitoring schedule during the rainy season.

3.2.7 Noise Monitoring

During September 2016, noise monitoring was conducted in Ban Hatsaykham and Ban Hat Gnuin for at least 72 consecutive hours in each village. Noise monitoring was also conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp, Song Da 5 Camp No. 2 and Sino Hydro Temporary Worker Camp (new) to assess possible impact on workers' health and Owner's Site Office and Village (to monitor the ambient noise levels) for 24 consecutive hours

The noise monitoring location are described in the Figure 3-7 below

Figure 3-10: Noise and Dust Emission Monitoring Locations



At Hat Gnuin Village, the records indicated that most average noise level monitored during 01 -04 September 2016 were higher than the standard. The average noise level during the period of 18:01-

06:00 at Hatsaykham Village monitored during 04-07 September 2016 were higher than the standard with an average data recorded between 55.58 – 63.22 dB(A).

The noise levels recorded at all Project Construction Site's stations indicated full compliance with the National Standard for the period of 06:01-22:00. However, for the period of 22:01-06:00, slightly higher noise levels than the Standard were recorded at the RCC, Aggregate Crushing Plant, Sino Hydro Camp, Sino Hydro Temporary Workers' Camp, Song Da 5 Camp No. 2, the Main Dam and Owner's Site Office and Village [between 51.09 – 75.32 dB(A) compared to the Standard of 50 dB(A)]. The key causes of high noise levels were most likely to be the windy and raining conditions during the night time period except at the Aggregate Crushing Plant where the crushing machine operated during the night time period.

Results of the noise monitoring for July 2016 are shown in Annex B.

3.3 Construction Site Waste Management

3.3.1 Solid Waste Management at the Construction Site

In September 2016, NNP1PC closely supervised the landfill operations including waste disposal and compaction. Inadequate waste segregation at the source was still evident at a number of subcontractors' camps where some recyclables were mixed with general and construction wastes. The Contractors and their Subcontractors were instructed to properly segregate the mixed waste prior to the disposal. Approximately 170.5 m³ of waste was disposed of at the NNP1 Project Landfill during September 2016, an increase of 67.5 m³ compared with August 2016 (see Photograph 1 and Photograph 2).

Photograph 1: Waste Compaction and Soil Cover at the Landfill



Photograph 2: The Leachate from the Final Treatment Pond was pumped to the Waste Pit



In addition, a total of 10 m³ of black water from Song Da 5 Camp No. 1 was disposed and treated with lime at the designated site at Spoil Disposal Area No. 6 following NNP1PC's Standard Operating Procedure (SOP) for Sewage/Black Water Disposal.

3.3.2 Hazardous Materials and Waste Management

During September 2016, joint hazardous materials and waste inventories were carried out at the main construction sites and subcontractors' camps including Loxley's Stockyard (230 kV Transmission Line), Loxley Subcontractor's site office (RCR) and Workshop, TCM Camp, V&K Camp, CVC Plant, Sino Hydro fuel station, Sino Hydro's worker camp, Song Da5 Industrial Area, HM Hydro Workers' Camp, IHI Workers' Camp and SECC Workshop. During this monthly joint inspection, NNP1PC-EMO provided the workplace's hazardous waste management induction for TL, IHI and HM contractors. Approximately 10 supervisors attended. The induction focused on hazardous material spills protection and response through the "Control-Contain-Clean up Principles". NNP1PC-EMO used hydrocarbon and chemical absorbent sheets for demonstrations in this training.

The types and amounts of hazardous materials generated at the different construction sites and camps are sold to an authorised vendor (Khounmixay Processing Factory in Pakxan) for disposal.

Table 3-15 Results of hazardous material inventory

No.	Hazardous Waste Type	Unit	Total in September 2016 (A)	Disposal by Selling (B)	Remaining Amount by 30 September 2016 (A - B)
1	Used hydraulic and engine oil	Litre (l)	2,710	0	2,710
2	Cement bag	Bag	2,000	0	2,000
3	Empty used chemical drum/container	Drum (20 l)	1100	0	1,100
4	Used oil mixed with water	l	200	0	200
5	Used oil filters	Piece	220	0	220
6	Ink cartridge	Unit	110	5	105
7	Used tyre	Piece	104	0	104
8	Empty contaminated bitumen drum/container	Drum (200 l)	82	0	82
9	Empty paint and spray cans	Can	78	3	75
10	Empty used oil drum/container	Drum (20 l)	53	16	37
11	Empty used chemical drum/container	Drum (200 l)	31	0	31
12	Empty used oil drum/container	Drum (200 l)	25	2	23
13	Contaminated soil, sawdust and concrete	Bag	16	0	16
14	Car battery	Unit	11	1	10
15	Halogen/fluorescent bulbs	Unit	8	0	8
16	Contaminated textile and material	Bag	7	0	7
17	Acid and caustic cleaners	Bottle	0	0	0
18	Clinical waste	kg	0	0	0

Photograph 3: Hazardous Waste Management for Loxley's RCR Subcontractor (230 kV TL Contractor)



Photograph 4: Hazardous Waste Management for H-M Hydro's LILAMA10 Subcontractor



In addition, the amount of recyclable waste was recorded at each NNP1 Project construction site and offices including ESD Office, Loxley Office and Stockyard in Paksan, RCR's Site Office and workshop at Thaphabath District, Song Da 5 Camp No. 1, TCM Camp, V&K Camp, Song Da 5 Camp No. 2, Song Da 5 Workshop at the Spoil Disposal area No. 2, RCC Plant, Sino Hydro Camp, Sino Hydro Worker's Camp, SECC Camp and each Contractor's Camp at Houay Soup Resettlement Area (HSRA). The amount of sold recyclable waste is summarised below.

Table 3-16: Amounts of recycle waste sold

NO.	SITE LOCATION NAME	UNIT	TOTAL
1	Song Da 5 Camp No. 2	kg	1,348
2	Song Da 5 Camp No. 1	kg	1,193
3	Obayashi Corporation Camp	kg	575
4	Owner's Village and Site Office	kg	112
Total		kg	3,230

3.4 Community Waste Management Support

3.4.1 Community Recycling Programme

Since July 2015, a total of 8,144 kg of recyclables were received by the Community Recycle Bank. During September 2016, a total of 368 kg of recyclables was recorded, a slight decrease from a total of 373 m³ in August 2016. A total of 121 households hold accounts at the Community Recycle Bank (no increase in membership number in September 2016). The percentages of participation in the programme for each village remain to be 87% for Hat Gniun Village, 64% for Hatsaykham Village and 64% for Thahuea Village.

The types and amounts of waste recycled in September 2016 are presented below

Table 3-11: Types and amounts of waste traded

Types of Waste	Unit	Amount Recycled In August 2016	Accumulated Amount Recycled (July 2015 – September 2016)
Scrap metal	kg	185	2,779
Glass	kg	62	2,278
Paper/cardboard	kg	76	1,253
Plastic bottle	kg	16	1,174
Aluminium cans	kg	29	660
Total	kg	368	8,144

Photograph 5: Recyclable Waste Were Sold to the Community Recycle Waste Bank**Photograph 6: Recyclables Received from the Contractor**

In September 2016, the purchase of recyclables from villagers and students continued. Some recyclables were transported from Contractors' camps to the Recycle Waste Bank at Hat Gniun Village. Recyclables will continue to be stockpiled at the Community Recycle Waste Bank, the Owner's Site Office and Village and the Contractors/subcontractors with the intention of arranging a routine collection by the Khounmixay Processing Factory. Houay Soup Resettlement Area Waste Management.

In September 2016, the Houay soup landfill temporary waste pit started operating and will be opened every Tuesday and Thursday from 09:30 to 10:30 am through individual arrangement with NNP1PC-EMO staff. A total of 0.2 m3 of solid waste from HSRA's Contractors was disposed at the temporary waste pit. In addition, the wetland pond and temporary fence construction was nearly completed.

Photograph 7: Temporary Fence and Gate Construction at Houay Soup Landfill



Photograph 8: Wetland pond construction was Nearly Completed



3.5 Watershed and Biodiversity Management

3.5.1 Preparation of the Nam Ngiep 1 Watershed Management Plan

Obligations	Status by September 2016
Prepare: 1) Interim Nam Ngiep 1 Watershed Management Plan by 01 September 2016; and 2) Full draft Nam Ngiep 1 Watershed Management Plan by 15 November 2016	Continue with WMP development focusing on the improvement of interim plan based on the comments from ADB.
Prepare draft Watershed Management Regulations by 15 November 2016	Conducted internal workshop between WRPO Xaysomboun and WRPO Bolikhamxay on 28 September 2016 to further discuss the draft provincial regulation
Final Watershed Management Plan by 23 December 2016	Not relevant at this time
1) Draft provincial regulation submitted to Provincial Justice Department by 23 December 2016. 2) Start of public hearing process by 10 January 2017	Not relevant at this time
Activities in September 2016	Results
Data and Information Collection and Analysis for WMP Development	<ul style="list-style-type: none"> The International watershed consultant together with NNP1 team have focused on the improvement of the interim Watershed Management Plan which was submitted to ADB on 1st September 2016. The progress of work have been discussed regularly with NNP1 team and ADB Consultant. The key issues being addressed in the revision of the interim plan include: <ul style="list-style-type: none"> Prioritizing the watershed management plan into: <ul style="list-style-type: none"> Priority 1 - NNP1 watershed,

Obligations	Status by September 2016
	<p>Priority 2 - the downstream Nam Ngiep including the riparian zone 50 m either side of the river</p> <p>Priority 3 – Peripheral Impact Village, and</p> <p>Priority 4 – those areas of Nam Ngiep Watershed not included in the above</p> <ul style="list-style-type: none"> ○ Analyse the trend of land use changes from 2000 - 2015 ○ Revisit and rework the data and problem analysis based on the village consultation meetings ○ Rework and improve the structure of WMP ○ Review the draft biodiversity and fishery management plan and discuss with respective consultants ● Village consultation meetings were conducted on 23 September 2016 in Houayxay and Samsao Village, Hom District, Xaysomboun Province to provide some additional information for data and problem analysis such as: family setting, land use, forest use and its trend, food and income activities, and the preference of villagers on the land use, population, food, and rice sufficiency. ● The improved interim plan is expected to be submitted to ADB in the first week of October 2016.
<p>Prepare draft Watershed Management Regulations by 15 November 2016</p>	<ul style="list-style-type: none"> ● An internal workshop between WRPO Xaysomboun and WRPO Bolikhamxay was conducted on 28 September 2016 in Hom District to discuss the revisions made based on the comments from technical discussions on 28 June 2016, and to include references to relevant existing laws and regulation. ● The WRPO plans to have a follow-up village consultations on the draft regulations before the technical workshop on the full draft NNP1 WMP in October 2016.
<p>Procurement of Consultants to Support the WMP Development</p>	<ul style="list-style-type: none"> ● Completed, both the GOL consultant and the international watershed consultant have been hired. ● The international consultant was officially engaged on 5 September 2016. The consultant was officially introduced to WRPO DFRM, Xaysomboun and Bolikhamxay at the WRPO coordination workshop on 13 September 2016.
<p>WRPO Activities</p>	<ul style="list-style-type: none"> ● WRPO DFRM, Xaysomboun and Bolikhamxay conducted coordination workshop on 13 September 2016 with NNP1 team to review the proposal of pre-WMP activities for the period of September – December 2016. ● The revised proposal was submitted to NNP1 in the last week of September 2016 for further consideration. The proposal will be shared with ADB in the first week of October 2016. ● WRPO Xaysomboun: <ul style="list-style-type: none"> ○ Continue village land-use planning exercise of remaining villages in Anouvong, Hom and Thathom Districts. ○ Follow up monitoring and prevention of forest fire in Anouvong, Hom and Thathom Districts ● WRPO Bolikhamxay:

Obligations	Status by September 2016
	<ul style="list-style-type: none"> ○ Awareness raising on the importance of forest management ○ Monitoring and prevention of forest fire in 11 villages. ● WRPO DFRM: <ul style="list-style-type: none"> ○ Provide technical support on village land-use planning exercise of remaining villages in Anouvong, Hom and Thathom Districts ○ Provide technical support on monitoring and prevention of forest fire in BLK and XSB
Xaysomboun ISP	<ul style="list-style-type: none"> ● There was no feedback form MONRE DFRM on the report.

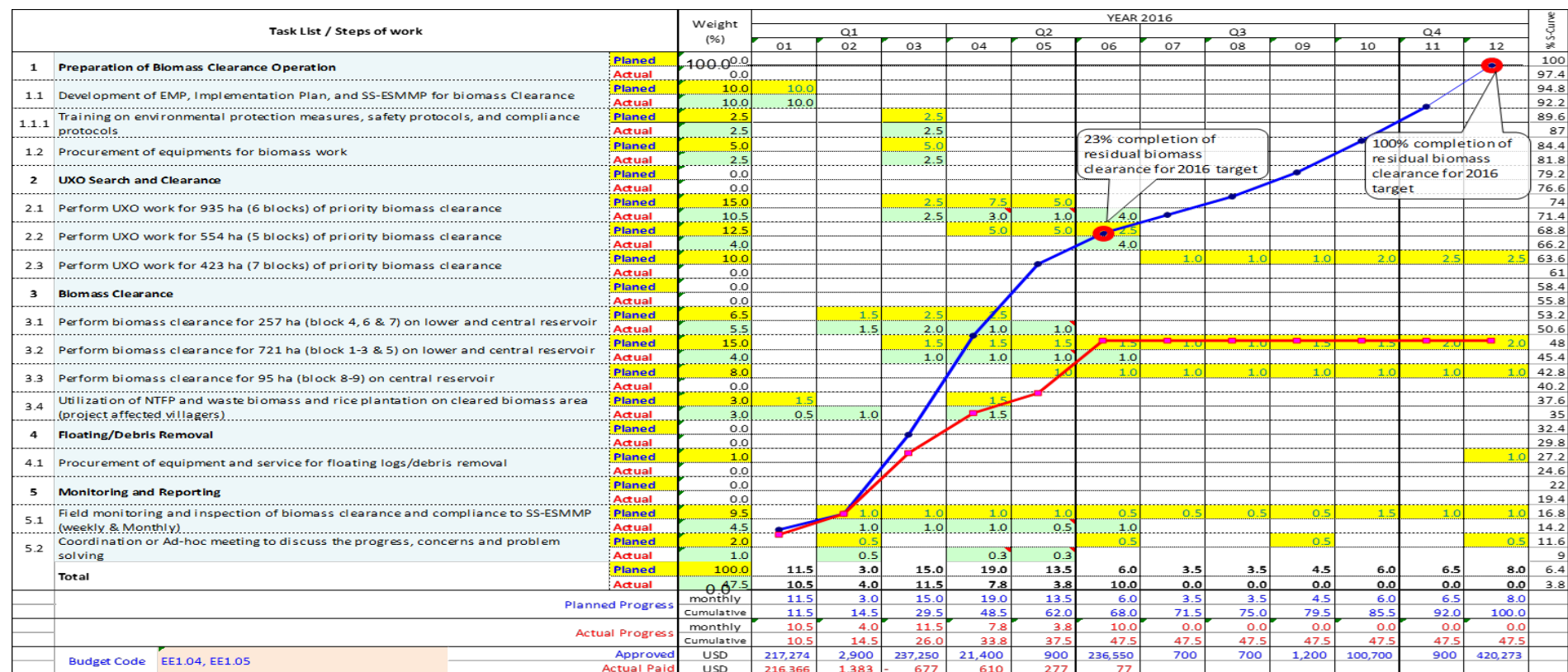
3.5.2 Biodiversity Offset Management

Obligations	Status by September 2016
Start of the Boundary Confirmation Baseline Survey by 20 September 2016	<ul style="list-style-type: none"> ● The local consultant was mobilized in August 2016 ● The international consultant was mobilized by ADB and arrived in Lao on 20 September 2016 ● The field work was started from 24 September 2016
Consultant acceptable to ADB is engaged as technical consultant for preparation of biodiversity offset management plan by 30 November 2016	<ul style="list-style-type: none"> ● The TOR for preparation of the BOMP was submitted to ADB on 15 September 2016
Issuance of the Boundary Confirmation Baseline Survey preliminary report by 30 November 2016	Not relevant at this time
Issuance of the Boundary Confirmation Baseline Survey draft final report by 31 January 2017	Not relevant at this time

3.5.3 Biomass Clearance

The overall progress of biomass clearance programme is demonstrated in Figure 3-9 below.

Figure 3-12: Gantt Chart of Biomass Clearance Programme in September 2016



The blue graph and yellow highlight represent the planned activity, the red graph and green highlight represent the actual progress.

Activities in September 2016	Results
Labour recruitment	<ul style="list-style-type: none"> • 24 labourers from Ban Nong are employed to support UXO work in Block 2.
Perform UXO work for 9 blocks of priority biomass clearance	<ul style="list-style-type: none"> • Completed around 30 ha in Block 2 • UXO work (scrub cutting and UXO detection) in Block 9 totalling 54 ha just started by the end of September 2016 • There was no UXO encountered during the survey • Progress in Block 2 can be seen in <i>Figure 3-10</i> and the overall UXO progress can be seen in <i>Table 3-11</i>.
Perform biomass clearance of block 1-9 on lower and central reservoir	<ul style="list-style-type: none"> • There is no progress on biomass removal during the period of reporting. Biomass removal will be resumed after the end of the rainy season. • NNP1 PC received notification letter from Hom District Governor on 07 September 2016 to stop clearance until further notice especially within the 4 Project affected villages. The notification is related to removal of trees with diameter greater than 20 cm. • A coordination meeting was held on 28 September 2016 in Hom District chaired by Mr. Bounlerth Lor, Vice District Governor of Hom and attended by 20 representatives from XSB WRPC, PONRE, Hom DONRE, DAFO, GOL line agencies of Hom District, NNP1-EMO, and the Biomass Clearance Contractor. It was concluded that a follow-up meeting will be held in October 2016 under the chairmanship of Xaysomboun Provincial Governor to decide: <ul style="list-style-type: none"> ○ The continuation of biomass removal work in the priority biomass removal areas ○ The engagement of additional contractor to deal with the cutting and stockpiling the tree with diameter of more than 20 cm ○ The future use of the cut timber of diameter of more than 20 cm
Utilization of NTFP, waste biomass and lesser value tree	<ul style="list-style-type: none"> • The future utilization of biomass waste in the target area within Hom District will be decided after the meeting in October 2016.
Opportunity of short-term crop plantation on cleared biomass area (project affected villagers)	<ul style="list-style-type: none"> • Crop plantation database is under finalization and will be presented in the next reporting period.

Figure 3-13 UXO Search and Clearance in Block 2

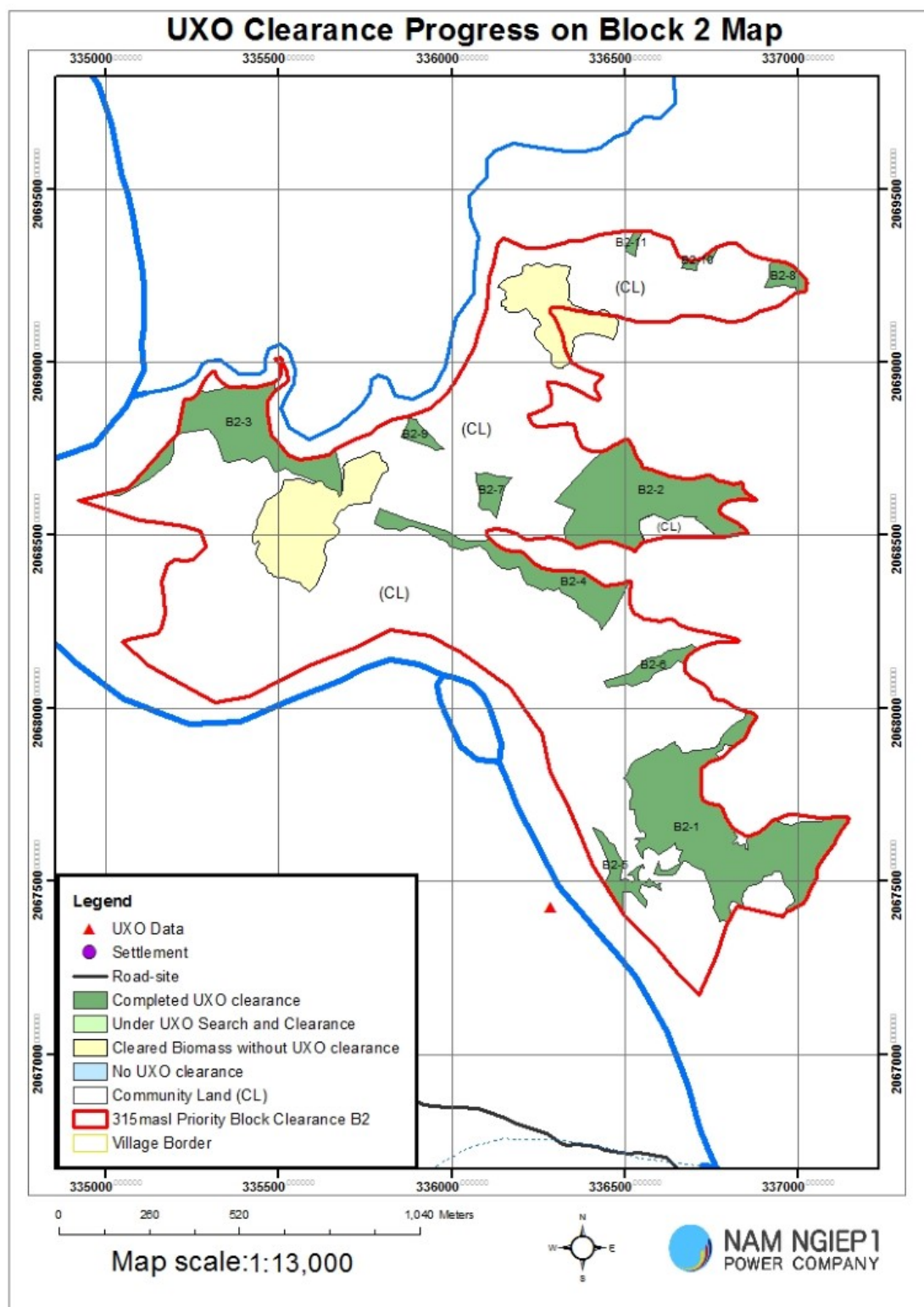


Table 3-14 Progress of UXO Search and Biomass Clearance by block as Sep 2016

Zone	Priority area	Total area to be cleared (ha)	Status of removal as of September 2016 (ha)	Status of UXO Search and Clearance	
				Under clearance (ha)	Completed (ha)
1	Block 01	115.38	30.00		26.10
1	Block 02	165.92	10.40		37.27
1	Block 03	88.86			14.23
1	Block 04	167.68	132.28		96.88
1	Block 05	350.72	50.70		43.80
1	Block 06	46.71	10.00		4.86
2	Block 07	43.03			-
2	Block 08	41.00	4.00		-
2	Block 09	54.13		54.13	-
2	Block 10	317.39			
2	Block 11	98.05			
3	Block 12	84.23			
3	Block 13	131.35			
3	Block 14	53.00			
3	Block 15	93.27			
3	Block 16	9.86			
3	Block 17	44.25			
3	Block 18	7.18			
	Total	1,912.01	237.38	54.13	223.14

3.6 Other Obligations and Support Programmes

3.6.1 Environmental Protection Fund (EPF)

There was no information on EPF activity during the month of September 2016.

3.6.2 115 kV Transmission Line IEE Due Diligence Assessment

There was no update from EDL on the revision of the 115 kV Transmission Line IEE.

3.6.3 Nabong Substation Upgrade Due Diligence Assessment

Two visits were conducted (September 9 and September 23, 2016) to Nabong village to confirm the payment of compensation to affected people due to the land acquisition for the construction of the Nabong Substation. The meeting was held on 23 September 2016 with the village authorities of Ban Nabong and Ban Phonekham confirmed that compensation for the Nabong Substation land is not required as it is State Land. The only compensation that was needed was along the alignment of the transmission lines and it was done accordingly.

3.7 External Monitoring

The LTA and ADB Environment Specialist visited the Project during 18 to 23 September 2016. The mission will issue their mission report in October 2016

3.7.1 Independent Monitoring Agency

The IMA attended the ESMMP-CP consultation meeting on 14 September 2016 and subsequently submitted their comments in writing. There was no IMA mission scheduled during the month of September 2016.

3.7.2 Biodiversity Advisory Committee

The BAC reviewed and provided their comments on the draft TOR for BOMP preparation and the draft pre-BOMP activity plan. The recruitment of third BAC member is in progress and the expert is expected to be on board by early October 2016.

ANNEXES

ANNEX A: RESULTS OF EFFLUENT ANALYSES

Table A- 1: Results of Camp Effluent in in September 2016 – The First Fortnight Sampling

	Site Name	Owner Site Office and Village	Obayashi Camp WWT1	Obayashi Camp WWT2	TCM Camp	Sino Hydro Camp	V & K Camp
	Station Code	EF01	EF02	EF15	EF03	EF06	EF10
	Date	07/09/16	08/09/16	08/09/16	08/09/16	08/09/16	08/09/16
Parameters (Unit)	Guideline						
pH	6.0 - 9.0	7.71	7.68	8.1	7.34	7.65	8.39
Sat. DO (%)		35.6	15.5	85.6	91	21.8	91.6
DO (mg/L)		2.71	1.18	6.62	7.09	1.71	7.2
Conductivity (µs/cm)		282	576	286	28.5	217.6	84.8
TDS (mg/L)		141	288	143	14	108	42
Temperature (°C)		27.9	27.5	27	26.8	26	26.2
Turbidity (NTU)		0.85	35.5	9.38	32.2	21.3	698
TSS (mg/l)	<50	ND ¹⁶	26.2	7.8	52.8	26	308
BOD (mg/l)	<30	ND ¹³	71.8	8.3	ND ¹³	11.6	5.3
COD (mg/l)	<125	10.6	133	38.9	15.7	31.1	20
NH ₃ -N (mg/l)	<10.0	ND ¹²	23	6	ND ¹²	4	ND ¹²
Oil & Grease (mg/l)	<10.0	ND ¹³	7	1	ND ¹³	1	ND ¹³
Manganese (mg/l)		ND ⁴	ND ⁴	ND ⁴	ND ⁴	0.063	0.082
Total Iron (mg/l)	<2	ND ¹⁰	0.233	0.225	1.01	0.499	13.5
Total coliform (MPN/100ml)	<400	260	160,000	24,000	160,000	160,000	160,000
Faecal Coliform (MPN/100ml)		170	160,000	24,000	92,000	160,000	160,000
Discharge Volume (m3/day)		12.3	0	0	0	0	0

	Site Name	Songda5 Camp#1	Songda5 Camp#2	HMH Worker Camp #1	SECC Camp	HMH Main Camp - Drainage	HMH Main Camp WWTP	IHI Camp
	Station Code	EF07	EF08	EF09	EF11	EF12	EF13	EF14
	Date	08/09/16	08/09/16	08/09/16	08/09/16		08/09/16	08/09/16
Parameters (Unit)	Guideline							
pH	6.0 - 9.0	7.51	8.33	8.09	7.33	No water	8.88	8.08
Sat. DO (%)		93.4	16.8	93.7	68.3		92.1	0.8
DO (mg/L)		7.2	1.46	6.87	5.2		7.05	0.06
Conductivity (µs/cm)		320	374	263	196.5		316	557
TDS (mg/L)		160	187	132	93		158	278
Temperature (°C)		27.4	26.8	30.9	27.2		27.6	27.4
Turbidity (NTU)		10.4	12.3	14.7	77.4		10.24	32.7
TSS (mg/l)	<50	30.9	18.3	49.8	99.8		47	27.7
BOD (mg/l)	<30	18.4	16.4	31.9	8.8		15.3	94.8
COD (mg/l)	<125	70.6	44.8	64.3	37.5		111	199
NH ₃ -N (mg/l)	<10.0	7	16	5	8		6	28
Oil & Grease (mg/l)	<10.0	ND ¹³	ND ¹³	ND ¹³	ND ¹³		2	5
Manganese (mg/l)		0.061	ND ⁴	0.072	0.062		0.063	ND ⁴
Total Iron (mg/l)	<2	0.976	0.243	0.667	3.68		0.231	0.116
Total coliform (MPN/100ml)	<400	92,000	92,000	160,000	160,000		160,000	160,000
Faecal Coliform (MPN/100ml)		35,000	28,000	92,000	11,000		35,000	160,000
Discharge Volume (m3/day)		0	0	0	0		0	0

Table A- 2: Results of Camp Effluents in September 2016 –Second Fortnight Sampling

	Site Name	Owner Site Office and Village	Obayashi Camp WWT1	Obayashi Camp WWT2	TCM Camp	Sino Hydro Camp	V & K Camp
	Station Code	EF01	EF02	EF15	EF03	EF06	EF10
	Date	21/09/16	22/09/16	22/09/16		22/09/16	22/09/16
Parameters (Unit)	Guideline						
pH	6.0 - 9.0	7.44	8.69	8.81	No water	8.25	8.55
Sat. DO (%)		46.6	9.4	90.1		17.4	75.9
DO (mg/L)		3.38	0.76	7.13		1.36	5.18
Conductivity (µs/cm)		366	661	524		463	319
TDS (mg/L)		193	330	262		231	159
Temperature (°C)		30	27	25.8		27.2	28
Turbidity (NTU)		5.22	14.4	11.46		6.92	7.03
TSS (mg/l)	<50	ND ¹⁶	36	10.2		9.6	12.9
BOD (mg/l)	<30	ND ¹³	64	15.8		30.4	15.2
COD (mg/l)	<125	9.2	139	72.6		60.5	52.4
NH ₃ -N (mg/l)	<10.0	5	31	ND12		15	5
Oil & Grease (mg/l)	<10.0	ND ¹³	6	1		1	ND ¹³
Manganese (mg/l)		0.081	ND4	ND4		0.12	0.122
Total Iron (mg/l)	<2	ND ¹⁰	0.239	0.266		0.382	0.348
Total coliform (MPN/100ml)	<400	300	160000	7,900		24,000	160,000
Faecal Coliform (MPN/100ml)		330	160,000	7,900		24,000	160,000
Discharge Volume (m3/day)		17.3	0	0		0	0

	Site Name	Songda5 Camp#1	Songda5 Camp#2	HMH Worker Camp #1	SECC Camp	HMH Main Camp - Drainage	HMH Main Camp WWTP	IHI Camp
	Station Code	EF07	EF08	EF09	EF11	EF12	EF13	EF14
	Date	22/09/16	22/09/16	22/09/16	22/09/16		22/09/16	22/09/16
Parameters (Unit)	Guideline							
pH	6.0 - 9.0	7.83	8.16	8.07	7.56	No water	8.52	7.84
Sat. DO (%)		44.4	5	23.7	28.7		3.1	0.8
DO (mg/L)		3.38	0.38	1.69	2.18		0.24	0.06
Conductivity (µs/cm)		465	526	231	249		387	751
TDS (mg/L)		232	263	115	124		193	375
Temperature (°C)		28.3	27.5	30.2	28.5		27.4	27.9
Turbidity (NTU)		13.1	9.65	15.6	8.76		12.1	19.7
TSS (mg/l)	<50	69.1	12.9	10.6	22.9		78.2	44.2
BOD (mg/l)	<30	40.4	25	8.3	8.6		60.3	126
COD (mg/l)	<125	169	76.6	10.6	48		194	284
NH ₃ -N (mg/l)	<10.0	8	27	3	8		8	38
Oil & Grease (mg/l)	<10.0	1	1	ND ¹³	ND ¹³		1	7
Manganese (mg/l)		0.075	0.061	0.139	0.062		0.109	0.053
Total Iron (mg/l)	<2	1.3	0.181	1.45	2.02		0.33	0.179
Total coliform (MPN/100ml)	<400	14,000	92,000	7,000	160,000		4,900	160,000
Faecal Coliform (MPN/100ml)		7,900	92,000	700	160,000		790	160,000
Discharge Volume (m3/day)		0	0	0	0		0	0

Table A- 3: Results of the Construction Area Discharge in September 2016

	Site Name	Aggregate Crushing Plant				CVC Plant			
	Station Code	DS02				DS03			
	Date	07/09/16	16/09/16	21/09/2016	26/09/2016	07/09/16	16/09/16	21/09/2016	26/09/2016
Parameter (Unit)	Guideline								
pH	6.0 - 9.0	8.6	7.78	8.99		10.15			
Sat. DO (%)		99	101.1	101		95.6			
DO (mg/L)		7.79	7.18	7.44	No Discharge	7.38	No Discharge	No Discharge	No Discharge
Conductivity (µs/cm)		30	40.5	47.1		82			
TDS (mg/L)		15	20	24		41			
Temperature (°C)		26.1	29.6	30		27.1			
Turbidity (NTU)		2,720	850	1,380		600			
TSS (mg/L)	<50	1,695	1,785	2937		2,476			
Oil & Grease (mg/L)	<10	ND ¹³	N/A	ND ¹³		ND ¹³			
Discharge Volume (m ³ /day)		432	43	173		432			

	Site Name	Spoil Disposal #2				RCC Plant			
	Station Code	DS04				DS09			
	Date	07/09/16	16/09/16	21/09/2016	26/09/2016	07/09/16	16/09/16	21/09/2016	26/09/2016
Parameter (Unit)	Guideline								
pH	6.0 - 9.0	6.9	6.93	6.81	5.34	9.2	8.89	7.91	8.65
Sat. DO (%)		99.8	78.8	41.2	55.5	77.4	99.8	101.5	96.4
DO (mg/L)		7.01	6.52	3.21	4.35	6.12	8.29	7.64	6.66
Conductivity (µs/cm)		14.46	12.08	449	16.53	182	215	78.9	115.4
TDS (mg/L)		7	6	221	8.77	91	107	39	57.7
Temperature (°C)		26.5	29	25.61	26.1	26.4	30	28.7	31.6
Turbidity (NTU)		63.4	39.7	18.5	12.6	7,790	60	87,000	4,099
TSS (mg/L)	<50	192.0	72.8	47.9	10.3	4,292	172	47,424	1,890
Oil & Grease (mg/L)	<10	ND ¹³	N/A	ND ¹³	N/A	ND ¹³	N/A	ND ¹³	N/A
Discharge Volume (m ³ /day)		8,640	1,728	1,296	864	605	173	259	5.4

	Site Name	Regulating Dam				Main Dam			
	Station Code	DS08				DS11			
	Date	07/09/16	16/09/16	21/09/2016	26/09/2016	07/09/16	16/09/16	21/09/2016	26/09/2016
Parameter (Unit)	Guideline								
pH	6.0 - 9.0	8.48	8.25	7.8	8.41	8.98	8.44	8.87	8.87
Sat. DO (%)		97.7	131.2	103.4	95.9	98.6	96	99.6	98.6
DO (mg/L)		7.28	8.94	7.65	6.9	7.79	8.62	7.77	7.53
Conductivity (µs/cm)		139.3	174.1	172.9	134.9	223	508	550	598
TDS (mg/L)		70	87	87	67.45	111	254	275	294
Temperature (°C)		29.1	30.6	29.6	30.4	25.9	28.8	26.8	27.8
Turbidity (NTU)		857	1.08	10.01	1,823	20.8	12.4	5.27	12.5
TSS (mg/L)	<50	372	ND ¹⁶	15.8	581	45.5	29.5	16.5	20.7
Oil & Grease (mg/L)	<10	ND ¹³	N/A	ND ¹³	N/A	ND ¹³	N/A	ND ¹³	N/A
Discharge Volume (m ³ /day)		86.4	17.3	43.2	4.8	6,000	6,000	6,000	6,000

ANNEX B: AMBIENT NOISE DATA

Table B- 1: Average of Noise Monitoring at Ban Hat Gniun

Noise Level (dB)	01-02/09/2016			02-03/09/2016			03-04/09/2016			04/09/2016
	09:27-18:00	18:01-22:00	22:01-06:00	06:01-18:00	18:01-22:00	22:01-06:00	06:01-18:00	18:01-22:00	22:01-06:00	06:01-09:27
Maximum Value Recorded	75.30	76.10	68.70	84.00	69.40	72.80	85.50	65.10	75.70	74.30
Guideline Max	115	115	115	115	115	115	115	115	115	115
Average Data Recorded	48.35	56.15	55.70	51.94	51.98	53.28	51.21	55.65	56.12	64.78
Guideline Averaged	55	55	45	55	55	45	55	55	45	55

Figure B- 1: Result of Noise Level Monitoring at Ban Hat Gnuin in September 2016

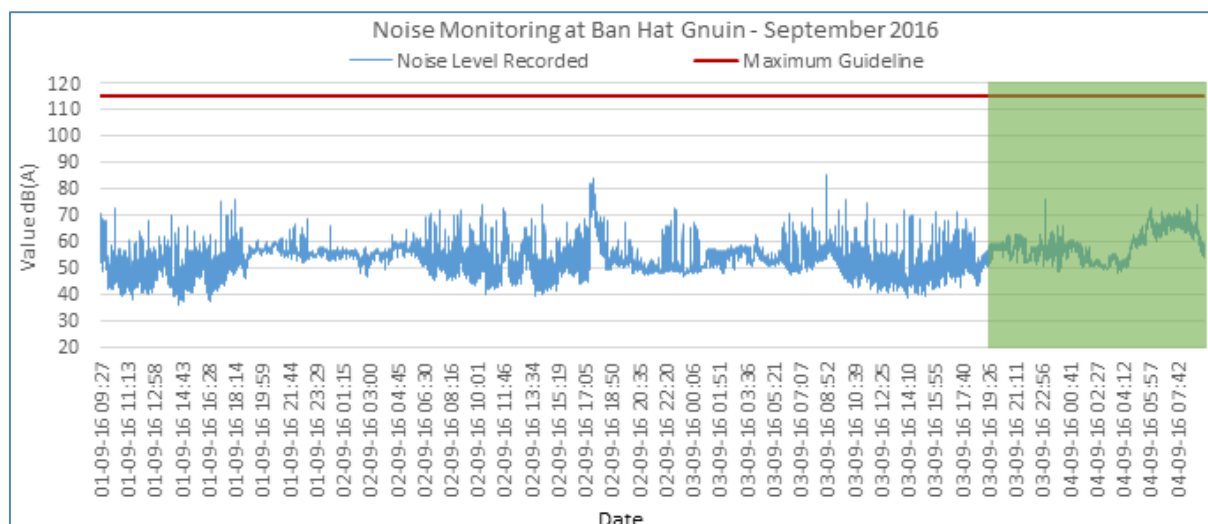


Table B- 2: Noise Monitoring Average Results at Ban Hatsaykham

Noise Level (dB)	04-05/09/2016			05-06/09/2016			06-07/09/2016			07/09/2016
	14:26-18:00	18:01-22:00	22:01-06:00	06:01-18:00	18:01-22:00	22:01-06:00	06:01-18:00	18:01-22:00	22:01-06:00	06:01-14:26
Maximum Value Recorded	80.40	70.00	79.20	73.40	86.50	84.30	74.40	59.10	79.30	82.10
Guideline Max	115	115	115	115	115	115	115	115	115	115
Average Data Recorded	53.84	59.13	59.78	49.82	63.22	61.21	46.98	55.58	55.61	52.64
Guideline Averaged	55	55	45	55	55	45	55	55	45	55

Figure B- 2: Results of Noise Level Monitoring at Ban Hatsaykham September 2016

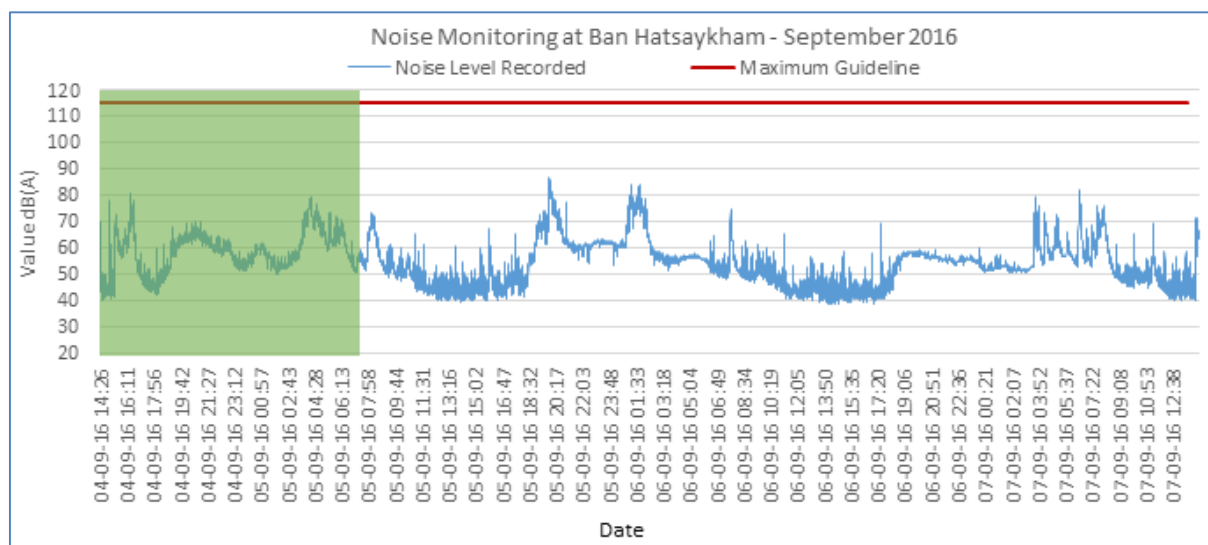


Table B- 3 and Table B- 4: Average Results Noise Monitoring at Aggregate Crushing Plant and RCC Plant in September 2016

Aggregate Crushing Plant

Noise Level (dB)	26-27/09/2016		27/09/2016
	11:32 – 22:00	22:01 – 06:00	06:01-11:21
Maximum Value Recorded	84.2	87	83.5
Guideline Max	115	115	115
Average Data Recorded	67.57	75.32	59.51
Guideline Averaged	70	50	70

RCC Plant

Noise Level (dB)	15-16/09/2016		16/09/2016
	14:12 – 22:00	22:01 – 06:00	06:01-14:30
Maximum Value Recorded	70	69.4	83.7
Guideline Max	115	115	115
Average Data Recorded	60.59	65.23	60.92
Guideline Averaged	70	50	70

Figure B- 3: Results of Noise Level Monitoring at Aggregate Crushing Plant in September 2016

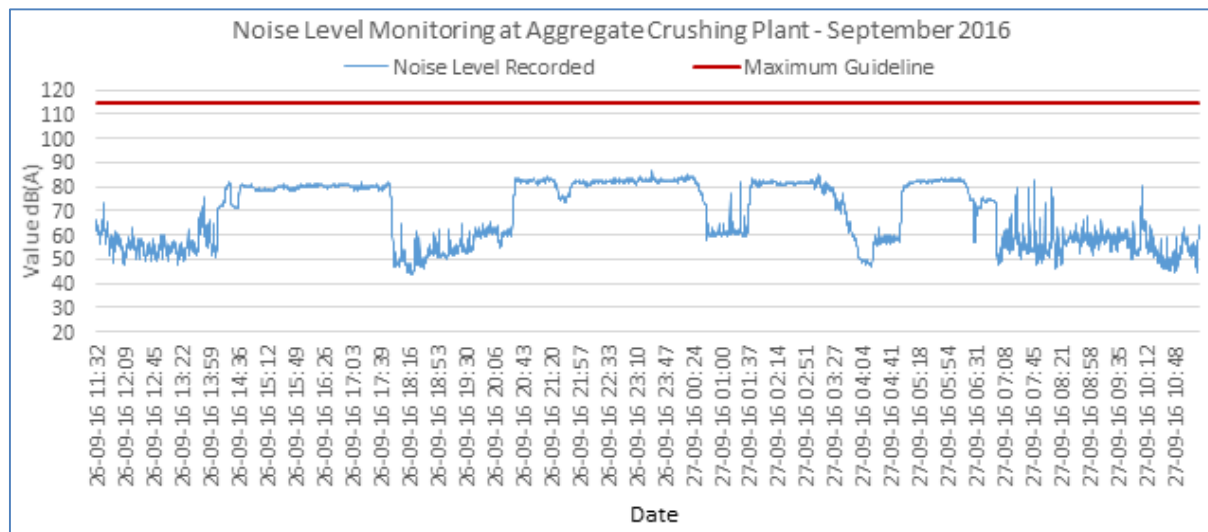


Figure B- 4: Dust Monitoring Results at RCC Plant in September 2016

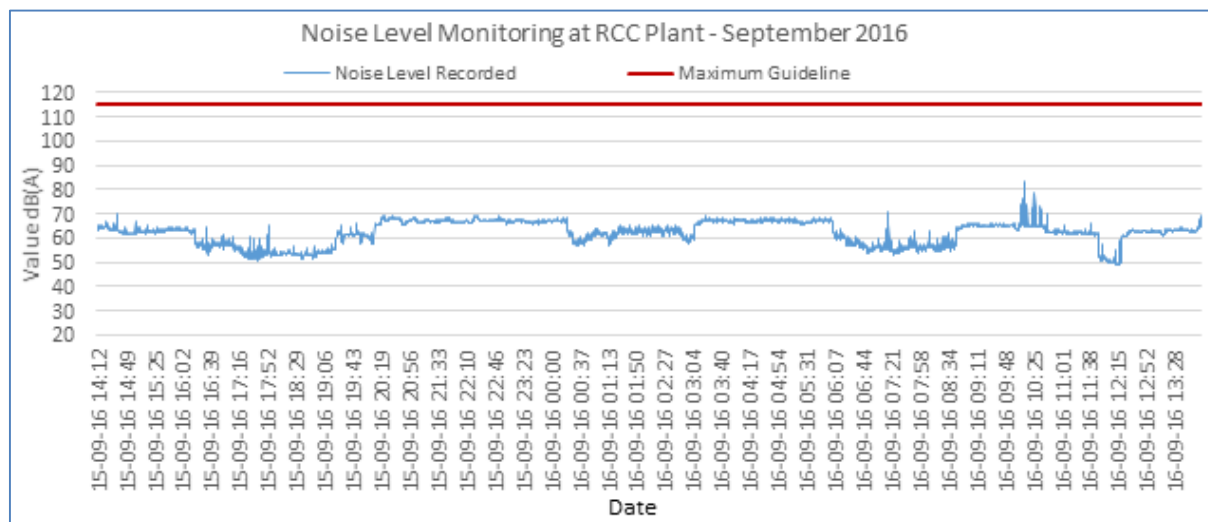


Table B- 5 and Table B- 6: Average Results of Noise Monitoring at Songda Camp#2 and Sino Hydro Camp in July 2016

Songda 5 Camp No. 2

Noise Level (dB)	12-13/09/2016				13/09/2016
	12:16	22:00	22:01	06:00	06:01-12:16
Maximum Value Recorded	72.6			70.6	72.8
Guideline Max	115			115	115
Average Data Recorded	59.23		62.12		60.72
Guideline Averaged	70		50		70

Sino Hydro Camp

Noise Level (dB)	14-15/09/2016		15/09/2016
	10:47 – 22:00	22:01 – 06:00	06:01-10:47
Maximum Value Recorded	81.9	67.7	71.8
Guideline Max	115	115	115
Average Data Recorded	57.56	58.34	57.31
Guideline Averaged	70	50	70

Figure B- 5: Results of Noise Level Monitoring at Songda5 Camp#2 in September 2016

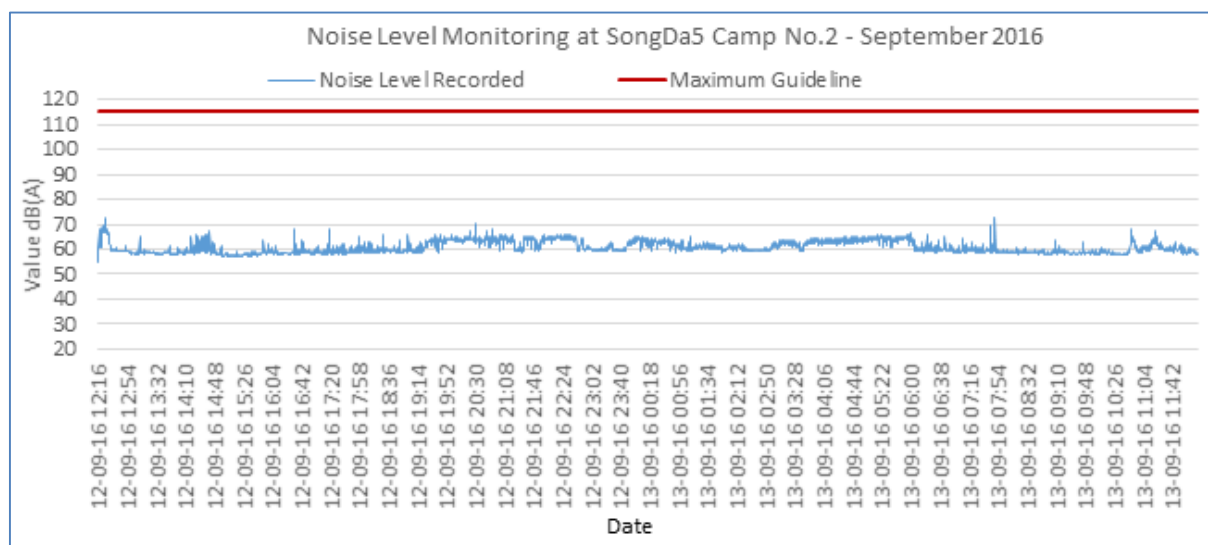


Figure B- 6: Results of Noise Level Monitoring at Sino Hydro Camp in September 2016

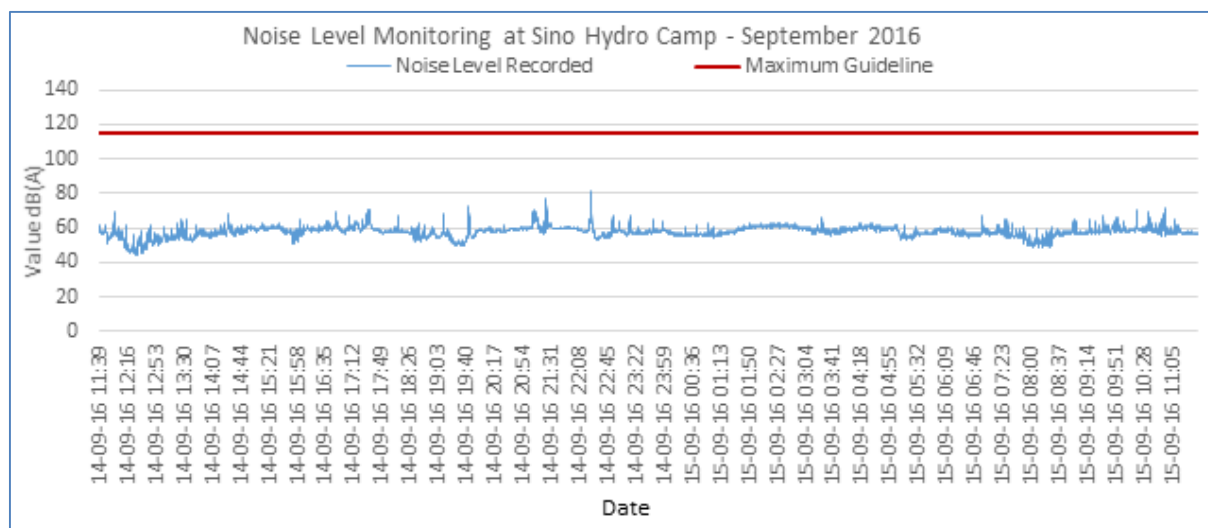


Table B- 6 and Table B- 7: Average Results of Noise Monitoring at the Owner's Site Office and Village and, the Main Dam in September 2016

Owner's Site Office and Village

Noise Level (dB)	09-10/09/2016		10/09/2016
	11:04 – 22:00	22:01 – 06:00	06:01-11:04
Maximum Value Recorded	62.8	67.4	59.3
Guideline Max	115	115	115
Average Data Recorded	44.39	51.09	42.15
Guideline Averaged	70	50	70

Main Dam

Noise Level (dB)	23-24/09/2016		24/09/2016
	10:09 – 22:00	22:01 – 06:00	06:01-10:09
Data Record Max	68.9	62	61.6
Guideline Max	115	115	115
Data Record Average	55.54	54.79	55.02
Guideline Averaged	70	50	70

Figure B- 7: Results of Noise Level Monitoring at Owner's Site Office and Village in September 2016

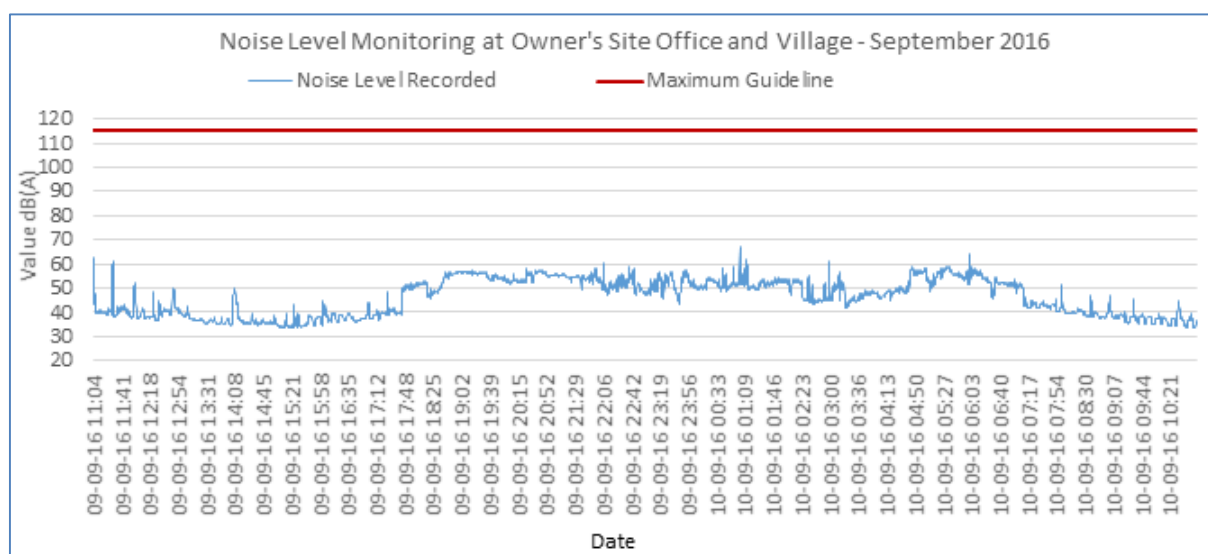


Figure B- 8: Results of Noise Level Monitoring at Main Dam in September 2016

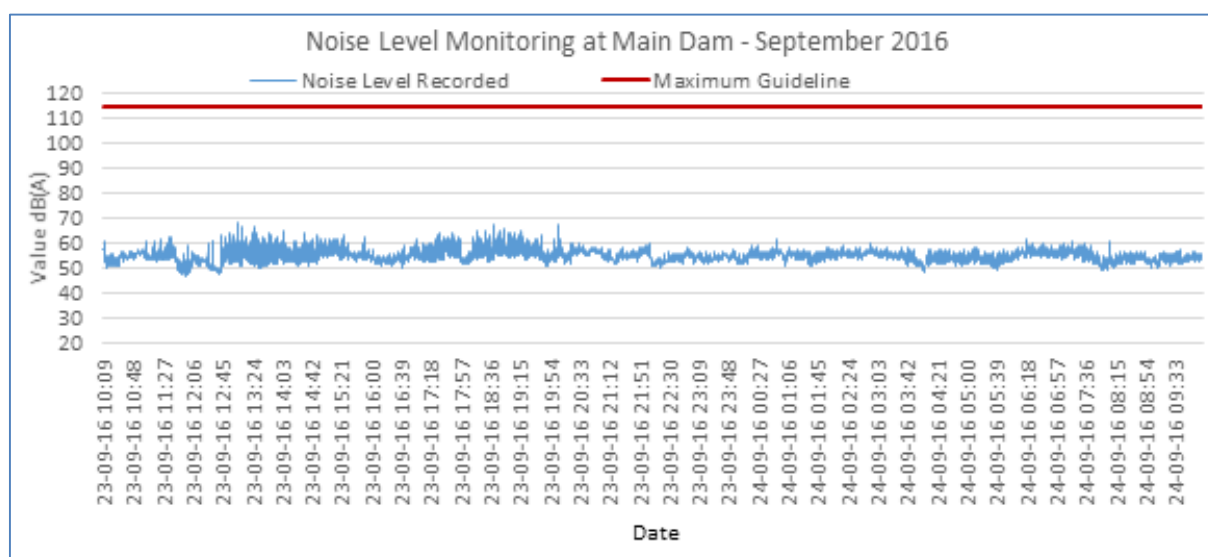


Table B-8: Average Results of Noise Monitoring at the Sino Hydro Temporary Worker Camp in September 2016

Sino Hydro Temporary Worker Camp

Noise Level (dB)	27-28/09/2016		28/09/2016
	12:05 - 22:00	22:01 - 06:00	06:01 12:05
Maximum Value Recorded	76.7	66.5	69.5
Guideline Max	115	115	115
Average Data Recorded	58.68	60.26	56.27
Guideline Averaged	70	50	70

Figure B- 9: Results of Noise Level Monitoring at Sino Hydro Temporary Worker Camp

