

# Environmental Monitoring Report

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Project Number: 41924-014

1 July 2016

## Nam Ngiep 1 Hydropower Project (Lao People's Democratic Republic)

### Quarterly Monitoring Report 2016 – Q1 Environmental

Prepared by Nam Ngiep 1 Power Company Limited for the Asian Development Bank

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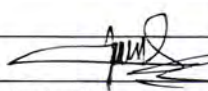
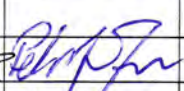

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## Nam Ngiep 1 Hydropower Project

# Environment Monitoring Report

## First Quarter of 2016

January to March 2016

					
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**ABBREVIATIONS / ACRONYMS**

ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BMSP	Biodiversity Management Sub-Plan
BOD	Biochemical Oxygen Demand
BRP	Biomass Removal Plan
CA	Concession Agreement between the NNP1PC and GOL
CBI	Community and Biodiversity Investment
COD	Chemical Oxygen Demand
DEQP	Department of Environmental Quality Promotion
DESIA	Department of Environmental and Social Impact Assessment, MONRE
DFRM	Department of Forest Resources Management, MONRE
DO	Dissolved Oxygen
ECZ	Elephant Conservation Zone
EGAT	Electricity Generating Authority of Thailand
EIA	Environmental Impact Assessment
EMO	Environmental Management Office
EMU	Environmental Monitoring Unit
EPF	Environmental Protection Fund
GOL	Government of Lao PDR
IEE	Initial Environmental Examination
IFMP	Integrated Fishery Management Plan
IMA	Independent Monitoring Agency
ISP	Integrated Spatial Planning
LTA	Lender's Technical Advisor
LTI	Lost Time Incident
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MVI	Motor Vehicle Incident
NCI	Non-Compliance Issue
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
NPA	Non-Profit Association
NPF	National Protection Forest
NTP	Notice to Proceed (under each construction contract)
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
PAFO	Provincial Agriculture and Forestry Office
PAP	Project Affected People
PCDP	Public Consultation Disclosure Plan
PONRE	Provincial Department of Natural Resource and Environment, MONRE
PPA	Provincial Protected Area
QMR	Quarterly Monitoring Report
RI	Recordable Injury
ROW	Right of Way

SMO	Social Management Office
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TD	Technical Division
TOR	Terms of Reference
TSS	Total Suspended Solids
UXO	Unexploded Ordinance
WMC	Watershed Management Committee
WMO	Watershed Management Office
WMP	Watershed Management Plan
WWTS	Waste water treatment systems

## 1. EXECUTIVE SUMMARY

The overall cumulative progress of the construction works until the end of the First Quarter, 2016 was 38.0% compared to planned progress of 38.5%.

During the First Quarter of 2016, the EMO received and reviewed ten SS-ESMMPs. Out of these, nine SS-ESMMPs were approved and one SS-ESMMP on the Construction of Houses and School Building (Lot3) was returned to the Contractor for further revision because the information provided in the Detailed Work Plan and environmental mitigations in the applicable sub-plans were not adequate. A total of 47 Observations of Non-Compliances (ONCs) were issued over this Quarter compared to 36 ONCs issued in the previous Quarter. Out of these 10 ONCs were carried over into this Quarter so that 57 ONCs were active at some point during this Quarter. There was one Level 1 NCR issued in January 2016 and resolved in February 2016.

In February 2016, the contractor for the construction of the NNP1 Project waste landfill was selected and contracted. The landfill contractor is required to submit a Detailed Works Programme (DWP) and Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP) to NNP1PC in early April 2016 for review and approval. Once cleared by NNP1PC EMO, the contractor will be able to start the construction works. It is expected that the construction of the waste landfill will start by the end of April 2016.

A small laboratory to carry out basic water quality analyses (including measurements of bacteria, biochemical oxygen demand, and total suspended solids) is intended to be constructed at the Owner's Site Office and Village area. The technical design of the laboratory has been prepared and approved and the construction works are out to tender. The procurement of the laboratory equipment and instruments is also under way. It is expected that the construction will be started and completed in the Third Quarter of 2016.

Regarding environmental monitoring, most of the effluent water quality at camps did not comply with the applicable standards which indicates that the upgrade of the waste water treatment systems at priority camps such as the Right Tunnelling Camp and Song Da 5 Camp No.2 is incomplete. The EMO is aware of the outstanding waste water treatment issues and is carrying out an internal review together with the NNP1PC Technical Department and the Civil Works Contractor to discuss and agree on the corrective actions necessary to bring the camps back into compliance. The progress on the agreed actions will be reported in the Environment Monitoring Report for the Second Quarter of 2016.

The NNP1 Watershed Management Committee (WMC) has agreed in principle to NNP1PC's proposed way forward for the preparation of the Nam Ngiep 1 Watershed Management Plan (WMP) and its related milestones. NNP1 WMC-WMO has progressed with the implementation of priority activities focusing on recruitment of a GoL consultant, watershed boundary surveys and land use planning at selected villages within the NNP1 watershed area as a basis for the development of the WMP. NNP1 WMC also conducted the first WMP planning workshop at the end of March 2016 to discuss and agree on the draft outline of the NNP1 WMP and its objectives with the aim of ensuring that the plan will be in line with the 8th National Socio-economic Development Plan, MONRE's vision and strategy, the Socio-economic Development Plans of Xaysomboun and Bolikhamxay Provinces and the Xaysomboun Integrated Spatial Planning (ISP). The development of Xaysomboun ISP has continued and district level ISP workshops have been completed resulting in a first draft ISP that will be further developed by MONRE/Department of Environmental Quality Promotion (DEQP) and Xaysomboun ISP technical committee. In parallel, NNP1 team also made progress on data and information collection and analysis, particularly for baseline profiling including GIS layers and maps, and displays of socio-economic and environmental data.

The NNP1 WMC and Bolikhamxay Province have agreed to NNP1PC's way forward on biodiversity offset site selection giving priority to the field survey in Nam Mouane Watershed of Bolikhamxay

Province. The proposal for ground truth survey was finalized by the Consultant in February 2016 incorporating the comments from NNP1PC and the Biodiversity Advisory Committee (BAC), including also the proposal from ADB's consultant to double the number of camera-traps. The survey was started at the end of February 2016 and was carried out throughout March 2016. The inception report produced at the end of March 2016 indicates that the area has rich natural habitats and wildlife species of high IUCN Red List Category.

In February 2016, following a series of reviews, the NNP1 Biomass Clearance Contractor finalized the SS-ESMMP and the Biomass Removal Implementation Plan also incorporating the comments from the ADB/IAP monitoring mission in December 2015. The contractor has proceeded with labour recruitment and induction/orientation on NNP1 Safety Procedures and compliance protocols followed by surveying and demarcation of the priority biomass clearance areas. The UXO search and clearance operations were carried out prior to vegetation cutting in Blocks 1, 4 and 5 covering an area of 633.78 ha. By the end of March 2016, vegetation cutting has been completed in 170 ha.



## 2. INTRODUCTION

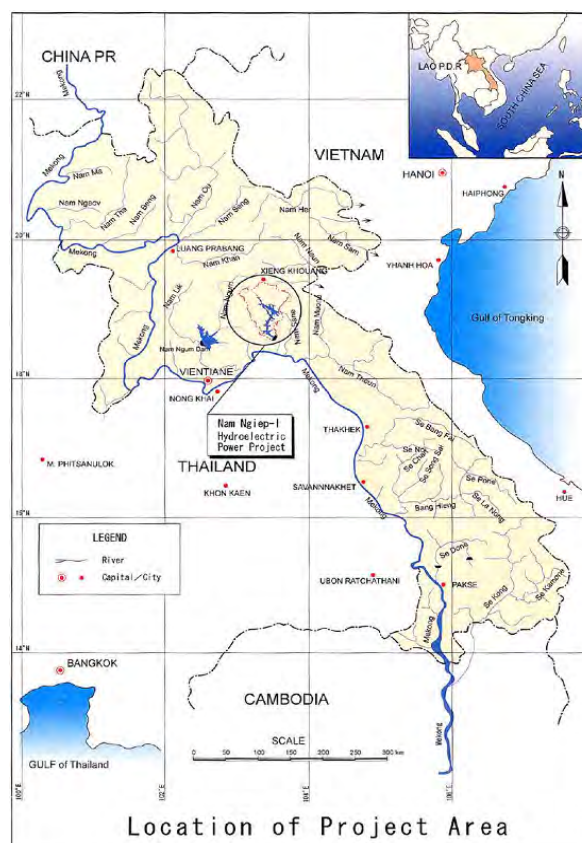
The Nam Ngiep originates in the mountains of Xieng Khouang Province, flowing through Khoum District into Thathom District of Xaysomboun Province, through Hom District and into Bolikham District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

The project is constructing two dams. The main dam, which is located 9 km upstream of Hat Gnuin Village in Bolikham 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 substation outside Vientiane Capital. A 115 kV transmission line will be constructed by EDL from the Re-Regulating Power Station to Pakxan substation over a distance of 40 km.

This Quarterly Monitoring Report (QMR) provides a summary of environmental management and monitoring activities from 01 January to 31 March, 2016. The QMR 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 Lenders’ Technical Adviser (LTA) and ADB.

The QMRs and other related reports, including the Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs), are publically disclosed on NNP1PC’s website <http://namngiep1.com/>. Hard copies of these reports are also available upon written request to the Project’s main office in Vientiane Capital and at the field office in Pakxan, Bolikhamxay Province.

Figure 2-1: Project Location

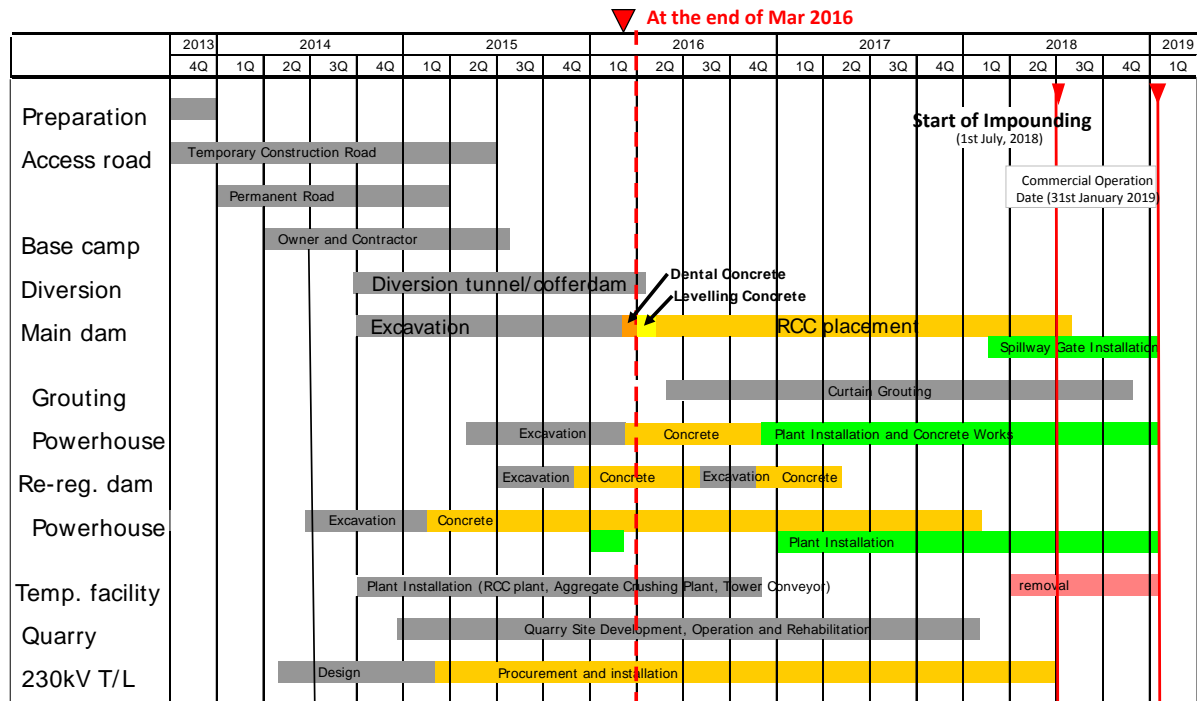


## 3. CONSTRUCTION PROGRESS

Construction Works for the Project are being carried out through four separate main construction contracts. These are the Civil Works, the Electrical and Mechanical Works, the Hydro-Mechanical Works and the 230 kV Transmission Line Works. The overall cumulative work progress up until the

end of the First Quarter of 2016 was 38.0%<sup>1</sup> compared to the planned progress of 38.5%. The main construction activities and respective progress made during the period of January to March 2016 is shown in Figure 3-1.

Figure 3-1: Overall Construction Progress up to the end of March 2016



Excavation works of the main dam, the diversion tunnel and the re-regulation dam were commenced in October 2014 and completed in February 2016. Accordingly, the concreting work has commenced. The cumulative work progress of the Civil Works until the end of March 2016 was 43.0% (compared to planned progress of 42.6%).

The diversion tunnel was completed in October 2015 and on 31 October 2015 the Nam Ngiep River was diverted, about a month ahead of schedule. The progress of critical works such as the main dam, main powerhouse and re-regulation dam structure continues to be the same as planned. The Civil Works overall can be considered to be on schedule despite increased quantities of dam excavation and slope stabilisation. The complex bedding of hard over soft layers of rock and the folding nature of these layers in the foundation rock of the main dam below the old river bed has created a difficulty to finalise the foundation design to the satisfaction of the Dam Safety Review Panel in all respects. Accordingly, further review of the dam foundation design was necessary to create sufficient safety factor for stability against sliding of the dam on the weak zones. This resulted in further excavation and concreting of a key structure in the old river bed. However, the original schedule is maintained

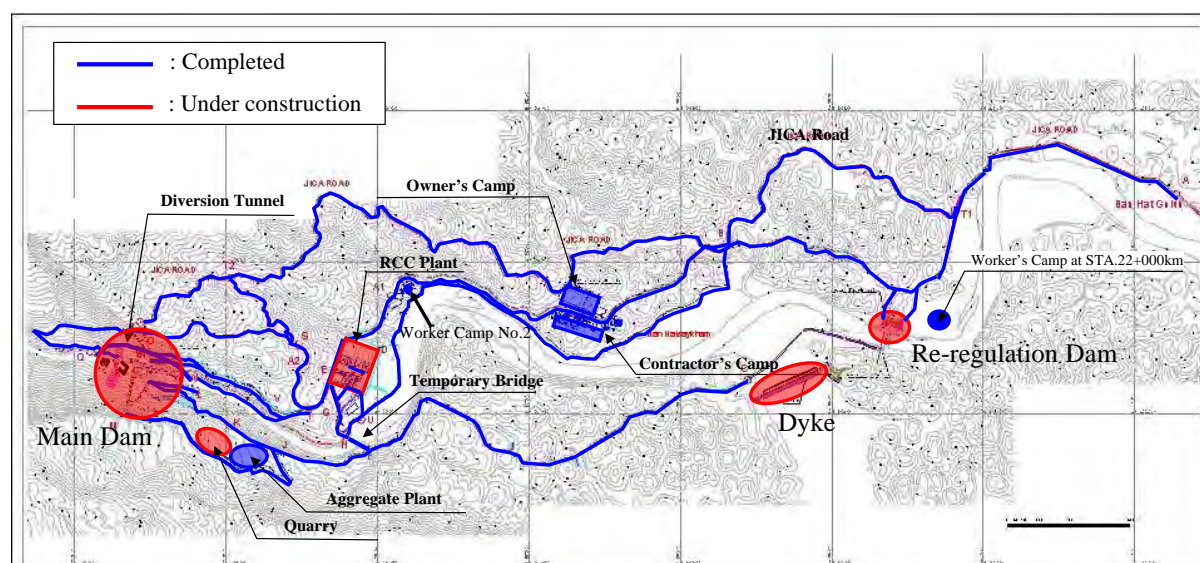
<sup>1</sup> The progress to-date is calculated as (Cumulative Amount of Achieved Interim Milestone Payments) / (Total Agreed Price of Construction Contracts) and expressed as a percentage.

as a result of the efforts of the Civil Works Contractor. The additional excavation works were completed as of the end of February 2016 and moved to levelling concrete work.

### 3.1 Access Roads

All main access road construction works are completed following an early December 2013 start, and only maintenance of these remains ahead of the 2016 wet season. Temporary access roads are mostly formed to reach various construction activities and others will be developed or modified as is necessary as activities change to reach current or new areas of dam concreting and consolidation grouting, the upstream and downstream cofferdams and the main powerhouse and belt conveyor support tower foundations. The layout of the access road system is as shown in Figure 3-2 below:

Figure 3-2: Access Road Progress



### 3.2 Main 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, and quarry management continues to improve.

### 3.3 Main Dam Excavation

After starting the main dam excavation works in October 2014 on the left bank, the works were well advanced until diversion of the Nam Ngiep River was achieved at the end of October 2015. However, excavated volumes are now known to be 20% greater than expected and part of this additional work is needed 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. The dental and levelling concreting works was commenced in March 2016, and conventional RCC placement for the main dam structure will follow in April 2016.

Powerhouse excavation works was completed in January 2016 and levelling concreting works was started in coordination with installation of the grounding system.

### 3.4 River Diversion Tunnel

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.

### 3.5 Re-Regulation Dam

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 3-1 below.

Table 3-1: Progress of Re-regulation Dam Structural Concrete Works to 31 March 2016

Structure	Concrete (m <sup>3</sup> ) placed as at the end of March 2016					
	Intake	Powerhouse	Tailrace	Spillway	Left Bank RCC	Total
Anticipated Qty.	24,000			23,500	13,200	60,700
Completed Qty.	11,098	7,682	1,676	3,758	13,228	37,442
Progress	<b>85%</b>			<b>16%</b>	<b>100%</b>	<b>62%</b>

The concrete volume placed already for both powerhouse and dam is 37,442 m<sup>3</sup> being 62% of the revised total estimate of 60,700 m<sup>3</sup> for both structures. The powerhouse concreting has advanced well and secondary concrete embedment for the draft tube liner was partially completed at the end of March 2016. The left bank structure was redesigned as roller compacted concrete (RCC) and was completed on 18 March 2016.

The shaping of the excavation of the re-regulating dam at the right bank was carried out starting in May 2015, being completed in the period ahead of the 2015 wet season. The excavation works at the left bank for the labyrinth dam portion and the left bank structure were started and finished in October 2015.

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

### 3.6 Camps

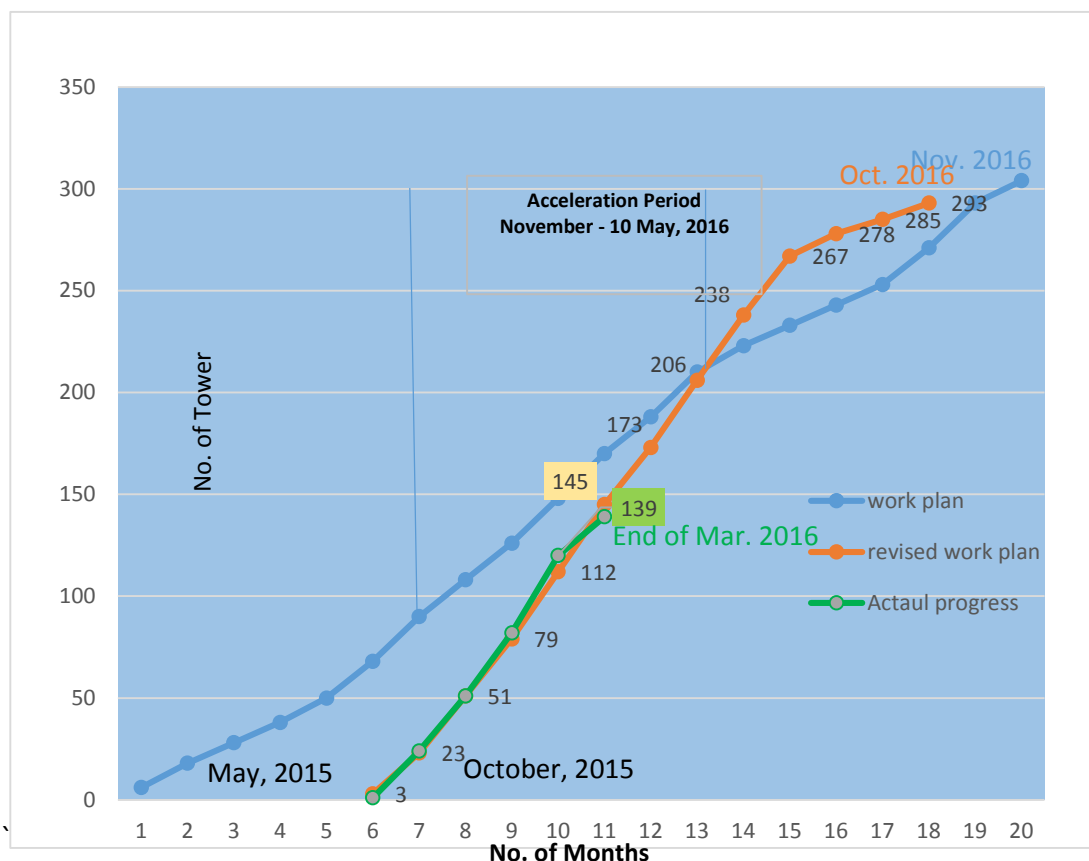
The Workers' Camps for the Electrical and Mechanical Contractor and the Bridge Contractor for the Houay Soup Resettlement Infrastructure were completed in December 2015 and the Workers' Camps for the Hydro-Mechanical Contractor were completed in February 2016.

The Hydro-Mechanical Contractor, IIS of IHI, has now received material for the main dam penstock fabrication and welding work has started at its workshop and labour camp facility located between the RCC Batching Plant and the Nam Ngiep River. Meanwhile the Electrical & Mechanical Contractor, Hitachi-Mitsubishi Hydro, has commenced work on its own laydown area at Disposal Area No. 9.

### 3.7 230 kV Transmission Line

The Transmission Line Works Contract was executed between Loxley-Sri Consortium and NNP1PC on 11 July 2014 and on 03 October 2014, NNP1PC issued the NTP to the Contractor. The cumulative work progress of the Transmission Line Works until the end of March 2016 was 22.0% (compared to planned progress of 42.6%). The difference is chiefly a result of a delay in commencement of construction works by approximately 7 months while awaiting compensation matters to be resolved by NNP1PC. The Contractor has agreed to accelerate its Works and is on target to get back onto the original schedule for tower foundation excavation by May 2016, within 8 months from starting.

Figure 3-3: Cumulative Work Progress of Tower Installation (Plan and Actual)



### 3.8 Electrical and Mechanical Work

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 progress until the end of March 2016 was 31.8% (compared to planned progress of 31.8%).

The installation work of embedded piping for the main powerhouse commenced on 17 February 2016 and it is under way in coordination with concrete casting work. The status of embedded pipe installation is shown in Figure 3-4.

The grounding works for the main powerhouse and re-regulation power house are under way in coordination with concrete casting work.

Figure 3-4: Embedded piping installation (Main powerhouse)



### 3.9 Hydro-Mechanical Work

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 March 2016 was 17.7% (compared to planned progress of 18.3%). The main activities carried out during this month are described below:

- a) Main dam
  - Steel materials for Upper Penstock were procured and transported to Workshop;
  - Cutting and Bending of Lower Inclined Penstock were completed;
  - Curved pipes for Lower Penstock were transported to Field Shop;
  - Material procurement of Draft Gate and Riparian Release Conduit will be started in April 2016.
- b) Re-regulation dam
  - Guide frame for Re-regulation Gate, Stoplog, Intake Gate and Draft Gate were delivered to Site.

## 4. ENVIRONMENTAL MANAGEMENT AND MONITORING

### 4.1 Contractor SS-ESMMPs

During the First Quarter of 2016, the EMO received and reviewed ten SS-ESMMP documents as listed below.

1. SS-ESMMP for the Construction of H-M Hydro Contractor Labour Camp No.2;
2. SS-ESMMP for Embedded Piping (First Stage);
3. SS-ESMMP for Casting Concrete in the Main Dam;
4. SS-ESMMP for the Construction in RCC of the Main Dam Body;
5. SS-ESMMP for the Temporary Disposal Area;
6. SS-ESMMP for Lot 1 of the Construction of Houses and Pre-School Buildings at the Houay Soup Resettlement Area (HSRA);

7. SS-ESMMP for Lot 3 of the Construction of Houses, Pre-school, and Accommodation Buildings at HSRA;
8. SS-ESMMP and EMP for Biomass Clearing in the Reservoir;
9. SS-ESMMP for the Main Road Construction at the HSRA;
10. SS-ESMMP for the Construction of the Project Solid Waste Landfill.

Out of ten SS-ESMMPs received, nine SS-ESMMPs were approved and one SS-ESMMP for Lot 3 of the Construction of Houses and School Building was returned to the Contractor for further revision because the information provided in the Detailed Work Plan and environmental mitigations in the applicable sub-plans were not adequate. More details on the approved SS-ESMMP can be found in Appendix 1: Status of SS-ESMMPs Approval During January to March, 2016.

## 4.2 Results of Non-Compliance Inspections

During January to March 2016, the EMO conducted bi-weekly and weekly follow up inspections in 21 main construction sites, camps, spoil disposal areas, 230 kV transmission line and biomass removal areas as listed in Figure 4-1 and Figure 4-2 below.

Figure 4-1: Inspection sites

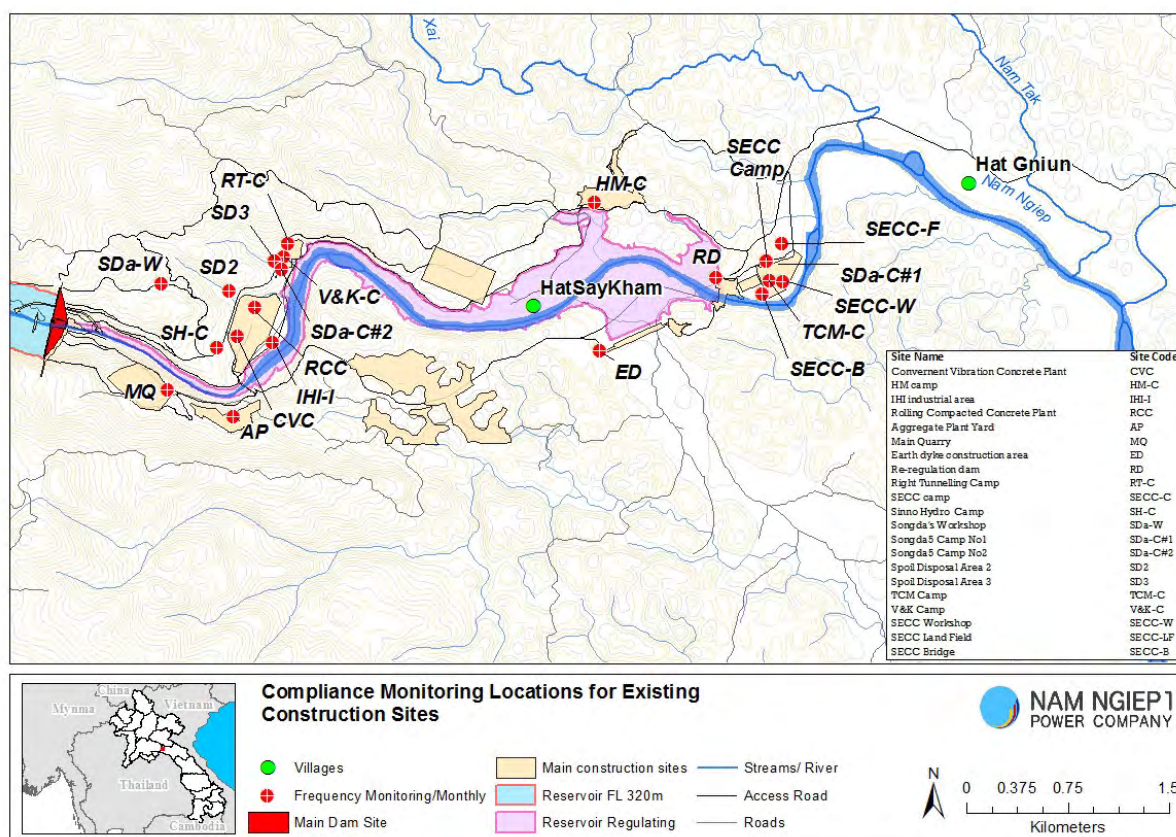
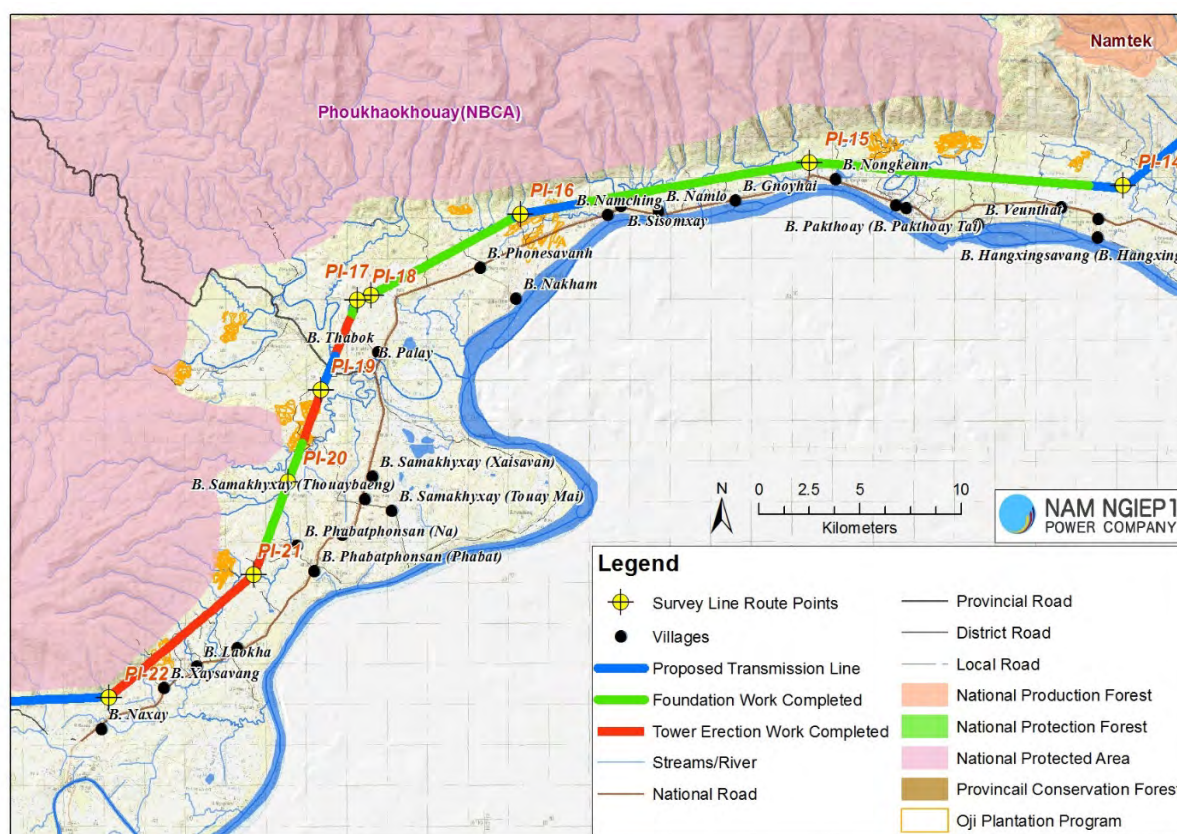


Figure 4-2: 230 kV Transmission Line construction monitoring



A total of 57 Observations of Non-Compliances (ONC) were recorded over this Quarter. Out of these, 10 ONCs were carried over from the previous Quarter and 47 ONCs were identified during this Quarter. (See Table 4-1 and Figure 4-3 below). There was one NCR (Level 1) issued in January 2016 as a result of the slurry disposal off-Site at the aggregate crushing plant and y the sediment pond located below Spoil Disposal Area No.7. The slurry percolated through the rock/soil profile of the pond and entered into the Nam Ngiep below the Temporary Bridge. The implementation of a corrective action plan was followed up in February 2016 and closed. Ten (10) ONC which were mostly related to the Waste Water Treatment Systems (WWTS) of camps and could not be resolved in this Quarter and will be carried forward into the Second Quarter of 2016. NNP1PC will have internal meeting and with the contractors in April 2016 to agree on the corrective actions prior to issuing more ONC/NCR. More details on the status of ONC and NCR as well as the corrective actions can be found in Table 4-1: Summary of Environmental Non-Compliance Status During Q1 of 2016' in Appendix 2: Environmental Monitoring Corrective Actions From January to March 2016.

Table 4-1: Summary of Environmental Non-Compliance Status During Q1 of 2016

Environmental Non-Compliance Status	ONC	NCR-Level 1	NCR-Level 2
Carried over ONC/NCR	10	0	0
New ONC/NCR	47	1	0
<b>Total ONC/NCR</b>	<b>57</b>	<b>0</b>	<b>0</b>
Resolved ONC/NCR	47	1	0
Unresolved ONC/NCR carried forward to the next quarter	10	0	0



Figure 4-3: Summary of ONC and NCR During Q1 of 2016

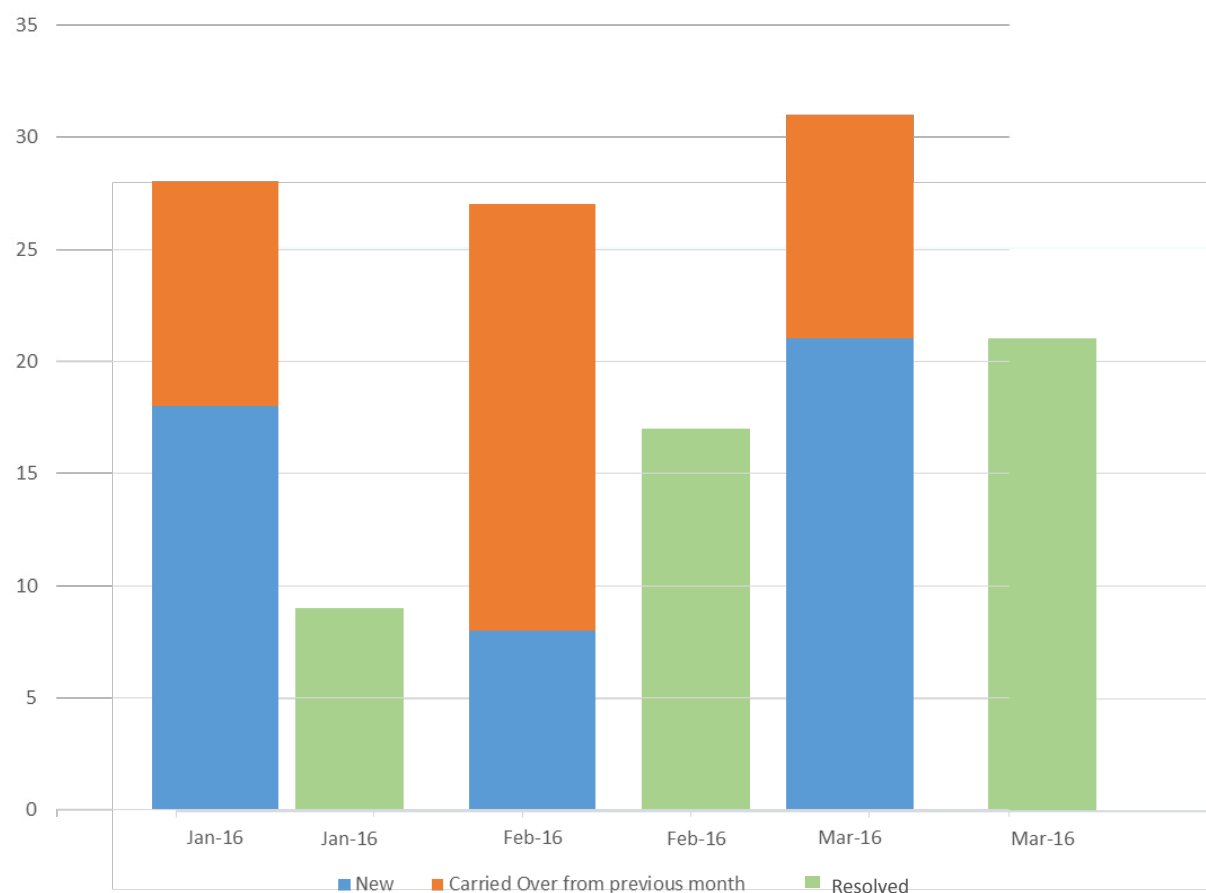


Table 4-2: Types of ONC and NCR During Q1 of 2016

Non-compliance Issue	ONC	NCR-Level1	NCR-Level 2	NCR-Level 3
Hazardous material management	15	0	0	0
Effluent discharge	16	0	0	0
Waste management	12	0	0	0
Erosion and sediment control	7	1	0	0
Project personal health program	4	0	0	0
Construction of workers' camp	2	0	0	0
Landscape and re-vegetation	1	0	0	0
<b>Total</b>	<b>57</b>	<b>1</b>	<b>0</b>	<b>0</b>

Photographs 1 and 2:  
Joint bi-weekly and weekly site inspections during the First Quarter of 2016



Photograph 3:  
Weekly follow up inspection on the erosion and sediment control at the temporary sand and aggregate material stockpile yard, Nam Ngiep River on the left bank



Photograph 4:  
Joint bi-weekly inspection on the improvement of the WWTs for main dam and powerhouse areas



### 4.3 Waste Management at the Construction Sites

#### 4.3.1 General Waste Management

In February 2016, the contractor for the construction of the NNP1 Project landfill was selected and contracted. The landfill contractor is to submit a Detailed Works Programme (DWP) and Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP) to NNP1PC in early April 2016 for review and approval. Once cleared by the EMO of NNP1PC, the contractor will be able to start the construction works, and this is expected by the end of April 2016.

A total of six temporary waste pits have been excavated at the landfill site. Four out of the six pits have already been closed to further disposal and covered with soil. Two are still in use. Once the NNP1

landfill is constructed, the waste in the temporary pits will be removed and placed in the newly constructed permanent pit.

During the First Quarter of 2016, several types of waste generated from construction activities were sold to Khunmixay Processing Factory for further processing. The EMO monitored the process to ensure that the Khunmixay Processing Factory implemented all waste collection, handling and processing in line with applicable environmental and social requirements. Table 4-3 presents the types and quantities of waste sold.

Table 4-3: Waste types and quantities sold from January to March 2016

No.	Date	Types of Waste	Unit	Site Name		Total
				TCM Camp	RT Camp	
1	14 Jan 16	Used tyres	Number	40	-	40
2		Empty used chemical containers (20 L)	Number	528	-	528
3		Empty contaminated bitumen drums/containers (200 L)	Number	80	-	80
4		Plastic bottles	kg	3	10	13
5		Aluminium tin/cans	kg	5	-	5
6		Paper/ cardboard	kg	15	-	15
7		Scrap metals	kg	700	-	700
8		Glass bottles	kg	30	-	30
9	17 Feb 16	Chemical plastic containers (20 L)	Number	775	-	775

Photograph 5:  
Used tyres at the TCM Camp



Photograph 6:  
Used chemical containers being stored at the TCM Camp



### 4.3.2 Hazardous Materials and Waste Management

From January to March 2016, the NNP1PC, the Civil Works Contractor and its sub-contractors conducted a joint hazardous materials inventory at all the main construction sites, workshops and sub-contractors’ camps including the camps of TCM, Song Da 5 Nos.1 and 2, the workshops of Right Tunnelling, and Song Da 5 No.1, the V&K Camp, the CVC Plant and the Sino-Hydro Camp. The findings from the hazardous material inventory are presented in Appendix 3.

The EMO also conducted a Joint Hazardous Material Management Audit together with the NNP1PC Technical Department, OC (the Civil Works Contractor) and its sub-contractors. The following locations were inspected: Song Da 5 Camp; RT Camp; Song Da 5 No.1 workshop, the CVC plant, the TCM Camp and the Sino-Hydro fuel and explosive storage areas. It was observed that the conditions for the hazardous material management were not satisfactory in terms of the facility condition and

waste management. These sites included the RT Workshop, the Song Da 5 No.1 Workshop and the CVC Plant. The Compliance and Monitoring Team issued Observations of Non-Compliances (ONC) to these subcontractors requiring each workshop to improve their standards. Results of the hazardous material audit are presented in Appendix 4.

**4.3.3 Medical Waste Management**

Small amounts of medical waste are generated at a number of small clinics on site (Owners’ Site Office and Village, Song Da No.2 camp, OC Camp and RT Camp). During this First Quarter less than half a kilogram of such waste was collected from the clinics and sent to the Vientiane landfill for incineration.

*Photograph 7:  
Medical waste at Song Da No.2 Camp*



*Photograph 8:  
Medical waste at the Owner’s Site Office and Village*



**4.4 Community Waste Management Support**

**4.4.1 Community Recycling Programme**

The EMO has set a target of handing over the Community Recycle Bank at Ban Hat Gnuin to villagers in June 2016. By the end of March 2016, a total of 6,278 kg of recyclables have been sold to the Community Recycle Bank as shown in the table below. In addition, the number of villagers participating in this programme has increased constantly. By the end of March 2016, a total of 180 people (136 adults and 53 students) representing 120 households held accounts at the Recycle Bank. The percentage of participation in the programme for each village are: Ban Hat Gniun 80%, Ban Hatsaykham 64% and Ban Thahuea 63%. Appendix 5 summarizes the amount of recyclables bought by the Community Recycle Bank in the First Quarter of 2016.

*Photograph 9:  
Local Villages Trade Recyclables at the Recycle Bank*



*Photograph 10:  
Local Villages Trade Recyclables at Bank*

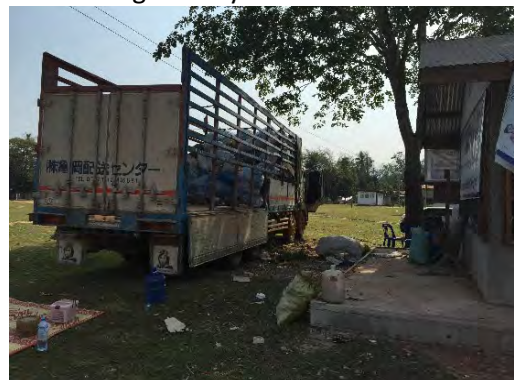


During January to March 2016, several types of recyclables were sold to the Khunmixay Processing Factory. The EMO continued to arrange that a contractor routinely collects these materials. A long term contract for purchase and transport all recyclables from the Community Recycle Bank and the NNP1PC on a regular basis has also been discussed with the Khunmixay Processing Factory. Appendix 6 summarizes the amount of waste traded in the First Quarter of 2016.

Photograph 11:  
Recyclables were sold to Khunmixay Processing Factory on 16-Jan-16



Photograph 12:  
Recyclables were sold to Khummixay Processing Factory on 17-Feb-16



In order to provide an improved waste management system for the community, reducing the size of the storage space and increase the saleability of recycle materials, the EMO purchased a crushing machine to compress cans and plastic bottles received at the Recycle Bank and from the Owners' Site Office and Village. The extension of a storage area for the pressing machine was completed. The machine was installed and instructions were provided for its use. The machine will be tested for the first time in April 2016. The machine will be operational when all safety measures have been approved by NNP1PC, as shown in the photograph below.

Photograph 13:  
The extended storage area for ressing machine



Photograph 14:  
Installation of the pressing machine



During 19 to 20 January 2016, a household waste management survey was conducted at the Project Affected Villages of Ban Hat Gniun, Ban Thaheua and Ban Hatsaykham as shown in the photographs below. The main purpose of this survey is to identify the amount of waste generated from each household so as to calculate the size of the Houay Soup Resettlement Village's landfill and to obtain feedback from the villagers regarding the Community Recycle Bank Programme.

The surveyed households<sup>2</sup> represented 10% of the total households in each village. In addition, one hotel, one restaurant and one general grocery store within the camp followers' area were surveyed.

The results of the survey are:

The average amount of domestic waste generated per day for each household were 0.5 kg of recyclables, 1.1 kg of food waste and 1.0 kg of general waste.

1. The villagers were satisfied with the Community Recycle Bank Programme because this Programme could reduce the amount of waste around the village residential areas and also generate some income for them. In the past, the villagers usually dumped waste on the ground, the river banks and burned all types of waste at their houses. Since the Community Recycle Bank Programme was established, the villagers have been willing to separate recyclables for sale at the Recycle Bank to earn some extra income instead of allowing the waste to be littered. This Programme has also changed their behaviour.
2. Some of villagers did not participate in the Community Recycle Bank Programme because they do not have enough waste to sell or they do not have a vehicle to bring their waste to the bank. This is especially the case for villagers at Ban Thaheua and Ban Hatsaykham.

*Photograph 15:  
Household Waste Management Survey at Ban  
Thaheua*



*Photograph 16:  
Household Waste Management Survey at Ban  
Hatsaykham*



#### **4.4.2 Animal Fodder (Pig Feed) Collection Programme**

In January 2016, the EMO conducted a food waste survey at the canteens of all the construction camps including those at Song Da 5 Camp No.1, Song Da 5 Camp No.2, TCM, SECC, OC and the Owner's Site Office and Village. The purpose of this survey was to investigate the quantity of food waste generated at these camps and identify opportunities to expand the Animal Fodder (Pig Feed) Collection

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<sup>2</sup> These are 7 households at Ban Thaheua (average of 5 persons per household); 9 households (with an average of 9 persons per household), 2 restaurants and 2 general stores at Ban Hat Gniun, and 4 households at Ban Hatsaykham. In addition, 1 hotel, 1 restaurant and 1 general store within the camp follow area need to be surveyed.

Programme to other villagers. The survey results revealed that about 200 kg of food waste is generated daily at the canteens.

In February and March 2016, two consultations were held with the village chief and villagers of Ban Hatsaykham to discuss the expansion of the Animal Fodder Collection Programme to other villagers in the village. In February 2016, one more household participated in this Programme and was assigned to collect food waste at the TCM and two Song Da 5 Camps. In March 2016, two more households were selected to participate in this Programme and was assigned to collect food waste at the camps of the Owners’ Site Office and Village, IHI and OC.

The EMO continued to monitor the food waste separation procedures at the canteens to ensure that other waste is not mixed with food waste as well as the safety procedures used by villagers to access the Site for food waste collection. A draft Operating Procedure for Food Waste Separation and Collection was prepared and is under review by the EMO.

#### 4.4.3 Waste Management Training

Waste management training for villagers at three villages (Ban Hat Gniun, Ban Hatsaykham, and Ban Thaheua) was undertaken from 15 to 17 March 2016 (Photograph 17 and Photograph 18). This training focussed on waste separation, the Community Recycle Bank operation, how to reduce the quantity of waste under the 3R principles (Reduce, Re-use and Recycle), how to dispose of waste types of recyclables accepted at the Community Recycle Bank and how to clean recyclables prior to selling. Purchasing procedures for recyclables from the villagers were also conducted after the training. The number of participants are presented in Table 4-4 below.

Table 4-4: Summarised number of participants who attended the waste management training

Date	Location	Total	Female
15 March 2016	Ban Hatsaykham	24	18
16 March 2016	Ban Thaheua	22	20
17 March 2016	Ban Hat Gniun	27	24
<b>Grand total</b>		<b>73</b>	<b>61</b>

Photograph 17:  
Waste management training was conducted at Ban Hatsaykham



Photograph 18:  
Waste management training was conducted at Ban Thahuea



Photograph 19:  
Recyclables purchase at Ban Hatsaykham



Photograph 20:  
Recyclables purchase at Ban Thaheua



#### 4.4.4 Houay Soup Waste Management

In March 2016, the Houay Soup landfill design was finalised. The construction works are currently out to tender and on 31 March 2016 NNP1PC arranged a site visit for the contractors bidding for the works. The deadline for submission of bids is 07 April 2016. It is expected that the landfill construction will start in June 2016.

#### 4.5 Environmental Monitoring

The environmental quality monitoring undertaken from January to March 2016 has followed the environmental quality monitoring programme presented in the ESMMP-CP Volume III. The programme consists of the following components:

- a) Effluent discharge from camps and construction sites
- b) Ambient surface water quality monitoring
- c) Ambient air quality monitoring (particulate matter of less than 10 microns)
- d) Ambient noise and noise emission monitoring

All the monitoring results have been assessed against the 2009 National Environmental Standards and the Effluent Standards specified in the Concession Agreement Annex C<sup>3</sup>, as applicable. For the purposes of simplified reporting, this Section focuses on the key results that do not meet the mentioned Standards. Appendix 6 of this report contains graphs of all key parameters since the beginning of water quality monitoring in September 2014.

A small laboratory to carry out basic water quality analyses (including bacteria, Biochemical Oxygen Demand, and Total Suspended Solid) will be constructed at the Owner's Site and Village area. The technical design of the laboratory has been prepared and approved. Procurement of a Contractor to

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<sup>3</sup> The Effluent Standards in Annex C are **the stricter of** the indicative guideline values applicable to sanitary wastewater in IFC Environmental Health and Safety Guideline, General Guidelines: Wastewater and Ambient Water Quality – and the applicable values in the Lao National Environmental Standards. Note also that the indicative guideline values in the IFC EHS Guideline are meant to apply in the absence of national values



build the laboratory is being undertaken. Quotations of the laboratory equipment are being obtained from suppliers in Lao PDR. It is expected that the construction will be completed by the end of the Fourth Quarter of 2016.

#### 4.5.1 Surface Water (River) Quality

Water quality monitoring is conducted at 13 stations in the Nam Ngiep 1 watershed area at:

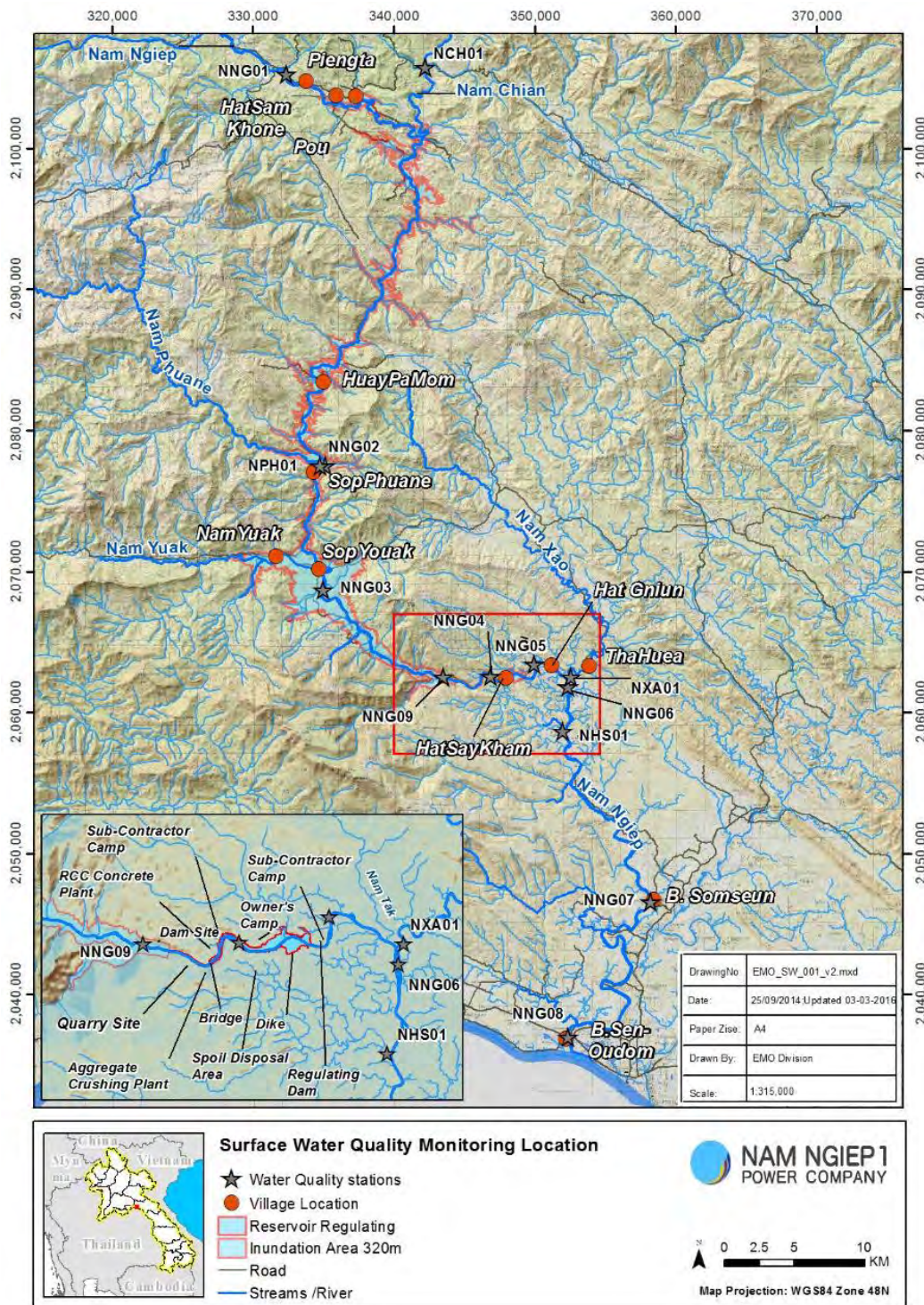
- i) 6 stations located in the upstream of the Main Dam, which includes 4 stations along the upper Nam Ngiep River. These are Station NNG09 which is a control station for the surface water quality monitoring, a station at lower Nam Phouan and a station at lower Nam Chian;
- ii) 7 stations located downstream of the Main Dam which include 5 stations along lower reaches of the Nam Ngiep. These are Stations NNG04 and NNG05 (which may indicate impacts from the Project activities), a station at lower Nam Xao and a station at lower Nam Houay Soup.

The monitoring parameters are presented in Table 4-5 and the locations of the monitoring stations are shown in Figure 4-4.

Table 4-5: Surface Water Quality Monitoring Parameters

Frequency of Monitoring	Parameters (Unit)
Fortnightly	pH, DO (%), DO (mg/l), Conductivity ( $\mu\text{s/cm}$ ), TDS (mg/l), Temperature ( $^{\circ}\text{C}$ ), Turbidity (NTU)
Monthly	TSS (mg/l), BOD5 (mg/l), COD (mg/l), NH3-N (mg/l), NO3-N (mg/l), Total Iron (mg/l), Manganese (mg/l), total coliform (MPN/100 ml), faecal coliform (MPN/100 ml)
Quarterly	Total Kjeldahl Nitrogen (mg/l), Chloride (mg/l), Sulphate (mg/l), Alkalinity (mg/l), Lead (mg/l), Arsenic (mg/l), Mercury (mg/l), Calcium (mg/l), Magnesium (mg/l), Potassium (mg/l), Sodium (mg/l)

Figure 4-4: Surface water quality monitoring locations



Descriptions of each monitoring station and surface water quality monitoring parameters can be found in the Appendix 5: Surface Water Quality Monitoring Code and Locations. Visits to two out of the 13 surface water quality stations were cancelled for the missions in January 2016 due to unsafe access to the sites.

During the First Quarter of 2016, the ambient surface water parameters that exceeded the Lao National Environmental Standard (Surface Water Quality Guideline) included Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD5) and faecal coliforms as described in detail below.

#### 4.5.1.1 Chemical Oxygen Demand (COD)

The COD levels measured in Nam Ngiep River since the start of the monitoring programme in 2014 indicate substantial spatial and temporal variation from ‘not detected’ to double-digit mg/l. A proper statistical analysis of the COD values will be included in the 2017 Annual Report.

It is highly unlikely that the previous and currently ongoing construction works of NNP1 would cause any measurable increase in the COD levels in the Nam Ngiep River downstream of the Site. The purpose of the monitoring is therefore mainly to establish a baseline prior to the formation of the reservoir after which it will be important to monitor and assess changes in the downstream water quality of the Nam Ngiep River.

Table 4-6: Surface water COD results from January to March 2016

Month Year	River Name	Nam Ngiep										Nam Chiane	Nam Phouan	Nam Xao	Nam Houaysoup
	Station	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08	(NCH01)	(NPH01)	(NXA01)	(NHS01)	
	Zone	Upstream of Project Construction Area			Within Construction Area	Downstream of Project Construction Area			Tributaries Upstream of Project Construction Area		Tributaries Downstream of Project Construction Area				
Guideline															
Jan-16	<5.0 mg/l	ND <sup>16</sup>	N/A	ND <sup>16</sup>	12.4	10.6	9.6	8.4	6.4	9.6	ND <sup>16</sup>	N/A	ND <sup>16</sup>	7.2	
Feb-16	<5.0 mg/l	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	6.3	ND <sup>16</sup>	21.9	17.8	ND <sup>16</sup>	8.3	
Mar-16	<5.0 mg/l	ND <sup>13</sup>	ND <sup>16</sup>	7.6	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	8.8	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	11.2	ND <sup>16</sup>	ND <sup>16</sup>	

Note: N/A means no data available due to the cancelled mission. ND<sup>16</sup> means less than the detection limit (<5.0 mg/l)

#### 4.5.1.2 Biochemical Oxygen Demand (BOD<sub>5</sub>)

During the First Quarter of 2016, a few Biochemical Oxygen Demand (BOD<sub>5</sub>) results at Nam Ngiep upstream (NNG01 & NNG03), upstream tributaries of the project construction area (NCH01 & NPH01) and Nam Ngiep within the Project area (NNG04) were higher than the Standard set at less than 1.5 mg/l.

Similar to the COD analyses, the purpose of the BOD<sub>5</sub> measurements is mainly to establish a baseline prior to inundation.

Table 4-7: Results of surface water BOD from January to March 2016

Month Year	River Name	Nam Ngiep										Nam Chiane	Nam Phouan	Nam Xao	Nam Houaysoup
	Station	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08	(NCH01)	(NPH01)	(NXA01)	(NHS01)	
	Zone	Upstream of Project Construction Area			Within Construction Area	Downstream of Project Construction Area			Tributaries Upstream of Project Construction Area		Tributaries Downstream of Project Construction Area				
Guideline															
Jan-16	<1.5 mg/l	ND <sup>13</sup>	N/A	2.3	1.2	1.8	ND <sup>13</sup>	ND <sup>13</sup>	1	ND <sup>13</sup>	1	N/A	ND <sup>13</sup>	ND <sup>13</sup>	
Feb-16	<1.5 mg/l	1.3	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	ND <sup>13</sup>	6.1	ND <sup>13</sup>	1	
Mar-16	<1.5 mg/l	1.6	ND <sup>13</sup>	ND <sup>13</sup>	1.2	ND <sup>13</sup>	ND <sup>13</sup>	1.3	1	ND <sup>13</sup>	2.4	ND <sup>13</sup>	1.2	ND <sup>13</sup>	

Note: N/A means no data available because of the mission was canceled. ND<sup>13</sup> means less than the detection limit (<1.0 mg/l)

#### 4.5.1.3 Faecal Coliforms

The amount of faecal coliforms exceeded the National Surface Water Quality Standard in January 2016 with values ranging from 1,700 to 4,900 MPN/100 ml at lower Nam Chian (NCH01), Nam Ngiep River upstream of the Main Dam (NNG09) and downstream of the Project construction area at Ban Somsuen (NNG07). The faecal coliform peak occurred at Nam Ngiep upstream Main Dam (NNG09) in January 2016.

Table 4-8: Results of the surface water faecal coliforms from January to March 2016

Month Year	River Name	Nam Ngiep										Nam Chiane	Nam Phouan	Nam Xao	Nam Houaysoup
	Station	NNG01	NNG02	NNG03	NNG09	NNG04	NNG05	NNG06	NNG07	NNG08	(NCH01)	(NPH01)	(NXA01)	(NHS01)	
	Zone	Upstream of Project Construction Area				Within Construction Area	Downstream of Project Construction Area				Tributaries Upstream of Project Construction Area		Tributaries Downstream of Project Construction Area		
Guideline															
Jan-16	1,000	7.8	N/A	220	4,900	3,300	3,300	1,700	2,600	490	1,700	N/A	330	170	
Feb-16	1,000	350	70	110	17	14	4.5	4.5	6.8	17	490	49	49	240	
Mar-16	1,000		46	110	49	130	49	170	21	49		46	6.8	13	

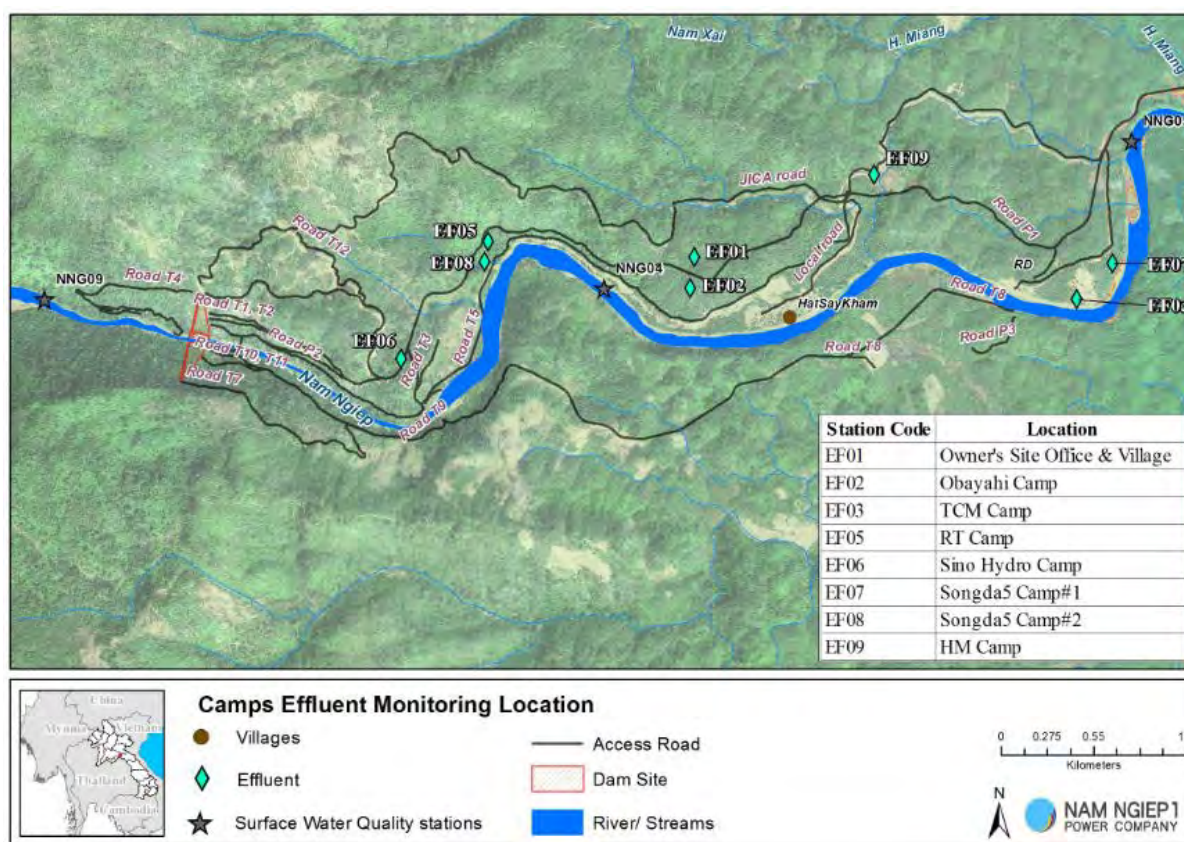
Note: 'N/A' means data 'not available' because the sampling visit was cancelled

### 4.5.2 Effluent Discharge Quality Monitoring

All the camps' effluent water were monitored irrespective of whether or not effluents were discharged at the time of sampling. In case of no discharge, the samples were collected from the downstream end of the final treatment pond

During the First Quarter of 2016, effluents were monitored in eight camps including the TCM Camp, the Right Tunnelling Camp, the Obayashi Corporation Camp, the Sino Hydro Camp, the Song Da 5 Camp No.1, the Song Da 5 Camp No.2, the HM Camp, and the Owner's Site Office and Village (see Figure 4-5). Since January 2016, the effluent monitoring has been conducted for TCM Camp, Sino Hydro Camp, Song Da 5 Camp No.1, Song Da 5 Camp No.2, RT Camp and Obayashi Camp as non-discharge condition.

Figure 4-5: Map of effluent monitoring locations



Results of the effluent water quality monitoring of selected camps during the First Quarter of 2016 are described and shown in Table 4-9 below.

Table 4-9: Results of the effluent water quality monitoring of the camps from January to March 2016

Month-Year	Parameter (Unit)	Site Name	Owner's Site Office and Village	OC Camp	TCM Camp	RT Camp	Sino Hydro Camp	Song Da5 Camp No.1	Song Da 5 Camp No.2	HM Camp
		Station	EF01	EF02	EF03	EF05	EF06	EF07	EF08	EF09
		Guidelines in the CA								
Jan - 16	TSS (mg/l)	<50	ND <sup>16</sup>	34.8	29.6	26.7	124	30.5	79.2	528
Feb - 16	TSS (mg/l)	<50	ND <sup>16</sup>	25	29.2	10	30	21.1	66.2	12.9
Mar - 16	TSS (mg/l)	<50	ND <sup>16</sup>	29.4	6.3	36.0	13.6	17.6	89.8	114
Jan - 16	BOD (mg/l)	<30	ND <sup>13</sup>	69.6	ND <sup>13</sup>	6	33.8	82.6	69.9	51.3
Feb - 16	BOD (mg/l)	<30	7.4	88.2	13.5	15.7	17.1	72	97.2	44.4
Mar - 16	BOD (mg/l)	<30	6.6	120	5.6	25.2	7.7	40	256	28.2
Jan - 16	COD (mg/l)	<125	9.4	136	19.9	17.9	84	162	202	84
Feb - 16	COD (mg/l)	<125	10.3	146	49.4	42.5	65.9	118	244	85.8
Mar - 16	COD (mg/l)	<125	15.6	208	16.7	91.5	31.7	114	329	99.6
Jan - 16	NH3-N (mg/l)	<10	5	35	ND <sup>12</sup>	3	13	11	29	8
Feb - 16	NH3-N (mg/l)	<10	3	38	ND <sup>12</sup>	5	11	12	30	31
Mar - 16	NH3-N (mg/l)	<10	9	37	ND <sup>12</sup>	3	10	10	35	3
Jan - 16	Total coliforms (MPN/100 ml)	<400	160,000	160,000	35,000	160,000	160,000	160,000	160,000	160,000
Feb - 16	Total coliforms (MPN/100 ml)	<400	160,000	92,000	24,000	54,000	240	92,000	160,000	160,000
Mar - 16	Total coliforms (MPN/100 ml)	<400	3,300	160,000	7,900	35,000	540	160,000	160,000	1,400
Jan - 16	Faecal coliforms (MPN/100 ml)			130	160,000	700	1,700	160,000	160,000	160,000
Feb - 16	Faecal coliforms (MPN/100 ml)		3,300	92,000	24,000	14,000	130	92,000	160,000	160,000
Mar - 16	Faecal coliforms (MPN/100 ml)		2,400	160,000	4,900	4,900	79	160,000	160,000	490

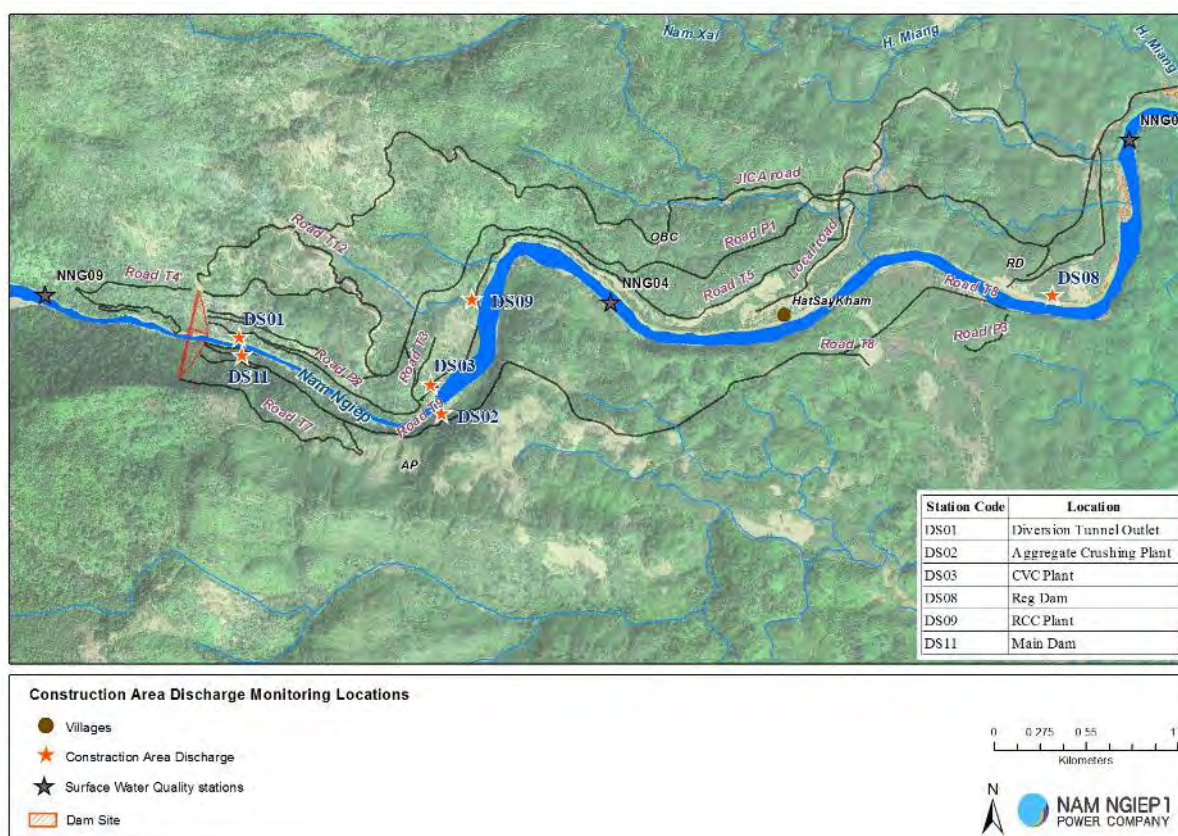
ND<sup>1</sup> (<0.0005 mg/L), ND<sup>2</sup> (<0.0003 mg/L), ND<sup>3</sup> (<0.0002 mg/L), ND<sup>4</sup> (<0.005 mg/L), ND<sup>5</sup> (<0.003 mg/L), ND<sup>6</sup> (<0.09 mg/L), ND<sup>7</sup> (<0.07 mg/L), ND<sup>8</sup> (<0.04 mg/L), ND<sup>9</sup> (<0.02 mg/L), ND<sup>10</sup> (<0.01 mg/L), ND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

Table 4-10: Compliance assessment of the effluent discharge from the camps and construction sites in March 2016

Site	ID	Treatment System	Compliance	Corrective Actions
Owner's Site Office and Village (NNP1PC)	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharged 70 m <sup>3</sup> /day	Faecal and total coliforms were higher than the Standards	This camp is subject to a review. Proposed measures and corrective actions will be discussed with TD for implementation by June 2016 before issuing ONCs/NCR
OC Camp	EF02	Septic tanks (kitchen and black water) and wetland (grey water)	Non-compliant of BOD <sub>5</sub> , Ammonia nitrogen, faecal coliforms and total Coliforms	The EMO conducted a follow up inspection of the waste water treatment systems (WWTS) at this camp on 5 April 2016 as well as discussing with the Contractor on the corrective actions in preparation for an internal meeting with TD in late April 2016 (See Annex 2)
TCM Camp	EF03	Septic tank (kitchen and black water), sediment ponds (grey water)	Faecal and total coliforms were higher than the standards	This camp WWTS will be reviewed <b>in April 2016</b> for corrective actions before issuing ONCs/NCRs
Right Tunnelling Camp	EF05	Septic tank (kitchen and black water), sediment ponds (grey water)	Faecal and total coliforms exceeded the Effluent Standards. The pH was measured 9.15 in March 2016 as a result of lime powder being added into the system.	The EMO conducted a follow up inspection of the waste water treatment systems (WWTS) at this camp on 05 April 2016 as well as discussing with the Contractor on the corrective actions in preparation for an internal meeting with TD <b>in late April 2016</b> (See Annex 2)
Sino Hydro Camp	EF06	Septic tank (kitchen and black water), sediment ponds (grey water)	BOD and TSS results exceeded the standard in January 2016; Ammonia nitrogen and Total coliform results exceeded the guideline (except total coliforms for February 2016)	The EMO conducted a follow up inspection of the waste water treatment systems (WWTS) at this camp on 05 April 2016 as well as discussing with the Contractor on the corrective actions in preparation for an internal meeting with TD in late April 2016 (See Annex 2)
Song Da 5 Camp No. 1	EF07	Septic tank (kitchen and black water), sediment ponds (grey water)	BOD, NH <sub>3</sub> , faecal coliforms and total coliforms were much higher than standards in January, February and March 2016	The EMO conducted a follow up inspection of the waste water treatment systems (WWTS) at this camp on 05 April 2016 as well as discussing with the Contractor on the corrective actions in preparation for an internal meeting with TD in <b>late April 2016</b> (See Annex 2)

Site	ID	Treatment System	Compliance	Corrective Actions
Song Da 5 Camp No. 2	EF08	Septic tank (kitchen and black water), sediment ponds (grey water)	Non-compliant of the TSS, BOD, COD, NH <sub>3</sub> , faecal coliforms and total coliforms	The EMO conducted a follow up inspection of the waste water treatment systems (WWTS) at this camp on 05 April 2016 as well as discussing with the Contractor on the corrective actions in preparation for an internal meeting with TD in late April 2016 (See Annex 2)
H-MH Camp	EF09	Septic tank (kitchen and black water), sediment ponds (grey water)	BOD, faecal coliforms and total coliforms	No ONCs were issued yet. However, the Contractor was informed of its effluent water quality results. The EMO will keep monitoring the situation and issue an ONC if it is still found that these parameters are not improving in the next Quarter
Aggregate Crushing Plant	DS02	Sediment ponds	In January 2016, the TSS was measured 708 mg/l which was higher than the Standards	No action was undertaken. The TSS level was less than the detectable limit in February and March 2016. The EMO will keep monitoring the situation
CVC Plant	DS03	Sediment ponds	Non-compliant with the Standards for pH (measured 11.33) and the TSS (measured 1,828 mg/l) in January 2016. The discharge volume was 300 m <sup>3</sup> /day	No action was undertaken. The pH and TSS levels dropped to less than the detectable limit in February and March 2016. The EMO will keep monitoring the situation
Re-regulating Dam	DS08	pH adjustment and chemical flocculation	In January 2016, the TSS value exceeded the National Effluent Discharge Standard (<50 mg/l) with a value recorded at 5,400 mg/l.	During February to March 2016, the TSS decreased to be less than laboratory detection limit (<5 mg/l) which complied with the Standards. The EMO will keep monitoring the effluent discharge at this site
RCC Plant	DS09	Sediment ponds	In January 2016, the pH was measured 10.0 and the TSS was measured 703 mg/l (higher than the Standards). The discharge volume was 500 m <sup>3</sup> /day.	During February to March 2016, the pH and TSS decreased to be less than laboratory detection limit (<5 mg/l) and complied with the Standards. The EMO will keep monitoring the effluent being discharge at this site
Main Dam Construction Area	DS11	pH adjustment and chemical flocculation 6000 m <sup>3</sup> /day	Non-compliant with TSS Standard in January and February 2016	The TSS level was decreased to below the Standards in March 2016. The EMO will monitor the effluent discharge at this site

Figure 4-6: Map of the effluent monitoring locations for construction areas



Key results of the construction area discharge monitoring are described below. Parameters that are above the prescribed Standards are highlighted in yellow and presented in the Table 4-11 below:

Table 4-11: Results of the construction area discharge monitoring from January to March 2016

Month- Year	Parameter (Unit)	Site Name	Aggregate Crushing Plant	CVC Plant	Reg. Dam	RCC Plant	Main Dam
		Station	DS01	DS03	DS08	DS09	DS11
		Lao National Standard					
Jan-16	pH	6.0-9.0	7.85	11.33	8.42	10.0	7.02
Feb-16	pH	6.0-9.0	N/A*	N/A*	8.03	N/A*	7.32
Feb-16	pH	6.0-9.0	N/A*	N/A*	6.86	N/A*	6.86
Mar-16	pH	6.0-9.0	N/A*	N/A*	8.18	N/A*	6.94
Mar-16	pH	6.0-9.0	N/A*	N/A*	8.02	N/A*	8.00
Jan-16	TSS (mg/l)	<50	708.0	1,828	5,400	703	100
Feb-16	TSS (mg/l)	<50	ND <sup>16</sup>	N/A*	ND <sup>16</sup>	N/A*	51.7
Feb-16	TSS (mg/l)	<50	N/A*	N/A*	ND <sup>16</sup>	N/A*	768
Mar-16	TSS (mg/l)	<50	N/A*	N/A*	ND <sup>16</sup>	N/A*	50.0
Mar-16	TSS (mg/l)	<50	N/A*	N/A*	ND <sup>16</sup>	N/A*	32.9

Note: N/A\* means data 'not available' due to no discharge into the environment



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

### 4.5.3 Groundwater Quality Monitoring

The groundwater quality was monitored in three boreholes of Ban Hatsaykham installed by NNP1PC and a private well in Ban Hat Gniun. The boreholes of Ban Hatsaykham are used for drinking, washing, cooking and bathing purposes for 42 households, whereas the private well in Ban Hat Gniun is used by 6 households for washing and bathing purpose only. The samples were tested for twenty two (22) parameters including: pH, DO (%), DO (mg/l), Conductivity (µs/cm), TDS (mg/l), Temperature (°C), Turbidity (NTU), Arsenic (mg/l), Cadmium (mg/l), Calcium (mg/l), Iron (mg/l), Magnesium (mg/l), Manganese (mg/l), Potassium (mg/l), Sodium (mg/l), Fluoride (mg/l), Nitrate (mg/l), Nitrite (mg/l), Total Hardness (mg/l), Total Coliforms (MPN/100 ml), Faecal Coliform (MPN/100 ml) and E. coli (MPN/100 ml).

Figure 4-7: Map of groundwater sampling sites at Ban Hatsaykham

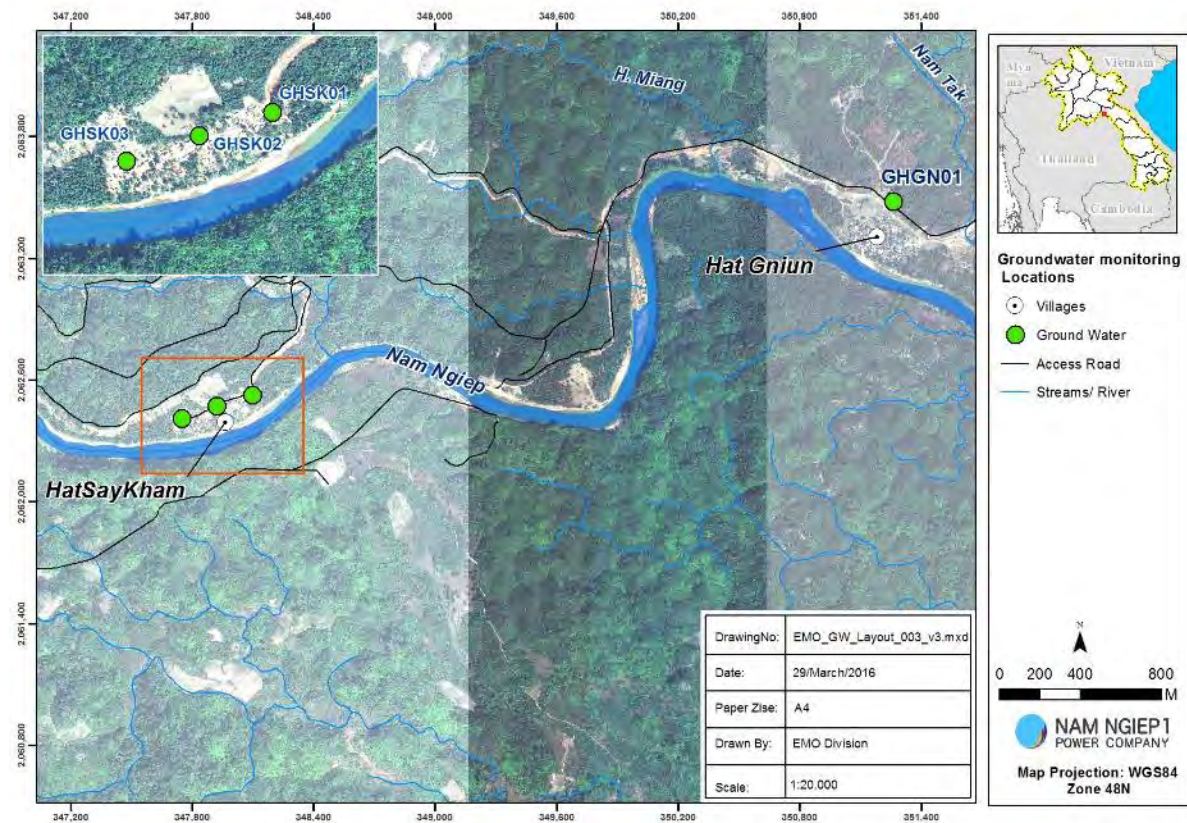


Table 4-12: Results of the groundwater quality monitoring from January to March 2016

Month-Year	Parameter	Site Name	Ban Hatsaykham			Ban Hat Gnuin
		Station	GHSK01	GHSK02	GHSK03	GHGN01
		Guideline				
Jan-16	pH	6.5 -9.2	6.63	6.37	6.5	
Feb-16	pH	6.5 -9.2	6.36	6.31	6.45	6.39
Mar-16	pH	6.5 -9.2	6.39	6.26	6.11	5.86
Jan-16	Faecal Coliform (MPN/100 ml)	0	0	0	0	
Feb-16	Faecal Coliform (MPN/100 ml)	0	0	0	0	4.5
Mar-16	Faecal Coliform (MPN/100 ml)	0	0	0	0	0
Jan-16	E.Coli (MPN/100 ml)	0	0	0	0	
Feb-16	E.Coli (MPN/100 ml)	0	0	0	0	4.5
Mar-16	E.Coli (MPN/100 ml)	0	0	0	0	0

Key findings of groundwater quality monitoring are summarized as the following:

**Ban Hatsaykham:** All parameters monitored complied with the relevant Standards, except with respect to pH which for all three boreholes (GHSK01, GHSK02 & GHSK03) was slightly lower than the Standard minimum level. However such low pH levels do not pose any risk to human health.

**Ban Hat Gnuin:** During February and March 2016, the pH level were 6.39 and 5.83 which were lower than the National Standard range of between 6.50 and 9.20. In February 2016, faecal coliform and E.coli bacteria contamination were recorded as 4.5 MPN/100 ml which slightly exceeded the National Standard. However, in March 2016, no faecal coliform and E.coli bacteria contamination was found. The low level of pH does not pose any risk to human health. NNP1PC regularly communicate the water quality results to the local authorities, and the Company follows up with awareness raising in the village.

#### 4.5.4 Gravity Fed Water Supply (GFWS) Monitoring

The GFWS monitoring was carried out by the EMO during the First Quarter of 2016 to monitor and assess the quality of the water that is used for bathing and washing by the villagers of Ban Hat Gnuin and Ban Thahuea. Water samples were taken from the tap for analysis. The results are shown in Table 4-13 and described below.

Table 4-13: Water quality results of the GFWS monitoring from January to March 2016

Parameter (Unit)	Site Name	Ban Thahuea			Ban Hat Gnuin		
	Station Code	WTHH02			WHGN02		
	Date	29/01/16	15/02/16	01/03/16	29/01/16	15/02/16	01/03/16
	Guideline						
pH	6.5-8.5	7.34	6.73	7.21	7.71	7.23	7.41
Sat. DO (%)		103.2	104.6	104.0	101.9	111.8	118.8
DO (mg/l)		9.29	8.85	8.44	9.19	9.16	9.89
Conductivity (µs/cm)	<1,000	54.3	77.0	63.9	79	94.2	148.5
TDS (mg/l)	<600	27.1	38.5	31.95	37	47.1	74.25
Temperature (°C)	<35	19.7	22.9	25.0	19.7	24.6	23.9
Turbidity (NTU)	<10	1.83	1.04	0.53	1.09	0.71	2.81
Color (Pt-Co)	<5	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>	ND <sup>16</sup>

Parameter (Unit)	Guideline	Ban Thahauea			Ban Hat Gnuin		
		WTHH02			WHGN02		
		29/01/16	15/02/16	01/03/16	29/01/16	15/02/16	01/03/16
Faecal coliform (MPN/100 ml)	0	23	12	0	12	23	0
Ecoli Bacteria (MPN/100 ml)	0	23	12	0	12	23	0
Nitrate (mg/l)	<50			0.22			0.17
Total Hardness (mg/l)	<300			35.2			45.0
Nitrite (mg/l)	<3			ND <sup>6</sup>			ND <sup>6</sup>
Fluoride (mg/l)	<1.5			0.16			0.18
Magnesium (mg/l)				1.61			1.92
Arsenic (mg/l)	<0.05			ND <sup>2</sup>			ND <sup>2</sup>
Manganese (mg/l)	<0.5			ND <sup>4</sup>			ND <sup>4</sup>
Mercury (mg/l)	<0.001			ND <sup>3</sup>			ND <sup>3</sup>
Selenium (mg/l)	<0.01			ND <sup>1</sup>			ND <sup>1</sup>
Cadmium (mg/l)	<0.003			ND <sup>5</sup>			ND <sup>5</sup>
Lead (mg/l)	<0.01			ND <sup>10</sup>			ND <sup>10</sup>
Iron (mg/l)	<1			ND <sup>10</sup>			0.02

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

**Ban Thahauea (WTHH02):** All parameters complied with the National Drinking Water Standard, except the faecal coliform and E.Coli bacteria parameters which were measured 23 MPN/100 ml (January 2016) and 12 MPN/100 ml (February 2016) above the National Standard (0 MPN/100 ml).

**Ban Hat Gnuin (WHGN02):** All parameters complied with the National Drinking Water Standard, except faecal coliform and E.Coli bacteria parameters which were measured 12 MPN/100ml (January 2016) and 23 MPN/100ml (February 2016) above the National Standard (0 MPN/100 ml).

The level of bacterial contamination is not likely to cause significant concerns for bathing and washing purposes. However, for drinking purposes, the villagers have been advised through the SMO to boil the water before drinking.

#### 4.5.5 Air Quality (Dust) Monitoring

##### 4.5.5.1 Ambient Air Quality in Nearby Villages

The ambient air quality monitoring for dust was carried out for 72 consecutive hours in the villages closest to the project construction site (Ban Hatsaykham, Ban Thahauea and Ban Hat Gnuin) by starting the monitoring on the weekend to obtain a record of at least 20 hours of background conditions. The main purpose of the dust monitoring in Ban Hatsaykham, Ban Hat Gnuin and Ban Thahauea is to help assess if the project construction works and the project related traffic passing through the villages cause elevated levels of dust in the ambient air. The dust emission monitoring for Ban Thahauea was stopped since February 2016 since this site is located approximately 6 Km away from the construction sites and the road passing this village was paved with asphalt concrete.

All village recordings were within the Lao National Environmental Standard for Air Quality of 0.12 mg/m<sup>3</sup>. The dust emission monitoring average results in 24 hours during the First Quarter are shown in Figure 4-8 and summarized in Table 4-14.

Figure 4-8: Noise and dust monitoring locations for Project nearby villages and construction sites

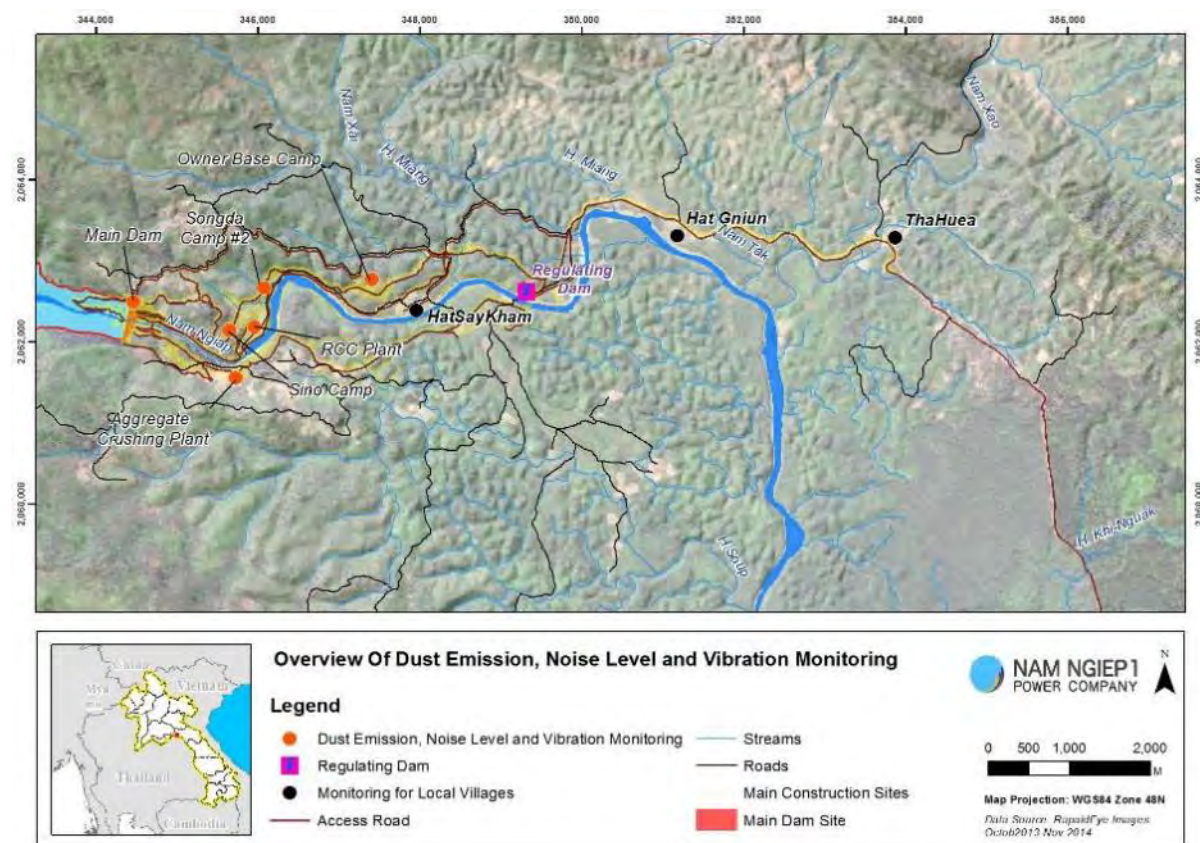


Table 4-14: Air quality (dust) monitoring results for villages near to the Project from January to March 2016

<b>Ban Hatsaykham - Average Dust Level in 24 h – January 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	10/01/2016 16:11	11/01/2016 16:11	12/01/2016 16:05
End Time	11/01/2016 16:10	12/01/2016 16:05	13/01/2016 16:05
Average Value Recorded in 24 h	0.07	0.07	0.05
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Hatsaykham - Average Dust Level in 24 h – February 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	05/02/2016 12:43	06/02/2016 12:43	07/02/2016 12:42
End Time	06/02/2016 12:42	07/02/2016 12:42	08/02/2016 12:42
Average Value Recorded in 24 h	0.05	0.11	0.10
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Hatsaykham - Average Dust Level in 24 h – March 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	05/03/2016 10:39	06/03/2016 10:39	07/03/2016 10:39

End Time	06/03/2016 10:39	07/03/2016 10:39	08/03/2016 10:38
Average Value Recorded in 24 h	0.05	0.07	0.09
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Hat Gniun – Average Dust Level in 24 h – January 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	17/01/2016 13:12	18/01/2016 13:28	19/01/2016 13:38
End Time	18/01/2016 13:28	19/01/2016 13:38	20/01/2016 8:50
Average Value Recorded in 24 h	0.07	0.05	0.06
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Hat Gniun – Average Dust Level in 24 h – February 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	13/02/2016 13:44	14/02/2016 13:49	15/02/2016 13:44
End Time	14/02/2016 13:49	15/02/2016 13:44	16/02/2016 14:24
Average Value Recorded in 24 h	0.05	0.04	0.06
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Hat Gniun – Average Dust Level in 24 h – March 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	24/03/2016 12:35	25/03/2016 12:35	26/03/2016 12:35
End Time	25/03/2016 12:35	26/03/2016 12:35	27/03/2016 12:35
Average Value Recorded in 24 h	0.07	0.03	0.05
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Ban Thahuea – Average Dust Level in 24 h – January 2016</b>			
Period	00-24 Hours	24-48 Hours	48-72 Hours
Start Time	14/01/2016 11:45	15/01/2016 11:45	16/01/2016 11:45
End Time	15/01/2016 11:45	16/01/2016 11:45	17/01/2016 08:59
Average Value Recorded in 24h	0.087	0.043	0.029
<b>Guideline Average in 24h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>

#### 4.5.5.2 Project Construction Sites

During the First Quarter 2016, the dust monitoring was implemented at prioritized project construction sites for 24 hours consecutively on a monthly basis at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp, Songda5 Camp#2 (to assess possible impact on worker's health) and Owner's Site Office and Village (to monitor the ambient dust levels). The results of dust monitoring in these construction sites are summarized in Table 4-15. All recordings were within the Lao National Environmental Standard for Air Quality of 0.12 mg/m<sup>3</sup>.

Table 4-15: Dust Monitoring Results from January to March 2016 – Project Construction Sites

<b>Aggregate Crushing Plant - Average Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time	25/01/2016 5:00	18/02/2016 15:00	22/03/2016 11:43
End Time	26/01/2016 5:00	19/02/2016 14:13	23/03/2016 11:43

Average Value Recorded in 24 h	0.03	0.09	0.076
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>RCC Plant – Average Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time	29/01/2016 10:59	01/02/2016 14:35	10/03/2016 15:51
End Time	30/01/2016 06:14	02/02/2016 10:29	11/03/2016 15:51
Average Value Recorded in 24 h	0.04	0.05	0.061
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Songda5 Camp#2 – Average Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time	05/01/2016 15:17	16/02/2016 15:28	09/03/2016 13:30
End Time	06/01/2016 15:34	17/02/2016 14:14	10/03/2016 13:30
Average Value Recorded in 24 h	0.05	0.07	0.06
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Sino Hydro Camp - Average Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time	04/01/2016 14:51	03/02/2016 14:50	17/03/2016 10:41
End Time	05/01/2016 14:23	04/02/2016 15:20	18/03/2016 10:41
Average Value Recorded in 24 h	0.04	0.04	0.056
<b>Guideline Average in 24 h</b>	<b>0.12</b>	<b>0.12</b>	<b>0.12</b>
<b>Main Dam - Average Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time		03/02/2016 14:50	21/03/2016 10:33
End Time		04/02/2016 14:50	22/03/2016 10:33
Average Value Recorded in 24 h		0.09	0.043
<b>Guideline Average in 24 h</b>		<b>0.12</b>	<b>0.12</b>
<b>Owner's Site Office and Village - Average Ambient Dust Level in 24 h – First Quarter 2016</b>			
Month	January 2016	February 2016	March 2016
Start Time		24/02/2016 14:53	01/03/2016 10:08
End Time		25/02/2016 14:53	02/03/2016 10:08
Average Value Recorded in 24 h		0.03	0.06
<b>Guideline Average in 24 h</b>		<b>0.12</b>	<b>0.12</b>

#### 4.5.6 Noise Monitoring

##### 4.5.6.1 Nearby Villages

The noise monitoring was carried out in Ban Hatsaykham, Ban Hat Gniun and Ban Thahuea from 10:50 in the morning for 72 consecutive hours by starting the monitoring on a non-working day (Sunday), to obtain a record of at least 20 hours of background conditions. The recorded values were measured against the Standards (maximum mean noise levels for daytime 06:00-18:00, evening 18:00-22:00 and night time 22:00-06:00; and the maximum peak noise level.

The noise monitoring for Ban Thahuea was stopped in February 2016 since this site is located approximately 6 km away from the Project construction sites. Therefore, this site would not be a significant site to be monitored for the noise impacts from the project construction activities.

The results revealed that all village recordings were within the allowable maximum peak value of 115 dB(A). However, the mean noise level occasionally exceeded the standard as described below:

- The recorded average noise level during the night time from 22:01 -06:00 on 06 to 07 February 2016 in Ban Hatsaykham was slightly higher than the allowable value of 45 dB(A) as demonstrated in **Table 4-16** below. The main source of the elevated noise level was because of the rain event which occurred during the monitoring period.
- In January 2016, the average noise level in Ban Hat Gniun from 18:01-22:00 and 22:01-06:00 were higher than the Standard with recorded values range of 49.3 dB(A) to 66.52 dB(A). The local entertainment activities and windy condition were the key factors causing this high noise level.

The average noise levels in Ban Thahuea exceeded the Standard for the period of 22:01-06:00 with recorded values range of 45.06 dB(A) to 52.81 dB(A) in January 2016. The windy conditions were the key factor of this high noise level.

Table 4-16: Noise monitoring results from January to March 2016 for Project nearby villages

Ban Hatsaykham - Noise Monitoring 72 consecutive hours - January 2016										
Noise Level (dB)	10-11/01/2016			11-12/01/2016			12-13/01/2016			13/01/2016
	16:20-18:00	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 - 16:20
Data Record Max	69.4	60.7	61.3	69.7	54.1	63	81.6	56.9	61.1	76.4
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	45.29	45.49	44.19	46.08	45.28	43.00	45.83	46.05	43.44	45.49
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>
Ban Hatsaykham - Noise Monitoring 72 consecutive hours - February 2016										
Noise Level (dB)	05-06/02/2016			06-07/02/2016			07-08/02/2016			08/02/2016
	13:01-18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 – 18:00	18:01 – 22:00	22:01 – 06:00	06:01 - 16:20
Data Record Max	72.2	67.1	73.1	85.3	60.3	71.1	74.7	76.1	71	74.2
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	45.87	45.31	44.54	48.55	44.65	41.82	48.54	43.88	42.33	47.93
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>
Ban Hatsaykham - Noise Monitoring 72 consecutive hours - March 2016										
Noise Level (dB)	05-06/03/2016			06-07/03/2016			07-08/03/2016			08/03/2016
	10:50-18:00	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 - 10:50
Data Record Max	74.4	68.5	57.7	90	77.2	74.1	73.4	64	80.8	67.5
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	41.83	46.43	43.86	45.34	45.89	45.22	44.53	45.22	44.57	46.83
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>
Ban Hat Gniun - Noise Monitoring 72 consecutive hours - February 2016										
Noise Level (dB)	13-14/02/2016			14-15/02/2016			15-16/02/2016			16/02/2016
	13:36-18:00	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	06:00-11:44
Data Record Max	71.00	69.10	64.40	73.60	75.20	71.80	74.60	71.60	74.60	73.70
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	50.76	48.07	42.40	51.15	51.02	43.17	48.70	48.29	40.57	50.43
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

Ban Hat Gnuin - Noise Monitoring 72 consecutive hours - January 2016										
Noise Level (dB)	21-22/01/2016			22-23/01/2016			23-24/01/2016			24/01/2016
	10:18-18:00	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	06:00-11:44
Data Record Max	72.80	77.20	81.70	79.00	76.10	75.50	84.60	68.50	76.30	74.30
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	46.62	59.76	66.52	49.66	58.19	58.04	50.51	51.25	49.37	49.72
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

Ban Hat Gnuin - Noise Monitoring 72 consecutive hours - March 2016										
Noise Level (dB)	24-25/03/2016			25-26/03/2016			26-27/03/2016			27/03/2016
	12:49-18:00	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 - 12:49
Data Record Max	75.3	73	71.3	84	73.2	74.9	75.7	75.3	64.2	71.8
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	47.40	47.11	42.48	54.75	53.00	41.44	48.43	49.45	42.35	48.14
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

Ban Thahuea - Noise Monitoring 72 consecutive hours - January 2016										
Noise Level (dB)	14-15/01/2016			15-16/01/2016			16-17/01/2016			17/01/2016
	12:00-18:00	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	06:00-09:10
Data Record Max	75.7	71	80.3	79.2	69.4	75.7	78.6	70.2	69.1	71.8
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Data Record Average	47.79	48.05	46.44	51.51	48.71	45.06	50.31	48.38	52.81	50.34
<b>Guideline Averaged</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>	<b>55</b>	<b>45</b>	<b>55</b>

#### 4.5.6.2 Project Camps and Construction Sites

During the First Quarter, noise monitoring was also conducted at the Aggregate Crushing Plant, RCC Plant, Sino Hydro Camp and Song Da 5 Camp No.2 and at the Owner's Site Office and Village mainly in order to assess possible impact on workers' health as well as to estimate any potential impact on the ambient noise levels in the surrounding areas.

The assessment found that all maximum peak noise levels were within the National Standard. However, the mean noise level during 22:00-06:00 at Song Da 5 Camp No.2 was slightly higher than the National standard (<50 dB(A)). The exceedance at Song Da Camp No.2 was likely caused by the windy weather conditions during the night.

The ESMMP-CP states that all workers must wear appropriate ear protection equipment if they are exposed to the noise levels that is greater than 80 dB(A).

Table 4-17: Noise monitoring results for Project construction sites from January to March 2016

Site	Aggregate Crushing Plant - Noise Monitoring 24 hour consecutively - First Quarter 2016								
	Jan-16			Feb-16			Mar-16		
	25-26/01/2016		26/01/2016	18-19/02/2016		19/02/2016	22-23/03/2016		23/03/2016
Noise Level (dB)	05:00 – 22:00	22:01 – 06:00	06:01-05:00	15:08 – 22:00	22:01 – 06:00	06:01-15:08	11:53 – 22:00	22:01 – 06:00	06:01-11:53
Max Value Recorded	77.1	85.5	70.9	84.9	78	77.3	85.8	67.8	79.1
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	53.58	50.53	54.17	53.40	49.71	50.79	58.37	52.54	55.26
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>

Site	RCC Plant - Noise Monitoring 24 hour consecutively - First Quarter 2016								
	Jan-16			Feb-16			Mar-16		
	29-30/01/2016		30/01/2016	01-02/02/2016		02/02/2016	10-11/03/2016		11/03/2016
Noise Level (dB)	16:06 – 22:00	22:01 – 06:00	06:01-16:02	16:06 – 22:00	22:01 – 06:00	06:01-16:02	16:06 – 22:00	22:01 – 06:00	06:01-16:02
Max Value Recorded	74	85.8	84.3	76.2	71.4	81	67.7	62.1	76.3
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	58.13	55.08	62.61	55.13	54.47	60.27	49.49	48.39	58.74
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>



Site	Sino Hydro Camp - Noise Monitoring 24 hour consecutively - First Quarter 2016								
Month	Jan-16			Feb-16			Mar-16		
Noise Level (dB)	04-05/01/2016	05/01/2016	03-04/02/2016	04/02/2016	17-18/03/2016	18/03/2016			
	15:03 – 22:00	22:01 – 06:00	06:01-14:31	15:08 – 22:00	22:01 – 06:00	06:01-15:08	10:50 – 22:00	22:01 – 06:00	06:01-10:50
Max Value Recorded	74.5	70.4	76.9	77.7	72.6	76.9	69.9	73.6	76.9
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	54.82	53.48	57.76	52.68	50.74	56.60	48.98	55.25	59.52
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>

Site	Songda5 Camp#2 - Noise Monitoring 24 hour consecutively - First Quarter 2016								
Month	Jan-16			Feb-16			Mar-16		
Noise Level (dB)	05-06/01/2016	06/02/2016	16-17/02/2016	17/02/2016	09-10/03/2016	11/03/2016			
	15:30 – 22:00	22:01 – 06:00	06:00-15:45	15:30 – 22:00	22:01 – 06:00	06:00-15:45	13:50 – 22:00	22:01 – 06:00	06:01-13:50
Max Value Recorded	69.8	69.3	77.9	70.9	58.7	77.9	67.6	70.8	70.2
<b>Guideline Max</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	51.64	50.30	50.88	49.37	45.43	48.68	49.57	48.85	49.35
<b>Guideline Averaged</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>

Site	Main Dam - Noise Monitoring 24 hour consecutively - First Quarter 2016							
Month	Jan-16		Feb-16			Mar-16		
Noise Level (dB)			22-23/02/2016	23/02/2016	21-22/03/2016	22/03/2016		
			15:08 – 22:00	22:01 – 06:00	06:01-15:08	10:35 – 22:00	22:01 – 06:00	06:01-10:35
Max Value Recorded	No monitoring carried out		64.6	67.1	70.2	63.3	68.7	65.7
<b>Guideline Max</b>			<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	No monitoring carried out		47.95	52.82	49.85	45.50	52.02	51.08
<b>Guideline Averaged</b>			<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>

Site	Owner's Site Office and Village - Noise Monitoring 24 hour consecutively - First Quarter 2016							
Month	Jan-16		Feb-16		Mar-16			
Noise Level (dB)			24-25/02/2016	25/02/2016	01-02/03/2016	02/03/2016		
			15:05 – 22:00	22:01 – 06:00	06:01-15:08	10:09 – 22:00	22:01 – 06:00	06:01-10:09
Max Value Recorded	No monitoring carried out		62.1	47.6	51.7	67.7	46	74.9
<b>Guideline Max</b>			<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>	<b>115</b>
Average Data Recorded	No monitoring carried out		44.27	43.08	38.73	39.04	41.85	41.77
<b>Guideline Averaged</b>			<b>70</b>	<b>50</b>	<b>70</b>	<b>70</b>	<b>50</b>	<b>70</b>

#### 4.5.7 Vibration

Lao PDR does not have a recommended guideline for vibration. Structural damage from road construction activity (e.g. vibratory rollers) and ancillary activity (e.g. blasting at the quarries) is unlikely given the distance from public infrastructure to the construction areas.

## 5. WATERSHED AND BIODIVERSITY MANAGEMENT

### 5.1 Watershed Management

Obligations	Status by end of the First Quarter of 2016
Prepare a draft Watershed Management Plan by 31 July 2016	30% completed. The outline and objectives of the WMP were discussed during the planning workshop with WMC-WMO in the third week of March 2016. Progress was made on data and information collection and analysis, particularly for baseline profiling including GIS layers and maps, and displays of socio economic and environmental data.
Prepare draft Watershed Management Regulations by 31 July 2016	Not relevant for this quarter
Final Watershed Management Plan by 31 October 2016	Not relevant for this quarter

Obligations	Status by end of the First Quarter of 2016
Final Watershed Management Regulations by 31 January 2017	Not relevant for this quarter

Activities in the First Quarter of 2016	Results
<b>Coordination workshop with NNP1 WMC-WMO in January 2016</b>	<ul style="list-style-type: none"> <li>• NNP1 way forward for watershed management program with the focus on preparation of WMP and the new milestones related to WMP were discussed and agreed with NNP1 WMC-WMO.</li> <li>• The workshop also agreed on the improved Terms of Reference for the NNP1 WMC-WMO and the reporting procedures for the implementation of priority activities</li> <li>• NNP1 WMC informed that Lao PDR Ministry of Finance (MOF) has received the first disbursement of Watershed Management Fund (WMF) that will be further processed according to GoL fund flow mechanism.</li> </ul>
<b>Xaysomboun Integrated Spatial Planning (ISP)</b>	<ul style="list-style-type: none"> <li>• The ISP planning for 5 districts in Xaysomboun was completed in March 2016 with the following key outcomes:                             <ul style="list-style-type: none"> <li>- Compilation of existing environmental and social information at District level and the spatial identification of the potential and future District and Provincial Development Plans;</li> <li>- Rapid environmental and social assessment;</li> <li>- Working draft of a District ISP reports. The working draft will be further developed by MONRE DEQP and Xaysomboun ISP Technical Committee</li> </ul> </li> </ul>
<b>Planning workshop lead by NNP1 WMC-WMO in the third week of March 2016</b>	<ul style="list-style-type: none"> <li>• The draft WMP outline was discussed and agreed.</li> <li>• The objectives of the WMP shall be in line with National Socio-economic Development Plan , Project CA, MONRE Vision and Strategy, Provincial Socio-economic Development Plans of Xaysomboun and Bolikhamxay Provinces and the Xaysomboun ISP</li> <li>• WMO and NNP1PC shall initiate the formulation of the five year and first year annual plan together with GoL consultant and NNP1PC Watershed Team Leader which are expected to be appointed by May 2016</li> </ul>
<b>Data and information collection and analysis</b>	<ul style="list-style-type: none"> <li>• Progressing with baseline profiling based on the existing information including GIS layers and maps, and displays of socioeconomic and environmental data.</li> </ul>
<b>Consultant procurement</b> <ul style="list-style-type: none"> <li>○ GOL Consultant</li> <li>○ NNP1 Watershed Consultant Team Leader</li> </ul>	<ul style="list-style-type: none"> <li>• MONRE DFRM could not find any suitable candidates for GOL consultant through single source procurement so the open advertisement was made in late March 2016.</li> <li>• NNP1PC is in progress to procure a short term consultant to assist on the preparation of the WMP in collaboration with GoL and NNP1 team.</li> </ul>
<b>Implementation of Priority Activity -</b>	<ul style="list-style-type: none"> <li>• Xaysomboun and Bolikhamxay WMO conducted technical training on the step by step process, GIS tool and application in mapping and</li> </ul>

Activities in the First Quarter of 2016	Results
<b>Watershed boundary survey</b>	developing the database for related officers such as from PONRE, DONRE, PAFO, Army, Police, and village cluster. <ul style="list-style-type: none"> <li>• Xaysomboun WMO completed the activities in 7 villages at Hom District, 4 villages at Anouvong District, and 12 Villages at Thathom District</li> <li>• Bolikhamxay WMO completed the activities in 5 villages at Bolikhan District</li> <li>• GPS marking and agreement with concerned villages (close to the boundary) were documented to avoid any practices related to forest encroachment or further land conversion</li> </ul>
<b>Implementation of Priority Activity - Land use planning activity</b>	<ul style="list-style-type: none"> <li>• Xaysomboun and Bolikhamxay WMO conducted technical training on step by step process of community mapping for related officers from PONRE, DONRE, PAFO, Army, Police, and village clusters.</li> <li>• Xaysomboun WMO completed the activity in 2 villages at Hom District and 2 Villages at Thathom District.</li> <li>• Bolikhamxay WMO completed the activity in 5 villages at Bolikhan District</li> <li>• Land zoning map highlighting agriculture, residential, forest, cultural, military, transport/route, and water resource are were produced through community mapping</li> <li>• The concerns on current land use and proposed area for future management were discussed and agreed with the villages</li> </ul>
<b>Implementation of Priority Activity - WMO Office Construction in Xaysomboun and Borikhamxay</b>	<ul style="list-style-type: none"> <li>• The construction progress in Xaysomboun is 70% complete</li> <li>• The construction progress in Bolikhamxay is 80% complete and the reparation is 50% complete</li> </ul>

Plan for the next quarter	
<b>Xaysomboun Integrated Spatial Planning (ISP)</b>	<ul style="list-style-type: none"> <li>• Complete the ISP report by the Second Quarter of 2016</li> <li>• Elaborate the ISP outcomes into NNP1 WMP</li> </ul>
<b>Consultant procurement</b>	<ul style="list-style-type: none"> <li>• Both Consultant (GoL Consultant and NNP1 Watershed Consultant Team Leader) on board and execute the work in 2<sup>nd</sup> quarter 2016 as scheduled.</li> </ul>
<b>WMP preparation</b>	<ul style="list-style-type: none"> <li>• Complete the data and information collection and analysis</li> <li>• Commence technical and stakeholder workshop to discuss and agree on management planning issues, measures and regulations to deal with the issues, and division of responsibilities to be elaborated into WMP</li> <li>• Initiate progress in working draft</li> </ul>
<b>Implementation of priority activity</b>	<ul style="list-style-type: none"> <li>• Continue with the implementation of activities</li> <li>• Maintain regular reporting and improve its quality</li> </ul>

## 5.2 Biodiversity Management

<b>Final Biodiversity Offset Survey Report by 30 June 2016</b>	50% completed The field work for the ground truth survey at Nam Mouane Watershed area was commenced on 24 February 2016 and has been ongoing throughout March 2016. The inception report was submitted to NNP1PC in the third week of March 2016
<b>Draft Offset Options Paper for the Biodiversity Offset Sites by 31 July 2016</b>	Not relevant for this Quarter
<b>Consensus building and workshops among stakeholders for the offset site selection by 15 September 2016</b>	Not relevant for this Quarter
<b>Final Offset Options Paper for the Biodiversity Offset Sites by 31 October 2016</b>	Not relevant for this Quarter

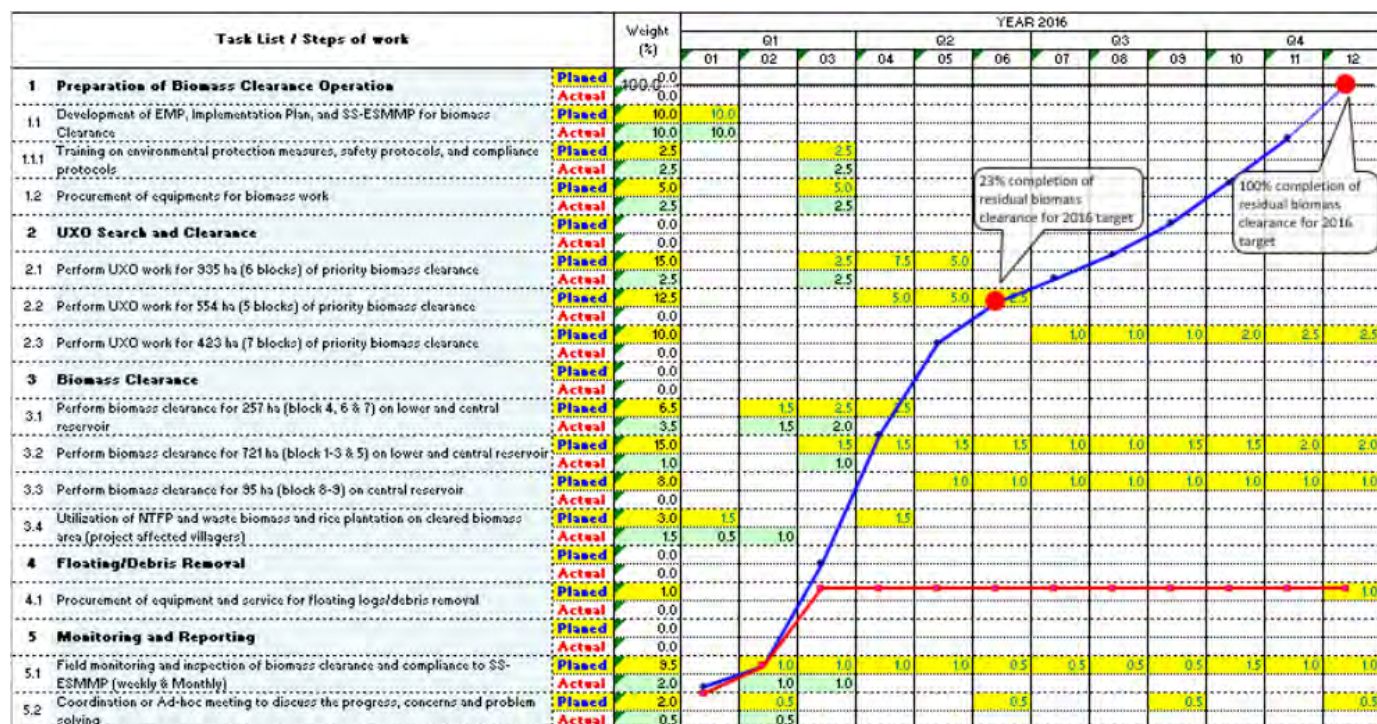
<b>Activities in first quarter 2016</b>	<b>Results</b>
<b>Coordination workshop with DFRM, Xaysomboun and Bolikhamxay PONRE in January 2016</b>	<ul style="list-style-type: none"> <li>• NNP1 way forward for biodiversity offset programme discussed and agreed with NNP1 WMC-WMO:                             <ul style="list-style-type: none"> <li>- To focus the survey in Nam Mouane Watershed Area, Bolikhamxay Province.</li> <li>- The survey or assessment in other province such as Khun Xe Nong Ma at Khammouan Province is subject for further discussion and agreement with relevant GoL authorities in the event that Nam Mouane Watershed is not suitable as an offset site.</li> </ul> </li> <li>• The workshop also noted on                             <ul style="list-style-type: none"> <li>- The coordination work for the rapid ground truth survey</li> <li>- The request of Xaysomboun Province to conclude the survey/assessment in Phou Hae and Phou Sod prior to deciding the offset site.</li> </ul> </li> </ul>
<b>Rapid ground truth survey in Nam Mouane Watershed, Bolikhamxay Province</b>	<ul style="list-style-type: none"> <li>• Obtained permission to access. It was requested for national expert involvement only due to some area particularly closer to the Lao-Vietnam border which is a national restricted location and so certain nationalities would not be allowed to access.</li> <li>• Rapid ground truth survey was started from 23 February 2016 and carried throughout March 2016 having village interview, reconnaissance walk and camera-trap recording totalling 96 cameras at the No. 2 priority sampling block.</li> <li>• The inception report indicates that the area remains rich in natural habitats and some wildlife species of high IUCN Red List Category.</li> </ul>

Plan for the next quarter	
<b>Biodiversity Advisory Committee (BAC) 3<sup>rd</sup> mission site visitation to Nam Mouane Watershed Area</b>	<ul style="list-style-type: none"> <li>Conduct site visitation to Nam Mouane Watershed Area and provide an independent initial assessment of the site's potentiality as a suitable biodiversity offset site for the NNP1 project.</li> </ul>
<b>Rapid ground truth survey in Nam Mouane Watershed, Bolikhamxay Province</b>	<ul style="list-style-type: none"> <li>Camera trap data retrievals and elaborate it into survey report</li> <li>Conclude the assessment of the suitability of the Nam Mouane Watershed Area</li> <li>Submit the final report (overall survey) on the assessment of proposed biodiversity offset area in Xaysomboun and Bolikhamxay Province</li> </ul>

### 5.3 Biomass Clearance

The overall progress of Biomass Clearance Programme is demonstrated in Figure 5-1 below.

Figure 5-1 : Gantt Chart of Biomass Clearance Programme in 2016



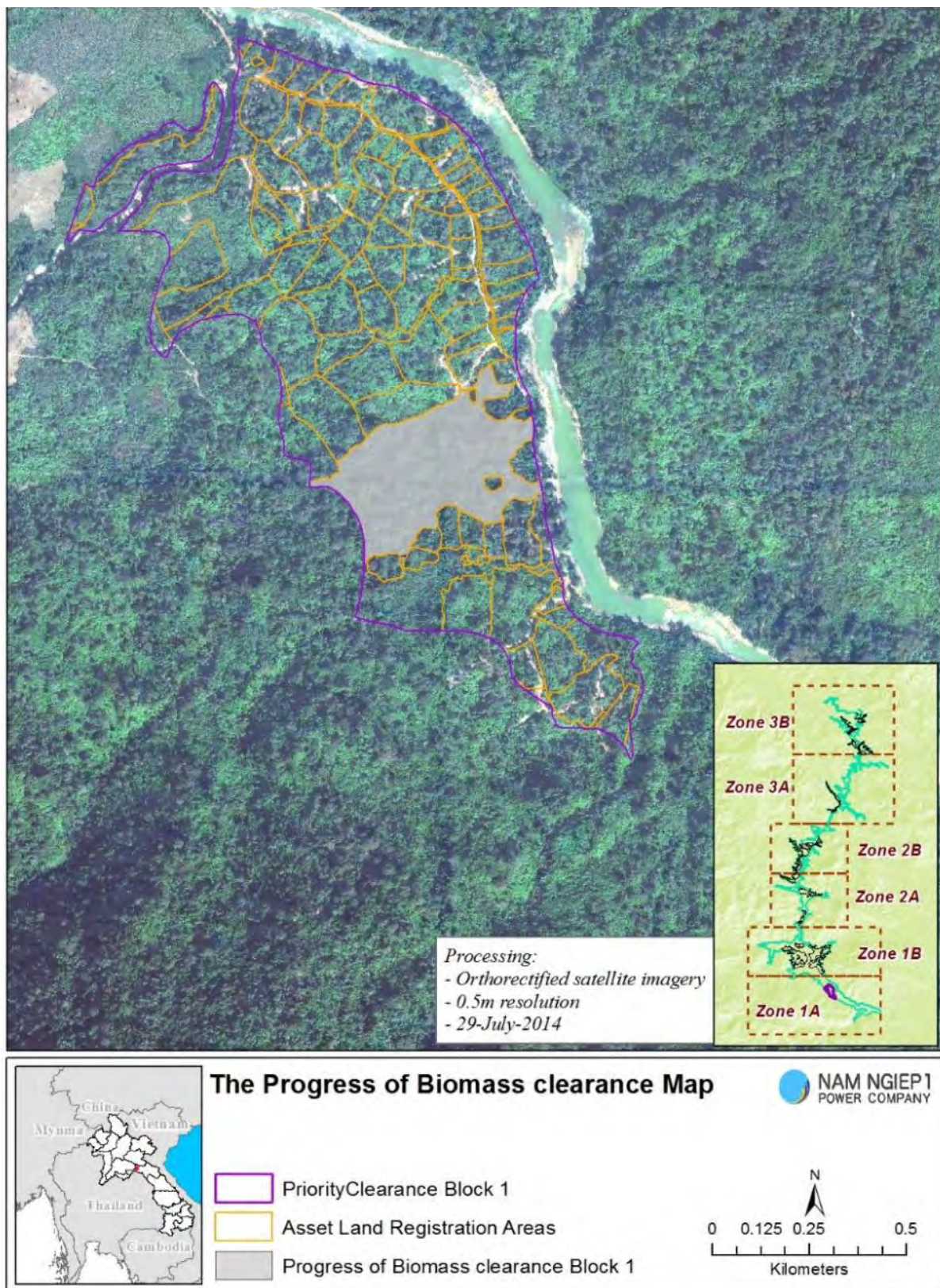
The blue graph and yellow highlight represent the planned activity, the red graph and green highlight represent the actual progress.

Activities in first quarter 2016	Results
<b>Development of EMP and SS-ESMMP for biomass clearance</b>	Contractor's Biomass Clearance Implementation Plan and SS-ESMMP were finalized in February 2016 after several review/revision including addressing the comments from ADB-IAP-LTA mission in December 2015

Activities in first quarter 2016	Results
<b>Labour recruitment</b>	Biomass Clearance Contractor-LAUNC has completed local labour recruitment in early March 2016 having labour agreement signed with 75 households totalling more than 100 people mostly from Ban Sop Youak in Hom District of Xaysomboun Province.
<b>Induction/orientation on NNP1 Safety Procedure and compliance protocol</b>	<p>NNP1-EMO and NNP1-TD organized an induction/orientation on NNP1 Safety Procedures, Biomass Clearance Safety and NCR/ONC Protocols.</p> <p>The participants in the event included two representatives from NNP1 EMU and WMO XSB, and 28 key staff and workers (including 21 villagers) of the Contractor.</p>
<b>Ground survey and demarcation of priority biomass clearance area</b>	Contractor has completed the ground surveys and demarcations in several target biomass clearance areas including Blocks 1, 4, 5, 6 and 7.
<b>Vegetation cutting and UXO search and clearance</b>	<p>In order to avoid complications with the compensation process, vegetation cutting was carried out and prioritized for Blocks 1, 4 and 5 totalling the area of around 633.78 ha. To date, vegetation cutting has been completed of in around 170 ha. The progress maps can be seen below.</p> <p>In parallel with vegetation clearance, the UXO search and clearance has been carried out in Blocks 1 and 4. The first 100 ha is in process of QA/QC for issuance of certification.</p>
<b>Opportunity in the cleared biomass area</b>	<p>To-date, 75 households of Ban Sop Youak have stated their interest in doing crop cultivation in the areas cleared of biomass. It is expected that more households will state the same in coming weeks.</p> <p>Further agreements on doing crop cultivation in the cleared biomass areas was reached with the Village Chief and will be communicated to the interested households.</p>

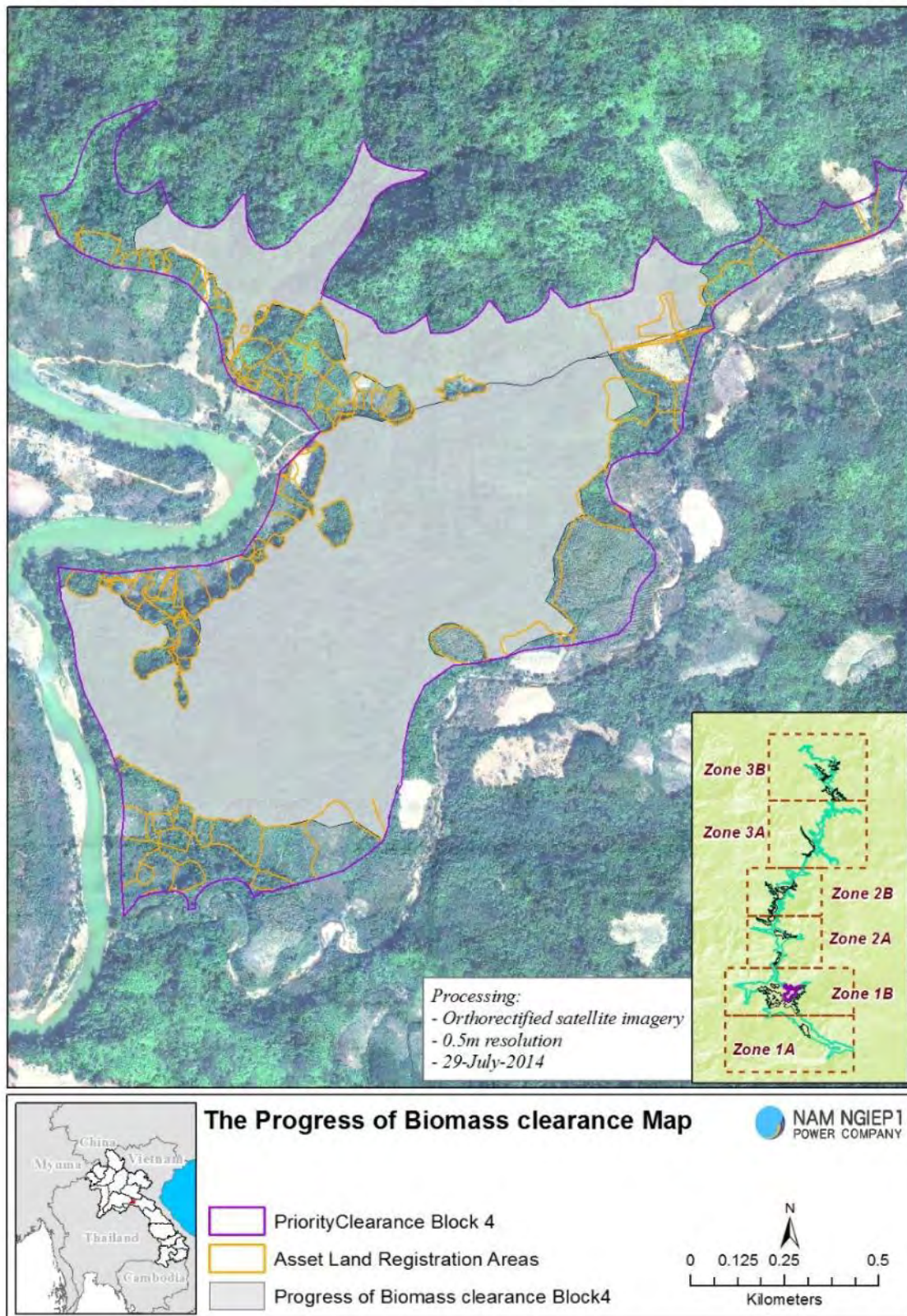
Plan for the next quarter	
<b>Ground survey and demarcation of priority biomass clearance area</b>	<ul style="list-style-type: none"> <li>• Complete the survey and demarcation in the remaining target areas (Blocks 2, 8 and 9) in April 2016.</li> </ul>
<b>Vegetation cutting and UXO search and clearance</b>	<ul style="list-style-type: none"> <li>• Continue to progress with vegetation cutting and UXO search and clearance</li> </ul>
<b>Opportunity in the cleared biomass area</b>	<ul style="list-style-type: none"> <li>• Obtain the agreement for doing crop cultivation by the interested household in April 2016.</li> <li>• Monitor the activities in the cleared biomass area</li> </ul>

Figure 5-2: Map showing the progress of biomass clearance in priority block 1



By the end of the First Quarter of 2016, the cleared area in this Block 1 is around 30 ha out of the target clearing of 115 ha.

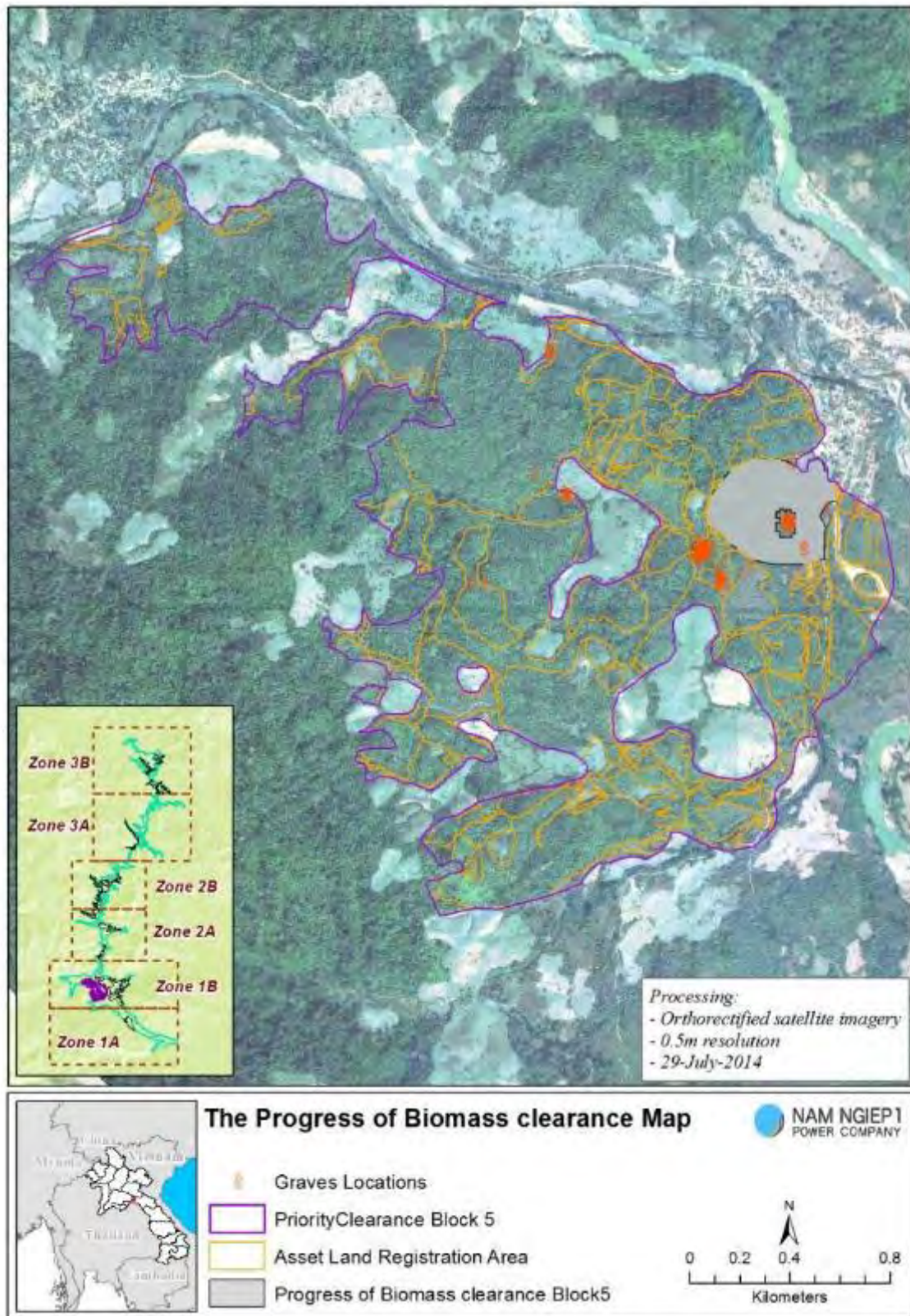
Figure 5-3: Map showing the progress of biomass clearance in priority Block 4



By the end of the First Quarter of 2016, the cleared area in this Block 4 is around 120 ha out of target clearing of 168 ha.



Figure 5-4: Map showing the progress of biomass clearance in priority Block 5



By the end of the First Quarter of 2016, the cleared area in this Block 5 is around 20 ha out of target clearing of 351 ha.

## 6. OTHER SUPPORT PROGRAMMES

### 6.1 Nabong Substation Upgrade - Due Diligence Assessment (DDA)

The EMO has achieved good progress on the Nabong Substation DDA for which a DDA Report is being finalized and will be submitted to the ADB by the end of April 2016.

### 6.2 115 kV Transmission Line IEE Due Diligence Assessment

The meeting between EDL and NNP1PC was held in February 2016 which confirmed that the Dongfang Company will complete the IEE in third week of March 2016 and will provide NNP1PC with a copy in early April 2016. The DDA will be commenced once NNP1PC has received the IEE.

### 6.3 Missions of the Environmental Management Units (EMU)

The EMU conducted two missions during the first quarter of 2016, the first in January and the second in February. The missions followed-up on issues and recommendations provided during the previous missions. The main concern raised by the missions during this quarter were the waste water treatment systems at the workers' camps, turbid water at the main dam construction site, the solid waste disposal site construction, drainage at the workshop at Houay Soup bridge construction site, and the sediment pond at the Song Da 2 workers' Camp No. 1. NNP1PC acknowledged the issues and commented that they will be addressed accordingly.

Photograph 21:  
Sites inspections and visit to the downstream village (Ban Xom Xeun) by the EMU Bolikhamxay Province during 12-14 January 2016



Photograph 22:  
Site inspections carried out by the EMU Bolikhamxay Province during 17-19 February 2016



#### 6.4 Independent Monitoring Agency (IMA) ToR and Procurement

The Independent Monitoring Agency (IMA) has been established in March 2016 by DESIA/MONRE, and NNP1PC is processing the first request for payment.

#### 6.5 Environmental Protection Fund (EPF)

NNP1PC/EMO received for review the first sub-project proposal for EPF/NNP1 financing. It is to support the management of Houay Ngoua Provincial Protected Area. Another two proposals are expected from the Xaysomboun and Xieng Khuang Provinces.

### 7 OCCUPATIONAL HEALTH AND SAFETY

#### 7.1 Safety Organisation

Since issuance of the Notice to Proceed in October 2014 to the Civil Contractor, safety was monitored and managed initially by one safety officer employed by NNP1, another by the Contractor and one for each subcontractor. They report to senior management within their organisations and in the case of the Contractor and Subcontractors to their respective Project Managers. The Contractor has further strengthened its safety team in the period by the appointment of a third experienced safety specialist, another Philippine national, who has previous experience on other Obayashi international projects. The philosophy of the Project is that every site engineer and site manager is a safety officer.

During the second quarter, the Owner lost its Safety Officer in an unfortunate and tragic fatal traffic accident off-site, after work, on the way home. A replacement Safety Officer was recruited and two experienced construction engineers co-opted to strengthen the Owner’s safety team. The Owner’s Manager (ex-EGATi) responsible for Safety was changed in the second quarter and a new experienced Deputy Manager, a Philippine national arrived in early October 2015. The Owner’s Safety team will then total 5 persons, excluding input from experienced senior management.

The Civil Works Contractor has 4 safety specialists in a health, safety and environmental team comprising of seven persons. The combined total of 9 persons from Owner and Contractor who are directly concerned with safety are from 4 different nationalities and 6 have previous international experience of construction of large hydropower projects. The Owner has appointed an experienced Vietnamese Deputy Manager for Safety and he is expected to arrive on Site in Q2 of 2016.

#### 7.2 Safety Training

All the training that the Safety Officers of the Owner and Contractor carried out in the period January to March 2016 is provided in the Contractor’s Monthly Progress Reports and is summarised in **Error!**

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*Table 7-1: Safety Training for the Reporting Period from January to March 2016*

Month & Year	Total Number of Training Courses held in each month	Total Number of Workers Receiving Training in Each Month According to Their Needs	Subject Matter of Training Courses Variously Attended According to the Needs of Workers
January, 2016	27	1,687	Scaffolding tagging system, induction and monthly safety meeting (3 topics).
February, 2016	30	1,233	Induction and safety training for improvement (2 topics).
March, 2016	50	3,033	Induction, concrete pump safely, driving safely on the road and guidelines of installation and removing the formwork (4 topics).

*Table 7-2: Environmental Training for the Reporting Period from January to March 2016*

Month & Year	Total Number of Training Courses held in each month	Total Number of Workers Receiving Training in Each Month According to Their Needs	Subject Matter of Training Courses Variously Attended According to the Needs of Workers
January, 2016	10	1,587	Water spray into road and emergency plan
February, 2016	10	975	Waste Management
March, 2016	10	1,465	Water quality management

### 7.3 Safety Classification and Statistics

Incidents are classified into six categories in accordance with international convention. The number of incidents by category are presented in *Table 7-2*.

*Table 7-2: Safety Incidents by Category*

ID	Incident Category	No. of Incidents from 01-Feb-14 to 31-Mar-16	No. of Incidents from 01-Jan-16 to 31 Mar-16
LTI	Lost Time Incident	9	0
RI	Recoverable Injury	5	1
NM	Near Miss (Reported)	11	1

ID	Incident Category	No. of Incidents from 01-Feb-14 to 31-Mar-16	No. of Incidents from 01-Jan-16 to 31 Mar-16
PD	Property Damage	3	1
FI	Fire Incident	3	0
MVI	Motor Vehicle Incident	30	3
	<b>Total</b>	<b>61</b>	<b>6</b>

The Table indicates both the total number of incidents since February 2014, and the number of incidents in the First Quarter of 2016.

The Project continues to focus on identifying risk by regular inspection, training and warning to avoid risk and in this has good cooperation between the Owner, the Civil Contractor and its Subcontractors.

#### **7.4 Reporting to the Lenders, LTA and Others on Safety Incidents and Accidents**

The total 61 incidents recorded to 31 March 2015 as above. No serious injuries were sustained in the period. The NNP1PC includes data and statistics on safety incidents in their Monthly Progress Report to its shareholders, Lenders and their Technical Advisors.

## APPENDICES: ENVIRONMENTAL MONITORING RESULTS

### APPENDIX 1: STATUS OF SS-ESMMPs APPROVAL DURING JANUARY TO MARCH, 2016

No	Site name	List of ESMMP and SS-ESMMP	Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status
<b>Electrical and Mechanical works (Hitachi-Mitsubishi Hydro)</b>						
1	Main dam and re-regulating dam	SS-ESMMP for HM's Sub-Contractor Labor Camp #2	Lilama 10 joint stock Company (LILAMA)	Approved with comments on 18 February 2016	Installing the camp for workers	Start installing the camp platform
		SS-ESMMP for Embedded Piping 1st stage	Zhejiang Fuchunjiang Hydropower Equipment Co., Ltd (ZHEFU)	Approved with comments on 09 February 2016	Installing the embedded piping 1 <sup>st</sup> stage at main powerhouse	Start installing the embedded piping 1 <sup>st</sup> stage at main powerhouse
<b>Civil Works Contractor (Obayashi Corporation)</b>						
2	Main dam	SS-ESMMP for Casting Replacement Concrete of MD	Song Da 5	Approved with comments on 26 February 2016	Carrying out casting replace concrete of main dam	On-going casting replace concrete of main dam
		SS-ESMMP for Construction of Main dam body	Song Da 5	Approved with comments on 31 March 2016	Constructing of main dam body	On-going
<b>Houay Soup Resettlement Area (ESD Contractors)</b>						
3	SECC temporary solid waste pit	SS-ESMMP for Disposal area (temporary solid waste pit)	State Enterprise of Communication and Construction (SECC)	Approved with comments on 09 March 2016	Disposing of solid waste at temporary pit. Food waste is also disposed in case no	On-going

					collection by villagers	
4	Construction of house buildings Lot1	SS-ESMMP for construction of house and pre-school buildings Lot1 on HSRA	Nalux	Approved with comments on 31 March 2016	To install the camp for workers	On-going
5	Construction of house buildings, pre-school, and accommodation buildings Lot3	SS-ESMMP for construction of house, pre-school, and accommodation buildings Lot3 on HSRA	Viengouxap	Approved with comments on 21 March 2016	Returned for the 1 <sup>st</sup> draft and approved with comments for the 2 <sup>nd</sup> version	On-going
6	Main road construction on HSRA	SS-ESMMP for construction of main road on HSRA (First time)	VRC	Approved with comments on 27 April 2016		On-going
7	Biomass clearing of the reservoir	SS-ESMMP for Biomass clearing	Lao UNEOD Cooper	Approved with no comment on 6 April 2016		On-going

**APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS FROM JANUARY TO MARCH 2016**

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
01	17-Feb-15	RT Camp	<p>The temporary current sediment pond / retaining ponds which incorporated the camp site’s grey water and storm run-off, currently accumulates and increase the wastewater quantity in the pond has been leaking to the environment / natural water.</p> <p>The result of the water discharge testing in December 2014 and January 2015 indicated continuously contaminated with high bacteria and has trended of bacteria increasing. 01/12/2014, detected 9200 MPN/100ml, total Coliform. And 01/01/2015, detected &gt;160,000 MPN/100ml, total Coliform and 160,000 MPN/100ml faecal-coliform.</p>	<p>EMO requested contractor to propose and submit the detail wastewater treatment plan including a sufficient operational information before any action being implemented.</p> <p>The contractor should consider to:</p> <ul style="list-style-type: none"> <li>(i) Review through the waste water treatment / seepage system including operational and maintenance activities what is the missing, wrong and /or necessary to be added / improved.</li> <li>(ii) Calculate the flow rate and evaluate pollutant load which it shall support to have an appropriate wastewater treatment system re-design.</li> <li>(iii) Design an appropriate treatment system for long term operation and effective in order to compliance with the environmental standard of effluent discharge.</li> </ul>	03-Mar-15	05-Apr-16	Open



List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
02	02-Jun-15	Song Da 5 Camp No.2	The wastewater treatment system does not follow the proposed design.	i. Contractors needs to follow the proposed plan, submitted on 31 Mar 2015; ii. Contractor should fix the drainage system with the sediment pond. It needs to separate the drain of surface water run-off and wastewater from bathroom and kitchen.	16-Jun-15	05-Apr-16	Open
03	02-Jun-15	V&K Camp	Refer the previous site inspection report ref; NNP1-ESD-EMO-SIR-OC-0005 on SI-0036 dated 03 Mar 2015, the issue has been repeated. No improvement on the design of wastewater treatment system. The camp has insufficient facilities for the long-term operation. There is an evidence of grey water has been released from the septic tank to the open ditch. This is observed to be non-compliance to the project’s environmental guideline.	i. Contractor needs to improve the submitted plan on 31 Mar 2015 which EMO has been commended and advised. ii. Contractor shall install the wastewater treatment system following the improved system under the EMO’s recommendation.	16-Jun-15	05-Apr-16	Open

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
04	10-Dec-15	230 kV TL	There are insufficient numbers of proper waste bins on site. The garbage is being scattered at the site, and their so regulation to separate solid waste materials.	i. The Contractor will be regular cleaned up the general waste along camp area; ii. The Contractor will be provided the sufficient waste bins on site.	24-Dec-15	14-Jan-16	Resolved
05	10-Dec-15	230 kV TL	Evidence of hydrocarbon spills on the ground from mobile maintenance activities without cleans up properly.	i. Clean up the spilt hydrocarbon completely, store in designated hazardous storage area properly, and provide dip tray/steel tray on-site while they had to fix the heavy equipment.	24-Dec-15	14-Jan-16	Resolved
06	15-Dec-15	RCC plant yard	Sediment has accumulated and filled ponds near the aggregate washing area. Sediment transported by future rain events will be carried to local streams and rivers, impacting on water quality.	i. Please remove / clean up the sediment from sediment pond to keep the actual capacity and its effectiveness; ii. The contractor needs to monitor and ensure their contractor clean up sediment and maintenance daily basis.	29-Dec-15	23-Feb-16	Resolved
07	24-Dec-15	230 kV TL	Improper waste management. Waste is not centralized in one managed location. There was not an adequate number of waste bins, and waste was not segregate.	i. The Contractor shall be provided the recycling centre with label at the stockyard and RCR camp; ii. The Contractor shall be segregated recyclable waste materials (bottles, cans, paper, cardboard etc.) and dispose them at recycling centre, as per NNP1 requirements.	12-Jan-16	14-Jan-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
08	29-Dec-15	RT Camp	A part of grey water pipe line (inflow) was lower than the new grey water treatment system, and the grey water cannot flow into the new treatment system, resulted in grey water leaked and stagnant in the open ditch.	The contractor needs to re-install the grey water pipe line to allow grey water flow into the new grey water treatment system and ensure any leakage is stopped.	12-Jan-16	09-Feb-16	Resolved
09	29-Dec-15	RT Camp	There is lack of spill response and spills clean up. (i) An evidence of black oil and hydrocarbon spilt surrounding the workshop without clean up. (ii) Contaminated soil was cleaned up from inside bund area and throw / scattered on the ground surrounding the workshop without a proper collection and storage. (iii) A number of used oil drum are stored on the ground without spillage protection facilities, resulting in black oil spilt onto the ground from handling activities. Without a proper mitigation measures, EMO concerned that (i) the area surrounding of workshop will created a mass ground contaminated, (ii), the oil / hydrocarbon spilt will be washed off-site when rainy (iii) show-off a poor hazardous waste management and spills response in the project to guest / visitor, especially GoL- EMU.	The contractor should be monitored and taken an appropriate action in order to ensure that spillages shall be cleaned up and stored properly. i. Clean up / collect the contaminated soil and store in designated hazardous storage area for proper disposal / elimination. ii. Move the used oil drum into bund area.  Hazardous material management awareness training and disposal orientation training or enforcement needs to be provided to the sub-contractor.	12-Jan-16	12-Jan-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
10	29-Dec-15	RT industrial area	1). The site was decommissioned and landscaped with remaining the septic tank (s) left without a proper management / decommissioning. 2). No proper site decommissioning and / or site closure plan has prepared and submitted to NNP1 for review, approval and reference.	The contractor needs to take an additional work such as: i. Apply lime into the septic tank to ensure the sewage was treated and backfill properly. ii. Prepare a site closure / site environmental restoration plan and submitted to EMO for review, approval and reference.	12-Jan-16	12-Jan-16	Resolved
11	04-Jan-16	SECC camp	A PVC pipe is connected from underground septic tanks to a wastewater retaining pond. This indicates that black water will be discharge when the septic tanks are full, causing untreated effluent to be discharged directly to the environment	Please close/ block the connected PVC pipe. Septic waste is to be treated and disposed according to Owners specification.  The Contractor is to provide detail on the WWTS internal system treatment processes, and then also seek advice from the Owner regarding disposal methods and treatment process when the systems approaches 60%-80% full. Disposal of effluent from full waste water treatment systems is not permitted without Owner approval.	19-Jan-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
12	04-Jan-16	SECC camp	<p>Inadequate environmental mitigation measures provided for the washing &amp; bathing area.</p> <p>1. Insufficient concreted area provided at the wash and bathing area. This has resulted in wash-water spreading out to the local environment. This has the potential to cause disease vectors, unpleasant odours and local waterlogged soils.</p> <p>2. Inappropriate drainage (ditches) from the wash-down area generally, and its connection to the sediment pond. This has resulted in stagnant water accumulating in the ditches causing waterlogged soils to form and potential vector for disease and bad odour.</p> <p>3. The worker bathing area is being operated without a privacy screen.</p>	<p>1. The bathing area concrete pad needs to be increased and bunding installed.</p> <p>2. Provide proper ditches around the washing / bathing area to drain / allow the grey water flow freely into the wastewater retaining pond provided.</p> <p>3. Provide appropriate partition around the worker’s washing/ bathing area to hide from public view and facilitate privacy.</p>	19-Jan-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
13	04-Jan-16	SECC camp	Unprocessed grey water from kitchen area is drained directly to an open ditch intended only for surface water. NNP1 is concerned that mixing of kitchen waste with surface water that the idea incorporating both grey water and storm water into the storm water sediment pond will facilitate rapid filling and overflow, causing localized waterlogged and contaminated areas.	The site drainages system between domestic wastewater and storm run-off are necessary shall be separated accordingly.	30-Jan-16	02-Feb-16	Resolved
14	04-Jan-16	SECC workshop & industrial area	The workshop was started operating without the benefit of spillage protection facilities. This has a potential risk of creating contaminated ground by the heavy machine maintenance activities.	<ol style="list-style-type: none"> <li>1. The contractor shall construct a concrete floor and bunding at the workshop. In addition the workshop requires an oil waste separator system.</li> <li>2. The immediate area surrounding the workshop requires appropriate drainage to avoid or minimize surface water from entering the site.</li> <li>3. Ensure that the site has oil spill clean-up kit</li> </ol>	19-Jan-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
15	04-Jan-16	SECC workshop & industrial area	There is no an appropriate hazardous material storage facility provided. A number of fuel drums and oily equipment are stored directly on the ground without spill protection measures. NNP1 is concerned that without appropriate mitigation measures, the current practice can create contaminated soil at the site.	1. A proper / designated hazardous material storage facility with bund, roof cover and side protection is required; 2. The contractor shall relocate fuel drums and oily equipment into designated hazardous material storage area.	19-Jan-16	02-Feb-16	Resolved
16	04-Jan-16	PC Bridge	1. During the time of inspection it was observed that sediment pond volume at the site compared to the volume of effluent discharged was inadequate. The pond system was insufficient to allow of the adequate effluent retention time. Untreated effluent was being discharged directly into the the Nam Ngiep. The pond settling system is for the most part ineffective. 2. The water from the site emptying into the pond system is creating turbulence which impacts on the settling process.	The contractor shall be responded as below: 1. The sedimentation pond volume needs to be substantially increased according to the volume of water pumped from the construction site. 2. The crest of the final pond outlet needs to be increased to increase retention time and facilitate sediment settling. 3. Provide an alternative method to drop effluent water into the pond system to prevent / minimize pond turbulence.	19-Jan-16	19-Jan-16	Resolved
17	12-Jan-16	Aggregate plant yard	Cement laden effluent wash-water (slurry) from Aggregate Plant is being released to the environment and river without processing.	1. Immediately suspend any further slurry effluent from leaving the site without separation of the residual cement from the natural sediments.	15-Jan-16	22-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
			<p>Effluent water from the aggregate plant is being directed offsite to a sediment pond below Spoil Disposal Area #7. The effluent is then percolating through the rock-soil profile of the pond and entering into the Nam Ngiep river below the Construction Bridge (Refer to photos.)</p> <p>Slurry cement waste is highly alkaline. It reduces water quality and is toxic to fish and other aquatic organisms (fauna and flora). Slurry sediment coats the poor spaces of the stream/river bed and destroys habitat.</p>	<p>Establishment of a treatment facility is requested. This can be in the form of separator bays or bermed area at the Aggregate Plant to separate the material.</p> <p>2. All wash down and work areas that produce cement slurry are to be directed towards the treatment facility.</p> <p>3. Do not dilute the runoff that is within the drainage system and or pond as this will exacerbate the pollution contamination. The cement slurry is to be removed and disposed of at an approved Spoil Disposal Area.</p> <p>4. The condition of the sediment pond wall below near Spoil Area #7 is required to increase its sediment trapping capacity.</p> <ul style="list-style-type: none"> <li>• Note: failure to correct as requested will result in an elevated NCR (2 or 3) being issued.</li> </ul>			



List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
18	12-Jan-16	Sino Hydro Camp	Evidence of cooking oil was direct thrown into the grease trap of wastewater treatment system. As a result of oil accumulating in the grease traps. Practiced that this has high potential risk of cause to treatment system operational failed and drainage pipe being blocked that caused the water will overflow in shortly period.	<ol style="list-style-type: none"> <li>1. Completely collected the oil in the grease traps and store properly in drum(s)/container to reduce food waste in the recently oil trap near the canteen;</li> <li>2. Install/connect the PVC 90° elbow to blocked food waste and to be filter only water.</li> <li>3. The oil traps needs to be cleaned up regularly at least twice /week, to minimized food waste, oil and foam decomposed in the waste water, which lead to bad water quality and/or un-pleasance odour.</li> </ol>	26-Jan-16	26-Feb-16	Resolved
19	14-Jan-16	TL 230 kV	There was improper concrete waste management on site at the tower No. 182. It potential discharge into water course and also indirectly impact to the river quality and aquatic animals.	<p>Reference to SSES MMP for foundation erection and stringing work. SP05 Waste management.</p> <ol style="list-style-type: none"> <li>1. The contractor shall clean up the concrete waste after finish work and disposed on designated area.</li> </ol>	28-Jan-16	28-Jan-16	Resolved
20	14-Jan-16	TL 230 kV	That is no temporary toilet facilities had been provided for temporary worker camp on field site at the Tower No.236-239. There is lack of proper hygienic and sanitation facilities for the cooking and toilet area.	<p>Reference to SSES MMP for foundation erection and stringing work. SP02 Water Availability and Pollution Control.</p> <ol style="list-style-type: none"> <li>1. The contractor shall install the temporary toilet or mobile toilet for environmental health management.</li> </ol>	28-Jan-16	11-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
21	19-Jan-16	SECC workshop & industrial area	The contractor has undertaken heavy machine maintenance works outside the workshop facility without the use of a spill kit, resulting in oil spills and soil contamination. The site also requires a general tidy up for improved safety	Reference to SS-ESMMP for PC Bridge Construction; Clause 2.3: Sub-Plan Detail for construction of PC bridge – Environment; SP06: Hazardous material management 1. The contractor shall provide oil drip trays / containers for any maintenance and hazardous material handling activities outside the workshop. If the drip trays are not provided maintenance works can only occur in the workshop facility. 2. Ensure that the site has is provided with an oil spill clean-up kit 3. All spilled oils and contaminated soil will be cleaned, stored in a proper manner and disposed according to NNP1 requirements for hazardous material	02-Feb-16	02-Feb-16	Resolved
22	19-Jan-16	SECC workshop & industrial area	The contractor was requested to provide a proper / designated hazardous material storage at the site. So far, no action been under taken on this request: (i), used oil and chemical drums, as well as spent oil filters and oily rags were discarded on the ground (ii), along with scattered general solid and construction waste.	1. A proper/designated hazardous waste storage facility with floor bunding, roof cover and side protection is required; 2. The contractor shall immediately relocate fuel drums and oily equipment into designated storage area. 3. Clean up the spills and the area, generally. Note: The contractor needs to take an appropriate corrective action within	26-Jan-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
				specified deadline. Otherwise NCR will be issued accordingly.			
23	19-Jan-16	SECC batching plant yard	<p>Accordingly to the status of site operational development. So far, the batching plant has been operating with inadequate environmental mitigation measures.</p> <ol style="list-style-type: none"> <li>1. Inadequate site ditch/drain diverting the cement water from the batching plant to the sedimentation ponds. Cement water is being released to the environment without processing as observed by EMU representatives (ref; EMU Mission Summary January2016)</li> <li>2. Improper landscaping, surfacing and drainage at the site generally, to prevent or minimize muddy surfaces and high turbid water being generated at the site during operations.</li> <li>3. Site sediment pond system capacity is too small to process all the waste water generated from the site, with the potential to pollute the nearby Nam Ngiep.</li> </ol>	<ol style="list-style-type: none"> <li>1. Improve the site ditch/drainage system between the batching plant facilitate and increase the sedimentation ponds capacity .100%.</li> <li>2. Improve the land surface and cover with gravel or similar surfacing type to avoid muddy and high turbid water being generating at the site during operation activities.</li> <li>3. Provide/extend earth bund and/or cut-off drain surrounding the batching plant area to stop storm run-off from leaving the operational areas.</li> <li>4. Inform EMO/NNP1 whenever pumping / emptying from the sediment pond is required.</li> <li>5. Effluent from the pond is to be disposed in a designated Spoil Area.</li> </ol>	29-Feb-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
24	19-Jan-16	SECC batching plant yard	<p>1. There is evidence that contaminated soil from the generator storage facility was discarded.</p> <p>2. A 200 liter drum of hydrocarbon / fuel connected to the generator (store nearby the NamNgiep River bank) has been placed on a table that lacks proper support. There is risk of spillage and contamination caused by table collapse.</p>	<p>The contractor shall provide the appropriate actions as below:</p> <p>1. Collect all contaminated soil and store in a designated hazardous storage facility. area for disposal, as advised by NNP1. Contaminated soil is to be treated off site by an authorized processor.</p> <p>Install a proper supporter for fuel drums that will prevent collapse / falling. Otherwise, re-locate the generator away from river bank. (Ref; project’s ESMMP defined 30-50 m from stream / channel)</p>	02Feb-16	02-Feb-16	Resolved
25	19-Jan-16	PC Bridge	<p>Disconnect all wastewater effluent pipes that direct effluent between the pier foundations pits to the Nam Ngiep. No direct discharge is permitted.</p>	<ul style="list-style-type: none"> <li>- All effluent waste from the pier foundation pits and construction areas generally, will be directed to and processed by the site sediment pond system.</li> <li>- All the wastewater from the site shall be tested prior to pumping to the environment. Test results shall be shared with EMO, and</li> <li>- Pumping is only to occur with NNP1 approval.</li> </ul> <p>Note: The issues listed shall not be repeat. Otherwise, NCR will be issued immediately.</p>	02-Feb-16	02-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
26	20-Jan-16	HM worker camp	There was improper waste management at worker camp. Construction waste and domestic solid waste littered the camp ground, and there was no waste bins provided.	1. The Contractor shall clean up all waste and segregate into recyclables, hazardous and solid waste for disposal. 2. The Contractor shall provide a) at least four waste bins such as food waste, general waste, recycle waste, and hazardous waste at worker camp, and b) provide two waste bins such as general waste and recycle waste bins at the construction site.	04-Feb-16	02-Feb-16	Resolved
27	20-Jan-16	HM worker camp	Cement waste dumped nearby to the camp.	The Contractor shall clean up and disposed the waste on designated disposal area.	27-Jan-16	02-Feb-16	Resolved
28	26-Jan-16	Main dam	Evidence of construction related turbid water continuing to be discharged directly to the Nam Ngiep River without processing. The pond is full and is likely to spill, given existing rain conditions. At a earlier inspection it was agreed between OC and NNP1 that i) turbid water from the upstream coffer dam is to be treated at the treatment plant located at on the right bank downstream of the main dam construction area, ii) discharged water from the treatment plant is to be tested for pH and turbidity levels. This information / results is to be circulated daily with NNP1. Effluent discharge can only occur on the	The contractor please take an appropriate action and ensure the contaminated water is being reduced prior discharge to minimize the accumulative impact on Nam Ngiep River at downstream. EMO recommend the following options: (i). Divert the turbid water to downstream part (powerhouse platform area) for the wastewater to be treated by installed wastewater treatment plant. (ii) Increase the volumetric capacity of the existing of the sediment ponds to allow for longer settling period. (iii). Prior to discharge (except emergency case), the turbid water shall	05-Feb-16	09-Feb-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
			approval of NNP1. To date the diversion of effluent water from the upstream coffer dam area continues to be disposed in the sediment pond without monitoring.	be tested (ensure pH and Turbidity is complied with standard guideline), and inform EMO accordingly.  Note: If the wastewater is being continue discharged with a highly turbid and / or sensitive of impaction without testing and informing NNP1-EMO is observed, NCR will be immediately issued.			
29	28-Jan-16	230 kV TL	There are some oil drums, oil filters and hydraulic pipes stored at the backyard without appropriately hazardous material storage, and also found some oil spill without any clean up proper; it has potential risk to impact on the environment when raining and reaching it to the adjacent natural creeks.	1. Provide the hazardous material storage with concrete platform and bunding; and store all hazardous materials and waste inside the designated area; 2. Segregate the hazardous material waste from activities properly and labeling its; Clean up the oil spillage and store properly in designated hazardous waste storage area.	11-Feb-16	25-Feb-16	Resolved
30	02-Feb-16	SECC camp	There was insufficient waste bin provided in the workshop area and construction site, there are the mixed wastes in the bin. No segregation before dump at new disposal area on behind SECC's worker camp.	1. The Contractor shall provide more waste bin (at least 2-3 bins/location) also install label on each waste bin on-site for waste segregation and provide the proper storage area for the next disposal; 2. The contractor shall separate the hazardous waste and non-hazardous waste into different waste bin accordingly.	16-Feb-16	01-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
31	02-Feb-16	SECC workshop & industrial area	There was improperly waste segregation, so that solid waste mixed together between general, construction, and recycle waste and they were disposed at temporary disposal area as behind SECC's worker camp. Also the contractor has burnt the waste without any waste segregation, which has a potential risk of air pollution to impact on an environment.	The contractor shall conduct: 1. Separate the hazardous and non-hazardous waste properly and transport and dump it on designated disposal area; 2. Stop burning waste (waste in landfall). Otherwise, NCR will be issued.	16-Feb-16	16-Feb-16	Resolved
32	09-Feb-16	RCC plant yard	EMO have conducted several site inspection follow up in previous weeks and issued ONC requesting the contractor to empty sediment pond. On the recent inspection it was found that: - The sub-contractor has not inadequately cleaned up / removed accumulated sediment from its treatment facility ponds. - Sediment from the system should be cleared when the capacity is 60% to 80% full. As the photo indicate, the system is at full capacity. High risk of potential overflow from the system.	In preliminary, results of discussion during the inspection agreed 1). Clean up / remove the sediment and dispose properly, 2) Routinely remove accumulated sediment between 60% and 80% 3). Provide L pipe (bend pipe) at outlet at some upper level to increase the pond's capacity and avoid direct discharge (see photo above)	19-Feb-16	23-Feb-16	Resolved
33	09-Feb-16	Spoil disposal N#2	The spoil disposal N#2 was currently reformed and used for other purpose of a main workshop, hazardous storage area ....etc. No environmental management plan has been	The contractor needs to develop the site operation's SSES MMP and submit to NNP1 for review and approval.	19-Feb-16	22-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
			submitted for EMO review.  No SSES MMP governs the site. EMO is concerned that without proper management plan and mitigation measures, this site has a high potential risk of environmental incident / accident particularly during the wet season, especially erosion and sedimentation, hazardous material/waste, sewage and visual amenity...etc.				
34	16-Feb-16	SECC camp	It's been identified through inspection that grey water from the SECC camp worker wash area has an unpleasant odor, the pond is near full and it is at risk of spilling to the environment. The effluent within the pond system is a potential disease vector and a health risk to workers and community.	<ul style="list-style-type: none"> <li>• The Contractor is required to improve the water quality in the sediment pond by adding water plant, also add Bio-organic (EM) and lime to reduce the strong odour at site. Additional treatments maybe required subject to testing.</li> <li>• The Contractor is required to provide a plan to improve the capacity of the sediment pond system in order to prevent any overflow to the environment. The pond system capacity design will be based on the Specialist design criteria.</li> <li>• The pond system is to be barricaded and signed-posted for safety.</li> </ul>	01-Mar-16	29-Mar-16	Resolved



List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
35	23-Feb-16	Earth dyke	There is no bunding was provided for the hazardous storage area, resulted in some hydrocarbon and black oil spilt in the storage is flowed - off the concrete floor and contaminated onto the natural ground. Without appropriate mitigation measures, this has a potential risk of increasing contaminated ground / soil and / or environmental incident.	A proper bunding needs to be provided for the hazardous storage area.	07-Mar-16	04-Mar-16	Resolved
36	23-Feb-16	CVC plant yard	Reference to water analysis results. The waste water generated and discharged from CVC plant yard detected highly pH, which exceeded the environment standard (effluent discharge standard). Currently, this wastewater been used to spray on the roads and expose areas for dust control. However, EMO concerned that without appropriate mitigation measures during the wet season this non-compliance wastewater will be continued to be discharged off-site. Actually, this was raised to the contractor for a couple months past ago and the contractor's confirmed to connect this wastewater to the wastewater treatment facilities of RCC Plant Yard. So far, no action has been undertaken.	The contractor please seek way /alternative of mitigation method to deal with this wastewater which it shall not allow to flow out of site to the open ditch or/and natural drain. <b>Note:</b> The contractor needs to ensure that capacity of wastewater treatment system of RCC plant is sufficient for additional treated the wastewater from CVC plant yard, otherwise the new ONC/NRC shall be raised by then.	07-Mar-16	05-Apr-16	Open

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
37	25-Feb-16	230 kV TL	There were waste oil drums and diesel drums are stored to temporary mobile camp and also had an evidence of oil spill. Resulting in black oil spills/leaking onto the ground surround the storage area without a proper management plan. The risk of waste oil might be washed away by runoff to drainage system and flow toward to natural creek.	i. The Contractor will improve the management of hazardous material of all construction site activities. ii. The Contractor should proper collect the waste oil/ diesel drums to the hazardous material stored area.	10-Mar-16	10-Mar-16	Resolved
38	01-Mar-16	SECC Camp	Worker of sub-contractor collect NTFPs and dry it at worker camp so that it was not comply with ESMMP-CP and also NNP1PC's Code of Conduct. The NNP1 staff, and all worker are prohibited to collect NTFPs in natural resource is surround construction.	1. The Contractor shall train environmental awareness all worker to prohibit from harvesting any forest products as follow ESMMP-CP/NNP1; 2. The Contractor shall inform notice letter on the camp for each worker to acknowledge on this issue and do not collect anything of NTFPs in the Project area.  Note: The contractor shall resolve this issues. If compliance staff will be found NTFPs again in the camp on next time. Otherwise, NCR will be issued.	15-Mar-16	15-Mar-16	Resolved
39	01-Mar-16	SECC Camp	There is improper waste management at camp and also to lack solid waste segregation at recycle center due to solid waste was mixed together between general and recycle waste such as cardboard, plastic bags, glass,	1. The contractor shall proper segregate solid waste before dump it at recycle center; 2. The contractor shall train to segregate solid waste and hazardous waste for all worker at the camp.	15-Mar-16	15-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
			plastic bottle, scrap metal and other waste.				
40	01-Mar-16	SECC Workshop and Industrial Area	There is no extend roof for Hazardous material waste storage area also it will be washed away used oil, contaminated sand and oil spillage on there in during wet season so that it to be potential risk pollution to impact water course especially Nam Ngiep River.	The contractor shall construct extended roof for hazardous material waste storage area. Note: EMU has recommended to extend roof for hazardous materials waste storage area in during site visit on 17 – 18 Feb 2016.	15-Mar-16	29-Mar-16	Resolved
41	01-Mar-16	SECC batching plant yard	There is inadequate bund/dyke at the rock and sand stockpile yard. It has potential risk to cast into Nam Ngiep river	The contractor shall increase bund/dyke, the height at least 1m at the rock and sand stockpile yard. Note: EMU has recommended to increase bund/dyke at the rock and sand stockpile yard in during site visit on 17 – 18 Feb 2016.	15-Mar-16	15-Mar-16	Resolved
42	01-Mar-16	PC Bridge	There is inadequate mitigation measure on temporary bridge construction area due to the sand bag was not enough to install along both side so that it's insufficient capacity to control erosion on there as well as water runoff very flashed to erode sediment the both side of temporary bridge so that to increase turbid water and also impact to water quality on Nam Ngiep River downstream.	1. The contractor shall install more sand bag along the both side of temporary bridge construction area; 2. The contractor shall appropriate mitigation measure plan for construction site activities; 3. The contractor shall follow SS ESMMP of bridge construction accordingly Otherwise, NCR will be issued.	15-Mar-16	29-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
43	09-Mar-16	Songda5 camp N#1	The wall of septic tank is not good quality (no concrete plastering). Resulted in sewage water is being leaked to the storm run-off channel and mixed with grey water in the wastewater retaining ponds. By other hand, storm run-off can be entered into the septic tank and resulted full quickly (reference to EMO inspection and follow up during last wet season). Actually, this issue was previously opened and closed by the reason of corrective action done. But unfortunately, the action done was not follow EMO recommendation and agreement (ref; NNP1-ESD-EMO-SIR-OC-0012; Issue ID-00075 dated 19 May 2015). Concrete was placed on the top (surface), but underneath hidden by foam-rubber is found. EMO concerned that without a proper improvement, the grey water has a potential risk of contains high bacteria and may difficult to manage during wet season.	The space between septic tank and storm run-off channel is necessary to be made with concrete as addition wall to completely stop of sewage water leaking and / or storm run-off entering into the septic tank.	22-Mar-16	22-Mar-16	Resolved
44	09-Mar-16	RT camp	During this site inspection there was evidence of black oil and hydrocarbon spilt onto the ground at surrounding of the workshop and on the parking area without cleanup are continuously observed. Additionally, a	i. Clean up / collect the contaminated soil and store in designated hazardous storage area for proper disposal / elimination. ii. No maintenance activities is allowed on parking area. By other hand;	14-Mar-16	22-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
			<p>fuel drum is stored on the ground at parking area without spillage protection facilities. Reference to EMO’s previously issued (ref; SIR-0013, 16, 17, 24 and 29; issue ID: 0089, 0099, 0108, 0169 and 0193 respectively). So far, the sub-contractor has inadequate attention been paid to improve and minimize spills on site. Without a proper mitigation measures, the area will created a mass ground contaminated, (ii), oil / hydrocarbon spilt will be washed off-site when rainy (iii) show-off a poor spills response in the project to the guest / visitor, especially GoL- EMU.</p>	<p>if necessary to do so, drip trays Shall be provided to prevent of spillage, iii. The contractor please take an appropriate action to minimize the spillage on site.</p>			
45	09-Mar-16	RT camp	<p>Luck of camp facilities management. Water stagnant in the toilet area without drains properly. This has a potential risk of mosquitos breeding, bad odor and un-pleasure visual amenity.</p>	<p>Please drain the stagnant water outside toilet area to keep tidy and functionally for long term operation.</p>	22-Mar-16	22-Mar-16	Resolved
46	09-Mar-16	RT camp	<p>Improper segregated of recyclable wastes. Scrap metal, plastics, dust filters, oil filter and oily ranges are mixed and stored in former used tires storage area.</p>	<p>Please segregate the waste according to waster type and ensure follows project’s waste management hierarchy (4R: Reduce, Re-use, Recycle and Right disposal)</p>	22-Mar-16	22-mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
47	09-Mar-16	V&K camp	The final pond of wastewater retaining ponds is nearly full. This has a potential risk of wastewater being discharged directly when the wastewater in the pond is increased.	Reference to pending issue (ref; NNP1-ESD-EMO-SIR-OC-0013; Issue ID: 0087, dated 02 Jun 2015), and the contractor’s proposal for the wastewater treatment system improvement referred to the case study and recommendation by specialist. So far, no inspection requested by the contractor. However, acknowledged that there is an additional comment by the specialist, ADB and AIP (un-official information). Therefore, until the addition comment is finalized, the contractor please completely close / block the open ditch at outlet of final pond to secures / prevent from non-compliance discharging. EMO planned and scheduled to collect sample in the pond in early April 2015.	14-Mar-16	22-Mar-16	Resolved
48	09-Mar-16	TL 230 kV	There was insufficient waste black plastic bags provided in the temporary mobile camp area and construction site, there are the mixed wastes around the temporary mobile camp area about tower 109-110. No segregation before plastic bottles can, and recycles waste. EMO strongly requested the contractor to take appropriate action to stop burning of non-segregate waste on site.	The Contractor will improve the waste management of temporary mobile camp area and all construction site activities.	24-Mar-16	24-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
49	15-Mar-16	SECC camp	The septic tank was full and over-flow into the environment. This caused bad odour and has a high risk of disease/bacteria contamination in watercourses that will impact the worker health.	The Contractor shall empty and dispose of the septic waste at an authorized area (through discussion and approval from the EMO). It also needs to regularly check the septic tank to ensure that no wastewater is discharged into the environment.	18-Mar-16	29-Mar-16	Open
50	15-Mar-16	SECC batching plant yard	The contaminated sand/soil was left around the generator storage area without cleaning up. This has a potential risk of hazardous material being spilled and washed away into the watercourses during the coming wet season which will impact the aquatic animals in the Nam Ngiep downstream.	The contractor shall regularly clean-up contaminated soil/sand around the generator area and store at the designated hazardous material storage (in sealed drums/tanks) for further disposal.	18-Mar-16	29-Mar-16	Resolved
51	15-Mar-16	PC Bridge	During a joint bi-weekly site inspection carried out on 15 March 2016, it was found that the turbid water was directly discharged into the Nam Ngiep and the capacity of the sediment pond was insufficient to retain the sediment in the pond. This resulted in the high turbid water being discharged directly into the Nam Ngiep which can potentially impact on water quality and aquatic animals downstream of Nam Ngiep.	The Contractor is required to: <ul style="list-style-type: none"> <li>- Remove the sediment in both ponds to increase their capacities in retaining and settling sediments;</li> <li>- The inlet and outlet of pond shall be established in the opposite direction (see drawing below);</li> <li>- Install rip-rap at the inlet and outlet to prevent erosion;</li> <li>- Use geotextiles for slopes to minimize the sediment load being washed into the Nam Ngiep downstream.</li> </ul>	29-Mar-16	29-Mar-16	Resolved

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
52	22-Mar-16	Earth dyke	There was inadequate waste segregation being practiced on site. Scrap metal, used tires, dust filters and oil filters are mix on site. This has a potential risk of creating ground contamination and impact on environment.	The Contractor needs to segregate the waste according to waste types and ensure that its managed follows project’s waste management hierarchy introduced.	05-Apr-16	05-Apr-16	Resolved
53	22-Mar-16	Earth dyke	The sub-contractor has lack of proper hazardous material management. (i). Contaminated soil and oily ranges was left behind at work place without clean-up / collection and store properly. (ii). No proper spillage protection facilities provided for maintenance activities. Resulted in engine oil and diesel spilt on to the ground are observed every times conduct site inspection and follow up. EMO has previously issued (verbally and officially) to the contractor to take an appropriate action and improve their contractor’s hazardous material management process on site, (ref; SIR-0026, 0027 and 0033). So far, it looked seem no attention is being paid by the sub-contractor.	The contractor please take an appropriate action to solve the issues. Otherwise, proposed and approved SS-ESMMP will be guided and followed strictly (ref; SS-ESMMP for Earth Dike, SP06: Hazardous material management).	05-Apr-16	05-Apr-16	Resolved



List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
54	22-Mar-16	Spoil disposal N#3	Because of the spoil area is directly located on the seasonal stream / channel which receiving a large catchment area on upstream. Refer to EMO's official issued (ref; SIR-0018, dated 11/08/2015) and later closed 17/11/2015 requested the contractor to provide an appropriate mitigation measures in the spoil area to minimize the erosion and sediment transported off-site. Currently, the contractor is about ongoing providing / constructing an open channel by rock compaction. EMO's inspectors concerned that without check dike installed along the open channel (see on picture), sediment is still high potential to be washed down when heavy rain.	A check dike/ stone dike (at least 30-40 cm high) is necessary to be installed along the open channel side (between material stockpile and open channel to stop and / or minimize sediment washed from this area).	11-Apr-16	05-Apr-16	Open
55	24-Mar-16	TL 230 kV	During the site inspection, there is improperly concrete waste management on site due to identified about 0.5 m3 concrete was dumped on the ground at adjacent the 157 tower and concrete waste water pumped to surround area as well so that it has a potential risk to impact the environment.	The contractor please remove concrete waste and dispose it at designated disposal area and also concrete wastewater shall pump into specific sediment pond after completed work please backfill on there.	07-Apr-16		Open

List of Environmental Issues Recorded and Corrective Action Progressed							
Issue ID	Inspection Date	Site Name	Issue/ Description	Action Required / Recommendation	Deadline	Latest Follow up dated	Final Status
56	29-Mar-16	SECC batching plant yard	There is improper new generator storage area at Batching plant and no concrete floor, bund, and roof accordingly so that it's has potentials risk to impact water course especially Nam Ngiep River when oil spilt on the ground and wash away in during coming wet season. - The oil trap is not work so that it blocked function system on there.	The Contractor shall install roof, concrete floor, and also the bund area also shall fix the oil trap function system again to reduce overflow of oil spillage and contaminated sand on there.	12-Apr-16		Open
57	29-Mar-16	SECC batching plant yard	There is inadequate mitigation on Nam Ngiep River left embankment of sediment pond of Batching plant regarding the erosion and sediment control due to this location is a potentials to erode or site casting to Nam Ngiep river.	The Contractor shall take appropriate action to control and protect erosion or site casting at left embankment of sediment pond.	12-Apr-16		Open
58	29-Mar-16	SECC batching plant yard	There is nearly full sediment of concrete waste in the pond. It's a potential overload and release into Nam Ngiep River so that it's an impact to water quality and aquatic animals.	The Contractor shall immediately action to clean up concrete waste accordingly when sediment is nearly full 80% and designated disposal area.	12-Apr-16		Open

**APPENDIX 3: HAZARDOUS MATERIALS AUDIT RESULTS FROM JANUARY TO MARCH 2016**

Site	PKC Fuel station and storage	Songda Camp			TCM fuel station and HazMat storage			RT work shop			V&K Camp			Songda Work shop			Sino hydro camp			Sino hydro fuel station			Songda CVC Plant					
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
<b>Storage area</b>																												
1	Floor of storage area is impervious	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Fully bunded with capacity >120% of combined container capacity	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Bunds in adequate condition	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X
4	Closed storage protected from rainfall and flood level	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Storage area is well ventilated	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	Oil trap linked to the storage area	√	-	-	√	√	√	√	√	√	X	X	X	√	√	√	N A	N A	N A	√	√	√	√	√	√	N A	N A	N A
7	Located not close to camp, office and watercourse	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8	Storage has the fence and lock	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X
9	Incompatible hazardous materials and chemicals stored separately	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
10	Explosives stored in underground facilities or in appropriate bunding	N A	-	-	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A
11	Explosive storage facilities are locked and access is restricted	N A	-	-	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A	N A
<b>Containers</b>																												
12	Containers leak-proof and in good condition	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Site	PKC Fuel station and storage	Songda Camp			TCM fuel station and HazMat storage			RT work shop			V&K Camp			Songda Work shop			Sino hydro camp			Sino hydro fuel station			Songda CVC Plant		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
13	Metallic (Iron) containers without corrosion (rust)	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
14	Container chemically compatible with material stored	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
15	Container closed unless material added or used	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
16	Refuelling equipment without leakages observed	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
<b>Labels</b>																									
17	Restricted access signs outside facility	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X	√	√	√	√	√	√
18	Display of labels with words "Hazardous product/waste"	√	-	-	√	√	√	-	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
19	Label describes hazards for users	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
20	PPE request sign posted within premises	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
21	Procedures for HazMat handling posted within premises	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
22	Procedures for emergency response posted within premises	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	N A	N A	N A	√	√	√
<b>Safety</b>																									
23	Fire fighting equipment available and controlled	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√

Site		PKC Fuel station and storage			Songda Camp			TCM fuel station and HazMat storage			RT work shop			V&K Camp			Songda Work shop			Sino hydro camp			Sino hydro fuel station			Songda CVC Plant		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3			
24	Fire fighting equipment is sited appropriately for ease of access	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X
25	Staff wear PPE on site	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
26	Staff trained for HazMat handling and spill response	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
<b>Spill response</b>																												
27	Spill response kits readily available with adequate supply	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	N	N	N	√	√	√	X	X	X
28	Safe storage is provided for contaminated materials after spill response	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X
29	Plan is in place for removal and final disposal of contaminated materials	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X
<b>Documentation</b>																												
30	HazMat Register in place	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
31	HazMat Register up-to-date	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
32	MSDS sheets readily accessible	√	-	-	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	X	X	X

**APPENDIX 4: HAZARDOUS WASTE INVENTORY DURING JANUARY TO MARCH 2016**

No.	Site	PKC camp	TCM camp			Songda camp			RT camp			Songda workshop			V&K camp			CVC Plant			Sino hydro fuel station			Songda cvc plant			Total										
		1	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3								
1	Used oil / hydraulic fluids/ cooking oil	25d	11c o	11co	11co	0	1d	1d	3d	4d	5d	1d	2d	1d	1d	1d	1d, 2sd	0	1d	3sd	3sd	3sd	1sd	1d	0	1d	31d, 3sd, 11co	9d, 3sd, 11co	9d, 6sd, 11co								
2	Used oil mixed with water	0	0	0	0	0	0	0	1d	2d	2d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1d	2d	2d					
3	Empty used oil drum/container	7d	8sd	9sd	10sd	1d	1d, 2sd	1d	2d	5d	1d	2d, 6sd	1d, 8sd	1d, 10sd	4d	2d	3d, 2sd	6sd	0	0	9d, 3sd	3d	5d	3d	5d	6d	28d, 23sd	17d,	17d,								
4	Used oil filters	55u	0	0	0	0	0	0	5u	10u	15u	0	2u	4u	9u	6u	8u	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69u	18u	27u			
5	Contaminated soil, sawdust and concrete	9b	0	0	0	0	0	0	10b	11b	15b	2b	3b	2b	1b	2b	2b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23b	16b	19b		
6	Contaminated textile and materials	4b	0	0	0	0	0	0	1b	2b	3b	2b	3b	3b	1b	2b	3b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8b	7b	6b	
7	Contaminated used rubber (hydraulic) hose	2d	0	0	0	0	0	0	2d	2d	2d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4d	2d	2d	
8	Contaminated grease	1d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1d	1d	0	
9	Empty contaminated	2d	0	0	0	0	0	0	0	0	0	0	1d	2sd	0	0	0	0	0	0	0	0	0	0	1d	1sd	2d	2d	3sd	2d	2d	3sd	2d	2d	3sd		
10	Empty contaminated bitumen drum/container	0	80d	80d	80d	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80d	80d	80d
11	Used tire	162u	40u	13u	11u	0	0	0	6u	3u	5u	30u	60u	69u	12u	10u	12u	0	0	0	9u	9u	4u	9u	11u	13u	268u	106u	114u	268u	106u	114u	268u	106u	114u		
12	Chemical mixed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

13	Empty used chemical drum/container	0	528sd	528sd	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3d	568d	55d, 528sd	45d
14	Acid and caustic cleaners	90bo	0	0	0	0	0	0	270bo	272bo	280bo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	360bo	272bo	280bo	
15	Empty paint and spray cans	0	4ca	5ca	7ca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4ca	5ca	10ca	
16	Used battery	10u	11u	7u	0	0	0	0	0	0	0	0	4u	5u	0	0	0	0	0	0	0	0	0	0	0	0	21u	11u	5u	

Note: d = drum (contain 200 l/unit); sd = small drum (contain 20 l/unit); co = container (contain 1-10 l/unit); ca = can (contain 1-5 l/unit); b = bag; bo = bottle (contain 1-5 l/unit); u = unit

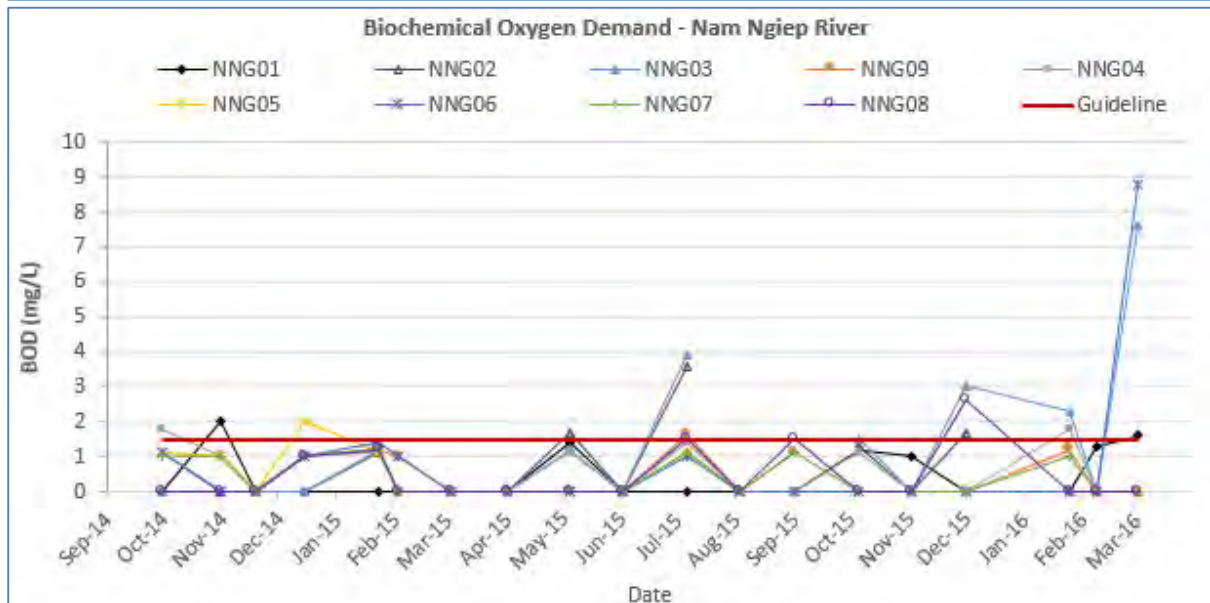
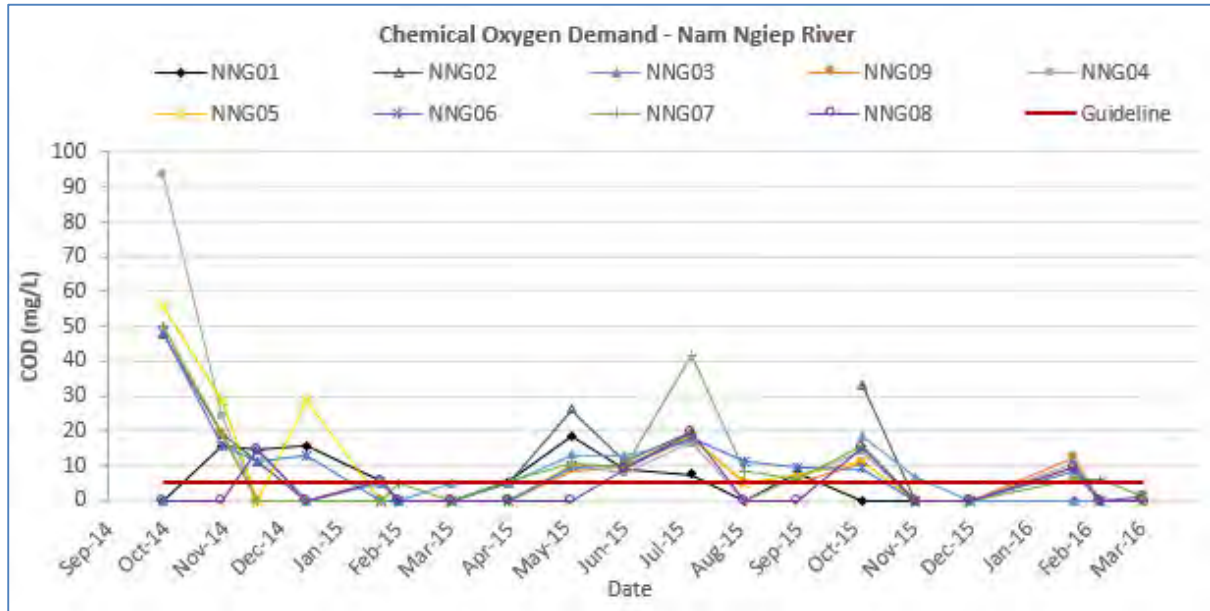
**APPENDIX 5: SURFACE WATER QUALITY MONITORING CODE AND LOCATIONS**

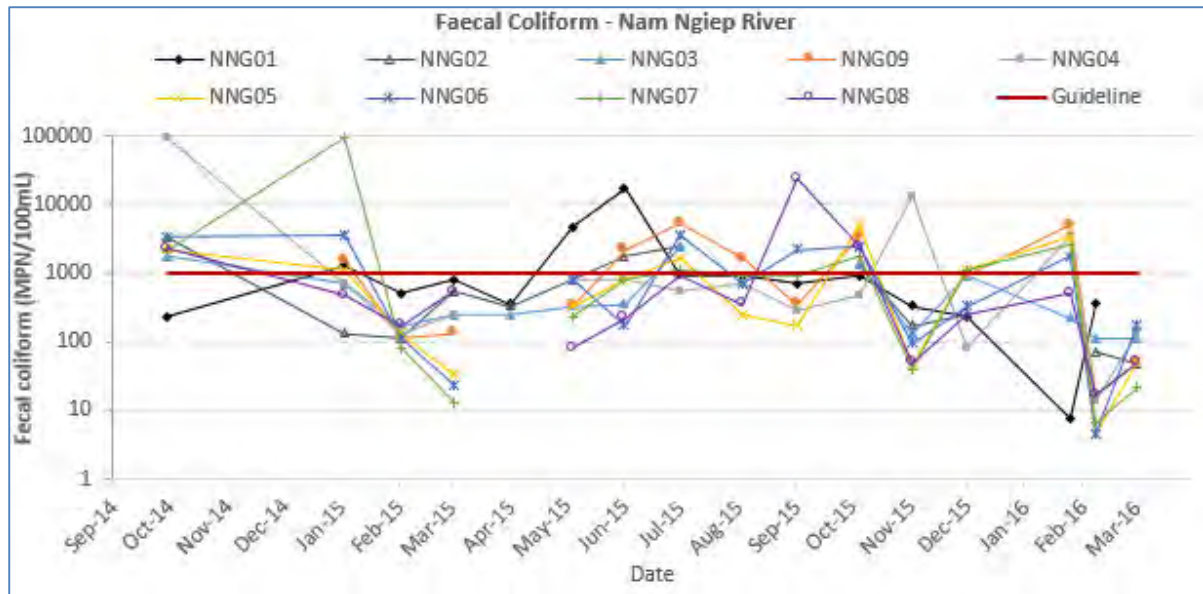
<b>Site Code</b>	<b>Location station</b>	<b>Zone</b>
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
NNG02	Nam Ngiep Upstream of Nam Phouan Confluence	
NNG03	Nam Ngiep Downstream of Ban Sop-Yuak	
NNG09	Nam Ngiep Upstream Main Dam	
NNG04	Nam Ngiep Downstream RT Camp	Within Project Construction Site
NNG05	Nam Ngiep Upstream of Ban Hat Gniun	Downstream Project Construction Site
NNG06	Nam Ngiep Downstream of Nam Xao Confluence	
NNG07	Nam Ngiep at Ban Somsuen	
NNG08	Nam Ngiep at the Bridge of Road 13	
NCH01	Nam Chiane at the Bridge of Road 1D	Tributaries Upstream of Project Construction Site
NPH01	Nam Phouan Upstream of Nam Ngiep Confluence	
NXA01	Nam Xao Upstream of Nam Ngiep Confluence	Tributaries Downstream of Project Construction Site
NSH01	Nam Houay Soup Upstream Nam Ngiep Confluence	



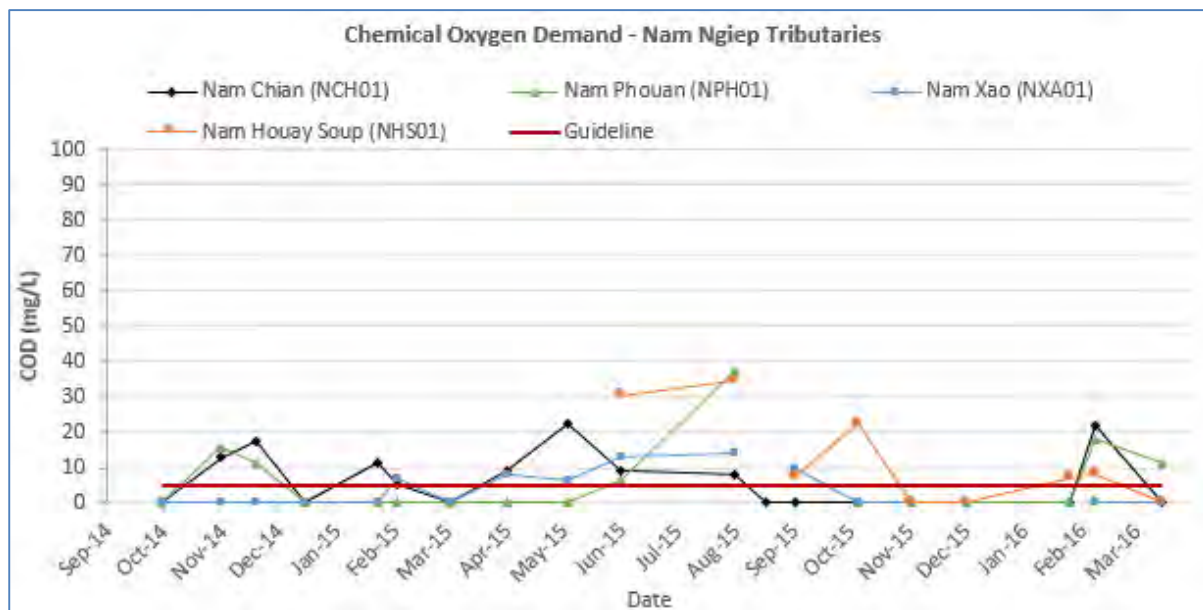
**APPENDIX 6: KEY TRENDS OF WATER QUALITY MONITORING FROM SEPTEMBER 2014 TO END OF MARCH 2016 (ONLY PARAMETERS THAT EXCEEDED GUIDELINE STANDARDS)**

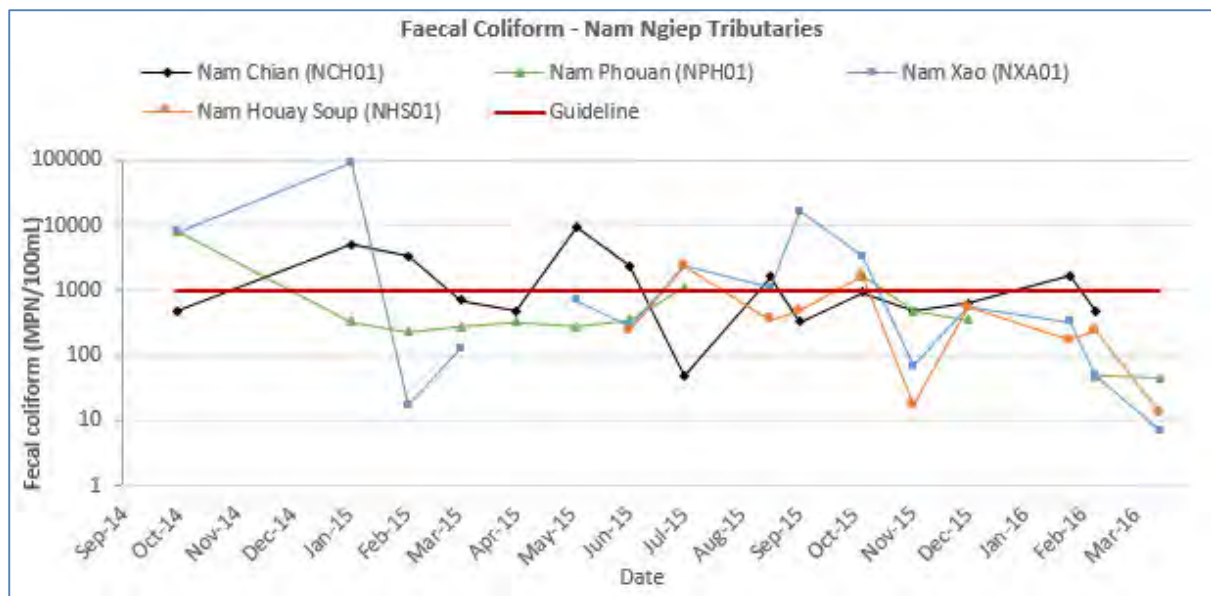
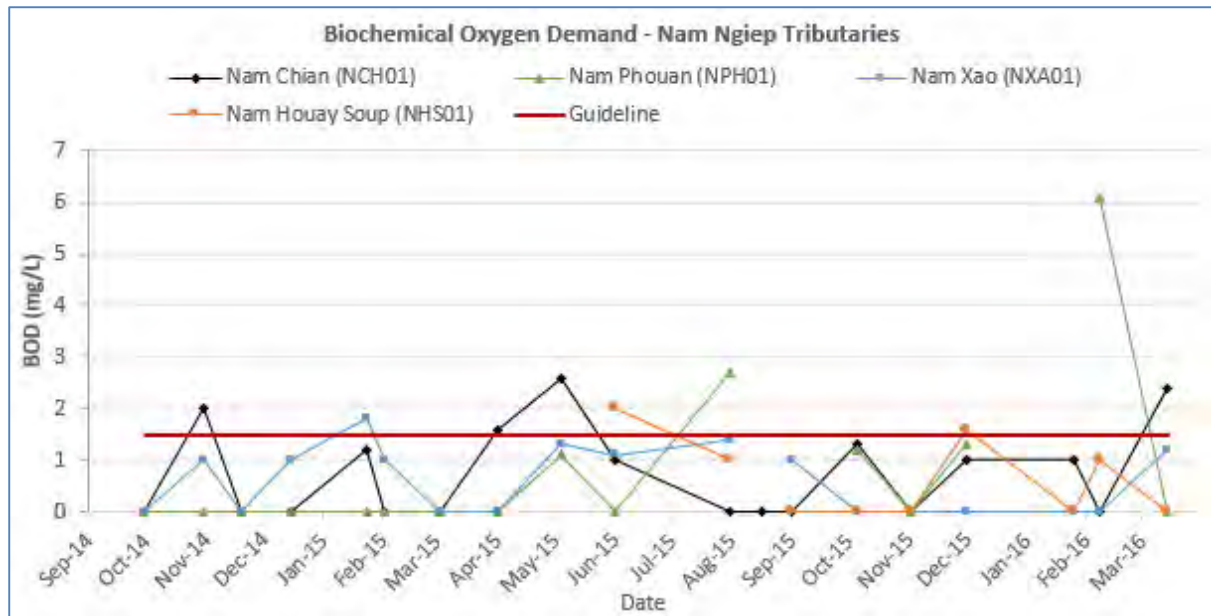
**Nam Ngiep Surface Water main channel**



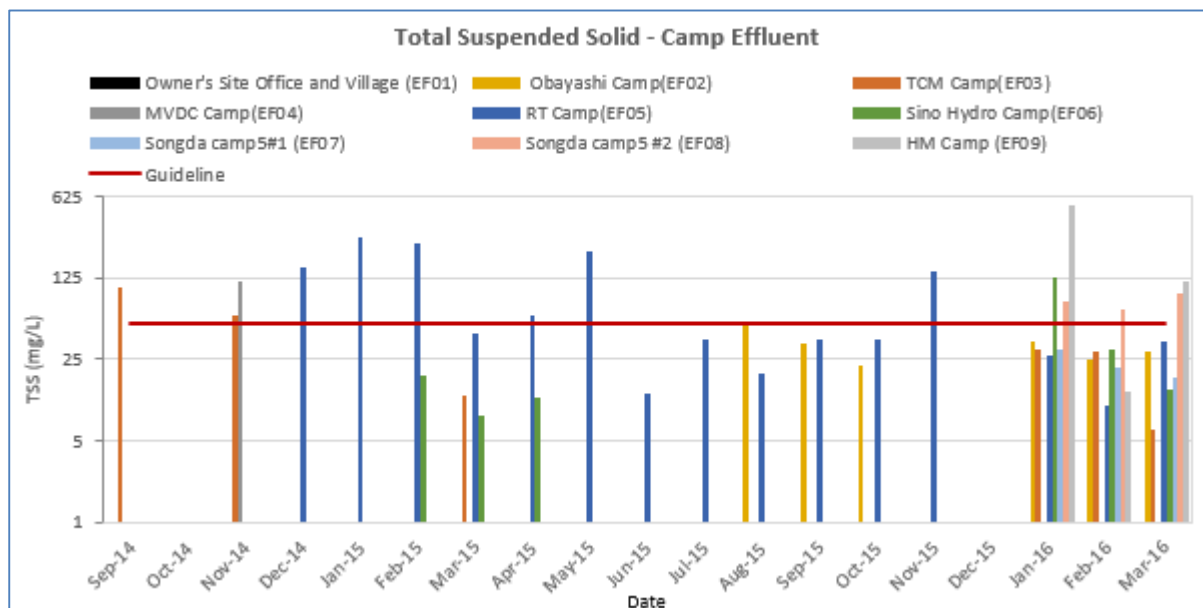
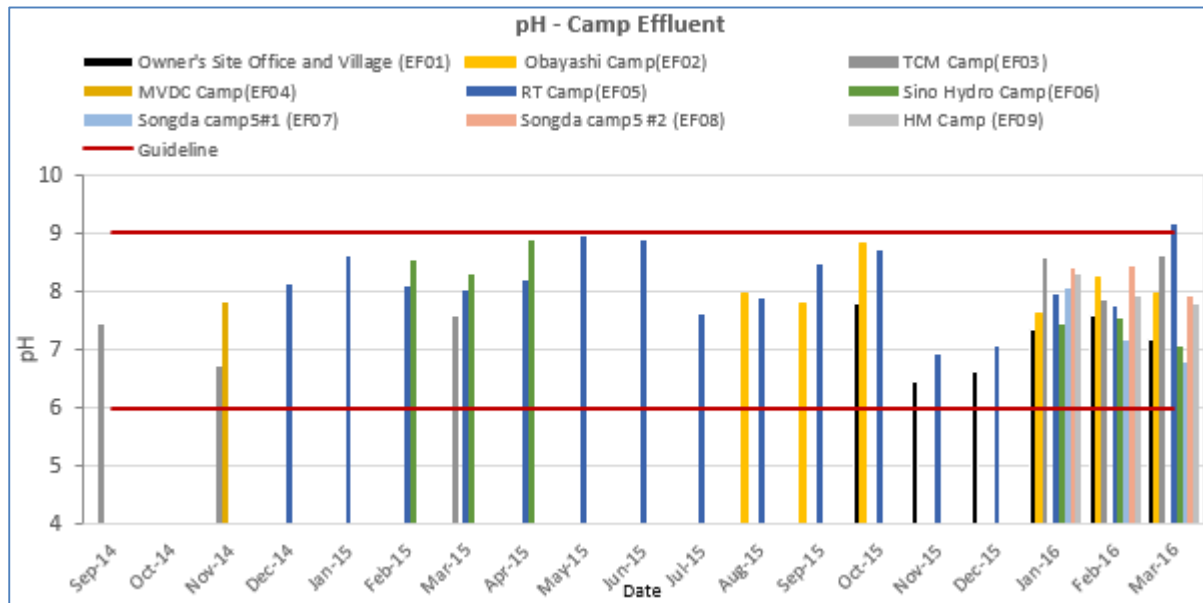


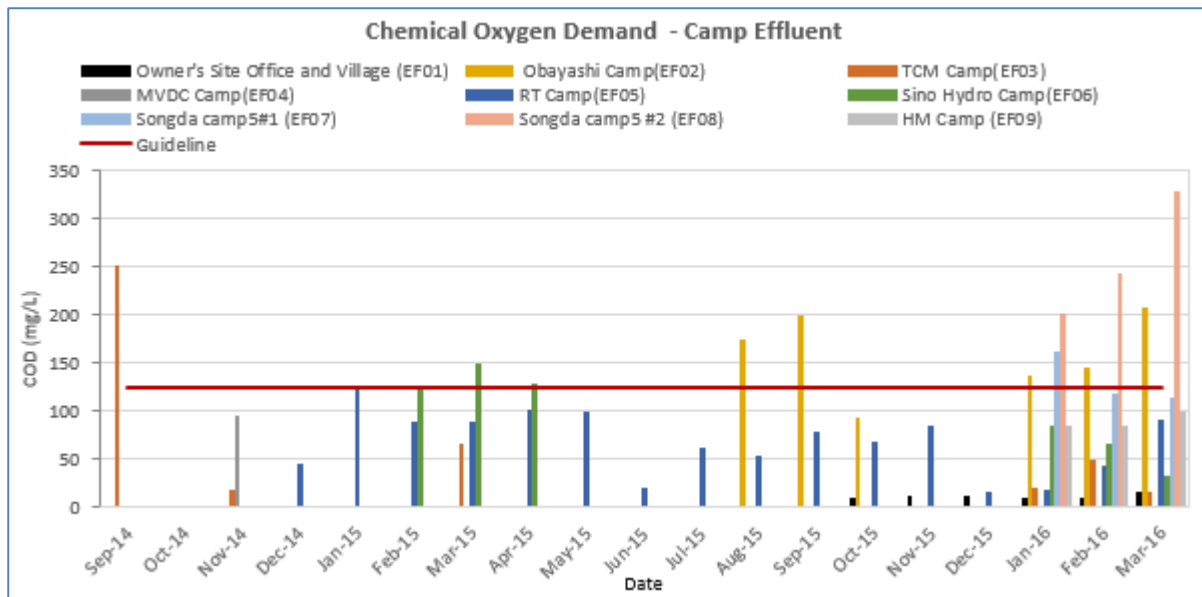
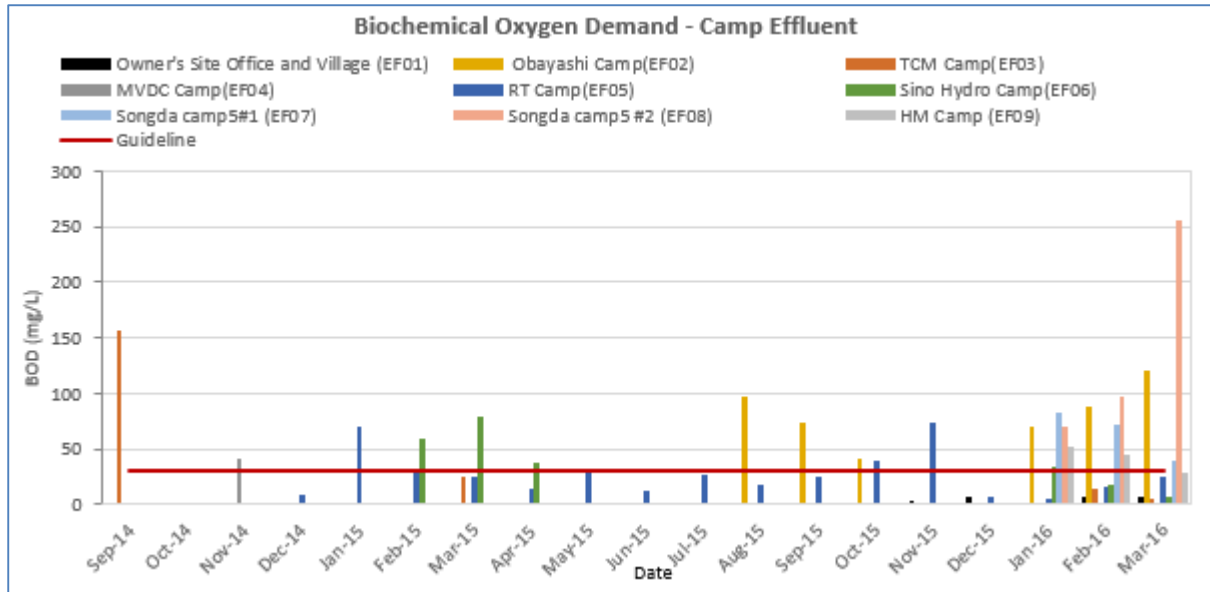
**Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup**

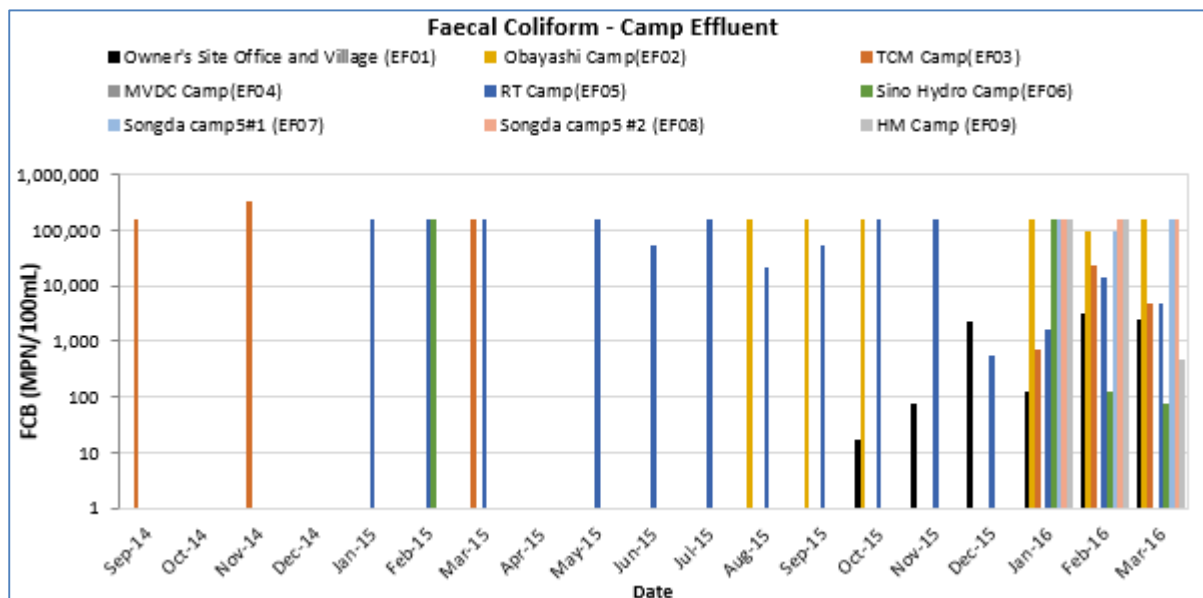
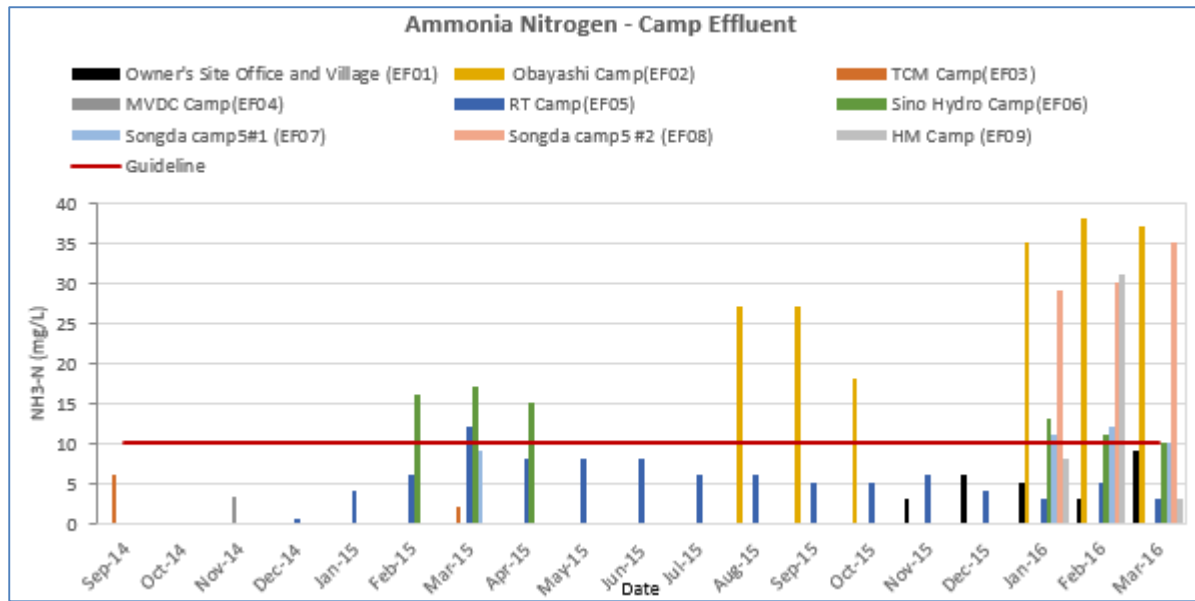


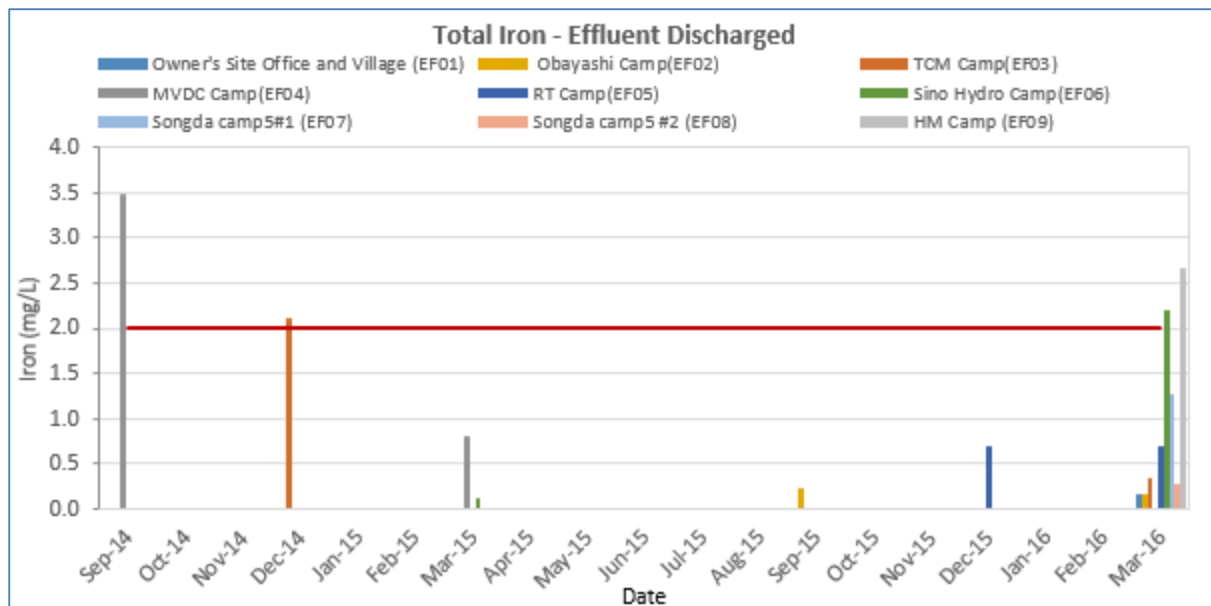
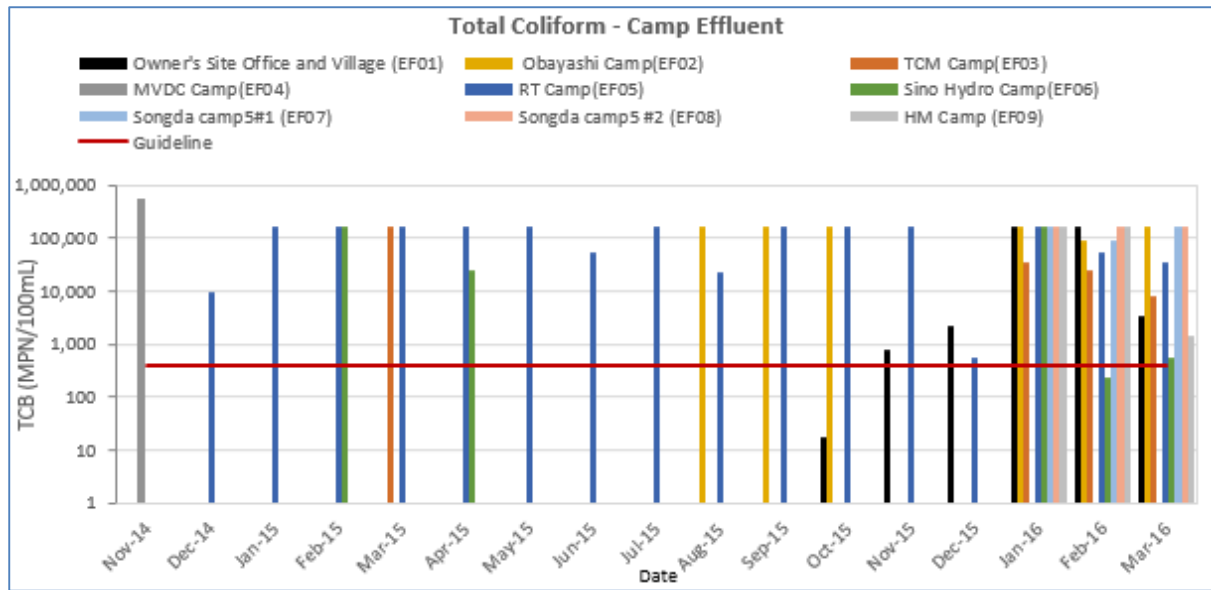


### Camps' Effluent Water Quality Trends









### Construction Area Discharge Water Quality

