Initial Environmental Examination

April 2018

LAO: Additional Financing of Water Supply and Sanitation Sector Project
(Xamneua Subproject)

Prepared by the Department of Water Supply, Ministry of Public Works and Transport for the Asian Development Bank.

CURRENCY EQUIVALENTS
(as of 27 February 2018)

Currency unit	–	kip (KN)
KN1.00	=	$0.0001205
$1.00	=	KN8,294

ABBREVIATIONS

ADB	–	Asian Development Bank
AP	–	affected persons
CAP	–	community actions and participation
CAT	–	community action team
CIPP	–	community information and participation program
CDP	–	capacity development program
CPI	–	Committee for Planning and Investment
DAFEO	–	District Agriculture and Forestry Extension Office
DCTPC	–	Department of Communication, Transport, Post and Construction
DWS	–	Department of Water Supply
DPACS	–	Department of Public Administration and Civil Service (of the PMO)
DPWT	–	Department of Public Works and Transport
DRC	–	District Resettlement Committee
EARF	–	environmental assessment and review framework
EG	–	executing agency
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMoP	–	environmental monitoring plan
GAP	–	gender action plan
HRD	–	human resources development
HSE	–	health, safety and environment
ICB	–	international competitive bidding
IEE	–	initial environmental examination
IEM	–	independent external monitoring
IPSA	–	initial poverty and social assessment
LAR	–	land acquisition and resettlement
LACF	–	land acquisition and compensation framework
M&E	–	monitoring and evaluation
MDGs	–	Millennium Development Goals
MOH	–	Ministry of Health
MONRE	–	Ministry of Natural Resources and Environment (previous WREA)
Nam Saat	–	The National Center of Environmental Health and Water Supply
NBCA	–	National Biodiversity Conservation Area
NCB	–	national competitive bidding
NCRWSSP	–	Northern and Central Regions Water Supply and Sanitation Sector Project
NGO	–	non-government organization
NGPES	–	National Growth and Poverty Elimination Strategy

NSEDP	–	National Socio-Economic Development Plan
OHUP	–	Office of Housing and Urban Planning (of DPWT at provincial level)
OOE	–	Office of Education
OOH	–	Office of Health
OPW	–	Office of Public Works
OMM	–	Operation and Maintenance Manual
O&M	–	Operation and Maintenance
PAFO	–	Provincial Agriculture and Forestry Office
PCU	–	project coordination unit
PDR	–	People's Democratic Republic
PIA	–	project implementation assistance
PIU	–	project implementation unit
PMO	–	Prime Minister's Office
PPP	–	public-private partnership
PPME	–	project performance monitoring and evaluation
PPSC	–	Provincial Project Steering Committee
PRA	–	participatory rapid appraisal
PRC	–	Provincial Resettlement Committee
PSA	–	poverty and social analysis
PSC	–	Project Steering Committee
PSP	–	private sector participation
RC	–	Resettlement Committee
RCS	–	replacement cost survey
RF	–	resettlement framework
ROW	–	right-of-way
RP	–	resettlement plan
SES	–	socio-economic survey
STDSP	–	Small Towns Development Sector Project
STEA	–	Science Technology and Environment Agency
STWSSP	–	Small Towns Water Supply and Sanitation Sector Project
UDAA	–	Urban Development Administration Authority
UXO	–	unexploded ordinance
VEI	–	village environmental improvements
VRC	–	village resettlement Committee
WASA	–	Water Supply Authority
WATSAN	–	Water and Sanitation Unit
WREA	–	Water Resources and Environmental Agency
WSARC	–	Water Supply Authority Regulatory Committee
WSD	–	Water Supply Division
WSIP	–	water supply investment plan
WSSP	–	Water Supply and Sanitation Sector Project
WTP	–	water treatment plant

WEIGHTS AND MEASURES

ha	–	Hectare
lpcd	–	liters per capita per day
l/s	–	liters per second
m	–	Meter
m^2	–	square meter

mg/l	–	milligrams per liter
mm	–	Millimeter
m^3/day	–	cubic meters per day
sqm	–	square meter

LAO TERMS

ban	–	village
nam	–	river

NOTE

(i) In this report, "$" refers to United States dollars.

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

2 INTRODUCTION 1

3 METHODOLOGY 1

3.1 Project Category 2

4 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK 2

4.1 Environmental Safeguards Policies, ADB 2

4.2 Legal and Institutional Framework on Environmental Management in Lao People's Democratic Republic 3

4.2.1 Environmental Impact Assessment 3

4.2.2 Drinking Water Quality and Discharge Standards 3

4.2.3 Other relevant legislation to the subproject. 4

5 DESCRIPTION OF THE SUBPROJECT 6

5.1 Output 1: Improved Sector Coordination and Policy Implementation 6

5.2 Output 2: Improved Nonrevenue Water Management, Water Supply Development and Drainage 6

5.2.1 Existing Situation 7

5.3 Enhanced Community Action in Urban Water Supply and Sanitation 10

6 DESCRIPTION OF THE ENVIRONMENT 12

6.1 Physical Resources 12

6.2 Geology and Hazards 12

6.3 Air Quality and Noise 13

6.4 Climate 14

6.4.1 Climate Change 16

6.5 Water Resources 17

6.5.1 Water Quality Results 17

6.6 Ecological Resources 20

6.7 Historical and Archaeological Sites 21

6.8 Unexploded Ordnance 21

6.9 Socio-Economic Conditions 22

6.9.1 Health and Sanitation 23

6.9.2 Education 23

6.9.3 Water Supply 23

7 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES 23

7.1 Anticipated Benefits from the Subproject 24

7.2 Environmental Impacts Related to Project Location (Pre-Construction Phase) 24

7.2.1 Impact on Land Acquisition and Community Assets 24

7.2.2 Impact of Location of Raw Water Intake on other Water Users 24

7.2.3 Impact on Natural Resources and Protected Areas 25

7.2.4 Impact on Historical and Archaeological Sites 26

7.3 Environmental Impacts During Construction 26

7.3.1 Temporary Disruption of Community Roads, Pathways and Access to Properties 26

7.3.2 Air Pollution 27

7.3.3 Noise 27

7.3.4 Impact of Borrow Materials 27
7.3.5 Impact on Ecological Resources 27
7.3.6 Clearing of Vegetation 28
7.3.7 Water Pollution 28
7.3.8 Generation of Construction Wastes 29
7.3.9 Impact on Community Health and Safety 30
7.3.10 Occupational Health and Safety 30
7.4 Environmental Impacts During Operation 30
7.4.1 Incremental Wastewater Generation and Increased Burden on Drainage Systems 31
7.4.2 Deterioration of Water Quality 31
7.4.3 High Pressure and Leaks on the Pipeline 32
7.4.4 Generation of Backwash Water and Sediments in the WTP 32
7.4.5 Occupational Health and Safety 32
7.4.6 Generation of Sludge from Detention Ponds 32
7.4.7 Community Health and Safety 32

8 ANALYSIS OF ALTERNATIVES 33
8.1 Alternatives to the Subproject 33
8.2 Alternatives Within the Subproject 33
8.3 “No Project” Alternative 33

9 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION 33
9.1 Consultations and Information Disclosure 33
9.2 Information Disclosure 38

10 GRIEVANCE REDRESS MECHANISM 38
10.1 Type of Grievances 39
10.2 Grievance Resolution Process 39
10.2.1 Arbitration Committees 39
10.2.2 Grievance Redress Procedures 40

11 ENVIRONMENTAL MANAGEMENT AND MONITORING 43
11.1 Reporting 53
11.2 Implementation Arrangements 54
11.2.1 Department of Water Supply - Ministry of Public Works and Transport 55
11.2.2 Project Implementation Unit (PIU) 55
11.2.3 Environmental Monitoring 56
11.2.4 Capacity Building 58
11.2.5 Environmental Management and Monitoring Costs 58

12 CONCLUSION AND RECOMMENDATIONS 58

APPENDICES 60

TABLES

Table 1 Total Monthly Rainfalls (mm) 2006-2016....14
Table 2 Daily Averaged Rainfalls (mm) 2006-2016....15
Table 3 Maximum Averaged Daily Rainfalls (mm) 2006-2016....15
Table 4 Minimum Averaged Monthly Temperatures2006-2016....15
Table 5 Maximum Averaged Monthly Temperatures 2006-2016....16
Table 6 Averaged Monthly Temperatures 2006-2016....16
Table 7 Water Quality Results from May and July 2017....20
Table 8 Xamneua Town Population Characteristics....22
Table 9 Summary of Xamneua Subproject villager participants....34
Table 10 Grievance Redress Procedures....40
Table 11 Individuals at Stage 1 (Subproject Village Level)....41
Table 12 Environmental Management and Monitoring Plan....43
Table 13 EMP Reporting Plan....54
Table 14 Institutional Responsibilities for Environmental Management....55
Table 15 Environmental Monitoring Plan....56

FIGURES

Figure 1 Location of WSSP Towns....4
Figure 2 Xamneua Water Treatment Plant Layout....9
Figure 3 General Layout of Xamneua Subproject....11
Figure 4 Land use of the Proposed Subproject Area....13
Figure 5 Sample Complaint Letter....42

APPENDICES

Appendix A: Rapid Environmental Assessment (REA) Checklist
Appendix B: Ministry of Public Health Drinking Water Quality Standards (2014)
Appendix C: Proceedings of Public Consultations for Xamneua Subproject
Appendix D: Checklist for Project Environmental Safeguards Monitoring
Appendix E: Semi-Annual Integrated Safeguards Monitoring Report Template
Appendix F: District IEE Environmental Compliance Certificate

1 EXECUTIVE SUMMARY

1.1 Introduction

1. The Water Supply and Sanitation Sector Project (WSSP) of the Ministry of Public Works and Transport (Executing Agency) supports the development of small district towns in the Lao People's Democratic Republic (PDR) through the improvement of water supply and sanitation services. Consistent with the government's urban water supply and sanitation sector policy and investment plan, the project aims to improve the performance of the provincial nam papas (PNPs[1]) and expand access to safe piped water supply and sanitation for urban residents in small towns in the Lao PDR. The project will comprise: (i) improvements to the water supply system; and (ii) enhanced community action in urban water supply and sanitation.

2. The WSSP will be implemented through a sector loan from the Asian Development Bank (ADB). The Ministry of Public Works and Transport (MPWT) and the Provincial Department of Public Works and Transport together with the PNPs or provincial water utilities (implementing agencies) will be responsible for identifying, prioritizing, appraising, selecting and approving subprojects in accordance with the government's and ADB's policies and procedures.

3. The original scope of the Small Towns Water Supply and Sanitation Sector Project (STWSP) is now essentially complete, with the thirteenth (13th) subproject currently under implementation and due for completion by June 2018. The STWSP design was essentially built on previous work in the sector by the Asian Development Bank (ADB) and the Government of the Lao PDR, with a strong policy dialogue and sector reform approach closely linked to the capital investment activities. It included the development and rehabilitation of piped water supply systems and complementary drainage and environmental sanitation works. The thirteen towns are located in eight provinces throughout the country. They include nine towns for new water supply systems and four towns with existing water supply systems that required rehabilitation to improve service levels. All nominated districts were among the 47 districts classed as priority poor and one town was among the 72 districts classed as poor by the government.[2]

4. Under the current project, two subprojects per province are selected, one being the provincial capital Xamneua (rehabilitation and expansion) and the other a small district town Sopbao (new development) in the same province. The rationale being that the focus on the provincial capital would help build a stronger PNP, while the development of a water supply system in a small district town would help the government move toward its target of 80 per cent coverage of the urban population by 2020.

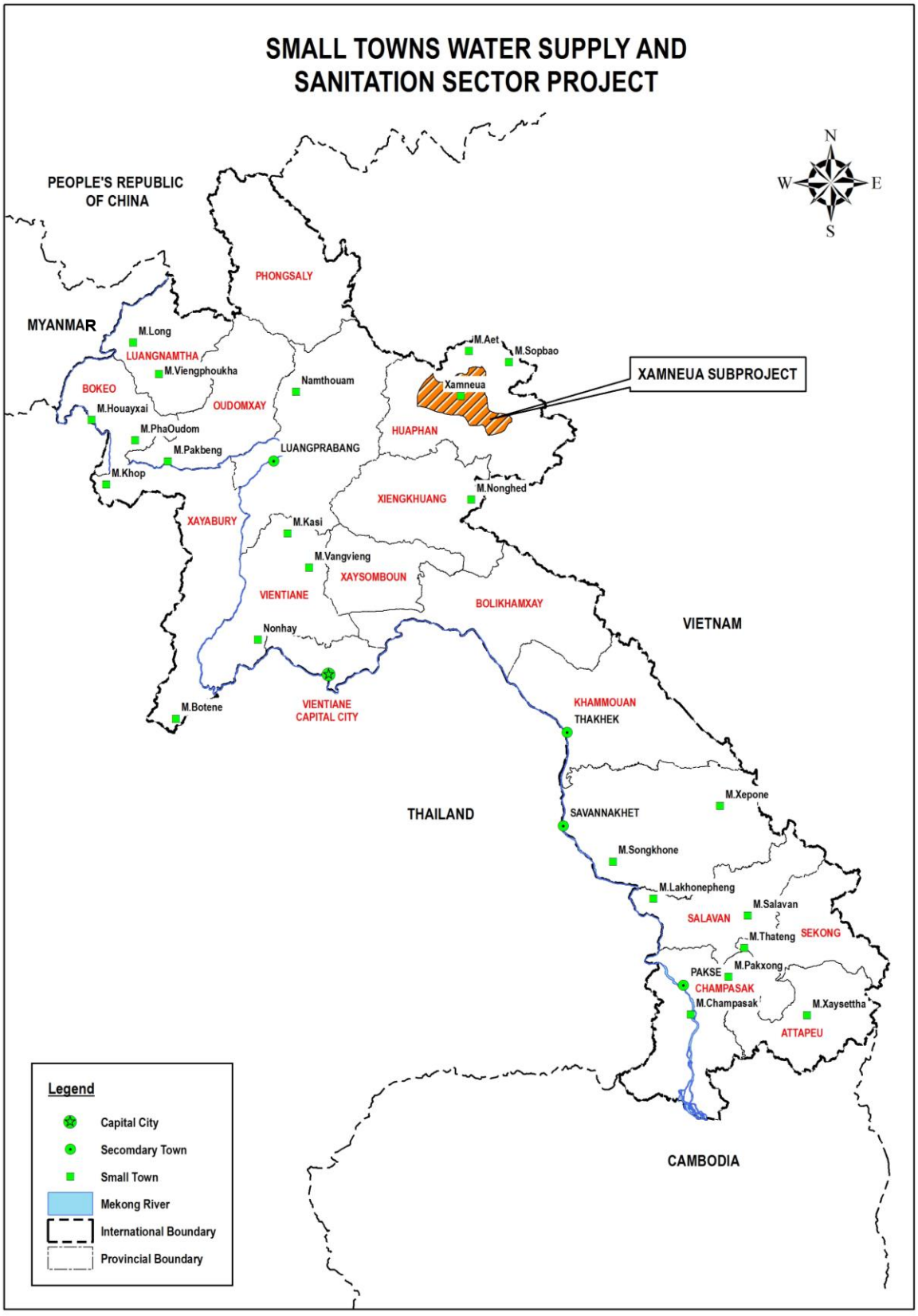
5. Using Grant savings realized under STWSP, it was agreed by ADB and the government to provide a contract variation to the incumbent project implementation assistance consultant (PIA) to conduct feasibility studies and carry out detailed engineering designs for a further two subprojects, which would be designed such that they would form sample subprojects to be covered under Additional Financing to the current project. All stakeholders have expressed a wish for the design and approach of the Additional Financing to be generally consistent to the current project, but taking into account the revisions to the Project Administration Manual (PAM) as well as incorporating any lessons learned with a view to making the approach more effective and innovative. Sopbao subproject will be designed and implemented in parallel with the subproject

[1] Provincial Water Supply State Enterprises managing the water supply system in each Province.
[2] Eighth Round Table Meeting, "The National Poverty Eradication Program (NPEP): A Comprehensive Approach to Growth and Development", September 2003.

initiatives in the provincial capital of Xamneua; this follows the approach developed under the current project.

6. This IEE for the Xamneua Town, Houaphan presents an assessment of the environmental impacts and the detailed Environmental Management Plan (EMP) for the subproject. The preparation of this IEE is guided by the Environmental Assessment and Review Framework (EARF) of the WSSP, ADB Safeguard Policy Statement (SPS, 2009), ADB Operational Manual Section F1/BP (2013), Public Communications Policy (ADB PCP, 2011), IFC-World Bank Environment, Health and Safety (EHS) Guidelines, the government's PDR's Environmental Protection Law (2009), and other Government environmental laws, policies, rules and regulations applicable for water supply projects. The Rapid Environmental Assessment (REA) checklist is presented in Appendix A.

Figure 1: Location of WSSP Towns



1.2 Description of Xamneua Subproject

7. **Water Supply**. The Xamneua subproject aims to provide safe, affordable, reliable, piped water supply with individual household connections to over 95% of the population in the twelve (12) core villages of the town.

8. The three principal water courses in the general area of Xamneua, Houay Dam (existing source), Houay Hin Men (existing source) and the Nam Xam river (proposed) were considered as the most secure raw water sources for supplying the provincial capital over the long-term. The existing sources (Houay Dam and Houay Hin Men) were considered to have an estimated sustainable yield of 2,500m3/day, which would allow an environmental base flow to continue in the houays (small streams) all year round. The current water supply demand from the houays is 2,900 m^3/day to 3,300m^3/day, a level which is constrained by flows in the houays during dry periods. By the year 2041, the demand from the capital is expected to be around 11,300m^3/day, which is an additional 8,800m^3/day, which necessitates a further supplementary source, the Nam Xam. Discharge estimates at the Ban Ngew weir upstream of the proposed intake on the Nam Xam are between 90,000m^3/day and 170,000m^3/day seasonally dependent, which makes the Nam Xam a secure source to meet current and future requirements.

9. Taking the additional raw water requirement from the Nam Xam necessitates a new intake on the river, together with a new conventional rapid sand treatment facility in the PNP compound area of the existing treatment plant. For the new source, the Nam Xam, a new raw water intake will be constructed on the left bank of the Nam Xam around 1.0km upstream from the northernmost fringes of the urban area, from which the raw water will be pumped along a DN300 transmission main to the new conventional rapid sand filtration facility.

10. Since its construction the Houay Hin Men weir has experienced regular overtopping (as its design intended) but the stream bed below the weir has degraded as a consequence of the overtopping, reducing the integrity of the structure and reducing its capacity to store water. To not address this issue could result in failure. The proposed rehabilitation works at Houay Hin Men intake will include the construction of a new diversion weir immediately downstream of the existing weir, and incorporating wing walls and a grout curtain to prevent seepage and erosion The existing raw water main down to the water treatment facility will be retained. No rehabilitation works are required on the Houay Hin Dam or the connecting raw water main.

11. The distribution network will be supplied by gravity to twelve core villages (which make up the township of Xamneua) from the existing on-ground and new on-ground storage reservoirs at the water treatment plant site. The existing pipelines will be supplemented with new and larger mains, which will also be designed to accommodate future population growth of the villages to the year 2041.

12. To supply treated water to the 12th core village, Ban Phon Kham, will require the replacement of the existing elevated storage with a new 200m^3 concrete elevated tank, which will require the addition of a further pump at the existing booster pumping station. In the eastern part of Ban Phon Kham, due to the low pressures there, the distribution pipe network will be disconnected from the existing main and connected to the new elevated tank.

13. A service coverage of 95% is sought immediately after commissioning. This will involve the installation of 800 additional connections.

14. **Drainage**. Investment in drainage in Xamneua will focus on the area of densely residential area which has highest priority for environmental improvement according to local stakeholders. The subproject will upgrade the existing unlined drain to open/cover stone lined drains. The

proposed works include (i) new 140m of covered stone-lined roadside drains in Ban Phoxay, (ii) new 500m (both sides) of open stone-lined roadside drains in Ban Misouk, (iii) new 130m of covered stone-lined roadside drains in Ban Naliew, (iv) new 60m of covered stone-lined secondary drain in Ban Phanxay, (v) culverts will be constructed for the drains associated including wingwalls/chambers where required, and (vi) accesses to property will be constructed over the open stone-lined drains.

15. Further components of the subproject are: (i) training of Xamneua PNP staff on operation and maintenance, and (ii) support to communities through the Village Development Committees (VDCs) for a range of activities to be agreed with the VDC. These activities will include: (i) village environmental improvements (VEIs), consisting of household and community level sanitation and drainage facilities, (ii) stakeholder consultation and public participation to raise awareness and provide organizational support required to implement the VEIs, and (iii) public sanitation facilities.

16. The sanitation component of the sub-project would consist of the construction of eleven (11) units of two-room public toilets at the Village Meeting Halls of Nathang, Misouk, Naliew, Navieng, Nanuangboa, Nathongchang, Thadmuang, Phoxay, Nasakang and Phonkham. A toilet will also be provided to the Nanuangboa Primary School.

1.3 Environmental Policy, Legal and Administrative Framework

The law governing the protection of the environment, including the assessment and management of projects in Lao PDR is the Environmental Protection Law (EPL), which was issued in 1999 and amended in 2013. The Ministerial Instructions on ESIAs of Investment Projects and Activities (No. 8030 – December 2013) outline the updated format and procedural requirements of this process. Section 2.2 of this instruction states projects of Category 1, or small-scale projects, an IEE is required and for Category 2 or large-scale projects, an EIA report is prepared. Under the schedule in the EIA Decree, water supply facilities (Item 3.52) fall under Category 1 so an IEE is required by GoL. Ministerial Instruction on the Process of Initial Environment Examination of Investment Projects and Activities, No. 8029/MONRE 2013 outlines how to conduct an IEE and the process for approval.

1.4 Description of the Environment

1.4.1 Physical Resources

17. Xamneua is the main town and seat of the provincial government in Houaphan Province (17,505 Km^2). The majority of the town's villages have urban characteristics and population densities. Twelve (12) villages that comprise the township of Xamneua is the service area of the proposed water supply system. The town proper is currently subject to considerable construction activity, land development and urban expansion. The district capital Xamneua is also located within the town, which is about 600 km north east of Vientiane.

18. Xamneua towns core lies within the Nam Xam river valley, which is relatively narrow and bounded on both flanks by mountain ranges which rise up to above 1000 masl. Natural forests dominate the hilly landscape of Xamneua although a substantial area is secondary forest as a result of over-logging and ongoing shifting cultivation practices.

19. The Nam Et - Nam Xam Protection Forest Area's (1309 Ha) closest boundary is about 2 km to the west the Xamneua, and the Nam Xam National Protected Area is approximately 7.5 km to the east and south-east of the town center (in direct lines). The sub-project area and the main components are located on hilly areas to the west of the center of town at the existing WTP site, and the intake on the Nam Xam located to the north east outside urban confines.

1.4.2 **Water Resources**

The Nam Xam is the largest tributary of the Nam Ma, an international river, whose part of the watersheds boundary skirts Houa peak at 2,062 masl near Xamneua town. The river is 325 km long (165 km in the Lao PDR and 160km in Viet Nam) and travels through Houaphan Province in a southeast direction before reentering Viet Nam. The total catchment area of the Nam Xam is 7,580 km2, with 60% (4570km2) of it within the Lao PDR. Total discharge in the vicinity if the proposed intake is between 90,000m3/day and 170,000m3/day.

20. Houay Hin Dam is a right bank tributary of the Nam Xam whose catchment area lays west of Xamneua town. Houay[3] Hin Men is a left bank tributary of the Houay Hin Dam, whose confluences join immediately to the west of town. The upper catchments of both houays contain densely vegetated natural forest which has served for water protection keeping turbidity levels low since they were commissioned to supply town water in 1997 and 2007 respectively.

1.4.3 **Geology and Natural Hazards**

21. The geological structure of the Lao PDR is known only in broad outline. Houaphan province is dominated by the Truongson belt, one of four which dissects the Lao PDR, and contains some of the country's oldest geological formations, dating back to the Neoproterozic period (1000-545Ma). The Nam Ma valley bordering Viet Nam, including Xamneua area, have Cambrian aged rocks comprised of metamorphized limestone, shales, sandstones and conglomerates that are marine in origin and are widely distributed.[4] The surface layers of the subproject area are dominated mostly by red clays.

22. The area is hilly to mountainous. Small to moderate earthquakes have occurred within the Lao PDR over recorded history, however Houaphan Province is considered to have low vulnerability to damaging earthquakes but can experience quakes up to *Mercalli* Scale VI in intensity.

23. The Lao PDR is prone to flooding, mainly associated with the presence of large river basins coupled with the prevalence of strong monsoon influences. There are two causes of heavy rains in the Lao PDR: the enhanced southwest monsoon caused by typhoons close to the Philippines and Viet Nam and the lasting southwest monsoon accompanied by the stagnation of tropical storms in neighboring Viet Nam. There are steep hills in the subproject areas surrounds which are prone to landslides during heavy rain events, particularly those cleared of vegetation and disturbed by construction activities, such as road cuttings.

1.4.4 **Ecological Resources**

24. Riparian lands along the banks of the Nam Xam have long since been converted into urban development within the subproject area and the river dominates as the central feature of the town. Small houays and undeveloped flood plain pockets of the Nam Xam have retained paddy fields within the towns precinct, but these are progressively being reclaimed for urban expansion. Degraded forests dominate the hilly to mountainous landscape behind Xamneua with a history of slash and burn (shifting cultivation) technique and logging practices.

25. It has been reported that several Fish Conservation Zones (FCZ) exist on the Nam Xam starting about 1 km upstream of the intake. These FCZ are usually village-controlled entities that apply regulations to limit fishing activities, such as the types of fishing techniques, or even complete prohibition. The sites are located upstream and will therefore not be impacted by intake

[3] Houay translated to English means 'stream'.
[4] http://www.explo-Lao PDR.com/Geologie/General_geology.html

drawdown and the intake pipes will have bell ends to reduce velocity andwill be fitted with fish screens. Also, given that no weir will be used at the intake fish passage will remain unimpeded. Potential impacts on FCZs will be further investigated further through public consultations and update of the IEE and EMP carried out during detailed engineering design.

26. The Nam Et Nam Xam Protection Forest Area (PFA) boundary is approximately 2km from the water treatment plant site. This PFA protects upper Nam Xam catchment water resources and is therefore expected to benefit the subproject. The Nam Xam PFA boundary is 8km from the WTP and protects water resources of the lower Nam Xam below Xamneua town.

1.4.5 **Historical and Archaeological Sites**

27. There are no sites that are considered as historically or archaeologically significant within the sites of the project components.

1.4.6 **Unexploded Ordnance**

28. Nearby Xiangkhouang Province was significantly more targeted by US-led bombing campaigns compared to Houaphan. However, Xamneua did suffer from bombardment during the Indochina War, and a focus was the Nam Xam river corridor which connects to Viet Nam. This area is located well south of Xamneua town.

29. The proposed water treatment plant and main holding tank already exist (refurbishing only required) as it's access roads. The domestic supply distribution network and drainage works will be located within urban areas along road/footpath right of ways. All these sites present a low UXO risk.

30. There is a potential for the intake works area on the Nam Xam and the Houay Hin Men to contain UXO as these sites are located on the outskirts of town and may have been contaminated by mobilized UXO from the surrounding catchment area. The intake on the Houay Hin Men, which will be refurbished, will require the upgrade of an existing track to access the site, although unlikely, this area may contain UXOs.

1.4.7 **Socio-Economic Condition**

Xamneua town is the center of Xamneua district and serves as the provincial capital. It lies in the northern Houaphan province, which is the second-least urbanized province in the country having the slowest population growth in the country at 0.3% annually (2005-2015 inter-censal period), compared with the national rate of 1.45%. Xamneua lies on National Highway No. 6, which connects with the international border with Viet Nam (about 70km) at Na Meow; it is about 594 km north-east of Vientiane. Xamneua town has twelve core villages: Ban Misouk, Ban Nathong, Ban Xamneua, Ban Naliew, Ban Navieng, Ban Nanongbua, Ban Nathongchong, Ban Phanxay, Ban Thatmuang, Ban Phoxay, Ban Nasakang, and Ban Phonkham.

The main occupation of the population in Xamneua town is government service, especially amongst the males; the provincial and district governments provide employment to some 24.5% of the female heads and over 40% of the male heads. Farming is the second largest occupation, employing around 19.8% of the male HHs and 28.2% of the female HHs. The average monthly income per HH is 5.67 million Kip, while the average monthly income per person is 1.21 million Kip; the median monthly income per person is 1.0 million Kip. The Lao/Tai Daeng/Tai Dam groups have the highest median incomes in the range 0.92 to 1.17 million Kip/month, with the Khmu and Hmong groups much lower in the range 0.29 to 0.45 million Kip/month.

1.5 Environmental Impacts

1.5.1 Benefits of the Subproject

31. For people living in Xamneua the principal benefits deriving from the rehabilitation and expansion of the existing piped water supply system will be (i) a secure and continuous supply of safe, clean water; (ii) good water pressure to serve two-story premises; (iii) adequate quantities of safe and clean water to meet all their needs; and (iv) high level of convenience. The water supply will also enable commercial establishments and light industry to sustain their business models and grow the economy, which in turn will provide employment.

1.5.2 Adverse Environmental Impacts

32. In general, the benefits of the subproject outweigh the anticipated minor negative environmental impacts. Most of the adverse environmental impacts are expected to occur during the construction phase and can be mitigated through implementation of appropriate mitigating measures. The following paragraphs describe the expected adverse impacts that have to be considered during subproject design and implementation.

1.5.3 Environmental Impacts Related to Location

33. **Impact on land acquisition and community assets.** There will be no land acquisition required for any of the infrastructure development proposed. The new intake is located on government-owned land, as is the expansion of the WTP. All pipelines will be laid in public rights of way (footpaths/roads). There will be temporary disruption to some communities during pipelaying. A Land Acquisition and Compensation Plan (LACP) for the subproject has been prepared separately to ensure that any loss of land or damage to property is properly addressed.

34. **Impact of WTP and reservoir location.** The proposed new 8,800 m^3/d WTP, upgrade of the existing WTP to 2,500m^3/d, and new reservoir tank of 2,000m^3 will be subject to an upgrade within their existing sites, so impacts are expected to be minimal and confined to the construction period. The upgrades may require some slope protection, which will be addressed in the engineering design.

35. **Impact of location of raw water intake on other water users.** In terms of the overall strategy for Xamneua, it was decided to maintain the existing raw water supply, Houay Hin Men, as it produces a relatively good quality water in the range of 2,900 m3/day to about 3,300 m3/day (based on plant records). However, since the future demand for the town is about 11,300 m3/day, then a supplementary source would be needed, and the only candidate able to supply that volume of water is the Nam Xam. Having two raw water supplies for the town provides a good security in terms of supply and provides flexibility in operation.

36. The existing irrigation diversion weir at Houay Hin Men is in poor condition, and the river water has scoured underneath and around the structure, and it is now full of sediment and gravel. A new diversion weir will be constructed immediately downstream, which will incorporate wing walls and a grout curtain to prevent any erosion. It will be designed such that part of it will have an overflow section to enable surplus water to pass down the river. There will be no adverse impact on other water users, as under the proposed subproject the abstraction will be limited to 2,500m^3/day, much lower than the current 2,900-3,300m^3/day.

37. The proposed tower intake on the Nam Xam will be located at the base of the river bank in the river. It will be designed such that the top of the tower and footbridge will be set at a level one metre above the highest water level recalled by locals and local officials; this will provide a considerable degree of safety as the water in the top one metre of the river in a flood would

represent a considerable return period. The inlet is set below the lowest water level ever recalled by locals and local officials.

38. The proposed upgrade will draw raw water from the Nam Xam river at a maximum rate of 8,800 m^3/d, at a point to the northeast of Xamneua town. Upstream from the proposed intake is the Ban Ngew Irrigation Weir designed to service 62 Ha of irrigable land in two stages, but is currently only supplying water to parts of Stage 1 of 37 Ha. Since commissioning in 1994, only 10 to 15% of the Stage 1 irrigation area is being utilized. While water remains available for the remaining areas, factors which have influenced the low uptake include off-farm employment, financial constraints to develop land, villager technical capacity and market forces. The flow in the river was measured by means of measuring the head over the upstream irrigation diversion weir, and the flow is calculated at 90,000m^3/day in the dry season and 170,000m^3/day in the wet season. The abstraction rate of 8,800m3/day at the intake represents only 10% of the dry season flow and therefore represents no threat to the ecosystem of other water users. Consultations with provincial officials revealed there are no medium to large scale water users upstream of the town. In addition, under the Water Supply Law of 2009 precedence is given to providing water for domestic supply over all other uses. During extended dry periods and low river flow, water demand to the town will be a priority over irrigation.

39. **Impact on natural resources and protected areas.** The Nam Xam National Biodiversity Conservation Area boundary is approximately 7km south east of the subproject area and will not be impacted by subproject activities. The Nam Xam has a flow of 90,000-170,000m^3/day; the abstraction of 8,800m^3/day for water supply will have no impact on the NPA. It is also noted that the flow in the Nam Xam river is also supplemented by numerous feeder streams between the intake and the NBCA boundary. As a precaution, fish screens will be fitted to the intake pipes, which will have a bell end to minimize velocity.

40. The Nam Xam and Nam Et Protection Forest Areas (PFAs) encapsulates upper tributaries of the Nam Xam watershed and are expected to be beneficial to the subproject as water source protection areas.

41. **Impact on historical and archaeological sites.** The proposed development will have no impact on any historical and archaeological sites.

1.5.4 Unexploded Ordnance

42. A clearance certificate has been obtained from the provincial state enterprise for UXO survey and clearance to confirm all construction areas are free of any UXO; the certificate is appended to this document.

1.5.5 Environmental Impacts During Construction

43. Most of the anticipated impacts are related to nuisances which may occur during the construction of the subproject components such as temporary disruption of access and community facilities, noise, and release of dust and pollutant and greenhouse gas emissions. The EMP, which is summarized in Chapter 10, includes mitigating measures and will be included as part of the bidding and contract documents. The effective implementation of the EMP will reduce these risks to an acceptable level.

44. **Temporary disruption of community roads, pathways, and access to properties.** During trench excavation and pipe laying works, temporary disruption of access to residential and commercial establishments, schools, and community facilities will occur. To mitigate this, temporary accesses to houses and other establishments will be built using sturdy materials. The

contractor will restore any damaged sections to properties. The contractor will be required to provide warning signs and barriers/fence at work sites.

45. Temporary closure or blockage of roads will occur during the excavation and pipe laying activities at pipe and road intersections. Information boards will be posted to provide information to the community about the temporary closure of roads, the schedule of works, and the traffic-rerouting plan. During night time, the excavated area should be covered with plates and provided with adequate lighting to warn villagers about the open excavation. Following completion of pipe laying, good quality permanent access will be restored by the contractor on any damaged road and path sections.

46. **Air pollution.** The main sources of air pollution are operation of machines, excavation works, and materials and equipment transportation. An increase in dust concentration near construction areas is expected within about 50m around the subproject sites. Winds may carry soil particles to nearby areas, if no preventative measures are applied. The contractor will be required to implement measures to control air emissions and dust from the affected sensitive receptors like residential areas, schools, clinics and offices.

47. **Noise.** The operation of equipment such as jackhammer for the installation of water supply distribution network may cause noise nuisance to nearby residential houses and commercial buildings. There may also be a need to utilize diesel generators during the construction period. Noise levels may reach 88dBA at a distance of about 15m away from the source or operation of construction equipment. Along roads used for material transport, the average noise level will also rise because of increased truck traffic. To avoid noise nuisance, construction operations will only take place during daytime hours from 0700H to 1800H.

48. **Impact of borrow materials.** The construction activities will require aggregates like sand and gravel. Quarrying of these materials directly from the Nam Xam River will be prohibited to avoid causing impacts on the ecological condition of the waterway. The contractor will be required to secure these materials only from Government-permitted sources or suppliers.

49. **Clearing of vegetation.** Vegetation cover at the proposed intake and access roads will have to be removed during construction. Impact of vegetation clearing will be minimal because the current vegetation cover at these sites only consists of bushes, shrubs and bamboo.

50. The existing WTP upgrade and the expansion are located in the PNP-owned compound area, which is covered with primary colonizer scrub. As per the LACP, these may need to be removed for the installation of the pipelines and related works. Should there be any affected trees in private land, compensation will be provided in cash in accordance with the Updated LACP.

51. **Sediment runoff.** When construction activities (particularly earthworks) are undertaken during the rainy season, sediments may erode and cause the runoff of silt into drains and waterways. To minimize the impacts of soil runoff, the contractor will be required to implement proper measures, such as the provision of silt traps, ditches, and sump pits to block the flow of silt into irrigation canals and the river. In addition, earthworks will be scheduled during the dry season to the extent practicable to avoid silt runoff.

52. **Domestic wastewater from worker's camp.** If domestic wastewater is disposed untreated, the wastewater could lead to the contamination of surface and groundwater and lead to the spread of water-borne diseases. Therefore, appropriate wastewater management measures should be implemented during the construction phase to prevent sanitation problems through the provision of adequate water supply and latrines at the worker's camp.

53. **Residual chlorine during pipeline and reservoir disinfection.** Chlorinated water is retained in the completed pipe works and reservoirs for a designated period to develop sanitary conditions. The standards require 25–50 g/m^3 chlorine residual held for a period of time, normally 12–24 hours. Extra caution is needed in disposing of water with excessive chlorine residual since this is toxic to fish and other aquatic life. When the chlorine concentration of the water in the pipelines and reservoirs has been reduced to less than 2 mg/l, it will be discharged into the nearest water body. The allowable limit for Chlorine (free residual) as per the Ministry of Public Health Drinking Water Quality Standards of 2014 is 0.1-2.0 mg/l. (Appendix B).

54. **Generation of construction wastes.** The construction of the proposed intake and access road will require earthworks and some leveling of the area. The excavation for the pipe laying will also generate material. The excavated material will be utilized to backfill the trench once the pipes have been laid out. Excavated material from the foundation of the intake and roads will be utilized to backfill other work sites where required.

55. Domestic solid waste at the construction camps is not anticipated to be of a significant volume because only small temporary camps will be provided at the sites of the WTP and reservoir, and for the intake and distribution pipes. However, proper waste disposal methods should be employed to avoid pollution of land and adjacent water resources. Solid waste will be collected and properly disposed in the local disposal site of the District.

56. Hazardous wastes such as paint containers and solvents and spent batteries are generated by construction activities, but in specific sites such as the intake, WTP and reservoir, no such waste is projected to be generated. Although the quantities are anticipated to be minimal, this type of waste is detrimental to the environment and public health and as such will be segregated from the general solid waste, collected and disposed for appropriate treatment.

57. The works to be rehabilitated will include the existing diversion weir on the Houay Hin Men and the existing sedimentation tank within the compound of the existing water treatment plant. In addition, the concrete tanks of the slow sand filters will replaced with rapid sand filters and new clearwater tanks. Other than concrete wastes (gravel-sized) emanating from the demolition of these rehabilitation works, there will be no other type of existing material or equipment to be disposed of under the subproject. All waste will be disposed at registered dumpsites/facilities.

58. **Occupational health and safety.** The contractor through a site safety plan will address hazards during civil works. The contractor will be required to appoint a safety supervisor who will ensure that safety measures during civil works are implemented. These safety measures include the use of personnel protective clothing and equipment (PPE), installation of the requisite hazard warning signs, and excavation covers and barriers. Arrangements for prompt medical attention in the event of accidents will also be made.

59. The contractor will be required to: (i) undertake priority hiring of qualified construction workers from the villages, (ii) consult with local people to avoid conflict if migrant workers will be brought to the site, (iii) install suitable toilets such as pit latrines and grey water drainage facilities such as soakage pits, (iv) arrange for the proper disposal of solid wastes, (v) brief workers and the villagers on the dangers of communicable diseases, and (vi) assign a senior member of his staff to be responsible for the workers and local peoples' welfare.

60. In addition, during the disinfection of water distribution lines, only staff who have had experience and proper training and are aware of the potential health hazards associated with chlorinating agents will be involved in such activity.

1.5.6 Environmental Impacts During Operation

61. **Incremental wastewater generation and increased burden on drainage systems.** Households receiving new water supply connections are likely to use more water for cooking and washing. The current condition and lack of well-designed drainage system in the villages will result in small quantities of grey water or sullage forming ponds of dirty water which may provide habitats for mosquitoes and pose health hazard to the communities. This impact will be primarily addressed through the drainage improvement and public awareness raising initiatives under the Village Environmental Improvements (VEIs). As a project policy, households will have a free water connection if the household has an approved sanitation facility to cope with the increased wastewater generated.

62. **Deterioration of water quality.** The quality of the Nam Xam raw water could deteriorate if there are substantial human activities in the upstream catchment area that are of sufficient magnitude to cause contamination of the river water. However, given the large size of the river and the treatment process proposed, including disinfection, any such contamination is extremely low risk. The quality of the Houay Hin Dam and Houay Hin Men is unlikely to be affected, as the catchment comprises steep sides that are well forested and is a protected water source catchment administered by PNP and DONRE. Nevertheless, the Project Implementation Unit (PIU) and PNP will continuously coordinate with the villages and Xamneua these authorities regarding community activities in the upstream catchment area. Laboratory testing equipment and training will also be provided to allow the PNP to conduct regular monitoring of raw and treated water quality parameters. The operational and maintenance manual will incorporate guidelines for environmental management in line with EHS Guidelines for Water and Sanitation.

63. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards. The operations and maintenance manuals will cover operational environmental mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation.

64. **High pressure and leaks on the pipeline.** Some of the network is located on low elevation, potentially exposed to high water pressure and leaks. This risk is minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) designing and operating pressure zones within the network (20-40m), (iii) careful construction supervision by the PIA to ensure that pipe laying and jointing is done with the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.

65. **Generation of backwash water and sediments at the WTP.** During the operation of the WTP, back wash water and sludge removed from the sedimentation tanks contains sediments and other pollutants that have been removed from the raw water during treatment. Discharging the sediment directly into land or river may result in deterioration of the condition of the receiving environment. As mitigation to eliminate this adverse impact, detention ponds have been included in the design of the WTP.

66. **Occupational health and safety.** Water treatment will involve the use of coagulants/flocculants and chlorine that will expose WTP personnel to hazards during chemical handling. Risks associated with these chemicals will be minimized by: (i) providing secure, dry and appropriately ventilated storage facilities for hazardous chemicals, (ii) use of chemicals in powder, rather than in gaseous form, which is safer to store and handle, (iii) posting of the Materials Safety and Data Sheets (MSDS) of these chemicals in the chemical storage area and chemical mixing tank area for information of workers, and (iv) training of staff and designation of responsible person on the handling of these chemicals.

67. **Generation of sludge from detention ponds**. The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low lying areas to be identified by the village leaders.

68. **Community health and safety.** The facilities that will be constructed will be properly fenced off and secured to restrict access and intrusion of unauthorized personnel. Watchmen/security personnel will be hired to secure the facilities on a 24-hour basis. This would eliminate the safety risks to the community and the school children near the proposed WTP and reservoir.

1.6 Information Disclosure, Consultation, and Participation

69. Public/Stakeholder consultations were held in October 2017 with the PNP Xamneua, the Project Implementation Unit (PIU), the 12 subproject villagers, local government officers and staff. The consultations were conducted to discuss with the stakeholders the proposed subproject and also to elicit the environmental concerns/issues of the community. Appendix C provides the details of these consultations.

70. In general, consultees were of the view that the subproject would result in more benefits than negative impacts. The people are willing to connect to the water supply subproject because of the improvement in their living conditions. It was requested that the PIU and contractors consult with people affected before construction commences.

71. Discussions were also undertaken with the Provincial Natural Resources and Environment Department (DONRE) of Xamneua to present the proposed subproject and validate the environmental requirements for the proposed project.

72. During subproject implementation, communities within the subproject impact areas should be appropriately and in a timely manner, informed of the construction activities particularly those which are likely to cause noise and dust nuisance, disruption to roads and pathways.

1.7 Grievance Redress Mechanism

73. A Grievance Redress Mechanism (GRM) was developed in compliance with the National regulations of the government and with ADB Safeguards Policy Statement (2009). The GRM will provide the means to resolve grievance and complaints in a timely and satisfactory manner.

74. Essential features of the GRM are: (i) resolution takes place as quickly as possible, (ii) all affected persons will be made fully aware of their rights, (iii) all persons with concerns about the environment are also entitled to lodge their complaints and seek redress, (iv) the community will be informed about the detailed grievance redress procedures through public information campaigns, (v) complaints can be made verbally or in written form, (vi) complainants will not incur administrative fees or costs of legal representation, (vii) the GRM uses existing village arbitration units, namely, the village chief and/or deputy chief, village elders and village representatives of the Lao Women's Union, Lao Front for National Construction, and the police, (viii) the arbitration unit is responsible for settling disputes between villagers through conciliation and negotiation and will be supported at district level, (ix) all complaints and resolutions will be properly documented and will be available for public review and monitoring and will be incorporated into safeguard monitoring reports.

75. The details of the PIU, GRM Focal Contact Persons and Construction Manager will be prominently displayed in the respective construction areas for the reference of the affected communities/persons. Complaints and grievances can be directly filed, both written and verbal,

to the concerned entities. This will provide alternative entry points to the village complaint system. The procedures for the GRM are outlined in Section 9 of this IEE.

1.8 Environmental Management Plan (EMP)

76. An EMP has been prepared, outlining the institutional responsibilities and management arrangements to ensure effective implementation and monitoring of mitigation measures. Throughout the construction period, the contractor will submit monthly environmental compliance progress reports to the PNP with a copy furnished to the PIU. The contractor should be able to highlight the summary of the progress of construction, activities undertaken to implement the measures outlined in the environmental management plan, record any community complaints received and how the complaint was eventually resolved.

77. The PIU will consolidate the results of the monthly environmental monitoring through a quarterly progress report that will be submitted to the Project Coordination Unit (PCU) which is based at the Department of Water Supply and Sanitation of the MPWT. The quarterly report will (i) summarize the significant findings and measures undertaken to address identified adverse environmental impacts during the works, (ii) discuss any unanticipated environmental impacts encountered during the subject monitoring period and (iii) recommend remedial actions to address these unanticipated environmental impacts. Copies of the quarterly progress report prepared by the PIU will be given to the members of the Provincial Project Steering Committee and the District Governor. PCU will consolidate information from quarterly progress reports, compile and submit integrated safeguards monitoring report semi-annually to ADB. Appendix D presents the Template for the Project Environmental Safeguards Monitoring Report.

78. The implementation of the EMP during the operational phase of the subproject will be undertaken by the PNP, with verification by the PCU who will report to ADB the project's adherence to the EMP, information on subproject implementation, and environmental compliance through semi-annual integrated safeguards monitoring reports. (Appendix D). The monitoring parameter during the operational phase, as outlined in the EMP, includes monitoring of water quality at the inlet of the WTP and of the treated water.

79. **Conclusion and Recommendation.** This IEE for the Xamneua town subproject was undertaken to determine the environmental issues and concerns on all the proposed works for the subproject. This assessment confirms that the subproject is classified as Category B for environment based on ADB Safeguards Policy Statement (SPS, 2009). In addition, an Environmental Compliance Certificate has been provided by the DONRE with regard to the IEE and EMP, and is appended to this document.

80. In general, the subproject will result in beneficial impacts on health and well-being of the people because of improved accessibility to potable and reliable water supply. There are also health benefits in the form of reduced incidences of water-related diseases as a result of hygiene awareness activities and improved access to safe water for the community.

81. Most of the adverse environmental impacts are expected to occur during the construction phase of the implementation of the subproject. However, these environmental impacts are not projected to cause irreversible and significant adverse environmental impacts and can be readily managed by the establishment of appropriate and conventional mitigation measures. Based on the assessment of environmental impacts, the anticipated impacts during project implementation are related to nuisances which may occur during the construction of the subproject components such as temporary disruption of access, and community facilities, noise, sediment runoff, generation of excavated/surplus material and release of dust and engine gas emission. The EMP will be in the bid and contract requirements of the contractor. Effective implementation of the

EMP and monitoring and inspection of construction work sites and during operation will reduce potential environmental risks to an acceptable level.

82. The EMP also presents the institutional responsibilities for implementing the mitigation and monitoring measures during construction and operation. The IEE concludes that the subproject combined with available information on affected environment is sufficient to identify the scope of environmental impacts of the subproject. In the event there are significant changes to the scope and location of the subproject components during detailed design, then the IEE will be updated. If there are no significant changes, then only the EMP will be updated prior to construction.

83. An environmental monitoring plan has been provided to ensure water quality is maintained according to the prevailing the Lao PDR standards. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards. The operations and maintenance manuals will include mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation to address key environment, health and safety risks during operation.

2 INTRODUCTION

84. The original scope of the Small Towns Water Supply and Sanitation Sector Project (STWSP) is now essentially complete, with the thirteenth (13th) subproject currently under implementation and due for completion by June 2018. The STWSP design was essentially built on previous work in the sector by the Asian Development Bank (ADB) and the Government of the Lao PDR, with a strong policy dialogue and sector reform approach closely linked to the capital investment activities. It included the development and rehabilitation of piped water supply systems and complementary drainage and environmental sanitation works. The thirteen towns are located in eight provinces throughout the country. They include nine towns for new water supply systems and four towns with existing water supply systems that required rehabilitation to improve service levels. All nominated districts were among the 47 districts classed as priority poor and one town was among the 72 districts classed as poor by the government.[5]

85. In 2013, a further project was approved by ADB and the government, the Water Supply and Sanitation Sector Project (the current project), which continued the approach developed under STWSP, but shifted the focus a little with a stronger emphasis on the rehabilitation of provincial capitals. The impact is expanded access to quality and reliable piped water supply and sanitation services for the urban population in the Lao PDR. The outcome is improved performance of participating PNPs in delivering sustainable water supply and sanitation services for urban residents in about eleven (11) of the Lao PDR's provincial and district towns. It aims to (a) strengthen PNP capacity in corporate planning, business and financial management and operation and maintenance; (b) rehabilitate and/or expand piped water supply systems; and (iii) improve environmental sanitation in priority towns. It also aims to continue to improve the financial sustainability of PNPs through support for financial management sector reform.

86. Using Grant savings realized under STWSP, it was agreed by ADB and the government to provide a contract variation to the incumbent project implementation assistance consultant (PIA) to conduct feasibility studies and carry out detailed engineering designs for a further two (2) subprojects, which would be designed such that they would form sample subprojects to be covered under Additional Financing to the current project. All stakeholders have expressed a wish for the design and approach of the Additional Financing to be generally consistent to the current project, but taking into account the proposed revisions to the Project Administration Memorandum (PAM), as well as incorporating any lessons learned with a view to making the approach more effective and innovative. Xamneua Town subproject will be designed and implemented in parallel with the subproject initiatives in the provincial capital of Sopbao; this follows the approach developed under the current project.

87. Xamneua Town has been selected as one of the two subprojects under the WSSP, the other being Sopbao District. An initial environmental examination (IEE) of the Xamneua Town subproject was undertaken in compliance with the ADB Safeguards Policy Statement (SPS, 2009) and the EIA Decree of April 2010.

3 METHODOLOGY

88. Although this Initial Environmental Examination (IEE) is funded under STWSP, as it is prepared for Additional Financing to WSSP, it is prepared according to the Environmental Assessment and Review Framework (EARF) of the WSSP, ADB Safeguard Policy Statement

[5] Eighth Round Table Meeting, "The National Poverty Eradication Program (NPEP): A Comprehensive Approach to Growth and Development", September 2003.

(SPS, 2009), ADB Operations Manual Section F1/P, Public Communications Policy (ADB PCP, 2011), International Finance Corporation - World Bank Environment, Health and Safety (EHS) Guidelines, and the government's Environmental Protection Law (2009), and other environmental laws, policies, rules and regulations applicable for water supply projects. The potential impacts have been analyzed and mitigation measures identified following site visits to the locations of the subproject component facilities and service area in July 2017. The visits included an assessment of the proposed sites, discussions with Provincial and District officials and village representatives.

3.1 Project Category

89. The requisite screening was carried out during the preparation phase of the feasibility study using the ADB Rapid Environmental Assessment (REA) checklist and, accordingly, the subproject is classified as Environment Category B requiring the preparation of IEE and EMP, only. The potential adverse environmental impacts are site-specific, reversible, and can be readily mitigated via an environmental management plan (EMP). An Environmental Compliance Certificate has been provided by the DONRE with regard to the IEE and EMP, and it is appended to this document.

4 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

4.1 Environmental Safeguards Policies, ADB

90. The environment safeguards requirements of ADB are presented in the following guidelines:

- Safeguard Policy Statement (2009);
- Operations Manual Section F1/P[6]; and
- Public Communications Policy (2011).

91. The Safeguards Policy Statement (SPS, 2009) of ADB governs the environmental and social safeguards of its operations. When a project/subproject has been identified for ADB financing, it is screened and categorized to determine the following:

- Significance of potential impacts or risks of the project/subproject to the environment;
- Level of assessment and institutional resources required to address the safeguard issues; and
- Information disclosure and consultation requirements.

92. The SPS outlines the environmental safeguards requirements that borrowers/clients need to comply with. These requirements include assessing impacts, planning and managing impact mitigations, preparing environmental assessment reports, disclosing information and undertaking stakeholder consultations, establishing a grievance redress mechanism, and monitoring and reporting. It also includes specific environmental safeguard requirements pertaining to biodiversity conservation and sustainable management of natural resources, pollution prevention and abatement, occupational and community health and safety, and conservation of physical cultural resources. Consideration of associated facilities, that are not funded as part of the project/subproject, and whose viability and existence on the project/subproject is also required.

93. ADB requires meaningful consultation with affected persons and concerned stakeholders and public information disclosure for Category A and B projects. For Category B, the draft IEE

[6] Operations Manual Bank Policies (BP) issued on 1 October 2013, based on ADB Safeguard Policy Statement, 2009.

report should be available to interested stakeholders before project/subproject approval and posted on the ADB's website upon Board approval of a project in accordance with the Operations Manual and Public Communications Policy (2012).

4.2 Legal and Institutional Framework on Environmental Management in Lao People's Democratic Republic

4.2.1 Environmental Impact Assessment

94. The law governing the protection of the environment, including the assessment and management of projects in the Lao PDR is the Environmental Protection Law (EPL), which was issued in 1999 and amended in 2013. The Ministerial Instructions for the Conduct of ESIAs (No. 8030 – December 2013) outline the updated format and procedural requirements of this process. Section 2.2 of this instruction states projects of Category 1, or small-scale projects, an IEE is required and for Category 2 or large-scale projects, an EIA report is prepared. Under the schedule in the EIA Decree, water supply facilities (Item 3.52) fall under Category 1 so an IEE is required by the government.

95. The Ministerial Instruction No. 8029 2013 on the Process for IEE Investment Project and Activities states that all investment projects that may create adverse environmental and social impacts are to be designed with the correct and appropriate environmental and social impact prevention and mitigation measures or environmental management and monitoring plans (EMP) and social management and monitoring plans (SMMP). According to the decree, the primary responsibility for undertaking environmental assessment of projects is with the project developer, which for this subproject, is the Department of Water Supply (DWS).

96. The Ministry of Natural Resources and Environment (MONRE), acting through the Department of Natural Resources and Environment (DONRE), is responsible for the review and approval of environmental assessment reports, coordination of monitoring and evaluation, and issuance of the requisite environmental compliance certificates (ECC). Public participation and discussion with local administrations is required throughout the environmental assessment process.

4.2.2 Drinking Water Quality and Discharge Standards

97. The Ministry of Public Health (MOH) has issued the Water Quality Standard for Management for Drinking and Domestic Use in March 2014 in accordance with Decision 561/MOH, 2014. The standard is based on the World Health Organization Guidelines for Drinking Water Quality, which is recommended by IFC's EHS Guidelines for Water and Sanitation. The MOH has the institutional mandate for overseeing and monitoring drinking water quality in the Lao PDR, while the PNPs (operators) are responsible for ensuring compliance with the standard. The MOH Drinking Water Quality Standards, 2014, stipulate that PNPs are required to conduct regular water quality monitoring and testing of 23 water quality parameters. The standards specify that up to 7 parameters must be tested weekly and an additional two parameters tested on a monthly basis, with an additional 14 parameters to be tested on an annual basis. The list of monitoring parameters is listed in Table 3 of the said water quality standards. Refer to Appendix B.

98. At this stage of the Lao PDR's socio-economic development however, the laboratory infrastructure necessary to conduct this level of testing across the country does not exist. There are two known laboratories, but both have produced suspect results in the past. Consequently, most of the samples under ADB-funded projects over the past couple of decades have been tested in Thailand, which is logistically quite difficult. Consequently, at this time DWS has agreed with the PNPs to focus on three parameters for routine testing of treated water – pH, turbidity and

residual chlorine at the extremity of the distribution network to keep the water supply safe for consumption. To supplement this testing, PNPs take samples once or twice per year for testing in one of the laboratories in the country; the tests are conducted for a full range of parameters as set out in the MOH standard. It would be wise for the PNPs to have these samples tested in Thailand until such time as the laboratory infrastructure in the Lao PDR is sufficiently developed.

99. National Wastewater Quality Standards have been adopted based on the Environmental Protection Law No.29/NA, dated December 18, 2012 and the Decree on National Environment Standard dated 81/GV, dated 21 Feb. 2017 and 0832/MONRE. The standards relate to drinking water quality (groundwater); surface water quality; and wastewater effluent discharge from industrial activities. This includes biochemical oxygen demand (BOD) of 40 mg/l and total suspended solids (TSS) of 40 mg/l. Detention ponds are incorporated into the design to ensure backwash water is discharged into the environment at much lower levels.

4.2.3 **Other relevant legislation to the subproject.**

- **Environmental Protection Law (2012).** Environmental Protection Law (National Law 29/NA) (EPL) dated December 18, 2012. The revised Environmental Protection Law has included 13 parts and 99 article. This Environmental Protection law defines principles, regulations and measures related to environmental management, monitoring of protection, control, preservation and rehabilitation, in order to ensure environmental quality, reduction of impacts and pollution created by human activities or by nature, aiming to provide balance between social and natural environment, to sustain and to protect natural resources and public health; and contribution to the national socio-economic development and reduction of global warming.

- **Law on Water and Water Resources (2017).** The Law on Water and Water Resources (No.23/NA) dates May 11, 2017. This Law on Water and Water Resources defines principles, regulations, and measures relating to the protection, administration, exploitation, use and development of water and water resources, protection damage to water or water resources, rehabilitation of the effect areas to assure the quality, quantity of water and sustainable water resources, to respond for the people's living requirements, to promote agriculture and industry, to ensure that natural environment, social environment are protection, to develop the nation sustainable and to the socio-economic development.

- **Forestry Law (2007).** The Amended Forestry Law, No. 06/NA (Dec. 2007) stipulates the basic principles, regulations and measures concerning forest conservation, management, and use. It aims to make the forests and forestland a stable source of livelihood and use for the people, by ensuring sustainable preservation of water sources, preventing soil erosion and maintaining soil quality, conserving plant and tree species and wildlife species, preserving the environment, and contributing to national socioeconomic development.

- **Wildlife and Aquatic Law (2008).** The Wildlife and Aquatic Law restricts and regulates the management, monitoring, conservation, and protection of wildlife and aquatic species in their natural habitats to promote the sustainable regeneration and utilization of wildlife and aquatic life, without any harmful impact on natural resources or habitats and decreasing species and the extinction of wildlife and aquatic life. Wildlife and aquatic species living within the territory of the Lao PDR are considered property of the national community, with the State representing the national community in managing those species

throughout the country. If an individual or organization has permission to raise and reproduce any of these species, it is then considered their own property so long as they abide by the laws and regulations.

- **Land Law (2003).** The Land Law was enacted on October 23, 2003. The law determines the management, protection and use of land to ensure its efficient use and to conform with land-use objectives, with other laws and regulations, to contribute to national socio-economic development, and to contribute to the protection of the environment.

- **Decree #84 on Compensation and Resettlement of People Affected by Development Projects (2016) 36.** Decree on Compensation and Resettlement of People Affected by Development Projects No.84/gov, dated April 5, 2016. This Decree provides principles, regulations and standards on the management, monitoring of compensation of losses and the management of resettlement activities in order to properly and effectively implement development projects with the aims to ensure that the affected people are compensated, resettled and are assisted with permanent livelihood alternatives leading to improving of living conditions to be better off or to be at the same level as they were before as well as to ensure that the projects can contribute to the socio-economic development of the nation in sustainable manners.

- **Technical Guidelines on Compensation and Resettlement of People Affected by Development Project (2005).** Pursuant to Prime Ministerial Decree No. 192/PM, the government endorsed the Technical Guidelines on Compensation and Resettlement of People Affected by Development Projects, first issued in November 2005. These guidelines adopted under the Decree 192 are currently under review and revision to be in line with the new Decree 84 and expected to be approved in June 2018. In the meantime, the guidelines prepared under the Decree 192 remain applicable. Any discrepancies and gaps identified between the government legislation and the World Bank's policy on Involuntary Resettlement (OP/BP4.12), the later will overwrite. This legislation provides procedure for the assessment, planning, and mitigation of environmental as well as social impacts from development projects. 39. These guidelines include detailed procedures for the conduct of public consultation and other participatory processes, to inform affected people of the environmental and social impacts, and to assure their involvement in all aspects of the mitigation and compensation process, from planning to implementation.

- **Decree on the Preservation of Cultural, Historical and Natural Heritage (1997).** This decree outlines the regulations and measures for the management, conservation and use of the national heritage, including for upgrading of movable and immovable assets with historical or cultural or natural value into national heritage with the view of raising the spirit of patriotism, people's democracy, awareness and ownership of the fine national and ethnic cultures. 42. This decree requires that in order to prevent exploitation of relics and antiquities, any person who discovers archaeological relics or a cultural site must inform the provincial and district offices within three days.

- **Guideline on Consultation with Ethnic Groups (2013).** The guideline on Consultation with Ethnic Group launched by the LFNC in 2013 aims to a) ensure that the implementation of consultation with ethnic groups follows an effective principles and process in line with the relevant national Laws and regulations, b) ensure that the right and lost assets of the ethnic people affected by development projects are fairly compensated by development projects, and c) to prevent or mitigate the potential

environmental and social impacts on ethnic groups generated by development project and ensure that the project is properly designed for the sustainability.

- **Decree 333 on Protection Forest (2010).** This Decree defines the principles, the procedures, and the measures on the management, the protection and conversation, the development, and the sustainable use of the protection forest, with the aims of bringing the richness to the protection forests and the protection forestry lands, ensuring the protection of the environment, the water sources, the soil erosion, and safeguarding the soil quality the strategic national defense and public security forests, including the restoration, the encouragement, the monitoring and assessment of the laws in order to contribute to the improvement of the living standards of the people and the national socio-economic development.

- **IFC Environment Health and Safety Guidelines for Water and Sanitation (2007).** The Environmental, Health, and Safety (EHS) Guidelines for Water and Sanitation are technical reference documents with general and industry-specific examples of Good International Industry Practice for the water supply and sanitation projects. The Xamneua subproject is required to comply with these guidelines regarding impacts and management, performance indicators and monitoring.

5 DESCRIPTION OF THE SUBPROJECT

100. The Xamneua subproject covers four (4) outputs:

(i) Output 1. Improved Sector Coordination and Policy Implementation
(ii) Output 2. Improved Nonrevenue Water Management, Water Supply Development and Drainage
(iii) Output 4. Enhanced Community Action in Water Supply and Sanitation
(iv) Output 5. Strengthened Capacity for Project Implementation, and Operation and Maintenance (O&M)

5.1 Output 1: Improved Sector Coordination and Policy Implementation

101. Under this output a province-wide service agreement will be introduced, as will an updated corporate plan, tariff adjustments and district sanitation regulations. Residential premises that apply to connect to the new water supply system during the construction period will not be required to pay any up-front charges for the connection. All of the above reform measures will be introduced and established for Xamneua as a condition of contract award for the civil works for the water supply system (Grant covenant), and this has been agreed through a letter of commitment with the Provincial Government of Houaphan and the PNP Houaphan.

102. With respect to nonrevenue water (NRW) management initiatives, and following agreed changes to the Project Administration Manual (PAM), NRW will now be considered as a part of an overall asset management approach. NRW management will comprise the introduction of “good practice” protocol, which will eventually enable PNP to conduct an accurate water balance, better measure NRW and prioritize initiatives in the future.

5.2 Output 2: Improved Nonrevenue Water Management, Water Supply Development and Drainage

103. The Xamneua subproject aims to provide safe, affordable, reliable, piped water supply with individual household connections to over 95% of the population in the twelve core villages of Ban Misouk, Ban Nathong, Ban Xamneua, Ban Naliew, Ban Navieng, Ban Nanongbua, Ban

Nathongchong, Ban Phanxay, Ban Thatmuang, Ban Phoxay, Ban Nasakang, and Ban Phonkham.

104. It will also address key environmental concerns in the urban area through the provision of key drainage works to eliminate localized flooding and stagnant water ponds.

5.2.1 Existing Situation

105. The Xamneua water supply system was built in 1997 under the ADB-funded Northern Provincial Towns Water Supply Project. The concept was to collect raw water via a diversion weir/intake on the Houay Hin Dam at an elevation of around 1,106m above msl, and convey the raw water under gravity to a water treatment plant (slow sand filtration) in the western fringe area of the town. Following treatment, it was then to be distributed under gravity into the pipe network to the consumers. In 2007, an additional diversion weir/intake was constructed on the Houay Hin Men to supplement the production.

Plate 1: Existing Conditions at Proposed Sites of Project Components

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>TOWARDS THE MAIN STORAGE TANK LOCATION FROM THE ACCESS ROAD LINKING THE WTP</td><td>TOP OF THE EXISTING MAIN STORAGE TANK TOWARDS XAMNEUA</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>HOUAY HIN MEN INTAKE TO BE REFURBISHED</td><td>XAMNEAU WTP AND RESERVOIR TO BE REFURBISHED</td></tr>
</table>

106. It is proposed to rehabilitate and maintain as much of the existing arrangements as possible, but to limit the raw water abstraction from the two houays to about 2,500m^3/day to enable base environmental flows in the dry season. It is proposed to:

(i). Rehabilitate the intake arrangement on the Houay Hin Men;
(ii). Rehabilitate the flocculation and sedimentation tanks at the WTP site;
(iii). Take away the existing slow sand filters and replace with rapid sand filters and clearwater tanks to be located on this site; and
(iv). Maintain the existing clearwater storage reservoir.

107. For the expansion works, it is proposed to:

(i). Construct a new intake on the Nam Xam river;
(ii). Lay a new raw water main from the intake to the new conventional WTP located in the compound of the existing WTP;
(iii). Construct a new WTP (8,800m3/day), together with a new storage reservoir; and
(iv). Construct an expanded distribution network, utilizing as much of the existing network as possible

108. **Raw Water Intakes and Raw Transmission Mains**. The Houay Hin Men weir crest width of approximately 10m and has height of 2.0m from bed level. Since its construction the Houay Hin Men has experienced regular overtopping (as its design intended) but the stream bed below the weir has degraded as a consequence of the overtopping's, reducing the integrity of the structure and reducing its capacity to store water. To not address this issue could result in failure. The proposed rehabilitation works at Houay Hin Men intake will include the construction of a new diversion weir immediately downstream of the existing weir and incorporating wing walls and a grout curtain to prevent seepage and erosion. The existing raw water main down to the water treatment facility will be retained. No rehabilitation works are required on the Houay Hin Dam or the connecting raw water main.

109. No rehabilitation works are required on the Houay Hin Dam or the connecting raw water main.

110. A new raw water intake will be constructed on the left bank of the Nam Xam around 1.0km upstream from the northernmost fringes of the urban area, from which the raw water will be pumped to the new conventional rapid sand filtration facility within the compound of the existing WTP. There will be two pumping steps at the intake; the first step will be a low lift submersible pumping arrangement from the river sump to pre-sedimentation tank, from where it will be pumped to the rapid sand filtration facility by high lift centrifugal pumps.

111. No weir is included in the preferred design option so navigation and fish passage remain unimpeded. Fish screens will be added to intake pipes.

112. **Water Treatment Facilities.** All new facilities, including office and laboratory, will be housed within the existing compound. No additional areas will be acquired. At the existing WTP, the inlet chamber and sedimentation tank can be rehabilitated and retained, and possibly lined with a water sealant if excessive cracking is found. The flocculation tank however, has not been designed correctly, and needs to be replaced, and the chemical dosing equipment no longer functions. At this stage, it is assumed that chemical coagulation/flocculation will be required, so provision will be made in the rehabilitation to install a static mixer, chemical mixing tanks and dosing pumps.

113. The existing roughing filters will be taken away, and the site used to locate parts of the new WTP, such as the clearwater tanks for example.

114. The existing slow sand filtration beds will be taken away and replaced with rapid sand filters. The site will be utilized for the location of the new clearwater reservoirs.

115. The existing chlorine disinfection equipment is showing its age, and it is proposed to replace this to ensure good quality water. The treated water flows into the existing on-ground storage reservoir (1,100m3) under gravity. The concrete storage reservoir is in sound condition, structurally, but requires the installation of level sensors.

116. All appurtenances associated with the rehabilitation of the existing WTP will need to be replaced in accordance with good engineering practice. They are all around 20 years old.

117. The new conventional rapid sand filtration facility (8,800m3/day) will be constructed within the boundary of the compound of the existing slow sand filtration facility. The proposed works will include coagulation, flocculation, sedimentation, rapid sand filtration and disinfection (chorine). Treated water will be fed under gravity to a new 2,000m^3 elevated reservoir, which will act in series with the existing clearwater reservoir to supply water under gravity into the distribution network. The combined storage will be 3,100m^3, which will be equivalent to some eight (8) hours of reserve storage at ADD. Backwashing will be supported by an air blower, chlorine dosing will be used to disinfect the treated water, polyaluminum chloride (PAC) dosing will be used to assist with settling, and a detention pond will be used to protect the environment.

Figure 2: Xamneua Water Treatment Plant Layout

118. **Distribution Network (including Secondary Storage).** The distribution network will be supplied by gravity to eleven (11) core villages from the existing and new on-ground storage reservoirs at the water treatment plant site. It will be designed as two distribution systems with about four (4) district metering areas (DMAs) for monitoring flows with about 800-1,000 connections in each area; pressure zones will be established within this DMA framework to maintain a consumer-friendly supply (20-40m) while minimizing leakages. The existing pipelines will be integrated into the proposed new pipelines, which will also be designed to accommodate future expansion to the year 2041.

119. To supply treated water to the 12th core village, Ban Phon Kham, will require the abandonment of the existing 30m^3 elevated storage tank, and replacement with a new 300m^3 concrete elevated tank. This will require the addition of a further pump at the booster pumping station, together with a new DN150 transmission main to the new reservoir.

120. For new distribution pipes (≥DN110), polyvinyl chloride (PVC) pipes will be primarily used, with polytheylene pipes (PE) where necessary. For rider mains, polyethylene (PE) pipes DN63

will be used. Approximately 25 km of new main distribution pipeline is proposed, with around 15 km of new secondary distribution and rider mains to replace the undersized HDPE/PVC 40-50 mm rider mains. Bulk flow water meters will be installed on the raw water mains, treated water mains from the treatment plant outlets and at the entry point to all DMAs.

121. All connections will be provided to any domestic premise free of charge, provided the application is made during the construction period. Institutional and commercial connections will be charged at the PNP's normal rate. A service coverage of 95% is sought immediately after commissioning. This will involve the installation of 800 additional connections; about 745 domestic connections, 15 institutional connections and 40 commercial connections.

122. **Nonrevenue Water Management**. The real (physical) losses of nonrevenue water management (NRW) are addressed through the introduction of good practice. Bulk flow meters will be used to monitor flow at the raw water inlet to the treatment plant, the outlet to the treatment plant, and at all DMAs. This will enable a water balance to be established, and bulk flows can be measured against the consumer demand measured through the consumer retail meters. Pressure zones (20-40m) will be incorporated into the distribution network to manage any leakage at reasonably low levels, whilst providing consumers with good pressure sufficient to service two-story premises. Leak detection equipment will be provided under the subproject as well as training in leak detection, so that leak detection can be carried out during construction to locate pipelines for replacement. PNP will subsequently incorporate a long-term leak detection program into its overall operations protocol.

123. Adoption of the "free connections" policy will help to minimize apparent losses by reducing the incentive for unauthorized connections. A permanent leak detection team will be established within PNP to implement the long-term leak detection program.

124. Also, provision has been made in the cost estimates and bidding documents for the supply of 500 consumer meters, which PNP can use to develop its long-term meter replacement program. Most of its meters are now around 20 years old, and will be severely under-registering.

125. With the adoption of the above procedures, PNP will be able to accurately assess its water balance and nonrevenue water, and set targets for the future. With these initiatives, it is expected that the system should have a NRW component of about 20-25% during the first year of operation.

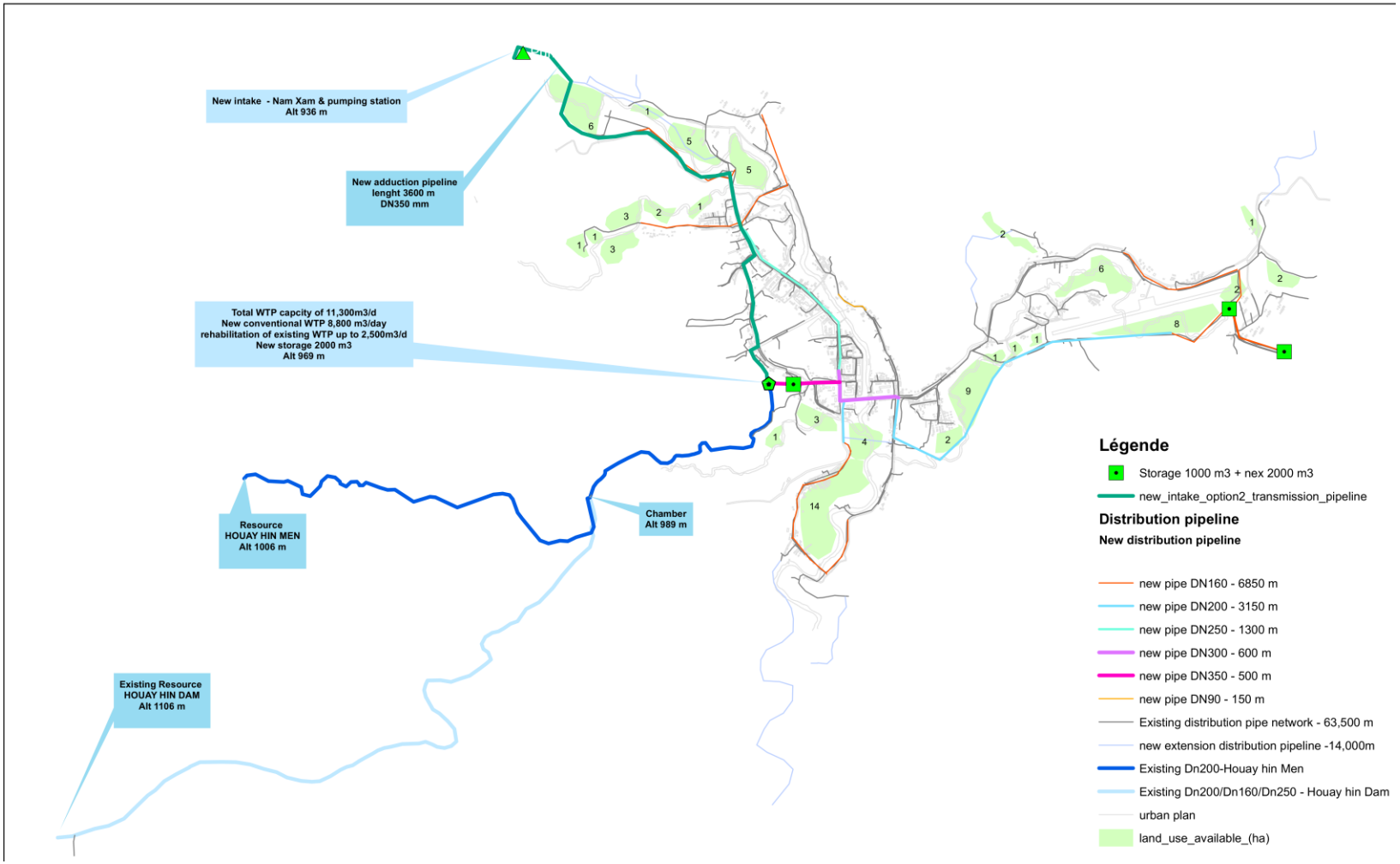
126. **Proposed Drainage Works.** Investment in drainage in Xamneua will focus on the area of densely residential area which has highest priority for environmental improvement according to local stakeholders. The subproject will upgrade the existing unlined drain to open/cover stone lined drains. The proposed works include (i) new 140m of covered stone-lined roadside drains in Ban Phoxay, (ii) new 500m (both sides) of open stone-lined roadside drains in Ban Misouk, (iii) new 130m of covered stone-lined roadside drains in Ban Naliew, (iv) new 60m of covered stone-lined secondary drain in Ban Phanxay, (v) culverts will be constructed for the drains associated including wingwalls/chambers where required, and (vi) accesses to property will be constructed over the open stone-lined drains.

5.3 Enhanced Community Action in Urban Water Supply and Sanitation

Support will be provided to communities, through elected Village Development Committees (VDCs) for a range of activities to be agreed with the VDC. This will include among others (i) village environmental improvements (VEIs), consisting of household and community level sanitation and drainage facilities, (ii) stakeholder consultation/town hall gatherings and public participation to raise awareness and provide organization support required to implement the VEIs, (iii) household sanitation, and (iv) public sanitation facilities.

Figure 3: General Layout of Xamneua Subproject

Xamneua Water supply network
Proposed layout 2041 - option 2 (2 existing resources + 1 new)
Complementary resource nam Xam - Existing resources (Houay Hin Men &Dam).
New treatment plant 8,800m3/day - Existing WTP 2,500m3/d on the same site location



6 DESCRIPTION OF THE ENVIRONMENT

6.1 Physical Resources

127. Xamneua is the main town and seat of the provincial government in Houaphan Province (17,505 Km^2). The majority of the town's villages have urban characteristics and population densities. The district capital Xamneua is also located within the town, which is about 600 km north east of Vientiane.

128. Xamneua District is composed of 59 villages. Twelve (12) villages that comprise the town are proposed to be the service area for the development of the proposed water supply system. Natural forests dominate the hilly landscape of Xamneua although a substantial area is secondary forest as a result of over-logging and ongoing shifting cultivation practices. The town proper is currently subject to considerable construction activity, land development and urban expansion.

129. The sub-project area and the main components are located on hilly areas to the west of the center of town at the existing WTP site, and the intake on the Nam Xam is 1.0 km upriver outside the urban confines. The main pipeline to the clearwater tank and transmission lines are located within the urban confines on already cleared land.

130. The intake is located in an area that is largely rural with the Nam Xam winding through large tracks of paddy development on the low lying areas, with surrounding hills still well vegetated and village settlements become infrequent in the upstream direction. Near the intake patches of hillside have been cleared for development. The closest village to the intake is approximately 2km upstream. A sealed road skirts the Nam Xam valley along the left hand lower hillside slopes. The road is adjacent to the intake site, which has already been cleared of vegetation. There are a number of small tributaries that enter the Nam Xam above the intake all with similar characteristics to the main channel which is agriculture on the foot slopes and valley flats with vegetated hillsides. Some minor tributaries are serviced by minor roads. The Nam Sim is a left bank tributary of the Nam Xam and their confluence is about 3.5 km upstream of the intake site. Its land use and vegetation cover is similar to that of the Nam Xam valley.

131. The intakes of the Houay Hin Men and Houay Hin Dam are in well vegetated catchments with no significant settlement area. Land use restrictions have preserved much of the vegetation in these valleys, however some small scale terraced paddy development occurs in some locations along the main trunk stream.

6.2 Geology and Hazards

132. The geological structure of the Lao PDR is known only in broad outline. Houaphan province is dominated by the Truongson belt, one of four which dissects the Lao PDR, and contains some of the country's oldest geological formations, dating back to the Neoproterozic period (1000-545Ma). The Nam Ma valley bordering Viet Nam, including Xamneua area, have Cambrian aged rocks comprised of metamorphized limestone, shales, sandstones and conglomerates that are marine in origin and are widely distributed.[7] The surface layers of the subproject area are dominated mostly by red clays.

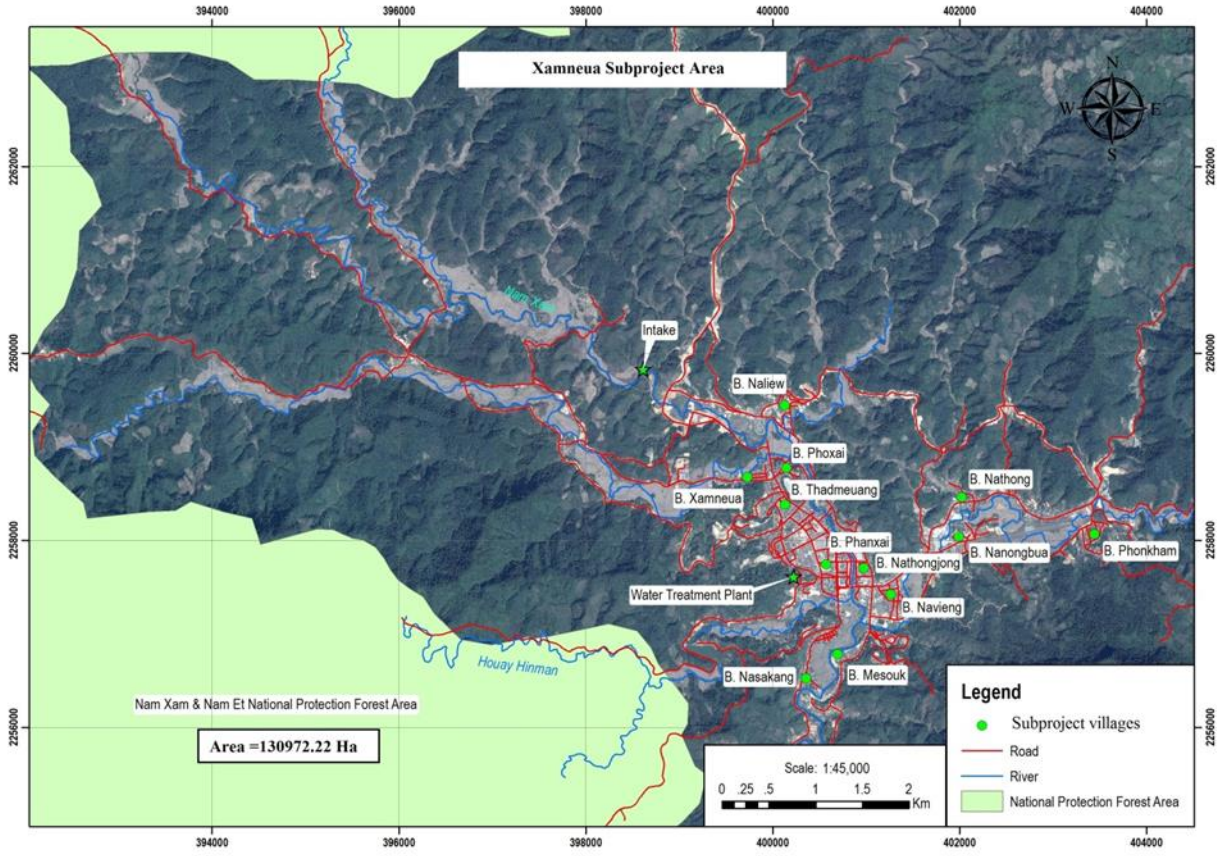
133. The subproject area is hilly to mountainous. Small to moderate earthquakes have occurred within the Lao PDR over recorded history, however Houaphan Province and the areas were infrastructure is located is considered to have low vulnerability to damaging earthquakes but may experience quakes up to *Mercalli* Scale VI in intensity. Earthquake activity in the area has not

[7] http://www.explo-Lao PDR.com/Geologie/General_geology.html

been recorded but tremors have been recorded in the area of Bien Dien Phu, Viet Nam which is160km to the north east[8]The risk from earth quake is considered low, but infrastructure has been designed to withstand large flood events, which poses the greatest potential risk.

134. The Lao PDR is prone to flooding, mainly associated with the presence of large river basins coupled with the prevalence of strong monsoon influences. There are two causes of heavy rains in the Lao PDR: the enhanced southwest monsoon caused by typhoons close to the Philippines and Viet Nam and the lasting southwest monsoon accompanied by the stagnation of tropical storms in neighboring Viet Nam. The hills surrounding the subproject facilities are not prone to landslides because of thy have retained vegetation cover and are gentle sloping. Outside Xamneua steep hills that have been cleared and disturbed by development, such as road construction, are vulnerable to landslide during heavy rain events.

Figure 4: Land use of the Proposed Subproject Area



Source: Google Earth

6.3 Air Quality and Noise

135. Air quality in the Xamneua District is generally good. There are no industries producing discharges/emissions which result in atmospheric pollution and pollution from vehicular exhaust emissions are not significant given the low levels of traffic and absence of any traffic congestion.

[8] https://earthquaketrack.com/vn-92-dien-bien-phu/recent, sourced 18/03/2018.

The only detrimental effect on air quality is the dust arising from the passage of vehicles over unsealed roads when the roads are dry. This is an intermittent problem with a minor effect over a limited area of 5 to 10 meters either side of the road.

136. The locations of the subproject components are relatively far from noise generating activities. There are no industries within the proposed sites so ambient noise levels can be considered very well below nuisance levels. Except for the proposed site of the WTP and reservoir, there are no sensitive receptors within in proximity of the proposed sites of the other components.

6.4 Climate

137. The climate in the Xamneua District is characterized by two seasons which are the dry and wet seasons. The dry season occurs between November and February while the wet season occurs between May and October. August is typically the wettest month with an average rainfall of 322.5 mm compared to December the driest month with only 17.4 mm. Refer to Table 1 to Table 3

138. For Houaphan Province, based on data averages collected from Xamneua, the coolest months are December and January with an approximate minimum average of 9.4 ^{o}C and the warmest months being June and July with a monthly maximum average of 29.3 ^{o}C. Refer to

139. Table **4** to Table 6.

140. Climate data in the following tables 1 to 6 was taken from a monitoring station located at the Xamneua airport and was provided by the Lao Department of Meteorology and Hydrology. Note that October 2016 data appears as 0.0 in the tables, which is likely to be an error as October is the lee-side of the wet season.

Table 1: Total Monthly Rainfalls (mm) 2006-2016

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	1.1	4.9	28.4	113.9	142.9	127.1	169.1	389.0	81.4	64.6	0.0	0.0
2007	1.9	70.3	27.4	137.2	163.6	187.7	278.5	223.0	340.6	428.5	16.0	5.2
2008	21.5	37.7	80.4	184.6	183.0	196.9	331.0	160.4	170.0	232.3	155.4	19.6
2009	12.2	7.8	22.2	111.6	284.9	98.8	234.2	218.9	217.9	44.2	4.9	2.6
2010	48.8	8.8	38.6	94.3	251.5	92.3	107.2	396.8	166.6	99.7	1.2	12.7
2011	30.6	5.7	154.3	85.2	109.5	292.7	274.1	273.0	219.2	55.6	27.2	11.8
2012	17.2	11.1	3.8	73.4	200.2	184.4	284.0	326.2	279.5	89.0	78.1	10.3
2013	10.2	2.9	26.8	75.5	162.6	212.7	314.6	328.7	130.0	50.1	19.4	29.2
2014	1.6	3.1	31.4	101.7	115.3	427.2	449.1	396.1	169.4	28.4	48.5	14.5
2015	33.3	9.4	28.3	132.3	10.5	236.2	230.1	285.9	141.6	50.0	108.3	75.7
2016	75.5	11.7	10.2	103.4	153.3	84.2	120.3	548.0	124.5	0.0	32.3	9.8

Table 2: Daily Averaged Rainfalls (mm) 2006-2016

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	0.0	0.2	0.9	3.8	4.6	4.2	5.5	12.5	2.7	2.1	0.0	0.0
2007	0.1	2.5	0.9	4.6	5.3	6.3	9.0	7.2	11.4	13.8	0.5	0.2
2008	0.7	1.3	2.6	6.2	5.9	6.6	10.7	5.2	5.7	7.5	5.2	0.6
2009	0.4	0.3	0.7	3.7	9.2	3.3	7.6	7.1	7.3	1.4	0.2	0.1
2010	1.6	0.3	1.2	3.1	8.1	3.1	3.5	12.8	5.6	3.2	0.0	0.4
2011	1.0	0.2	5.0	2.8	3.5	9.8	8.8	8.8	7.3	1.8	0.9	0.4
2012	0.6	0.4	0.1	2.4	6.5	6.1	9.2	10.5	9.3	2.9	2.6	0.3
2013	0.3	0.1	0.9	2.5	5.2	7.1	10.1	10.6	4.3	1.6	0.6	0.9
2014	0.1	0.1	1.0	3.4	3.7	14.2	14.5	12.8	5.6	0.9	1.6	0.5
2015	1.1	0.3	0.9	4.4	0.3	7.9	7.4	9.2	4.7	1.6	3.6	2.4
2016	2.4	0.4	0.3	3.4	4.9	2.8	3.9	17.7	4.2	0.0	1.1	0.3

Table 3: Maximum Averaged Daily Rainfalls (mm) 2006-2016

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2006	0.6	1.6	12.8	27.5	37.5	46.9	50.7	65.9	27.8	18.9	0.0	0.0
2007	1.3	39.5	9.5	32.5	38.2	29.6	70.6	37.1	89.3	176.0	12.1	4.4
2008	16.9	15.8	13.4	66.2	49.3	28.0	57.5	54.6	60.3	71.5	80.3	8.5
2009	1.8	5.2	8.7	23.1	45.0	37.0	54.0	55.7	83.9	18.0	2.1	1.2
2010	27.3	6.5	21.8	15.9	57.5	23.5	28.1	71.0	31.6	17.0	0.5	2.4
2011	9.0	1.5	55.3	30.3	23.3	110.5	37.1	68.7	46.5	22.9	17.1	5.3
2012	4.8	3.4	1.5	20.0	70.1	55.6	57.6	46.9	83.6	27.0	55.8	3.3
2013	2.7	0.9	9.6	19.6	36.7	35.9	47.5	69.2	22.9	13.4	9.9	20.3
2014	1.1	1.4	19.8	22.9	25.0	122.0	62.9	110.8	44.7	8.8	35.0	3.6
2015	16.4	2.6	16.0	47.0	7.9	87.0	37.3	81.0	65.8	25.1	29.8	25.2
2016	43.7	3.0	8.9	45.6	33.0	29.6	27.9	119.2	38.0	0.0	10.6	3.2

Table 4: Minimum Averaged Monthly Temperatures2006-2016

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	8.6	13.2	14.1	16.6	18.1	20.6	20.9	20.5	18.1	17.8	13.0	10.3	16.0
2007	9.2	9.5	14.0	16.0	18.2	20.7	20.4	20.2	18.5	16.6	10.5	11.8	15.5
2008	9.2	7.8	13.7	17.6	18.6	20.4	20.6	20.4	19.5	18.3	13.1	9.6	15.7
2009	**7.5**	12.3	13.8	16.9	19.4	20.3	20.8	20.3	19.2	18.2	11.7	10.2	15.9
2010	11.6	8.9	12.1	17.3	20.0	20.7	20.9	20.6	19.7	16.8	12.4	11.8	16.1
2011	9.0	10.6	11.6	16.6	18.3	20.8	20.6	20.2	20.0	17.1	13.8	9.8	15.7
2012	10.1	10.6	12.8	16.5	20.0	21.8	20.6	20.2	19.5	17.8	16.5	12.5	16.6
2013	11.4	13.8	12.7	17.0	19.3	19.9	20.8	20.2	19.0	15.8	15.4	8.3	16.1
2014	8.2	9.1	13.8	18.1	19.7	21.3	**21.0**	20.8	19.9	16.9	15.4	10.8	16.2
2015	8.6	11.0	14.6	15.5	19.5	20.6	20.6	20.6	20.2	17.5	16.9	12.0	16.5
2016	10.3	8.2	12.7	17.1	19.4	20.7	**21.0**	20.7	20.0	18.7	15.8	11.9	16.4

Table 5: Maximum Averaged Monthly Temperatures 2006-2016

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	21.4	22.8	26.3	28.9	28.7	29.7	28.2	27.3	26.7	25.6	26.4	20.5	26.0
2007	19.1	26.6	28.0	26.6	27.7	30.0	29.1	28.4	26.7	23.3	20.4	22.1	25.7
2008	21.0	13.5	24.6	28.2	28.2	28.1	28.0	28.4	27.7	24.4	21.8	19.2	24.4
2009	18.1	26.8	27.0	26.8	28.2	29.0	28.2	29.2	27.6	25.9	23.1	22.0	26.0
2010	**21.6**	25.7	26.7	29.3	31.1	29.9	29.6	27.8	28.6	23.5	22.6	21.6	26.5
2011	14.6	23.8	19.6	26.3	27.9	28.8	28.8	28.1	26.8	23.5	22.5	17.2	24.0
2012	19.5	23.5	26.7	29.9	30.0	28.5	28.4	28.3	26.7	26.0	25.8	22.4	26.3
2013	19.3	25.0	27.9	27.9	29.8	28.7	28.4	28.3	25.5	23.6	21.4	17.2	25.2
2014	20.1	23.4	27.9	29.9	30.5	29.4	28.9	27.6	28.0	25.4	24.1	18.5	26.1
2015	20.9	22.7	27.9	27.9	32.1	**30.3**	28.2	28.7	27.7	26.0	24.6	19.9	26.4
2016	20.9	17.5	25.9	31.2	30.3	30.0	29.2	28.2	27.1	26.1	23.2	21.2	25.9

Table 6: Averaged Monthly Temperatures 2006-2016

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Annual
2006	15.2	18.3	20.6	23.6	24.3	25.6	24.9	23.9	23.1	22.1	20.5	15.9	21.5
2007	14.4	18.8	21.4	22.1	23.7	25.9	25.5	24.7	23.2	20.1	15.7	16.8	21.0
2008	14.8	10.5	19.4	23.3	23.8	24.5	24.4	24.8	23.7	21.4	17.4	14.4	20.2
2009	12.7	20.1	20.9	22.4	24.1	25.2	24.9	24.6	23.8	22.2	17.4	16.0	21.2
2010	16.6	18.1	20.0	23.8	26.6	26.1	26.0	24.1	24.1	20.3	17.7	16.7	21.7
2011	11.4	17.3	15.7	21.7	23.6	25.2	24.8	24.4	23.5	20.4	18.3	13.6	20.0
2012	14.6	17.3	20.3	24.1	25.5	25.2	24.7	24.3	22.9	21.9	21.4	17.2	21.6
2013	15.2	19.4	21.1	22.6	24.8	24.6	24.6	24.3	22.5	19.9	18.4	12.2	20.8
2014	14.3	17.1	21.3	24.2	25.8	25.6	25.1	24.3	23.5	21.3	19.8	14.3	21.4
2015	14.6	17.3	21.9	22.6	27.1	26.0	24.8	24.7	24.2	21.9	20.7	15.7	21.8
2016	15.6	13.2	19.6	25.1	25.5	25.8	25.6	24.8	23.9	22.8	19.7	16.4	21.5

6.4.1 **Climate Change**

141. Primary evidence for the nature and magnitude of future climate change is provided by General Circulation Models (GCMs), which are mathematical models of the coupled earth-ocean-atmosphere system. GCMs resolve the earth spatially at between 100 and 300 km; and do not fully represent many features important in shaping local climate, such as topography. They are useful primarily in assessing broad regional and seasonal trends in climatic variables such as temperature and precipitation.

142. Model projections for Southeast Asia suggest the current rainy season (May – October) is projected to get wetter, and the dry season (November – April) dryer. Projections of daily rainfall intensity (not pictured) suggest increases in the maximum 1-day precipitation by 10 to 15 mm/day by the 2090's. Higher precipitation intensities result in higher runoff ratios, all other factors equal. Impacts on basin runoff are more uncertain, with many recent studies projecting changes in discharge of between -15% and +15% of current annual discharge[9].

143. A review of recent global and regional climate modeling, and recent studies of climate change impacts on the Lower Mekong Basin indicate that the region may become up to 2 ^{0}C

warmer by mid-century; and will most likely experience moderate increases in precipitation. While most monsoon regions are projected to experience decreases in monsoon precipitation relative to historical climate as a consequence of climate change, the South Asian, and to a greater extent the Southeast Asian monsoons are projected to experience increases in total precipitation [9].

6.5 Water Resources

144. The Nam Xam is the largest tributary of the Nam Ma, an international river, whose watershed has a boundary at Houa peak at 2062 masl near Xamneua town. The river is 325 km long (165 km in the Lao PDR and 160km in Viet Nam) and travels through Houaphan Province in a southeast direction before reentering Viet Nam. The total catchment area of the Nam Xam is 7580 km2, with 60% (4570km2) of it within the Lao PDR. Discharge estimates at the Ban Ngew weir upstream of the intake are between 90,000m^3/day and 170,000m^3/day, seasonally dependent.

145. Houay Hin Dam is a right bank tributary of the Nam Xam whose catchment area lays west of Xamneua town. Houay Hin Men is a left bank tributary of the Houay Hin Dam, whose confluences join immediately to the west of town. The upper catchments of both houays contain densely vegetated natural forest which has served for water protection keeping turbidity levels low since they were commissioned to supply town water in 1997 and 2007 respectively.

146. There have been no official groundwater investigations in the area according to the local district government, and consequently there are no existing records of groundwater availability or potential aquifer characteristics.

6.5.1 Water Quality Results

Preliminary investigations identified the Nam Xam met the criteria to be considered as potential water sources for rehabilitation of the existing water treatment plant. The Houay Hin Men and Houay Hin Dam have been used for town water supply since 1997 and 2007 respectively. Results for samples taken during May and July 2017 are typical of surface water under wet season conditions. Refer to

[9] ICEM 2015, Draft Climate Change Impact Assessment of the proposed Nam Ngiep 1 Hydropower Project, Lao PDR.

147. Table 7.

148. Turbidity readings for Nam Xam (110 NTU) were taken on separate sampling days so it is not possible to draw conclusions but the Ban Ngew irrigation dam, upstream of the intake on the Nam Xam can be expected to have a mitigating effect on water quality at least with respect to total solids (sediment loading). July is generally considered the 2nd month of the rain season. Rains occur frequently, generally daily storms and this would influence parameters, particularly turbidity.

149. Moderate to low color (22 and 20 TCU) matched the Nam Xam turbidity readings. Iron concentration for the Nam Xam was high (16.8 mg/l) on the 1st July 2017 and slightly high (0.72 mg/l) for the 24th July 2017 sample. It is possible that these high readings are a consequence of the laboratory analytical procedure which includes digesting unfiltered samples so abstracting the iron from the sediment/soils. Turbidity readings are in the low to normal range, so an equally valid conclusion is that the water quality is typical of impounded water (low to moderate turbidity and low to moderate color). The color content differentiates run of the river water from impounded water.

150. The Houay Men sample 24th July had a turbidity reading of 25 NTU. This sample was taken on the same day as the Nam Xam sample (turbidity 110 NTU) suggesting that the Houay Men catchment has a mitigating effect on sediment and turbidity. The existing slow sand filtration water treatment plant uses this raw water source and it is known that under some circumstances, treatment is not effective so the options include taking more frequent turbidity samples to refine the preferred pre-treatment process or to adopt a conservative design for pre-treatment if the existing treatment plant is to be retained. It is likely that Houay Men turbidity during the wet season will exceed 25 NTU particularly in later months when rain periods last longer.

151. Alkalinity for the Nam Xam (45 mg/l) is marginally acceptable if poly aluminium chloride is to be used as a coagulant.

152. The Nam Xam water sample is marginally hard (77.8 mg/l) and this result compares well with a MONRE sample taken in May 2017 (82mg/L) but this hardness concentration is not significant in terms of the proposed treatment process or for customers. The Nam Xam sample hardness 30mg/l (3rd July 2017) and 77.8 mg/l on 24th July 2017 are significantly different suggesting a major contribution to Nam Xam river flow from the Nam Sim which has a moderately high hardness (132mg/l) as recorded during the 10th My 2017 sampling period.

153. In contrast, the Houay Men water is very soft (around 25mg/l) so if conventional treatment is adopted it will have to include a site-specific coagulant dosing regime.

154. The organic indicators (BOD, COD and Permanganate value) are all below ‘detection limits’.In addition to the normal water quality variables, water treatment may have to cope with contaminants (pesticides and metals) arising from activities in the catchments. Pesticides are ‘lost’ to the environment through numerous pathways. The standard treatment plant as designed in the Lao PDR can cope with this water quality. The key to performance is continuous coagulation – the contaminants will end bound-up in the sludge for further denaturing/neutralization in the settlement ponds.

155. Commissioning and training of WTP operations will ensure that the Standard Operating Procedures reflect the identified risks, including pesticides.

156. **Conclusion:** The water quality of the Nam Xam and Houay Men is suitable for conventional water treatment (hydraulic mixing, sedimentation followed by rapid sand filtration

and disinfection with powdered chlorine) as is standard practice in the Lao PDR. The Houay Men has a low alkalinity concentration so careful consideration of the coagulant dosing regime will have to be carried out.

157. The existing slow sand filters will be removed and replaced with conventional rapid sand filters to treat the raw water of Houay Hin Men (and Houay Hin Dam) which will then be able to consistently maintain clearwater turbidity to less than about 1 NTU.

158. The water quality evidence supports the case for conventional water treatment i.e. hydraulic mixing, sedimentation tank followed by rapid sand filtration and powdered chlorine for disinfection.

Table 7: Water Quality Results from May and July 2017

Xamneua Subproject			RESOURCE				
Parameter	UNIT	Standard	NAM XAM		HOUAY MAN	NAM SIM	Ban Ngew Weir (Irrig. Dept.)
			SAMPLING DATE				
			1-Jul-17	24-Jul-17	24-Jul-17	10-May-17	10-May-17
Cyanide	mg/l CN^-	0.07		ND	ND		
Alkalinity	mg/l	na		57.1	18.1		
Arsenic	mg/l As	0.05		0.0005	0.0011		
Aluminuim	mg/l	0.2	14.3				
Ammonium	mg/l as NH^+_4	$\leq$ 1.5	ND				
Calcium	mg/l	na	11.9				
Color	Pt. Co	na	22	20	10	2.67	3.25
Iron	mg/l	<1	16.8	0.718	0.452	4.43	0.23
Magnesium	mg/l	na	3.39				
Manganese	mg/l	<0.5	0.29	0.129	0.071	0.24	0.02
Nitrate	mg/l as NO_3	50	0.85				
Permanganate (as a teatment)	mg/l	na	4.44				
Phosphorus	mg/l as P	na	<0.15				
Sodium (NaCl)	mg/l	<350	2.15				
Sulfate	mg/l as SO_4^{-2}	<250	ND				
Bicarbonate Alkalinity	mg/l as $CaCO_3$	na	45.8				
Chemical Oxygen Demand	mg/l	na	< 40				
Chloride (residual of treatment)	mg/l as Cl	<0.2	< 5	ND	ND		
Conductivity	10^{-6} S/cm	$\leq$ 1000	31.9			132.9	
Hardness	mg/l as $CaCO_3$	300	30	77.8	25.9	132.9	82
M-Alkalinity	mg/l as $CaCO_3$	na	46				
pH		6 to 8	7.6			7.3	
Total Dissolved Solids	mg/l	600	82				
Turbidity	NTU	<10	18.54	110	25	108	9.25

159. The raw water sample results are typical of the Lao surface water, so the proposed conventional water treatment system will be capable of treating the water to comply with the Lao Drinking Water Standards (column 3). Repeat samples for mineral analysis including for iron will be taken to confirm the assumption that the high concentrations were a consequence of laboratory digestion of unfiltered high turbidity content raw water.

160. The water treatment plant design incorporates chlorination for the disinfection of the filtered water that will be stored in the clear water reservoir prior to distribution in the network.

6.6 Ecological Resources

161. Riparian lands along the banks of the Nam Xam have long since been converted into urban development in the project area and the river dominates as the central feature of the town. Smaller tributaries and undeveloped flood plain pockets of the Nam Xam within the towns precinct have retained paddy fields, but these are progressively being reclaimed for urban expansion. Degraded forests dominate the hilly to mountainous landscape behind Xamneua with a history of slash and burn (shifting cultivation) technique practices and logging.

162. The Nam Xam National Biodiversity Protected Area (NBCA) and the Nam Et (NBCA) are two of 25 protected areas across the Lao PDR. These natural areas retain rare wildlife species and unique environments however, their forests and wildlife are being depleted due to shifting agriculture, unplanned logging, and uncontrolled hunting. The Nam Xam NBCA boundary is

approximately 7km south east of the subproject area, and the Nam Et NBCA is about five kilometers to its west. Neither NBCAs will be impacted by project activities.

163. The Nam Xam National Protection Forest Area (PFA) occupies 1,310 km^2 of forest directly to the west of Xamneua Town and encapsulates large areas of the Nam Xam headwaters. The Nam Xim PFA of 997 km^2 is located to the east of Xamneua town and covers upstream areas of the Nam Xim, a tributary of the Nam Xam. These PFAs will not be impacted by the project but are expected to provide protection benefits to water sources. [10]

164. The Nam Xam is an eastern flowing river and a tributary of the Nam Ma. Not being part of the Mekong River basin has a disadvantage in terms of efforts to catalogue fisheries. With no large water developments in the area, such as hydropower, publicly available information is scant. The Nam Xam and its tributaries are used for fish and other aquatic resources (OAR). Across all provinces, the average consumption of fish is 25 kg/person/year and OAR is 4kg/person/year11. Wild fish stocks have been on the decline for a range of factors but are generally caused by destructive fishing methods, channel blockages, increased number of fishers and access to markets. While construction of the intake may cause local and temporary impacts to fisheries and can be mitigated, this pales into insignificance compared to the reasons listed, and even more so when coupled with other developments such as the irrigation weir and urbanization which significantly impede migration and reduce spawning areas.

165. It's been reported that several Fish Conservation Zones (FCZ) exist on the Nam Xam starting about 1 km upstream of the intake. These FCZ are usually village-controlled entities that apply regulations to limit fishing activities, such as the types of fishing techniques, or even complete prohibition. The sites are located upstream and will therefore not be impacted by intake drawdown and fish screens will be added to intake pipes. Intake pipes will have a bell end to minimize velocity. Also, given that no weir will be used at the intake fish passage will remain unimpeded.

6.7 Historical and Archaeological Sites

166. There are no sites of archaeological significance within and around the town area. The subproject components (Intake, WTP, reservoir and laboratory, raw transmission and distribution lines, office and access roads) will not affect any historical and archaeological sites such as temples and burial sites. There are remains of ancient temples in the neighboring districts but not within the subproject area.

6.8 Unexploded Ordnance

167. Nearby Xiangkhouang Province was significantly more targeted by US-led bombing campaigns compared to Houaphan. However, Xamneua did suffer from bombardment during the Indochina War, and a focus was the Nam Xam river corridor which connects to Viet Nam. This area is located well south of Xamneua town.

168. The proposed water treatment plant and main holding tank already exist (refurbishing only required) as it's access roads. The domestic supply distribution network and drainage works will

[10] Decree 333 Article 2. "The Protection Forests Areas (PFAs) are the forests and the forestry lands which are located in the areas of the water sources, watershed areas, wetland forest, and river bank's forest, road side forest, including the forest in and around the town, Municipality or outskirts of city, village's sacred forests and cemeteries. The protection forests are determined for the purpose of protection of the watershed areas, the natural environments, the soil erosion, natural disasters, strategic points for the national defense-public security and other types of forests as determination."

[11] MRC, May 2013. An Introduction to Fisheries of Lao PDR.

be located within urban areas along road/footpath right of ways. All these sites present a low UXO risk.

169. There is a potential for the intake works area on the Nam Xam and the Houay Hin Men to contain UXO as these sites are located on the outskirts of town and may have been contaminated by mobilized UXO from the surrounding catchment area. The intake on the Houay Hin Men, which will be refurbished, will require the upgrade of an existing track to access the site, although unlikely, this area may contain UXOs.

170. A clearance certificate has been obtained from the provincial state enterprise for UXO survey and clearance to confirm all construction areas are free of any UXO; the certificate is appended to this document.

6.9 Socio-Economic Conditions

171. Xamneua town is the centre of Xamneua district and serves as the provincial capital. It lies in the northern Houaphan province, which is the second-least urbanized province in the country having the slowest population growth in the country at 0.3% annually (2005-2015 inter-censal period), compared with the national rate of 1.45%. Xamneua lies on National Highway No. 6, which connects with the international border with Viet Nam (about 70km) at Na Meow; it is about 594 km north-east of Vientiane. Xamneua town has twelve core villages: Ban Misouk, Ban Nathong, Ban Xamneua, Ban Naliew, Ban Navieng, Ban Nanongbua, Ban Nathongchong, Ban Phanxay, Ban Thatmuang, Ban Phoxay, Ban Nasakang, and Ban Phonkham.

172. The town area serves as the administrative, commercial and social center of the province housing many of the government offices, community and commercial facilities. There are eleven (11) primary schools, four (4) high schools, seven (7) clinics/hospitals, three (3) markets and six (6) temples. The local economy is based around government services, commercial services, agriculture and trade. The main income is from government service, with another significant group working in rice cropping and animal breeding (cows, pigs and poultry) and trade.

173. The household survey carried out as part of the socio-economic survey asked respondents about their household income from all sources over the past year. These data were analyzed to obtain a picture of income and capacity to pay of the poorer groups within the core villages. The average monthly income per HH is 5.67 million Kip, while the average monthly income per person is 1.21 million Kip; the median monthly income per person is 1.0 million Kip. The Lao/Tai Daeng/Tai Dam groups have the highest median incomes in the range 0.92 to 1.17 million Kip/month, with the Khmu and Hmong groups much lower in the range 0.29 to 0.45 million Kip/month.

174. The population and selected socio-demographic features of the proposed service area is shown Table 8.

Table 8: Xamneua Town Population Characteristics

Village Name	Households	Male	Female	Total Population	M:F ratio	HH size
Ban Misouk	218	559	558	1,117	1.00	5.12
Ban Nathong	262	825	713	1,538	1.16	5.87
Ban Xamneua	286	729	718	1,447	1.02	5.06
Ban Naliew	213	692	612	1,304	1.13	6.12
Ban Navieng	173	441	489	930	0.90	5.38
Ban Nanongbua	225	718	690	1,408	1.04	6.26

Village Name	Households	Male	Female	Total Population	M:F ratio	HH size
Ban Nathongchong	235	645	612	1,257	1.05	5.35
Ban Phanxay	329	914	964	1,878	0.95	5.71
Ban Thatmuang	593	1,571	1,619	3,190	0.97	5.38
Ban Phoxay	330	880	908	1,788	0.97	5.42
Ban Nasakang	292	900	777	1,677	1.16	5.74
Ban Phonkham	108	331	322	653	1.03	6.05
Foreign Nationals		263	226	489	1.16	
Total	**3,265**	**9,468**	**9,208**	**18,676**	**1.03**	**5.72**

Source: Xamneua district government

6.9.1 **Health and Sanitation**

175. The survey results for 'incidence of water-related disease by HH' showed that 13% of children under 5 and 7.5% of adults and children over 5 had diarrheal disease requiring treatment during the 2-week period before the survey date. The inclusion of a hygiene awareness activity in the overall project design is therefore justified.

6.9.2 **Education**

176. According to the sample of household heads surveyed, only 9.2% of female HHs in the core area have no schooling, compared to a figure of 2.8% for male HHs. Over 35% of female HHs and around 19% of male HHs have attended primary school education; 24% of female HHs and 29% of male HHs have attended lower secondary education; 11% of female HHs and 19% of male HHs have attended upper secondary education; 7% of female HHs and 21% of male HHs have a technical/vocational education; and 13% of female HHs and 9% of male HHs have a university education.

6.9.3 **Water Supply**

177. Nearly 83% of respondents use bottled water in both wet and dry seasons for drinking and cooking. Almost all of the others use the PNP supply for their drinking water, with a couple of houses using wells or the river. All HHs who used PNP water for drinking treat it by boiling, and 14% of HHs who used bottled water also reported that they boil it before drinking.

178. The primary sources of water for purposes other than drinking, in both dry and wet seasons, was the PNP supply at 90% (wet and dry seasons). The remainder use the nam saat standpipes, covered wells, and/or local rivers. Nearly all respondents (95%) connected to the PNP system store water in jerry cans or buckets in their houses.

7 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

179. All the subproject activities will occur largely in residential areas and the intake in a non-residential area. The environmental impacts were evaluated in the areas of influence at the subproject component sites. At the raw water intake, the area of influence includes the upstream and downstream sections from the intake considering the potential effects to water quality, sustainability of the water supply source, and potential conflict on river water use. At the locations of the main transmission line and distribution lines, the affected area may extend to an average of 1-50 meters along the excavated area of the pipelines. At the proposed site for the WTP and reservoir and office and laboratory, temporary disruption and nuisance impacts may be experienced, mainly during the construction period. These affected areas may experience direct impacts associated with temporary disturbance from construction activities. The potential

environmental impacts were identified based on the project activities that may occur in each component and evaluation of the environmental and social baseline situation at the subproject area. The identification of environmental impacts was mainly based on the technical information related to project component design and operation, field visits, information from stakeholders, and the feasibility study.

7.1 Anticipated Benefits from the Subproject

180. There are expected beneficial impacts on health and well-being of people because of the proposed water supply subproject for Xamneua Town For people living in Xamneua the principal benefits deriving from the rehabilitation and expansion of the existing piped water supply system will be (i) a secure and continuous supply of safe, clean water; (ii) good water pressure to serve two-story premises; (iii) adequate quantities of safe and clean water to meet all their needs; and (iv) high level of convenience. The water supply will also enable commercial establishments and light industry to sustain their business models and grow the economy, which in turn will provide employment.

181. Health benefits will result from the provision of safe water and improved household sanitation conditions that reduce the incidence of diarrhea, dysentery, kidney stones and other water-related illnesses. Drainage works in core villages will improve living and business conditions and help to eliminate disease vectors such as mosquitoes. Other health benefits will include reduced costs for health care and a reduction in work time lost.

7.2 Environmental Impacts Related to Project Location (Pre-Construction Phase)

7.2.1 Impact on Land Acquisition and Community Assets

182. There will be no land acquisition required for the development of the requisite subproject component facilities namely the construction of the WTP and laboratory, intake, reservoir, office and access roads. It is anticipated that there will be minimal and temporary disruption during pipe laying.

7.2.2 Impact of Location of Raw Water Intake on other Water Users

183. A raw water intake will be located on the bank of Nam Xam around 1.0km northeast of the urban fringe. The site was selected because it will be upstream of any urban runoff from Xamneua. It is expected that the location of the subproject components, specifically the intake, will not affect nor impact other water users upstream of the sub-project area.

184. Stream flows downstream of the intake will only be influenced through the town precinct, as immediately below the town there are a number of small and large tributaries that drain into the Nam Xam main channel. The area through the township is not used by boats given the streams rocky and steep morphology.

185. The Houay Hin Men and Hin Dam have a narrow channel that is steep and traverses well vegetated forest. Boat passage is not possible. While upgrade of the existing weir may cause local and temporary impacts to fisheries these can be mitigated. The impacts of the weirs on fish migration have long since occurred and the system now has a new dynamic due to the barriers.

186. The Houay Hin Dam and Houay Hin Men catchment areas are currently protected for water conservation and so are unlikely to suffer from development in the near future. The upper Nam Xam drains degraded forested areas that have a long history of swidden agriculture. The

greatest threat to water supply and quality would be from over clearing, but since swidden is conducted in a mosaic fashion the risks are considered minimal.

Plate 2: Houay Hin Dam and Houay Hin Men (right side)

7.2.3 **Impact on Natural Resources and Protected Areas**

187. There are no areas of special ecological or biodiversity significance within the impact area of the proposed subproject. The Nam Xam National Biodiversity Conservation Area is approximately 7km south east of the subproject area and will not be impacted by subproject activities.

188. The Nam Xam and Nam Xim Protection Forest Areas (PFAs) encapsulates upper tributaries of the Nam Xam watershed and are expected to be beneficial to the subproject as water source protection areas. However, as a further precaution, fish screens will be fitted to the intake pipes, which will have bell ends to minimize inlet velocity.

7.2.4 Impact on Historical and Archaeological Sites

189. There are no sites of archaeological significance within and around the sub project area footprints. The subproject components (Intake, WTP, storage tank and laboratory, raw transmission and distribution lines, office and access roads) will not affect any historical and archaeological sites such as temples and burial sites.

7.3 Environmental Impacts During Construction

190. Construction activities that may be undertaken for the proposed subproject would include land clearing, excavation and grading, filling, disposal of excavated soil, road construction/rehabilitation, intake construction, and movement of construction vehicles, operation of heavy equipment, and operation of worker camps. The works for the proposed subproject are expected to generate the following adverse impacts:

- Loss of vegetation as a result of clearing and grubbing
- Generation of excavated material
- Runoff of silt
- Temporary loss of access to houses and establishments
- Occurrence of acute increase in ambient Noise
- Acute increase in generation of Dust
- Generation of wastes, i.e. domestic wastewater, solid wastes and hazardous wastes
- Community hazards as a result of open excavations
- Hazards to occupational health and safety.

191. The mitigation measures to address the adverse environmental impacts during the construction phase of the subproject implementation are presented in the following sections. The Subproject will conform to the Environmental, Health, and Safety General Guidelines of 30 April 2007 (IFC-WB).

7.3.1 Temporary Disruption of Community Roads, Pathways and Access to Properties

192. In general, pipe laying for the water supply distribution network will be undertaken along the existing road right-of-way. The pipe lines will be laid out in the 2.5 – 4.0 m wide footpath or road shoulder from the edge of the road for arterial, sub-arterial and collector roads and about 2.0m wide road shoulder for distributor roads[12]. Roads are currently a mix of sealed and unsealed surfaces. During trench excavation and pipe laying works, temporary loss of access to residential and commercial establishments, schools, and community facilities may occur. As mitigation for this impact, temporary accesses to houses and other establishments affected by the works will be provided. Particular attention will be given to ensuring safety along roads and paths normally traversed by pedestrians. The duration of pipe laying individual areas will be subject to work activities from several days to weeks depending on the existing conditions and infrastructure to

[12] In accordance with MPWT Regulation No. 205 on Town Planning (2004), services may be installed in the 2.5-4.0m wide road shoulder for arterial, sub-arterial and collector roads in the following order from the road edge: drainage, tree planting, water supply pipeline, electricity, telecommunications wires. The drain must not be closer to the road edge than 0.3m and telecommunications must not be closer than 0.5m from the outer edge. For distributor roads having only 2.0m wide footpaths, the facilities may be divided between the two sides of the road, with drainage, tree planting, electricity, and telecommunications on one side and drainage, tree planting and water supply pipeline on the other side.

be installed. The contractor will restore and reinstate any damaged sections to properties immediately after completion.

7.3.2 **Air Pollution**

193. The potential sources of air pollution during the construction stage include dust from earth works concentrated within a 50-meter radius of the work site; emissions from the operation of construction equipment and machineries; fugitive emissions from vehicles plying the area; fugitive emissions during the transport of construction materials; and localised increased traffic congestion in work areas. Most of the emissions will be in the form of coarse particulate matter and will settle down in close vicinity of the work sites. The impacts will be minor, local, short-term, direct and reversible. The best management practices will be adopted during conduct of the works to minimize dust and release of combustion emissions from operation of the requisite heavy equipment and machineries. Excavated material and stockpiles will be kept moist while transport vehicles will be required to install tarpaulin covers or other suitable material to prevent spillage of the hauled materials. Furthermore, construction equipment and vehicles will, at all times, be well maintained and in good working condition to reduce fugitive emissions. Speed limits on areas will be imposed to minimize dust emission and to reduce the risk of traffic accidents in the work sites. Information about planned construction activities will be provided to residents in the area and will be planned to minimize public disturbance and nuisance.

7.3.3 **Noise**

194. Construction activities may cause noise and vibration impacts for a short duration. The operation of equipment such as jackhammer for the installation of water supply distribution network may cause nuisance to adjacent residential houses. Excavation works in pipe road crossing sections on paved roads would require the use of jackhammer to break the concrete. Diesel generators will also be required during the works. Ambient noise levels in these areas may reach 88dBA at a distance of about 15m away from the source or operation of equipment. Along the haul roads, the average ambient noise level will also experience an acute increase because of increased vehicular traffic. As mitigation for the adverse impacts identified, work at the sites will be limited only during the daytime from 0700H to 1800H. There will no works that will be permitted beyond this period. Furthermore, the community will be provided with updated information about the schedule of the construction activities through billboards/sign. Stationary equipment like the diesel generators will be installed as far as practical from sensitive receptors. Buffers will also be established as further mitigation.

7.3.4 **Impact of Borrow Materials**

195. The construction activities for all components of the project, including the access roads will require material, specifically sand and aggregate for the works. The sourcing of these materials from the Nam Xam River will not be permitted as the mining/quarrying activities may irreversibly impact the ecology and hydraulic characteristics of the waterway. The contractor will be required to secure these materials from Government permitted/licensed suppliers.

7.3.5 **Impact on Ecological Resources**

196. During the implementation of the construction activities, workers and laborers of the contractor may undertake hunting of wildlife and cutting of wood upstream of the intake. The contractor will be instructed to orient their workers and staff that such activities are strictly prohibited. The contractor is responsible for the provision of the requisite kitchen facilities, food and cooking fuel for their workers and staff.

7.3.6 **Clearing of Vegetation**

197. The construction of the WTP and laboratory, clear water reservoir, intake, office, access roads and contractor camps and facilities will require the removal of the existing vegetative cover in these sites. The impact of the clearing and grubbing works will be minimal because the existing vegetative cover at the sites consists only of primary colonizing bushes and bamboo.

198. The rollout of the distribution network may affect trees that have been planted by communities in front of their houses. The clearing/removal of trees required for the works will only be undertaken based on an inventory contained in the approved updated LACP for the subproject and upon securing of the requisite permits for tree cutting from thegovernment. In accordance with the approved LACP, trees and improvements within private land that will be affected by the proposed subproject will be properly, and in a timely manner, compensated in cash.

199. The requisite roads and paths to the intake, WTP, and reservoir will be constructed with a limited width enough only to accommodate construction vehicles and equipment. This is to minimize the impact on the receiving environment. In steeply sloping terrain, manual labor will be utilized as the utilization of heavy equipment would cause irreversible and unnecessary damage to the area. Upon completion of works, the exposed surfaces will be planted with the appropriate vegetation to prevent soil erosion.

7.3.7 **Water Pollution**

7.3.7.1 Impacts of Sediment Runoff

200. The construction of the facilities such as the intake, WTP, reservoir, distribution line and office, and the rehabilitation of the weir on Houay Hin Men may result in erosion of unstable areas during earthworks, especially during heavy rainfall events. Sedimentation of nearby watercourses and channels from runoff heavily laden with material from the work sites may occur as a result of the works. These impacts are transient, short-term and insignificant. As mitigation, the contractor will be required to implement proper measures which would include the provision of silt traps, ditches, and sump pits to intercept the flow silt laden runoff from the worksites into the nearby channels and watercourses. Moreover, activities, especially earthworks, will be scheduled during the dry season or be stopped during heavy rainfall.

7.3.7.2 Domestic Wastewater from Contractors Facilities and Worker's Camps

201. The contractor and workers' camps will generate domestic wastewater. Contamination of surface and groundwater sources and surrounding land is a potential risk that should be addressed accordingly by the contractor. Potential adverse impacts are minimal and temporal in duration and can be readily mitigated through measures established in the EMP. Proper management of the domestic wastewater from the contractor's facilities and workers' camps should be undertaken at all times. Appropriate latrines shall be installed in the camps and facilities of the Contractor.

7.3.7.3 Residual Chlorine During Pipeline and Reservoir Disinfection

202. Chlorinated water is retained in the completed pipe works and reservoirs for a pre-determined period to effectively sanitize the system. This is typically done after the completion of the leakage and pressure tests. The chlorinated water is then drained as the system is filled with potable water. Consequently, residual chlorine is inadvertently discharged. Extra caution is needed to avoid discharge of water with excessive chlorine residuals as this is toxic to fish and other aquatic life. Flushed water from the system during commissioning of the pipelines and reservoirs will only be discharged to the nearest water body when the chlorine concentration of

the water has been reduced to less than 2 mg/l. The allowable limit for Chlorine (free residual) as per the Ministry of Public Health Drinking Water Quality Standards of 2014 is 0.1-2.0 mg/l.

203. The established protocol is that when the piped system has been assessed to be reasonably clean, the effluents from the flushing of the system will take well over a week to reduce to a residual level (less than 2 mg/l) fit for discharge. Discharge to soil will allow for further reduction through the combined effect of soil contact and sunlight. However, discharge at pipe ends will have to be monitored to minimize soil erosion. The normal chlorine residual test kit will give a NIL chlorine residual if the chlorine residual is above 10 mg/l. Options are (i) use a normal chlorine test kit and use 10x15x dilution with distilled water and calculate the final result or (ii) purchase and use a high range chlorine test kit.

7.3.8 **Generation of Construction Wastes**

7.3.8.1 Excavated Soil

204. The construction of the proposed WTP and reservoir will require excavation and levelling works. Excavated materials during pipe laying will also be generated. The excavated materials from the foundation of the WTP tanks and reservoir will be utilized as backfill in the other work sites where required. Material during trench excavation will be utilized to backfill the trench after the pipes have been laid out. Any surplus material will be disposed properly and given for free to interested villagers as backfill materials in coordination with the village authority. There is no anticipated need for spoil disposal sites.

7.3.8.2 Domestic Waste

205. Solid waste will be generated at the work sites and the worker's camp. Wastes may include domestic solid waste, inert construction waste, and hazardous waste. Domestic waste is not anticipated to be a significant volume as only small temporary camps will be established at the sites of the WTP and reservoir. There will not be camps for the worksites for the intake, transmission and distribution pipelines. It is projected that the temporary camps will generate an estimated 0.4 to 0.5 kg/person/day and would consist mainly of plastic and glass bottles, paper, cardboard, food wastes, and packaging wastes. This will be collected and properly disposed in the approved disposal facility of the District.

7.3.8.3 Inert Construction Waste

206. The inert waste that will be generated during the works will consist mainly of scrap wood and metal, cement bags, aggregates and concrete debris. These wastes are generally disposed of and/or land filled in appropriate sites and represent no direct danger to health. The scrap metal and wood can be collected for recycling.

7.3.8.4 Hazardous Waste

207. Hazardous wastes such as containers of paint and solvents and spent batteries are projected to be generated during the works, especially at the worksites for the intake, WTP and reservoir. Although the volume is anticipated to be small, this type of waste is highly detrimental to the environment and public health. As mitigation, these materials will be segregated from the general solid waste, collected and disposed appropriately, mainly by encapsulation.

7.3.8.5 Rehabilitation Wastes

The works to be rehabilitated will include the existing diversion weir on the Houay Hin Men and the existing sedimentation tank within the compound of the existing water treatment plant. In

addition, the concrete tanks of the slow sand filters will be replaced with rapid sand filters and new clearwater tanks. Other than concrete wastes (gravel-sized), there will be no other type of existing material or equipment to be disposed of under the subproject. All waste disposal will be at registered sites.

7.3.9 Impact on Community Health and Safety

208. During the works, the community may be exposed to the health and safety risks from increased vehicular movements in the area, open excavation, and operation of heavy equipment. As mitigation and to prevent accidents and hazards to motorists, pedestrians, and residents around the worksites, barricades and wood/steel plate covers will be provided in open excavations during non-working time. The worksites will be properly secured with fences and access to the area restricted. The contractor is to ensure that all vehicles and transport equipment and materials that may be required to pass through villages are operated safely without endangering these communities. All loads are to be secured and all loads with fugitive materials (e.g. excavated soil and sand) are to be covered with tarpaulins. The contractor is to immediately remove any drivers that ignore any of the community safety requirements. The required warning signage will be installed in all the worksites.

7.3.10 Occupational Health and Safety

209. During the construction phase, the implementation of the works may result in hazards to the safety of workers such as tripping, falling from height, slippery surfaces, carrying heavy loads, and during operation of machines and equipment. The contractor will be required to prepare a site safety plan and designate a safety supervisor who will ensure that safety measures during construction are implemented. These safety measures include the use of personnel protective clothing and equipment, placing of hazard warning signs, and excavation covers and barriers. Arrangements for prompt medical attention in the event of accidents will also be made.

210. The contractor will be required to: (i) provide priority hiring of qualified skilled and 100% unskilled workers from the villages, (ii) consult with local people to avoid conflict if migrant workers will be brought to the site, (iii) installation of suitable toilets such as pit latrines and grey water drainage facilities such as soakage pits, (iv) arrangement for the proper disposal of solid wastes, (v) briefing of workers and the villagers on the dangers of communicable diseases, and (vi) assignment of responsibility to workers and local peoples' welfare to a senior member of the contractor's staff.

211. In addition, during the disinfection of water distribution lines, only crews who have had experience with chlorinating agents and who are trained and aware of the potential health hazards associated with these chemicals will be involved in such activity.

7.4 Environmental Impacts During Operation

212. The potential long-term or permanent impacts of subproject development are most important and generally determine the magnitude of impact. The potential long-term impacts include:

- Incremental wastewater generation and increased burden on drainage systems;
- Conflict with other water users of Nam Xam;
- Deterioration of water quality;
- Generation of backwash water and sediments from operation of the WTP;

- Exposure of workers to chemicals for water treatment;
- Generation of sludge from the detention ponds;
- Occupational health and safety; and
- Community health and safety.

The Environmental, Health, and Safety Guidelines for Water and Sanitation Projects (IFC, 2007) outline a range of safeguard measures including management requirements, monitoring regimes and performance evaluations that will be adopted within the operations and maintenance manual, where possible.

7.4.1 **Incremental Wastewater Generation and Increased Burden on Drainage Systems**

213. Households receiving new water supply connections are likely to use more water for bathing, cooking and washing. This may lead to more grey water or sullage as the standard of living improves, the population increases and more people have access to water supply. The current condition and lack of well-designed drainage system in the villages will result in an increase in the volume of grey water or sullage. The potential for the ponding of dirty water because of the absence of proper drainage systems may, consequently result in the formation of habitats for mosquitoes and other pests and pose health hazards to the communities. In most of the households in the District, the domestic wastewater drains into irrigation canals and on their yard. Under the subproject, key elements of the drainage system within the town will be upgraded to help address this problem.

214. As project policy, a water connection will only be provided to a household once an approved sanitation facility is present to cope with the increased wastewater that will be generated with improved water supply services. Public awareness raising initiatives have been undertaken under the feasibility study about the drainage improvements and VEI component. Villagers have been informed about the need to provide latrines before a water connection service can be made.

7.4.2 **Deterioration of Water Quality**

215. The quality of the Nam Xam raw water could potentially deteriorate if there were substantial human activities in the upstream catchment area that are of sufficient magnitude to cause contamination of the river water. However, this is unlikely to be the case given the fact that the upstream catchment lies in a rural mountainous area, with parts used for agriculture, as well as the large dilution capacity. However, mitigation measures in place are (i) surveillance of catchment activities through the provincial governmental system (village, district and provincial dialogue and meetings); (ii) design and operation of the water treatment plant and distribution system to national standards; and (iii) disinfection of the treated water. Additionally, the raw and treated water will be tested in accordance with MOH's standard, as well as for pesticides, arsenic, cyanide and mercury. As such, it is considered that deterioration of water quality can be identified and addressed if it should occur. Monitoring and testing will commence prior to construction. It should be noted that the water treatment plant/process proposed will be capable of treating pesticides at levels close to or at "not detectable".

216. Nevertheless, the Project Implementation Unit (PIU) and PNP will continuously coordinate with the villages, Xamneua District and Provincial authorities regarding community activities in the upstream catchment area. Laboratory testing equipment and training will also be provided to allow the PNP to conduct regular monitoring of raw and treated water quality parameters.

7.4.3 **High Pressure and Leaks on the Pipeline**

217. The proposed distribution network will have sections located at low elevations. These sections experience higher water pressure which may potentially result in leakages in the line and ultimately water loss. This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) designing and operating pressure zones within the network (20-40m), (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.

7.4.4 **Generation of Backwash Water and Sediments in the WTP**

218. During the operation of the WTP, the cleaning of filters generates backwash water which contains sediments and other pollutants that have been removed from the raw water during treatment. Discharging the backwash water and sludge from the sedimentation tanks directly into the adjacent land or river may result in the deterioration of the condition of the receiving environment. As mitigation, sediment will be collected and conveyed to a detention pond to separate the concentrated waste sludge or sediments. In the design of the WTP, discharge of sludge from the WTP will be into the detention pond and not directly into the adjoining land.

219. The WTPs coagulation process binds all the removed contaminants and the turbidity (mainly clay particles) into high aluminium content settleable solids when naturally dewatered . These solids are inert so there is no need for laboratory testing before the solids are used for leveling ground and filling depressions or being disposed off to wasteland. The high aluminium content arises from the predominate contaminant (turbidity) or clay particles and to some extent from the coagulant itself (aluminium sulphate).

7.4.5 **Occupational Health and Safety**

220. Water treatment will involve the use of coagulants/flocculants and chlorine that will expose WTP personnel to hazards during chemical handling. The risk is particularly present during chlorination because chlorine is a reactive chemical that is hazardous to skin and eyes in case of accidental spill or leak. Risks associated with these chemicals will be minimized by (i) providing secure, dry and well-ventilated storage facilities for these chemicals, (ii) application of chlorine and coagulants/flocculants by automatic dosing instead of manual dosing (iii) use of chemicals in powder rather than in gaseous form which is safer to store and handle (iv) posting of the Materials Safety and Data Sheets (MSDS) of these chemicals in the chemical storage area and chemical mixing tank area for information of workers, and (v) training of staff and designation of responsible person on the handling of these chemicals.

7.4.6 **Generation of Sludge from Detention Ponds**

221. The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. There will be no land application of the generated sludge without the required approval by the village authorities.

7.4.7 **Community Health and Safety**

222. The facilities that will be constructed will be properly fenced off and secured to restrict access and intrusion of unauthorized personnel. Watchmen/security personnel will be hired to secure the facilities on a 24-hour basis.

8 ANALYSIS OF ALTERNATIVES

8.1 Alternatives to the Subproject

223. The beneficiary villages in Xamneua center have been selected as the site of the subproject. The selection process adopted involves screening and prioritizations, following which candidate subprojects are selected for the feasibility study. The feasibility study then confirms subproject eligibility. Prioritization is based on a set of criteria aimed primarily at ensuring alignment with Government priority, maximizing impact in terms of number of population to be served, and also maximizing the contribution to economic development and poverty alleviation.

8.2 Alternatives Within the Subproject

224. Alternatives considered for the preliminary design included: (i) the siting of the WTP, and (ii) alternative water sources. The existing sources Houay Hin Dam and the Houay Hin Men, and the proposed Nam Xam were selected on the basis of being able to provide a secure, long-term yield by utilizing two separate sources, of suitable water quality sufficient to meet the total demand of the town by 2041. Houay Hin Dam and Houay Hin Men have been retained as part of the overall scheme. They provide gravity flow of good quality water, however, they do not provide sufficient yield due to catchment characteristics and design restrictions of the transmission mains and intake. Nam Xam is therefore required to provide the supplementary flow. In terms of siting of the WTP, a least cost analysis found that the option of siting the WTP expansion within the compound of the existing WTP would offer a more cost effective solution, and would provide a more efficient management of the overall facility.

8.3 "No Project" Alternative

225. The "No Project" alternative would mean, inter alia, (i) that the opportunity to provide potable water supply to a significant urban population toward meeting GoL goals and priorities would not be realized, (ii) that strengthening of PNP would not take place, and (iii) that drainage, sanitation, and VEI works would not be realized.

9 INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

9.1 Consultations and Information Disclosure

226. Initial environmental assessment. Initial consultations for the Feasibility Study and IEE were held between the 24th and 26th July 2017. Over the course of the site visit, PIA met with district and provincial departments of DPWT, PNP, MONRE, Provincial State Enterprise (UXO) and the Department of Irrigation. The intention of the consultations was to inform the government representatives of the environmental assessment process and be updated on potential environmental risks the subproject may cause during construction and operations phase. The consultations allowed PIA to be informed of local conditions that might influence final design, and to gather information and data on local environmental aspects, such as water quality, vegetation and hazards (land stability, UXO etc.), and current water uses and issues.

227. Presentations were made on the general introduction of the project, specific description of the water treatment plant (WTP) for Xamneua, ADB policy and the Lao PDR policy on entitlement and eligibility, introduction on the IEE and FS process, explanation on the data to be collected and locations, and briefing on possible environmental impacts (temporary and permanent). The consultation meetings were attended by DPWT, PNP, PIU/PNP, LCG, and DONRE.

228. During the meetings, the representative from the Governor's office stressed the importance of the WTP. In general, the participants understood the project's environmental impacts and benefits. The consultations identified overwhelming public support for the project, but some concerns were raised about inconvenience caused by construction activities, and compensation for lost trees and gardens. In addition, according to the stakeholders who were consulted, UXO is unlikely to be an issue because all sites are already modified environments. Summaries of the consultations are provided in Appendix C.

229. A second round of consultations with a focus on meeting the Village Development Committees (VDCs) and affected villagers was conducted between the 16th to 21st October 2017 in all the twelve villages of the subprojects, i.e. Xamneua, Nathong, Phounkham, Navieng, Phanxay, Naliew, Nanongboua, Thadmouang, Phoxay, Nathongiong, Nasakang, and Misouk. The following list the profile of the participants in each village consultation meeting.

Table 9: Summary of Xamneua Subproject villager participants

No	Name of village	Participants		Ethnic				
		No.Total	Female	Lao loum	Tai Deng	Tai Dum	khmer	Hmong
1	B. Xumnuer	103	52	93	0	0	0	10
2	B. Nathong	57	30	50	7	0	0	0
3	B. Phonkham	26	18	19	0	0	0	7
4	B. Navieng	36	15	31	5	0	0	0
5	B. Phanxai	9	1	9	0	0	0	0
6	B. Naliew	39	20	19	1	1	12	6
7	B. Nanongbua	39	17	27	0	0	0	12
8	B. Thadmuang	114	51	88	11	0	5	10
9	B. Nathongjong	21	12	21	0	0	0	0
10	B. Phoxai	26	15	23	0	0	0	3
11	B. Misouk	108	49	100	2	0	4	2
12	B. Nasakang	112	49	74	4	3	25	6
Grand Total		690	329	554	30	4	46	56

230. Discussions on land acquisition and environmental impacts and mitigation measures were presented during the consultation process. Public information brochures were provided to all participants as part of the consultation process. Topics discussed included the project scope, timing, environmental issues, cut-off date, water supply system, connection policy, installation of meters, pipe laying, temporary impacts, intake sites, water quality, protection of forests and water sources. The consultations were facilitated by the PIU, District, and the PIA.

231. The consultations set out information on the IEE and EMP by way of the distribution of a Environmental Impact Assessment Public Information Brochure (PIB) and a PowerPoint presentation to inform them of what was being propose. Consultations were conducted in all five subproject villages. Feedback from these consultations was highly favorable toward the project with no dissent registered. All comments received will be considered within the final design of the new water supply system and drainage works upgrades. The following are the comments that were raised during the village consultation meetings:

Comments	Responses of PIU/PIA
Xamneua Village October 16, 2017 9:30 – 12:00nn	

Comments	Responses of PIU/PIA
The villagers expressed their willingness to cooperate with the subproject.	Noted.
Will the project use the old or new pipe?	The project will first inspect the existing pipe. If there is damaged pipe, these will be changed to new pipes.
Is there any compensation when the project is completed? Compensation should be given to affected people's assets along the road.	The pipe laying will not go inside any house. If the fence of a property is on the right-of-way, then the project will have an impact on the asset but the fence will not be removed. If a tree or crops will be affected, the Government will compensate based on current market rate. During the construction phase, pipe laying can occur under the fence but the property owner has to be consulted first and give approval of the digging.
Nathong Village October 16, 2017 13:30 – 16:30pm	
The villagers welcomed the project in their community.	Noted.
Is there any change on the water supply meter?	Old meters will be changed in case these are not in good condition.
Please extend the project connection to 4 km Gas Station.	This will be considered in the detailed engineering design.
Phonkham Village Oct. 17, 2017 08:30 – 12:00nn	
The villagers expressed their happiness in getting water. A suggestion was raised for everyone who joined the public consultation meeting to relay the message to other villagers.	Noted.
Will the project use local labor or not?	This will all depend on the contractor who will win the bid.
We would like to ask for the relocation of the old basin to another location because the villagers live there. The new land is state owned.	This will be considered during detailed design. A letter should be submitted to DONRE to get the permission and also the land title.
We agree with the project especially the tree planting. We expect the project to be implemented soon because the current volume of water is not enough.	This will be considered.
Navieng Village October 17, 2017 13:30 – 16:30pm	
The villagers expressed their hope for good and reliable water supply.	Noted.
Will the project keep the old pipe or take it out?	The old pipes will be inspected first to check if these are in good condition; if not, new pipes will be installed.
In case the fence is affected by the project, what will be done?	The pipe laying will not go inside any house. The project will not remove any fence. If the project will affect a tree or crop, the Government will
Will the project affect houses?	

Comments	Responses of PIU/PIA
	compensate based on current market rate. The property owner will be consulted to give access to the contractor if digging will occur under a fence.
Phanxay Village October 18, 2017 09:00 - 11:300am	
The villagers expressed their need for good water supply.	Noted.
What is the duty of the village committee?	The village committee will inspect and help facilitate the quick and smooth implementation of the project.
Is there any detail of the pipe layout already?	Currently, this is still being surveyed as part of the detailed design.
Is there any compensation in case the project affects a restaurant?	The restaurant can still operate. There will be temporary impacts.
We need to know the details of the pipe layout so that we can inform affected households.	When the final design is completed, the information will be provided to the villages.
Naliew Village October 18, 2017 13:30 – 16:30pm	
The villagers welcomed the project in their community.	Noted.
Can the old water supply system connect to the new one?	This will depend on the meter and pipe conditions. If the existing meters and pipes are not in good condition, these will be changed to new one.
Will the main pipe connect to the north of the village because there is not enough volume of water in this area?	Survey and design of the pipe layout is ongoing. We expect all villagers can use the water supply service.
Nanongboua Village October 18, 2017 09:00-11:30am	
The villagers welcomed the project in their community.	Noted.
After construction is finished, will they fix any damage or not?	The contractor will be required to fix any damage. However, they need to spend a few days to check the quality of the new pipe before final restoration.
We hope the project construction will avoid impacts to shop and area along the road in Khounsabieng Zone.	The project will pay attention to avoiding the impacts, so coordination is very important between the village committee and the survey team.
Thadmouang Village October 19, 2017 13:30 – 16:30 pm	
The villagers welcomed the project in the community.	Noted.
Will 2% of compensation be paid to affected persons?	The layout of the pipelines will not go inside any house. The project will not remove fence. Any

Comments	Responses of PIU/PIA
What will the project do if the pipe line will be inside a villager's garden?	affected tree or crop will be compensated at current market rate. The contractor will coordinate with the property owner in case of digging under a fence.
I bought a house after the project has closed and I have not installed the water supply meter in AT District. What are your suggestions for water connection?	You can contact the AT Water Supply District if they still have free connection policy for you. For this new project, the villagers will receive free connection as one meter per family registry, so all villagers should prepare by having their own family registry.
Phoxay Village October 20, 2017 9:15 – 11:30 AM	
The villagers expressed their happiness in getting water supply.	Noted.
What will the project to in case erosion and concrete affect a property?	The contractor will be required to have erosion control measures. The pipe laying will not go inside a house.
We have old pipes. Will these be changed with new ones?	The old pipes will be inspected first if these are in good condition. If not, the project will install new pipes.
The current volume of water is not enough. We agree with the project and we need to start the construction quickly.	Noted.
Nathongiong Village October 20, 2017 13:45-16:00pm	
The villagers expressed their satisfaction in getting water.	
If the project will pass any household, we would like the contractor to coordinate with the landowner.	This will be done.
There is no problem with cutting of trees. Can the villagers connect to the water supply by themselves?	The project will connect only from the main pipe to the meter in each house. The house needs to connect to a meter.
Will the project give compensation to tree, assets, etc?	The pipe laying will not go inside any house. The project will not remove the fence. If a tree or crop will be affected, the Government will compensate based on current market rate. The contractor will coordinate digging under a fence with the property owner.
When the project is completed, will this be operated by the PIU?	PIU will operate the project.
I need to remove my water supply meter, how can this be done?	You can contact the PIU directly and they will inspect and remove the meter.
Nasakang Village October 21, 2017	
The villagers expressed their satisfaction of getting the water supply.	Noted.
Will houses in the upland able to use the water supply?	Survey and design is ongoing. We hope every zone will be able to receive water supply.

Comments	Responses of PIU/PIA
When will the project start construction?	At the end of 2018.
Will this new project be the same as the old one?	This project will be able to produce more water than the old one.
Will a villager pay for pipe installation?	No. Villagers will not pay because it is the project's policy.
Misouk Village October 21, 2017	
The villagers expressed their satisfaction of getting water supply.	
Will a village pay for pipe installation. What will the project do in case it will affect a fence or other assets?	No, the villagers do not need to pay because it is the project's policy. The pipe laying will not go inside any house. Fence will not be affected. Trees or crops will be compensated.
If the villagers installed the pipe before the project construction, will they have to pay?	Yes they have to pay if the pipe was installed prior to the project. However, when the project starts construction, the pipe installation is free.
Can I move the location of the water supply meter?	Contact the PIU anytime. They will conduct inspection first.
The project contractor should follow standard construction especially the operation of equipment and pay attention to asset data collection.	This will be undertaken.

9.2 Information Disclosure

232. As part of the feasibility study, a powerpoint presentation was provided to PIU, VDC and villagers in each village in the core area, setting out the findings of the IEE and EMP, and facilitating feedback. Project implementation booklets (PIBs) have also been circulated to project affected villagers to support the PIU and VDCs in their downstream consultations/communication with the communities. The IEE and EMP have been approved by DONRE, and have been submitted to ADB for uploading onto its website. During construction and operation, communities within the impact area of the subproject will be kept informed of construction activities through billboards or information boards about the construction activities and schedules. The details of the PIU, GRM Focal Contact Persons and Construction Managers will be prominently displayed in the respective construction areas for the reference of the affected communities/persons. Complaints and grievances can be directly filed, both written and verbal, to the concerned entities. This will be an alternative to the village complaint system. All suggestions, opinions and responses from the community on the subproject should be taken into account and feedback provided on how concerns and recommendations have been addressed.

10 GRIEVANCE REDRESS MECHANISM

233. Article 13 of Decree 192/PM requires the subproject to establish an effective mechanism for grievance resolution. The government's legal requirements for this mechanism are further described in Part VI of the Decree's implementing regulations, and in detail in the Technical Guidelines. The loan covenants stipulate the GRM requirements of the ADB SPS (2009) for the project. The mechanism to address any grievances on environmental issues is the same as that designed to address grievances related to land acquisition and compensation. The objective of the grievance redress mechanism is to resolve complaints as quickly as possible at the local level through a process of conciliation, and if that is not possible, to provide clear and transparent

procedures for appeal. All affected persons will be made fully aware of their rights, and the detailed grievance redress procedures will be publicized through an effective public information campaign.

234. This will also consist of notice boards being placed at each construction site that provides contact information of the contractors allocated safeguards staff. Information will also be provided on notice boards of affected village and the PNP offices. Again, each of these will have contact information of the person(s) responsible from their organization who will assist with managing public grievance.

235. An aggrieved affected person (AP) or affected household (AH) will be free from any fees in connection with the lodging and resolution of complaints, as the costs will be borne by the Executing Agency and the appointed contractors.

10.1 Type of Grievances

236. Complainants are entitled to lodge complaints regarding any aspect of the subproject. Any affected person will be able to submit a grievance if they believe a practice is having a detrimental impact on the community, the environment, or on their quality of life. Eligible grievances or complaints include:

- Negative impacts on a person or a community (e.g. financial loss such as from loss of water, loss of roadside trees, health and safety issues, nuisances, etc.).
- Dangers to health and safety or pollution of the environment.
- Hazards due to construction activities (e.g. noise, dust, disruption of access, etc.)
- Impacts on social infrastructure.
- Failure to comply with standards or legal obligations.
- Improper conduct or unethical behaviour of contractor leading to nuisance of affected person(s).
- Misuse of funds and other irregularities.
- Grievances due to land acquisition, resettlement, compensation, relocation and unaddressed losses.
- Complaints related to gender issues.

10.2 Grievance Resolution Process

237. Complaints can be made verbally or in written form. It is recognized that in many cases, complainants do not have the writing skills or ability to express their grievances verbally, however, complainants are encouraged to seek assistance from family members or village heads, to have their grievances recorded in writing and to ensure that where disputes do occur and all the details have been recorded accurately enabling all parties to be treated fairly. In the case of verbal complaints, a written record of the complaint will be made during the first meeting with the complainant. Complainants who present their complaints within the prescribed procedures will be exempt from all administrative fees incurred. In addition, complainants who lodge complaints and appeals to district courts will be provided with free legal representation.

10.2.1 Arbitration Committees

238. The subproject's GRM will rely on the existing arbitration procedures that already exist in the villages. The Village Development Committee (VDC) generally consists of the village chief,

deputy chief, village secretary, and village representative of the Lao Women's Union, Lao Front for National Construction, village elders, youth, and village land taxation unit. The VDC is responsible for settling disputes between villagers through conciliation and negotiation. In the absence of these units, the members of the village committee (if formed) or the village leaders will act as grievance officers.

239. Moreover, the details of the PIU, GRM Focal Contact Persons and Construction Manager will be prominently displayed in the respective construction areas for the reference of the affected communities/persons. Complaints and grievances can be directly filed, both written and verbal, to the concerned entities. This will provide alternative entry points to the village complaint system.

240. The affected households (AHs) may present their complaints to the concerned local administrative officials and resettlement committees. The complaint can be filed first at the village level and can be elevated to the highest or provincial level if the affected persons (APs) are not satisfied with the decisions made by the VDC at village level.

241. At the district and provincial levels, the district and provincial steering committees of the project will act on grievances or complaints that have not been resolved at the VDC. The District Project Steering Committee (DPSC) are composed of the Vice District Governor, Director of the DPWT, and representatives of the District Natural Resources and Environment Office, health office, police office, education office, Lao Women's Union, Lao Front for National Construction, and youth office. A representative of the PIU of the subproject is a member of the district project steering committee.

242. The Provincial Project Steering Committee (PPSC) is headed by the Vice Provincial Governor and is composed of representatives of provincial departments such as the DPWT, DONRE, health department, police department, and education department, Lao Women's Union, Lao Front for National Construction, and provincial youth department. The representatives of the PIU and the PNP Xamneua are members of the Provincial Project Steering Committee.

10.2.2 **Grievance Redress Procedures**

243. All complaints and resolutions will be properly documented by the concerned committee and be available for public review and for monitoring purposes. As a general policy, the PNP and PIU will work proactively toward preventing grievances through the implementation of impact mitigation measures and community liaison activities that anticipate and address potential issues before they become grievances. Nonetheless, during construction and operation it is possible that unanticipated impacts may occur if the mitigation measures are not properly implemented, or unforeseen issues occur. The procedures for the grievance resolution process for the subproject are detailed in Table 10

Table 10: Grievance Redress Procedures

NO.	STAGES
1	**Stage 1 (Village – Subproject Area).** In the first instance, complainants will raise complaints or grievances to the PIU, GRM Focal and Construction Manager via the Village Development Committee or other designated village grievance officers. The committee will organize a meeting with the complainants and the PIU, GRM Focal and Construction Manager to resolve the issue using its traditional methods of conciliation and negotiation. The meeting will be held in a public place and will be open to other members of the community to ensure transparency. The VDC aims at clarifications and amicable solution with the complainant. This mediation aims at a village internal immediate solution agreed with the subproject. If the complaint cannot be solved at this stage, the next step will apply.
2	**Stage 2 (District Implementing Level).** If within 5 days of lodging the complaint and no understanding or amicable solution can be reached or no response is received from the

NO.	STAGES
	Village Development Committee, the complainant can bring the complaint to the District Project Steering Committee (DPSC). The DPSC will meet with the complainant to discuss the complaint and provide a decision within 10 days of receiving the appeal.
3	**Stage 3 (Provincial Implementing Level).** If the complainant is not satisfied with the decision of the DPSC or in the absence of any response, the complainant can appeal to the Provincial Project Steering Committee (PPSC) with contribution of authorities and village representative/s. The PPSC will meet the complainant to clarify the complaint and will inform the complainant about its decision aiming to solve the complaint. The PPSC will provide a decision on the complaint within 10 days.
4	**Stage 4 (Ministerial Project Executive Level).** If the AP is still not satisfied with the decision of the PPSC, or in the absence of any response within the stipulated time, the complainant can submit his/her grievance to Department of Water Supply (DWS). The DWS acting on behalf of the MPWT will verify with the PPSC and DPSC. DWS might consider an independent external opinion in this matter. The DWS will render a decision within 10 days of receiving the complaint. Before the next stage is applied additional efforts should be made to find an agreement with the AP.
5	**Stage 5 (Country Level).** As a last resort, the complainant may submit his/her case to the Court of Law. The complaint will be lodged with the Court of Law. The Court will take note and register the case and will provide the final juristic decision. The DWS will be responsible for forwarding the complaint and ensuring its process in the courts.

244. Normally complaints related to construction and environmental issues are resolved at the level of the VDC wherein the conciliation and negotiation are promptly attended to by the PIU and contractors. Complaints related to resettlement and land disputes are normally the ones that are elevated to the district and provincial levels, and at times up to the Court.

245. At each stage of the grievance redress process, careful written records will be maintained. The VDC will submit reports to the DPSC documenting the following: (i) the complaints received; (ii) the names and other pertinent information about complainants; (iii) the dates of the original complaint, meetings and any other actions; and (iv) the outcomes and/or resolution. The DPSC, PPSC, and DWS will each maintain similar records for appeals that are submitted to them. The records of grievances will be included in regular progress reporting on the subproject.

246. Table 11presents the individuals at Stage 1 (Subproject Village Level) who will be responsible for receiving and recording the complaints from the affected persons (APs).

Table 11: Individuals at Stage 1 (Subproject Village Level)

Name	Designation	Contact detail
Mr. Phetsamone	Vice Head of Xamneua Village, Head of VDC	030 5189 696
Mr. Phonechith	Head of Phanxay Village, Head of VDC	020 9996 6138
Mr. Neo	Vice Head of Navieng Village, Head of VDC	020 5449 4864
Mr. Boonmawang	Vice Head of Phonkham Village, Vice Head of VDC	030 949 8456
Mr. Amphone	Head of Nathong Village, Head of VDC	020 5665 6056
Mr. Chanpheng	Vice Head of Naliew Village, Vice Head of VDC	030 984 9160
Mr. Khamsouvanpheng	Head of Nanongbua Village, Head of VDC	020 5544 4140
Mrs. Paen	Thatmuang Village Woman Union, Secretary of VDC	020 5608 8631
Mr. Shengyang	Vice Head of Phoxay Village, Head of VDC	020 5598 2749
Mrs. Buavanh	Head of Nathongjong Village, Head of VDC	020 5525 7720
Mr. Vongseng	Nasakang Village Environment Unit, Vice Head of VDC	020 5445 3660
Mr. Sonechanh	Misouk Village Redress Mechanism Unit, Vice Head of VDC	020 55664277

If efforts to resolve complaints or disputes are still unresolved and unsatisfactory following the government's grievance redress mechanism, the affected persons/households have the right to send their concerns or problems directly to ADB's Operations Department, i.e., Urban and Water Division, Southeast Asia Department (SERD) or through ADB's Lao Resident Mission. If the AP is still not satisfied with the responses of SERD, he/she can directly contact the ADB's Office of the Special Project Facilitator (OSPF) as outlined in the "Information Guide to the Consultation Phase of the ADB Accountability Mechanism". The Information Guide can be downloaded through this link: https://www.adb.org/documents/information-guide-consultation-phase-adb-accountability-mechanism. Those who want to make a complaint with the ADB can refer to the sample letter of complaint adapted from the Information Guide as shown in the following figure.

Figure 5: Sample Complaint Letter

Date:

Office of the Special Project Facilitator
Asian Development Bank
6 ADB Avenue, 1550 Mandaluyong City
Metro Manila, Philippines

Tel: (+632) 632-4825
Fax: (+632) 636-2490
Email: spf@adb.org

Dear Special Project Facilitator,

We, _____ *[(name of your group) or name of representative authorized by your group]*, whose names and addresses are attached, live in _____ *[location and country]*.

We hereby present this complaint to the Special Project Facilitator. *[If the complaint is filed through a representative, please provide the names of the project-affected people with their addresses and evidence of authority to represent them.]*

1. We are currently experiencing problems due to an ADB-assisted project *[specify name and description of project, and specify the site and country where it is located].*
2. The direct harm we experience is/are the following: *[describe the problem].*
3. We seek the following outcomes and remedies through the help of the Special Project Facilitator: *[describe what you would like to happen, how the harm or problem can be resolved].*
4. We have previously made efforts to address our problem with the EA/IA and ADB Operations Department concerned in the following manner: *[list and attach correspondence, details of meetings, emails, and other communications].*
5. We do not request that our identities be kept confidential
   [or]
   We request that our identities be kept confidential for the following reason: *[state reason].*
6. You can contact us at: *[specify directions how to set a meeting with you and/or your authorized representative].*

_____

Signatures:
Names:
Addresses:
Other contact information:
Tel:
Fax:
Email:
Attachments: *[complete list of complainants and addresses; representative's letter of authorization, if any]*

Some matters not eligible for complaints/requests

- Allegations of fraud and corruption
- Procurement of goods, services, and consulting services
- Projects with a project completion report
- ADB personnel matters

11 ENVIRONMENTAL MANAGEMENT AND MONITORING

247. The matrix of mitigation measures in Table 12 presents all the required measures and monitoring responsibilities corresponding to the impacts as assessed that are considered necessary through the environmental assessment process. The mitigation measures required cover all stages of the contract and are separated into pre-construction, construction and operation phases. This EMP is based on the type, extent and duration of the environmental impacts identified at the design stage, and has been prepared in line with the IFC EHS Guidelines for Water and Sanitation. In the event that unexpected impacts occur during implementation, the EMP will be amended to take into account of unexpected impacts and mitigation measures will be amended as necessary.

Table 12: Environmental Management and Monitoring Plan

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
I. PRE-CONSTRUCTION PHASE				
Impact on land acquisition and community assets Loss of community assets due to land acquisition and damage to properties.	Implement the land acquisition and compensation plan that was approved by the ADB for the subproject. Design access roads to minimum necessary width and installation of pipelines within the Right-of-Way when feasible.	External LACP monitoring report	c/o PNP operations cost and/or District government budget	PIU
Baseline Water Quality Monitoring	Identify baseline water quality conditions at the intake location. Samples should be taken at least once during the dry season and once in the wet season	pH, turbidity, E.Coli, chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO3 heavy metals. Pesticides will also be monitored if identified.	c/o PNP operations cost	PIU
Impact of location of raw water intake on other water users Downstream river uses such as irrigation, bathing, washing, and fishing will be affected if excessive water	**Houay Hin Dam and Houay Hin Men**. The abstraction rate of raw water to the existing WTP will be limited to 2,500m^3/day; the flow in the houays is estimated at >3,000m^3/day to >7,000m^3/day, seasonally dependent. No downstream users are anticipated to be affected, but the environmental	River level assessments at the intake on a monthly basis River flow rate measurement on a monthly basis. Monitoring of inlet site and fish screens.	c/o PNP operations cost	PIU, PNP

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
abstraction will occur.	base flow will ensure the integrity of the ecosystem. **Nam Xam**. The abstraction rate will be limited to 8,800m^3/day; the actual flow in the river is 90,000-170,000m^3/day. There is negligible conflict with other water users of Nam Xam because only between 5% and 10% of the total discharge will be drawn. The downstream reaches also have small and large tributaries which will attenuate any loss from the water supply system. Fish screens will be fitted to the intake pipes. Pipes will have bell ends to reduce velocity.			
Impact to Natural resources and protected areas Impact on natural resources and protected areas from cutting/clearing of trees and other vegetation.	Cutting of trees will be undertaken as per approved design and only upon approval. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash in accordance with the approved Land Acquisition and Compensation Plan. Orient workers about restrictions and prohibitions on harvesting of natural resources from the NCBA.	Conduct inventory of trees to be affected	N/A	N/A
UXO clearing	Secure UXO clearance following detailed design	UXO clearance	c/o PNP operations cost	PNP Xamneua
Environmental compliance	Submit the IEE to DONRE and secure an Environmental Compliance Certificate (ECC) prior to	Approved ECC secured from DONRE	c/o PNP operations cost	DPWT, PNP Xamneua
II. CONSTRUCTION PHASE				
Impact on Historical and Archaeological Sites Damage to relics and artifacts during the	The Contractor will ensure that the workforce are briefed that in the event of accidental finds relics they should immediately cease any works in the area and promptly report the find to their supervisor.	Accidental finds	c/o PNP operations cost	PNP is required to monitor and the contractor is responsible to decure the site and implement Chance Find

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
conduct of the works.				Procedures. PNP is responsible executing the removal of artifacts.
<u>Temporary disruption of existing community roads, pathways, and accesses</u> Pipe laying will cause temporary disruption of community services and access to properties. Particularly at pipe road crossings, construction activities along narrow roads may lead to temporary blockage or closure of roads and hamper movement of vehicles and people in the community. Community access to areas in the vicinity of the WTP, pump station, reservoir, and intake will be affected. Community access to areas in the vicinity of schools, temples, village offices, market places and meeting halls will be affected	Walking access will be maintained to affected properties and access routes will be temporarily lined with timber or similar material. Particular attention will be given to ensuring safety along roads and paths used by school children. Side street parking of construction vehicles on prolonged basis will not be allowed. Install barriers and safety warning signs on road sections and if necessary deploy traffic aides/ flag persons at affected locations. Information boards at blocked roads will provide information about the temporary closure of roads, schedule of works and the traffic-rerouting plan. Require the contractor to immediately rehabilitate the excavated areas and any damaged road and path sections. Enclose the WTP; pump station, reservoir, and intake perimeters so that pathway use and stream access remains unimpeded. Enclose the latrine construction site to prevent access and limit disruption for the use of the schools and public buildings.	Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
during construction of public latrines.				
Air pollution Dust and air emissions from earthworks and movement of vehicles can pose nuisance to nearby communities	Require the contractor to cover materials with tarpaulin or other suitable materials while in transit to avoid spillage of materials. Moisten earthen roads during dry and dusty conditions, particularly roads near residences and through the town core area. Impose speed limits on construction vehicles. Conduct regular maintenance on construction equipment and vehicles to control air emissions during vehicle operation.	Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Noise Operation of construction equipment such as jackhammer will cause excessive noise resulting in nuisance to communities.	Limit construction activities, particularly operation of noise generating equipment at night. Position any stationary equipment that produce high noise levels such as diesel generators as far as practical from sensitive receptors. Erect temporary barriers around construction sites especially near schools, hospitals, and houses. Install noise suppression devices to noise generating equipment. Require drivers to minimize blowing of horn and to comply with speed limits. Provide information to community on schedule of construction activities through billboard/signs.	Include EMP in bid documents and contract. Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
Impact of borrow materials Quarrying of aggregates on Nam Xam river will cause siltation and affect the ecological condition of the river.	The contractor will be prohibited from quarrying materials directly from Nam Xam. Construction materials will be procured from Government-permitted sources / suppliers only.	Include EMP in bid documents and contract. Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Impact on ecological resources Construction workers may undertake hunting of wildlife and cutting of wood upstream of the intake.	The contractors will prohibit activities such as cutting wood for cooking, hunting, or wildlife trade.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Clearing of vegetation Poor planning and execution of tree clearing/vegetation removal at project facilities and along pipeline alignments can result in loss of vegetation and general landscape	Cutting of trees will be undertaken as per approved design and only upon approval of relevant authorities. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash accordance with the approved Land Acquisition and Compensation Plan. Roads and paths to the intake, WTP, and reservoir will only be sufficiently wide to accommodate construction vehicles/equipment to minimize land take. Manual labor will be utilized in sloping terrain where use of heavy equipment would cause unnecessary damage. Steep exposed slopes will be graded and covered with bush and grass to minimize erosion.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
	Implement landscaping and planting of trees/vegetation at WTP site.			
Water pollution - Sediment runoff Sediment runoff undertaken during excavation, earthworks and grading in the rainy season will cause siltation of rivers	Construct silt traps, deviation channels, mounting barriers or trenches around the stockpiles of materials.	Include EMP in bid documents and contract Report any complaint received from the community PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Water Pollution - Worker's camp Domestic wastewater from worker's camp would result to the discharge of sewage into drainage canals. Unsanitary conditions at the worker's camp will occur without the provision of necessary sanitation arrangements.	Provide adequate water supply and temporary toilet facilities at the worker's camp.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Water pollution - Generation of residual chlorine during pipeline and reservoir disinfection Prior to commissioning, disinfection will be undertaken on the pipeline and reservoir. Discharge of residual chlorine above the	Follow the recommended dosage of chlorine during the disinfection of pipes and reservoir. Discharge of water with high chlorine concentration to soil at the end of pipelines to be controlled to minimize soil erosion. Use chlorine test kit and use 10x15x dilution with distilled water or use high range chlorine test kit with high range tablets to detect chlorine residual before flushing.	Include EMP in bid documents and contract	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
allowable limits is toxic to fish and other aquatic life.				
Generation of construction waste - Generation of excavated soil Generation of excavated materials during pipe laying and foundation works for WTP tanks and reservoirs.	During pipe laying, excavated material will be utilized to backfill the trench. The contractor will be required to properly reinstate the excavated trench after completion of pipe laying. Surplus excavated material/cut soil from construction of the WTP and reservoir will be used as backfill material for low-lying areas that have been identified by the village authority.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Generation of construction wastes – Solid, Inert and Hazardous Wastes Solid wastes, inert construction wastes, and hazardous wastes during construction will result to pollution of land and receiving water bodies.	Provide appropriate segregation bins or areas for construction wastes. Secure and control storage of all hazardous materials including fuels. Reuse recyclable construction wastes such as wood, steel, and scaffoldings or sell to junk shops. Solid waste to be collected and disposed in approved disposal site of the District. In cases where existing equipment is to be replaced under the rehabilitation part of the subproject, it is to be segregated according to material type and disposed of/recycled in a manner to be approved by the Engineer at licensed facilities.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations, including rehabilitation.
Community health and safety Community may be exposed to dangers of open excavation	Install barricades/barriers and sturdy plate covers in open excavations during non-working time. Install warning signs in the area.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
				mitigations, including rehabilitation.
<u>Occupational health and safety</u> Construction activities may pose hazards to workers because of the use of heavy equipment, lifting of heavy loads, and exposure to open excavations and chemicals. Potential conflict with local people will occur if migrant workers will be brought to the site.	Require the contractor to implement the construction health and safety plan in accordance with the World Bank EHS Guidelines (http://www.ifc.org/ehsguidelines) as a minimum standard. The contractor will appoint an environment, health and safety officer to ensure implementation of the plan. The plan will at minimum include: • Provision of first-aid facilities readily accessible by workers. • Provision of personal protective equipment (PPEs) such as hard hats, gloves, rubber boots, etc., • Wearing of PPEs while working onsite will be a mandatory requirement for workers. • Posting of safety signs/reminders in strategic areas within the construction area. • Installation of sufficient lighting at night. • Employ only trained personnel in handling chlorine during the line disinfection process. • Ensure that vehicle and equipment operators are properly licensed and trained. • Provide staff with communicable disease and HIV-related awareness training. The contractor will be required to provide priority hiring of qualified construction workers from the villages and to consult with the local to avoid conflict if migrant workers will be brought to the site.	Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	Included in civil works cost	PIU is responsible for monitoring all contract work activities, while the contractor is responsible for implementing mitigations.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
III. OPERATION PHASE				
Generation of incremental wastewater and increased burden on drainage systems Increased water supply to public buildings and households will generate additional quantities of wastewater.	As project policy, water connection will be provided only if the household has an approved sanitation facility to cope with the increased wastewater generated. This policy and the public awareness raising initiatives was presented to the villages under the Village Environmental Improvements (VEI) component. The public institution shall sign a service and management agreement before construction and have sufficient funds to maintain the facility.	Monitor the number of households with latrines and with water connections, population served, and billed water volume. Monitor that the service and management agreements are followed and facilities are properly maintained.	Part of PNP operations cost To be arranged public institution	PNP
Deterioration of water quality Potential deterioration in quality of raw water supply and of treated water Potential risk on public health in deterioration of treated water quality due to use of poor quality treatment chemicals	Monitor community activities in the catchment area to check activities at the upstream that may cause contamination of raw water quality. Provide laboratory test equipment and training to allow the PNP to conduct regular monitoring of raw and treated water quality parameters. Follow O&M standard operating procedures in accordance with the water treatment plant manuals. Use of potable grade chemicals, especially PAC, and request a Supplier product specification data sheet signed off by a reputable external laboratory. Grant covenants on: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and applying good practices to treat water to acceptable Ministry of Health standards to be included.	Monitor the following parameters: Daily at the inlet to the treatment plant: turbidity, pH Daily after the reservoir: pH, turbidity, residual chlorine, temperature Weekly at several locations in the network: residual chlorine, pH, turbidity Annually after Clearwater tank: chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO3.	Part of PNP operations cost	PNP

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
High Pressure and Leaks on the Pipeline The proposed distribution network will have sections located at low elevations which may experience high water pressure which may potentially result in leakages in the line and ultimately water loss	This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) use of pressure zones, (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.	Daily visual monitoring of pipelines. Pressure monitoring will also be occasionally applied.	Part of PNP operations cost	PNP
Disposal of backwash water and sediments from WTP Backwash water and sludge from the sedimentation tanks will be generated from the cleaning of filters and tanks. Backwash water and sludge contain high total suspended solids.	Filter backwash water and periodic discharges from the sedimentation tanks will be collected to a detention pond to separate the concentrated waste sludge or sediments. Land application of wastes with high dissolved solids concentrations from the detention pond is preferred over discharge to a landfill.	Check condition of detention ponds; report frequency/schedule of backwashing	Part of PNP operations cost	PNP
Occupational health and safety Potential hazards to WTP workers due to accidental release of chlorine	Provide secure, dry and well-ventilated storage facilities for chlorine and other hazardous chemicals. Use chlorine compounds in power form, which is safer than gas. Training of staff and allocation of responsibility to ensure that materials are properly handled.	Training undertaken for staff on chemicals handling and monitoring and reporting of incidents	Part of PNP operations cost	PNP
Generation of Sludge from Detention Ponds	The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. No land application of the generated	Quarterly check on the volume of sludge in the detention ponds.	Part of PNP operations cost	PNP

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	BUDGET	RESPONSIBLE OFFICE
Increased volume of sludge in detention ponds.	sludge without the required approval by the village authorities.			
Community health and safety Potential hazards to residents and school children near the WTP site.	Facilities (Intake, WTP and Laboratory, Office and Reservoir) properly fenced and secured and watchmen/security personnel to be employed on a 24-hour basis.	Daily log of security personnel	Part of PNP operations cost	PNP

11.1 Reporting

248. **Pre-construction Phase.** The EMP monitoring during the pre-construction phase of the subproject will be undertaken by PIU with support from PIA. Semi-annual Integrated Safeguards Monitoring Reports will be prepared by the PCU with support of the PIA and submitted to ADB for review and disclosed on the ADB project website.

249. **Construction Phase.** Throughout the construction period, the contractor will submit monthly environmental compliance progress reports to the PNP, with a copy furnished to the PIU. The contractor should be able to highlight the summary of the progress of construction, activities undertaken within the reporting period to implement the measures outlined in the EMP, record any community complaints received and how the complaint was resolved.

250. The PIU will consolidate the results of the monthly environmental monitoring through a quarterly progress report that will be submitted to the PCU which is based at the Department of Water Supply of the MPWT. The quarterly report will summarize the significant findings and measures undertaken to address any adverse environmental impacts during construction and also present any unforeseen environmental impacts and suggested remedial actions for the next monitoring period. Copies of the quarterly progress report prepared by the PIU will be given to the members of the Provincial Project Steering Committee and the District Governor. PCU will consolidate information from quarterly progress reports, compile and submit integrated safeguards monitoring report semi-annually to ADB.

251. Once the reports are received by the PCU, these will be reviewed relative to subproject compliance with the indicators defined in the EMP. The PCU will submit the quarterly reports to the Department of Water Supply of MPWT and other national agencies (MONRE, MOF, MOPC, etc.), and to ADB. The PCU will also prepare the quarterly Project Progress Reports including the main points of environmental monitoring and Semi-annual Integrated Safeguards Monitoring Reports in English to be submitted to ADB.

252. **Operational Phase.** The EMP monitoring during the operational phase will be undertaken by the PNP. Semi-annual reports will be submitted by the PIU to the PCU. The PCU will review the report and check the project's adherence to the EMP and then submit the Semi-annual Integrated Safeguards Monitoring Reports to ADB until the Project Completion Report (PCR) is prepared. The monitoring parameters during the operational phase, as outlined in the EMP, include monitoring of water quality at the inlet of the WTP and of treated water. Table 8 presents the EMP Reporting Plan while Table 13 shows the Matrix for reporting of the Water Quality Monitoring Results.

Table 13: EMP Reporting Plan

TYPE OF REPORT	BASIC CONTENT	PREPARED BY	SUBMITTED TO	FREQUENCY
PRE-CONSTRUCTION THROUGH OPERATIONAL PHASE				
Progress report	Integrated Safeguards Monitoring Report including EMP implementation and monitoring	PCU, Department of Water Supply	MPWT ADB	Semi-annual until project completion report (PCR)
CONSTRUCTION PHASE				
Construction Progress Report	Progress of construction, including EMP monitoring results, complaints received and actions taken	Contractor	PCU and copy furnished to PIU	Monthly
Progress Report	Progress of construction, EMP implementation, complaints received and actions taken	PIU	PCU, District Governor, Provincial Project Steering Committee	Quarterly
Progress Report	Progress of construction, safeguards (EMP and LACP) implementation, complaints received and actions taken	PCU, Department of Water Supply	MPWT, MONRE, and other national agencies ADB	Quarterly
OPERATIONAL PHASE				
Progress Report	Subproject progress report including EMP implementation and monitoring	PNP	PCU	Semi-annual until project completion report (PCR)
Integrated Safeguards Monitoring Report	Subproject progress report including EMP/LACP implementation and compliance with ADB's policies and regulations	PCU, Department of Water Supply	MPWT ADB	Semi-annual until project completion report (PCR)
Project Completion Report	Project evaluation, lessons learnt and recommendations	PCU	MPWT ADB	After physical completion of the sub-project and before end of contract of PIA

11.2 Implementation Arrangements

253. Table 14 sets out the Institutional Responsibilities for Environmental Management. The Ministry of Public Works and Transport - Department of Water Supply and the PNP are the key institutions that will play crucial roles in the implementation of the subproject as well as in ensuring the proper and timely implementation of the requisite environment safeguard reports. The

succeeding sections details the administrative and environmental management responsibilities of the concerned institutions.

11.2.1 **Department of Water Supply - Ministry of Public Works and Transport**

254. The Department of Water Supply of the MPWT as Executing Agency (EA) will house the Project Coordination Unit (PCU) responsible for the overall project and will be the primary point of contact with ADB. The Department of Water Supply will head the PCU. The PCU will receive overall direction and policy guidance from a Project Steering Committee (PSC), which includes representatives of the main central level agencies, including MONRE.

11.2.2 **Project Implementation Unit (PIU)**

255. The Project Implementation Unit (PIU) at the provincial level, will be responsible to the day-to-day coordination and supervision of subproject implementation. The PIU is headed by the Director of the PNP. The PIU will receive support in coordinating the provincial and district agencies including the DONRE offices and take decisions on behalf of the provincial government from a Provincial Project Steering Committee (PPSC), chaired by the Provincial Vice Governor. At the district level, the District Government or Vice Governor will oversee the subproject, monitor progress, coordinate the subproject with the PIU and local communities and report on the progress to the PPSC.

Table 14: Institutional Responsibilities for Environmental Management

AGENCY	ROLE	CONSTRUCTION	OPERATION
MONRE	Overall central level supervision and guidance related to natural resources and environment	✓	✓
PCU	Overall supervision IEE preparation and implementation: Review of IEE and coordination of approvals from ADB Uploading of the IEE on MPWT website Ensuring EMP is included in contract documentation. Check the project's adherence to the EMP Review the quarterly environmental monitoring reports prepared by the PIU during the construction phase and submit the report to ADB. Review the semi-annual progress report prepared by the PNP during the operational phase and submits the report to ADB.	✓	✓ (prior to PCR)
PIU	Principal responsibility for monitoring EMP implementation during construction. Preparation of IEE and contract documentation Submission of IEE to ADB for approval Submission of IEE to PPSC and DONRE for reference during monitoring Conduct consultations with local residents in respect of specific sites where the proposed works will include excavation, determine the need for any further investigation and/or clearance services and submit to the PCU Monitor compliance of the contractor with the EMP	✓	✓

AGENCY	ROLE	CONSTRUCTION	OPERATION
	Consolidate monthly environmental monitoring reports prepared by contractor through a quarterly progress report to be submitted to the PCU. Provide members of the Provincial Project Steering Committee and the District Governor with copies of the quarterly progress report		
PIA	Advice on issues arising with EMP implementation and overall technical support	✓	✓
PPSC	Coordination of provincial and district agencies for EMP implementation during construction and operation, and ensuring compliance monitoring.	✓	✓
PNP	Participation in PIU	✓	
	Implementation of operational aspects related to water supply output in the EMP Conduct water quality monitoring at WTP inlet, treated water, and distribution lines		✓
OPWT	Participation in PPSC	✓	
	Implementation of operational aspects related to drainage and public sanitation output in the EMP		✓
DOH	Participation in PPSC	✓	
	Participation in environmental monitoring and awareness raising		✓

Notes: PIA – Project implementation assistance; OPWT – Office of Public Works and Transport (District); DOH – District Heath Office

11.2.3 **Environmental Monitoring**

256. Table 15 presents the environmental monitoring plan and performance indicators during the construction and operational phases of the subproject based on the EMP.

Table 15: Environmental Monitoring Plan

PARAMETERS	LOCATION	ENVIRONMENTAL PERFORMANCE INDICATOR	FREQUENCY	MEANS OF MONITORING
CONSTRUCTION PHASE				
Adherence to provisions in the EMP to mitigate construction impacts	All subproject sites (intake, WTP, reservoir, access roads, main and distribution network)	Compliance with EMP	Daily	Compliance monitoring by contractor and PIU
Direct effects on communities from impacts such as damage to properties, dust generation, noise, and safety	All subproject sites (intake, WTP, reservoir, access roads, main and distribution network)	Views and opinions of communities and complaints received via GRM	Weekly	Through community feedback and grievance redress mechanism
Monitoring of EMP during construction/excavation, including	All roads, particularly at road pipe crossings	Compliance with EMP	Daily	Compliance monitoring by contractor and PIU

PARAMETERS	LOCATION	ENVIRONMENTAL PERFORMANCE INDICATOR	FREQUENCY	MEANS OF MONITORING
compliance with traffic management requirements				
Residual chlorine during pipeline and reservoir disinfection prior to commissioning	Pipeline and reservoir	Residual chlorine should be less than 2 mg/l before flushing	Prior to decommissioning	Residual chlorine testing or report on dilution activity
OPERATIONAL PHASE				
Wastewater management	Villages	Number of households with latrines and with water connections, population served, and billed water volume	Monthly	PNP records
Raw water source	Intake	Water abstraction rate at intake	Monthly	PNP records
Water quality of raw and treated water	Inlet of WTP	pH, turbidity	Daily	In-situ test kits
Water quality of treated water and at the distribution networks	WTP and sampling stations strategically scattered around the distribution area	After the reservoir: pH, turbidity, residual chlorine, and temperature At locations in the distribution system: Residual chlorine, pH, turbidity After the Clearwater tank: Chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO3	Daily Weekly Annually	Using portable test kits and/or analysis in laboratory
Backwash water and sediments from WTP	WTP	Schedule of backwashing and condition of detention ponds	Monthly	PNP records and site observation
Occupational health and safety	WTP	Staff training on chemicals handling and monitoring of incidents	Before the start of WTP operation and throughout operation	PNP records

11.2.4 **Capacity Building**

257. The office of PNP Xamneua Province lacks the capacity for environmental management and monitoring and water quality testing. The subproject will include equipment for a small water testing laboratory at the WTP site. Regular water quality tests on the raw and treated water will help determine appropriate dosing of chemicals to be applied at the WTP as well as ensure potable water quality at the distribution lines. The PNP will receive training on the operation, calibration, and maintenance of the laboratory equipment. At the minimum, the laboratory will include portable equipment for testing of turbidity, temperature, residual chlorine and pH. The PNP staff will also be trained on the proper and correct sampling and preservation methods for water samples that will be brought to external laboratories for analysis.

11.2.5 **Environmental Management and Monitoring Costs**

258. The cost for the environmental safeguard activities during construction, i.e. environmental management, review, and monitoring, for the subproject will be primarily included in the civil works cost. The cost of environmental management and monitoring activities during the operational phase will be borne by the PNP, as part of operation and maintenance activities.

12 CONCLUSION AND RECOMMENDATIONS

259. This IEE for the Xamneua Subproject was undertaken to determine the environmental issues and concerns associated with all proposed works under the subproject. The assessment confirms that the subproject remains classified as Category B for environment based on ADB Safeguards Policy Statement (SPS, 2009). In addition, an Environmental Compliance Certificate has been provided by DONRE with regard to the IEE and EMP, and it is appended to this document.

260. The subproject will have beneficial impacts on health and well-being of the people because of improved accessibility to potable and reliable water supply. There are also health benefits in the form of reduced incidence of diarrhoea, dysentery, skin rashes, and other water-borne diseases as a result of hygiene promotion activities and improved access to safe water for the community.

261. Most of the environmental impacts are expected to occur during the construction phase. The environmental impacts are not expected to cause irreversible and significant adverse environmental impacts and are easily controllable by appropriate and conventional mitigation measures. Based on the assessment of environmental impacts, the anticipated adverse impacts during project implementation are related to nuisances which may happen during the construction of the subproject components such as temporary alienation of access, temporary disruption of community facilities, noise, and sediment runoff, release of dust and engine gas emissions. Recommendations formulated in the EMP, its inclusion in the contractual framework, and an effective inspection of construction sites will reduce these risks to an acceptable level.

262. Environmental mitigation measures have been designed as outlined in the subproject EMP to address any adverse impacts during the various phases of subproject implementation. The EMP also presents the institutional responsibilities for implementing the mitigation measures. All Subproject activities prior to construction, during construction and during operation will be managed as provided in the EMP and the Contractor’s compliance and implementation of the mitigation measures shall be monitored. An environmental monitoring plan has been provided to ensure water quality is maintained according to the prevailing Lao PDR drinking water standards. In addition, grant covenants will require: (i) testing and monitoring of water quality in subproject towns, and (ii) long term strategy on capacity building with regards monitoring water quality and

applying good practices to treat water to acceptable Ministry of Health standards. The operations and maintenance manuals will cover operational environmental mitigation and monitoring measures in line with EHS Guidelines for Water and Sanitation.

263. The IEE concludes that the subproject combined with available information on affected environment is sufficient to identify the scope of environmental impacts of the subproject. No further environmental assessment is therefore required unless the scope and location are significantly changed.

APPENDICES

Appendix A: Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES) for endorsement by the Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: LAO PDR: Water Supply and Sanitation Sector Project Xamneua Subproject
Sector Division: SEUW

SCREENING QUESTIONS	YES	NO	REMARKS
A. Project Siting Is the project area…			
Densely populated?		X	The service area and locations of project components are in urban town centers. These areas are not densely populated.
Heavy with development activities?		X	Development activities in the service area are limited to small-medium sized commercial activities. Most of the area is used for residential purposes with some paddy fields.
Adjacent to or within any environmentally sensitive areas?		X	There are no environmentally sensitives areas within or nearby to the subproject footprint.
Cultural heritage site		X	Not applicable
Protected Area		X	The Nam Xam National Protection Forest Area (PFA) is directly to the west of Xamneua Town and encapsulates large areas of the Nam Xam headwaters. The Nam Xim PFA is located to the east of Xamneua town and covers upstream areas of the Nam Xim, a tributary of the Nam Xam. These PFAs will not be impacted by the project but are expected to provide protection benefits to water sources.
Wetland		X	Not applicable
Mangrove		X	Not applicable
Estuarine		X	Not applicable
Buffer zone of protected area		X	Not applicable
Special area for protecting biodiversity		X	Not applicable
Bay		X	Not applicable
B. Potential Environmental Impacts Will the Project cause…			

SCREENING QUESTIONS	YES	NO	REMARKS
▪ pollution of raw water supply from upstream wastewater discharge from communities, industries, agriculture, and soil erosion runoff?	X		There are small farming village settlements in the upstream reaches of the Nam Xam
▪ impairment of historical/cultural monuments/areas and loss/damage to these sites?		X	There are no historical/cultural sites that will be affected by the project.
▪ hazard of land subsidence caused by excessive ground water pumping?		X	Not applicable.
▪ social conflicts arising from displacement of communities ?		X	Not applicable.
▪ conflicts in abstraction of raw water for water supply with other beneficial water uses for surface and ground waters?		X	There is sufficient water in Nam Xam for downstream users. Villagers disclosed that even during the dry season, the river still has water.
▪ unsatisfactory raw water supply (e.g. excessive pathogens or mineral constituents)?		X	The current condition of the raw water in Nam Xam is satisfactory. A WTP is proposed for the subproject to improve quality of water supply.
▪ delivery of unsafe water to distribution system?		X	The subproject will ensure delivery of safe and potable water.
▪ inadequate protection of intake works or wells, leading to pollution of water supply?		X	Measures are included in the EMP to protect intake works against contamination.
▪ over pumping of ground water, leading to salinization and ground subsidence?		X	Not applicable. Groundwater abstraction is not included in the scheme.
▪ excessive algal growth in storage reservoir?		X	Disinfection will be undertaken to prevent algal growth.
▪ increase in production of sewage beyond capabilities of community facilities?		X	The project policy will ensure that households have pit latrines before connecting to the water supply system. The drainage and sanitation concerns will be addressed in the VEI component.
▪ inadequate disposal of sludge from water treatment plants?		X	Back wash water from sand filters and sludge resulting from the WTP process will be piped into detention pond and clarified water will be decanted into a drainage pipe. Sludge will be removed from the retention pond periodically and disposed of to agricultural land as soil conditioner.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances and protect facilities?		X	Noise control measures are included in the EMP.
▪ impairments associated with transmission lines and access roads?		X	Installation of pipelines will affect access of vehicles and passersby. A management plan is included in the EMP.
▪ health hazards arising from inadequate design of facilities for receiving, storing, and handling of chlorine and other hazardous chemicals.		X	The WTP will include a chlorination and coagulation which needs proper chemical storage and handling system to avoid health hazards.

SCREENING QUESTIONS	YES	NO	REMARKS
▪ health and safety hazards to workers from handling and management of chlorine used for disinfection, other contaminants, and biological and physical hazards during project construction and operation?		X	Workers and staff of the WTP will be oriented on the proper handling of coagulants and chlorine.
▪ dislocation or involuntary resettlement of people?		X	Not applicable
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not applicable
▪ noise and dust from construction activities?		X	Noise and dust may be generated during the construction of the subproject components (intake, WTP, and secondary mains). Mitigating measures are incorporated in the EMP.
▪ increased road traffic due to interference of construction activities?		X	Some roads may be blocked during construction of the lines. Also, the movement of vehicles carrying construction materials along the narrow roads to the subproject component sites may cause disturbances. Appropriate management of traffic are incorporated in the EMP.
▪ continuing soil erosion/silt runoff from construction operations?		X	Temporary silt runoff from excavation activities may be generated. Silt traps and other measures to control sediment flow into rivers are included in the EMP.
▪ delivery of unsafe water due to poor O&M treatment processes (especially mud accumulations in filters) and inadequate chlorination due to lack of adequate monitoring of chlorine residuals in distribution systems?		X	O&M training will be provided to the operators of the WTP and water distribution system resulting preventing delivering of unsafe water.
▪ delivery of water to distribution system, which is corrosive due to inadequate attention to feeding of corrective chemicals?		X	Polyaluminium Chloride (PAC) will be used as primary coagulant to maintain pH above 7.2.
▪ accidental leakage of chlorine gas? ▪		X	Powder chlorine will be used.
▪ excessive abstraction of water affecting downstream water users?		X	Abstraction will be limited to the capacity of the WTP.
▪ competing uses of water?		X	Domestic water supply is the priority on the use of the Nam Xam. The proposed abstraction volume will be sufficient to allow water for downstream users.
▪ increased sewage flow due to increased water supply		X	Improvement in water supply may result to increased water consumption and therefore increase the volume of wastewater. Households will be required to have a pit

SCREENING QUESTIONS	YES	NO	REMARKS
			latrine with soakaways if needed before connecting to the water supply system.
▪ increased volume of sullage (wastewater from cooking and washing) and sludge from wastewater treatment plant	X		There is potential increase in sullage with improvement in water supply. Drainage improvement measures will be provided as part of the VEI activities.
▪ large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	Not applicable
▪ social conflicts if workers from other regions or countries are hired?		X	PIU and contractor will be required to hire qualified locals during construction and operation.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?		X	Not applicable
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?		X	Not applicable

A CHECKLIST FOR PRELIMINARY CLIMATE RISK SCREENING

Country/Project Title: LAO PDR: WATER SUPPLY AND SANITATION SECTOR PROJECT
SUBPROJECT: XAMNEUA DISTRICT
Sector : WATER SUPPLY
Subsector:
Division/Department: SEUW

SCREENING QUESTIONS		SCORE	REMARKS[13]
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather related events such as floods, droughts, storms, landslides?	0	The river has not dried up even during the dry months. The WTP and reservoir are located in elevated areas and will not be affected by extreme floods.

	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc)?	1	Design of intake needs to consider highest and lowest flows of the river and rainfall intensity. River level assessments will be undertaken as part of the monitoring plan.
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s) ?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered a low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Total score is 1 thus LOW RISK

Other Comments:

_____

_____

_____

Prepared by: _____

Appendix B: Ministry of Public Health Drinking Water Quality Standards (2014)

PARAMETER	UNIT	PERMISSIBLE LIMITS	EXCEPTIONS	MONITORING FREQUENCY		
				WEEKLY	MONTHLY	YEARLY
MICROBIAL						
E. Coli	Units / 100 mL	<0	-		✓	
CHEMICAL						
Aluminium (Al)	mg/l	<0.2	There is no exception if aluminum-based coagulants are used		✓	
Arsenic (As)	mg/l	<0.01	There is no exception if source is groundwater			✓
Chloride Cl-	mg/l	<250				✓
Chlorine Cl2 (free residual)	mg/l	0.1 – 2	There is no exception if chlorine is used for disinfection	✓		
Copper (Cu)	mg/l	<2	There is no exception if copper pipe work is used			✓
Cyanide (Cn)	mg/l	<0.5	There is no exception if source is surface water and catchment includes gold mining / processing, although none was reported in this subproject area.			✓
Fluoride (F)	mg/l	<1.5	There is no exception if source is groundwater or fluoride is added to water in the treatment process			✓
Iron (Fe)	mg/l	<0.3				✓
Lead (Pb)	mg/l	<0.01				✓
Manganese (Mn)	mg/l	<0.1				✓
Mercury (Hg)	mg/l	<0.006				✓
Nitrate (NO_3^-)	mg/l	<50		✓		
Nitrite (NO_2^-)	mg/l	<3		✓		
Sodium (Na)	mg/l	<200				✓
Sulfate ion (SO_4^{2-})	mg/l	<250				✓
Zinc (Zn)	mg/l	<3				✓
PHYSICAL						
Colour	TCU	<5		✓		
Taste		Acceptable		✓		
pH		6.5-8.5		✓		
Conductivity	uS/cm	<1000				✓
Turbidity	NTU	<5		✓		
Total hardness as $CaCO_3$	mg/l	<300				✓

Appendix C: Proceedings of Public Consultations for Xamneua Subproject

Summary on FS and IEE during feasibility implementing phase (1st Round Consultations)
Consultations for the Feasibility Study and Initial Environmental Examination were held between the 24th and 26th July 2017. The team was lead by the Environmental Specialist, Mr. Cliff Massey with Mr. Thanongsith Pathoumthong (Mr. Sith), Environmental Engineer from the Lao Consulting Group (LCG) and supported by Mr. Somnouk Sangthong, Deputy Head of PNP, Xamneua Province. Over the course of the site visit the Environmental Team meet with district and provincial departments of DPWT, PNP, MONRE, Provincial State Enterprise (UXO) and the Department of Irrigation. Some informal consultations were also held with local residents of Sopboa village and Xamneua.

The intention of the consultations was to inform the government representatives of the FS and IEE process and be updated on potential environmental risks the project may cause during construction and operations phase. The consultations allowed the Environmental Team to be informed of local conditions that might influence final design, and to gather information and data on local environmental aspects, such as protected areas, water quality, vegetation and hazards (land stability, UXO etc.), and current water uses and issues. The outcomes from the consultations and along with data collected have been shared with the town water supply design team who have factored this information into design options.

FS and IEE Development Phase: Environmental Examination related Consultation for Water Supply Component					
DATE	**TYPE OF MEETING AND LOCATION**	**AGENCY**	**PARTICIPANTS**		**DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY**
24 July 2017	IEE Kick Off Meeting Xamneua Department of Public Works and Transport 08.30-10.30 	▪ DPWT ▪ PNP	▪ PIU/PNP; ▪ DPWT; ▪ LCG ▪ DONRE	Participants By sex: - 0 female - 7 male	**Presentation:** • General introductions • Specific description on WTP for Xamneua and Sopbao; • Explanation of ADB policy and Lao policy on entitlement and eligibility; • Introducing of IEE and FS process • Explanation on data to be collected and locations • Subproject related briefing on possible environmental impacts, temporary / permanent. **Comments – Questions – Answers:** • Gov. staff stressed the importance of WTP; • Participants well understood the project environmental impacts and benefits
25 July 2017	IEE Kick Off Meeting Sopbao District Department of Public Works and Transport 9.30 – 11.00	▪ DPWT ▪ PNP	▪ PIU/PNP; ▪ LCG ▪ DONRE	Participants By sex: - 0 female - 6 male	**Presentation:** • General introduction into topic; • Specific description on WTP for Sopbao; • Explanation of ADB policy and Lao policy on entitlement and eligibility; • Introducing of IEE and FS process • Explanation on data to be collected and locations • Subproject related briefing on possible environmental impacts, temporary / permanent.

FS and IEE Development Phase: Environmental Examination related Consultation for Water Supply Component					
DATE	**TYPE OF MEETING AND LOCATION**	**AGENCY**	**PARTICIPANTS**		**DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY**
					Comments – Questions – Answers: • Gov. staff stressed the importance of WTP; • Participants well understood the project environmental impacts and benefits • Discussion on historical fish kills and issues on water quality. Cyanide to be tested in water samples
26 July 2017	IEE assessment of potential UXO risks of the two sub projects. PNP Office, Xamneua 9.00 – 10.00 	▪ UXO	▪ PNP ▪ LCG ▪ UXO	Participants By sex: - 1 female - 6 male	**Presentation:** • General introduction into topic; • Specific description on WTP for Xamneua and Sopbao; • Explanation of ADB policy and Lao policy on entitlement and eligibility; • Introducing of IEE and FS process • Explanation on data to be collected and locations • Subproject related briefing on possible UXO **Comments – Questions – Answers:** • UXO unlikely to be an issue because all sites are already in modified environments.

Summary of the Land Acquisition and Environmental Impact Assessment 2nd Round Consultations

- Between the 16th and 21st October 2017 meetings took place in Xamnuea District Natural resource and Environmental Office with project affected people of the Xamneua suproject .
- All twelve villages of sub project were engaged. These include Xamneua, Nathong, Phounkham, Navieng, Phanxay, Naliew, Nanongboua, Thadmouang, Phoxay, Nathongjong, Nasakang, and Misouk.
- Between the 23rd and the 24th October 2017 meetings were held in the Sopbao District subproject villages of in Ban. Sopbao; Ban. Phiengxay; Ban. Mouanghome; Ban. Hatsane and Ban. Soplong.
- Land acquisition and environmental impact issues were combined in the consultations process. Public Information Brochures on both subjects were provided to all participants as part of the consultation process.
- Topics discussed included: project scope, timing, environmental issues, cut-off date, water supply system, connection policy, installation of meters, pipe laying, temporary impacts, intake sites, water quality, protection of forests and water sources.

SUMMARY OF CONSULTATIONS OUTCOMES					
Date	**TYPE OF MEETING AND LOCATION**	**FACILITATOR**	**PARTICIPANTS**		**DISCUSSION / RESPONSES / OUTCOMES FOLLOW-UP ACTIONS WITH RESPONSIBILITY**
16 Oct 2017	District coordination and consultation meeting on LARC and Envirobmental (Assets loss, etc.) at Natural Resource and Environmental District Office 08.30 -9:.25 AM 	▪ PIU ▪ District ▪ PIA	▪ PIU ▪ District authorities ▪ PIA	7 participants By sex: - 7 female By Ethnic Group: - Lao: 6 - Hmong: 1 Male 7	**Presentation:** • General introduction into topic, specific description on LAC, Environmental and explanation on surveys; • Handing out Lao Public Information Booklets ; • Subproject related briefing on severe affectedness and impacts, temporary / permanent loss of assets, vulnerable groups, entitlement; no loss of land. **Comments – Questions – Answers:** **General:** • Clarifying and agreeing on coordination and public consultation concerning dissemination of information and surveys • Gov. staff stressed the importance of STWSP; **Specific:** 1.1 Mr. Khamphouay Thipdavong/ deputy of Natural resource and Environment Office. : we are understanding about project policy and people need enough for water , and how the project calculate for compensation to Aps who will be impact ?. 1.2 Mr. Kanda Keosopha / National Resettlement Specialist : we will following for compensation by ADB policy and Lao regulation as Degree No. 84, after detail design have done, resettlement team will be survey again focussing to APs in each subproject. and the cost to be compensation it is depend on current market price. and we are need unit rate in each subproject. 1.3 Mr. Kanda / National Social Development Specialist & Resettlement Specialist : The policy of STWSP try to avoided or reduce impact for the private land or private assets, for the lay out pipe line it is inside the right of way, and for the Intake and WTP / Reservoirs also try to build in public land.
16 Oct 2017	Village consultation meeting at Xamnuea village, Time: 9.30 -12.PM	▪ same	▪ same	103 participants By sex: - 52 female	**Presentation:** • General introduction of project features and project phases; • Specific description on LAC and Environmental during project construction;

				By Ethnic Group: Lao : 93 Hmong: 10	• Handing out Lao Public Information Booklets ; • Describing Grievance Redress Mechanism; • Subproject related briefing on severe affectedness and impacts, temporary / permanent loss of assets, vulnerable groups; • Explaining entitlement and eligibility; and Environmental will be affects during project construction phase. • Providing selected environmental aspects. **Comments – Questions – Answers:** **General:** • Villagers expressed their willingness to cooperate with the subproject. **Specific:** 1.1 Q. Mr Phonekham: Will the project use the old or new pipe? 1.2 A. Mr. Kanda: First, the project will inspect the existing pipe. If any damage pipe, we will change the new ones. 1.3 Q. Mr. Khambone: Is there any compensations when it finishes? 1.4 Q. Mr. Lowheng; we would like the project give the compensation. Is case, there is the impact to people's asset along the road. 1.5 A. Mr. Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.
16 Oct 2017	Village consultation meeting at Nathong village Time: 13.30-16.30 pm	▪ same	▪ same	57 participants By sex: - 30 female By Ethnic Group: Lao Loum: 50 Tai Deng: 7	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers welcomed the project in their community. **Specific:** 1.1 Q. Is there any water supply meter to change? 1.2 A. Mr Khanda: Yes, there is. In case, the old one is not in good condition. 1.3 Head of village: We would like the project extend the connection of pipe to 4 Km Gas Station.

					2.1 Mr. Kanda: We will keep considering.
17 Oct 2017	Village consultation meeting At Ban. Phonkham Time: 08.30-12.00 pm 	▪ same	▪ same	26 participants By sex: - 18 female By Ethnic Group: Lao Loum: 19 Hmong: 7	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their happiness of getting the water supply. **Specific:** 1.1 Q. Ms Manivaone: I am agreed. I would like to suggest anybody who has joined this public consultation meeting to distribute the message to other. Will the project use the local labour or not? 2.1 A. Mr Kanda: It depends on the company that win the bid, they will use or not. 2.2 Q. Mr Singthong (Head of village): we would like to relocate the old basin to other location because we need the villagers live there. But the new land is still state owner. 2.3 A. Mr Khamphuery: We will consider, but you should submit the letter to DONRE to get the permission and land tittle. 2.4 Q. Mr Boonma (Village committee) : we are totally to be a part of this project especially tree. We expect this project will run quickly because the volume of water is not enough. 2.5 A. Mr Somnouk: we will keep your opinion considering.

17 Oct 2017	Village consultation meeting At Ban Navieng Time: 13.30-16.30 pm 	▪ same	▪ same	36 participants By sex: - 15 female By Ethnic Group: Lao : 31 Tai Deng: 5	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers mentioned their hope for a good and reliable water supply. **Specific:** 1.1 Q. Mr Boontee: Will the project keep the old pipe or take it out? 1.2 A. Mr Kanda: We will not take it out. But we will inspect it first that it is good condition or not; then, we will connect the new one. 1.3 Q. Mr Phoonsin: In case, the fence is impacted from project? How can we do? 1.4 Q. Ms Phaengchan: Will pipe impact to the house? 1.5 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.
18 Oct 2017	Village consultation meeting At Phanxay village Time 09:00-11:30AM 	▪ same	▪ same	9 participants By sex: - 1 female By Ethnic Group: Lao : 9	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their need for a good water supply provision. **Specific:** 1.1 Q. Mr Phonchid (Head of village): Could you explain the duty of village committee? 2.1 A. Mr Kanda: the village committee is the part of project to inspect and facility to run quickly and smoothly. 2.2 Q. Mr Thongmee: I am agreed, is there any the detail of pipe lay out done yet? 2.3 A. Mr Kanda: Right now, we are surveying and designing. 2.4 Q. Mr Singkham: Is there any compensation? In case, it is affected to restaurant?

					2.5 A. Mr Kanda: the restaurant can still open, it is temporally impacted. 2.6 Q. Mr Phonchid (Head of village): And we need to know the detail the pipe layout to inform the impact household. 2.7 A. Mr Kanda: when we finish/ finalize the design, we will inform you later.
18 Oct 2017	Village consultation meeting at Naliew village Time 13.30-16.30 pm 	▪ same	▪ same	39 participants By sex: - 20 female By Ethnic Group: Lao : 19 Tai Deng: 1 Tai Dum: 1 Khmer: 12 Hmong: 6	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers welcomed the project in their community. **Specific:** 1.1 Q. Mr Senglaphone : Can the old water supply usage connect the new one ? 2.1 A. Mr Somnouk: It depends on the meter and pipe's condition. If it is not in good condition, we will change the new one for you. 2.2 Q. Ms Pee. Will the main pipe be connected to the north of village because there is not enough volume water? 2.3 A. Mr Kanda: Now, we are surveying and designing the pipe layout. We expect all villagers can use the water supply service.
19 Oct 2017	Village consultation meeting at Ban Nanongboua Time 09:00-11:30 AM	▪ same	▪ same	39 participants By sex: - 17 female By Ethnic Group: Lao : 27 Hmong: 12	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers welcomed the project in their community. **Specific:** 1.1 Q. Head of village: After they finish the construction, will they will fix the damage or not? 1.2 A. Mr Kanda: Sure, they will fix it. But it will spend few days to check the quality of new pipe. 1.3 Q. Ms Sengngen: we hope the project construction will avoid the impact to our slop construction and belong the road especially Khoumsabieng Zone.

					1.4 A. Mr kanda: For this issue, we will pay more attention to avoid the impact. So the coordination is very important between village committee and survey team.
19 Oct 2017	Village consultation meeting at Ban Thadmouang Time 13.30-16.30 pm 	▪ same	▪ same	114 participants By sex: - 51 female By Ethnic Group: Lao : 88 Tai Deng: 11 Tai Dum: Khmer: 5 Hmong: 10	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers welcomed the project in their community. **Specific:** 1.1 Q. Mr Vanhsy: 2% of compensation will be paid to affected persons or not? In case, it is high value. 1.2 Q. Mr Viengphet: In case, how will the project do if the lay out pipe line inside the villager's garden? 1.3 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 1.4 Q. Mr Phien Lattanavong: Do you have any suggestions? In case, I bought a house after the project has closed and I have not installed the water supply meter in AT District. 1.5 A. Mr Kanda: you can contact with AT Water Supply District, will they still have free policy for you or not. But for this new project, village will receive the free installation as one meter per one family book, so all of villagers should prepare yourself by having own family book.

20 Oct 2017	Village consultation meeting At Phoxay vllage Time 9:15-11:30 AM 	▪ same	▪ same	26 participants By sex: - 15 female By Ethnic Group: Lao : 23 Hmong: 3	**Presentation:** 2 Same as above. **Comments – Questions – Answers:** **General:** 3 Villagers showed their happiness of getting the water supply. **Specific:** 3.1 Q. Ms Aieng: How will the project do? In case, it is impacted type of erosion control, concrete, etc.. 3.2 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 3.3 A. Mr Phommathone: we have spent the old pipe long time ago. Will it be changed the new one or not? 3.4 A. Mr Kanda: we will inspect it first that it is good condition or not; then, we will connect the new one. 3.5 Mr Vongekham: now volume of water supply is not enough. So I am totally agreed with this project and need it start the construction quickly. 3.6 Ms Phouangchai: No problem, thank you for this good project.
20 Oct 2017	Village consultation meeting At Ban Nathongjong Time 13:45-16:00 PM 	▪ same	▪ same	21 participants By sex: - 12 female By Ethnic Group: Lao : 21	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Ms Phaungvanh : if the lay out pipe line passes any household, we would like the developer project coordinate with the own land. 1.2 Q. Mr Salee: For cutting tree, I do not have any problem. I am interesting that “will villagers connect to their house by themselves or not? 1.3 A. Mr Kanda: the project will connect only from the main pipe to the meter in your house. But you need to

					connect by yourself from meter to your apart of building. 1.4 Q. Mr Singkham: Will project give the compensation to tree, asset, etc. or not? 1.5 A. Mr Kanda: The lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 1.6 Q. Ms Khamphout: when completed the project, will it be the PIU or not? 1.7 Mr Did: I need to remove my water supply meter. How can I do? 1.8 A. Mr Somnouk: Yes, it is one project. You can contact PIU directly, then, we will inspect and remove for you.
21 Oct 2017	Village consultation meeting At Ban Nasakang 	▪ same	▪ same	112 participants By sex: - 49 female By Ethnic Group: Lao : 74 Tai Deng: 4 Tai Dum: 3 Khmer: 25 Hmong: 6	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Q. Ms Bunsy: Will upper land house be able to use water supply or not? 1.2 A: Mr Kanda: Now we are designing and surveying. We hope every zone will be able receive the water supply. 1.3 Q. Mr New: When will the project start the construction? 1.4 A. Mr Kanda: the end of 2018. 1.5 Q. Mr Thongsawat; Will this new project be as same as the old one? 1.6 A. Mr Kanda: this one will be able to produce more water supply than the old one. 1.7 Q Ms Fongseng: Will villager pay to pipe installation or not? 1.8 A. Mr kanda: No, villagers do not pay because it is the project's policy.

21 Oct 2017	Village consultation meeting At Ban Misouk 	▪ same	▪ same	108 participants By sex: - 49 female By Ethnic Group: Lao : 100 Tai Deng: 2 Khmer: 4 Hmong: 2	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Q. Mr Singtham: Will villager pay to pipe installation or not? And how will the project do when it impacts to fence or other asset? 1.2 A. Mr kanda: No, villagers do not to pay because it is the project's policy. For the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you. 1.3 Q. Mr Sonechan: if villagers install the pipe before the project construction, will we have to pay or not? 1.4 A. Mr Kanda: yes, you have to pay. But it is free while the project starts the construction phase. 1.5 Q. Mr Phuiy Inthala: can I remove the location of water supply meter? 1.6 A. Mr Somnouk: Yes, you can contact PIU any time. They will inspect and calculation for you. 1.7 Mr Maichan; I would like to share my opinion that: the developer project should follow up closely for standard construction especially the equipment and pay attend about the asset data collection.
23 Oct 2017	Village consultation meeting At Ban Sopbao	▪ same	▪ same	171 participants By sex: - 84 female By Ethnic Group: Lao : 93 Tai Deng: 48 Tai Dum: 17	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Q. Mr Khammon: I am very agreed with this project. I will give collaboration with this project for quickly construction.

				Khmer: 1 Hmong: 12	1.2 Q. Ms Xieng: How long will the project start? 1.3 A. Mr Kanda: it will start about the end of 2018.
23 Oct 2017	Village consultation meeting At Ban Soplong 	▪ same	▪ same	43 participants By sex: - 15 female By Ethnic Group: Lao : 2 Tai Deng: 41	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Q. Mr Buaphone: we would like you explain what villagers has to give or pay ? For example: clear the area of water supply location. 1.2 Q. Mr Syvone: we are worry about the impact to our house. 1.3 A. Mr Kanda: When it is in construction phase, villagers just give convenience. The contractor will work all tasks. For the second question, the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.
23 Oct 2017	Village consultation meeting At Ban Phiengxay	▪ same	▪ same	49 participants By sex: - 27 female By Ethnic Group: Lao : 3 Tai Deng: 44	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:**

				Khmer: 1 Hmong: 1	1.1 Q.Mr Viengsavath: In case, it is high value such as tree, garden, etc. Will the project compensate or not? 1.2 A. Mr Kanda: the lay out pipe line not go inside any house, if your fence have construction over the right of way it is maybe impact on your assets, but the project not remove your fence, if impact on your tree or crop, government will be compensate on current market rate. During construction the company can digging under your fence and give access for you.
24 Oct 2017	Village consultation meeting At Ban Mouanghome 	▪ same	▪ same	50 participants By sex: - 18 female By Ethnic Group: Lao : 50	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 We are totally agreed in this project. We do not have any problem.
24 Oct 2017	Village consultation meeting At Ban Hatsane 	▪ same	▪ same	24 participants By sex: - 4 female By Ethnic Group: Lao : 2 Tai Deng: 22 Tai Dum: 3	**Presentation:** • Same as above. **Comments – Questions – Answers:** **General:** • Villagers expressed their satisfaction of getting the water supply. **Specific:** 1.1 Head of village said that this will be our first time to have the Water supply system. For previously, we were affected from disease in water. So we are totally agreed.

CONDUCTED WORKSHOP ON IEE

XAMNEUA DPWT OFFICE; 24/07/2017;

TIME 8.30-10.30, PARTICIPANTS 7

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ

ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນາຖາວອນ

****

ລາຍຊື່ຜູ້ເຂົ້າຮ່ວມກອງປະຊຸມ ຄັ້ງວັນທີ...... ກໍລະກົດ 2017 24/7/2017

ເລື່ອງ: ....

ລຳດັບ	ຊື່ ແລະ ນາມສະກຸນ	ພາກສ່ວນ	ຕຳແໜ່ງ	ເບີໂທ	ລາຍເຊັນ
1	[illegible]	[illegible]	[illegible] PIU	[illegible]	[signature]
2	[illegible]	[illegible]	[illegible]	23244310	[signature]
3	[illegible]	[illegible]	S PIU.	58889370	[signature]
4	[illegible]	[illegible]	[illegible]	55909930	[signature]
5	Cliff Massey	IES-WSSP	IES	23686355	[signature]
6	Thavongsith	WSSP	NGS	54603579	[signature]
7	[illegible]	[illegible]	[illegible]	24993152	[signature]
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

ຜູ້ບັນທຶກ

CONDUCTED WORKSHOP ON IEE

SOPBAO DISTRICT DPWT OFFICE

TIME 09.30 – 11.00, PARTICIPANTS 6 MALES

ສາທາລະນະລັດ ປະຊາທິປະໄຕ ປະຊາຊົນລາວ

ສັນຕິພາບ ເອກະລາດ ປະຊາທິປະໄຕ ເອກະພາບ ວັດທະນະຖາວອນ

000@@@000

ໃບລົງທະບຽນ

ລ/ດ	ຊື່ ແລະ ນາມສະກຸນ	ມາຈາກພາກສ່ວນ	ຕຳແໜ່ງ	ລາຍເຊັນ	ເບີໂທ	ໝາຍເຫດ
1	Thamongsith Pathoumthong	WSSP	NES	[signature]	54603579	
2	ທ. [illegible]	[illegible]	[illegible] PIU	[signature]	99347997	
3	ທ. [illegible]	[illegible]	[illegible] PIU	[signature]	22408883	
4	ທ. [illegible]	[illegible]	[illegible] PTU	[signature]	55333228	
5	ທ. [illegible]	[illegible]	S PIU	[signature]	58889370	
6	Cliff Massey	Environ. Special	LCG	[signature]	23686355	
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						

ວັນທີ.໒໕../໐໗./໒໐17

ຜູ້ບັນທຶກ

CONDUCTED WORKSHOP ON IEE – UXO RISK

XAMNEUA PROVINCE PNP OFFICE

TIME 09.00 – 10.00, PARTICIPANTS 6 MALES 1 FEMALE

ບັນທຶກລາຍຊື່ຜູ້ເຂົ້າຮ່ວມ ກອງປະຊຸມວຽກງານສິ່ງແວດລ້ອມ,ນ້ຳປະປາ ແລະ ສຸຂະພິບານຕົວເມືອງນ້ອຍ

ຄັ້ງວັນທີ 26/07/2017

ລ/ດ	ຊື ແລະ ນາມສະກຸນ	ມາຈາກພາກສ່ວນ	ໜ້າທີ່ຮັບຜິດຊອບ	ເບີໂທ	ລາຍເຊັນ
1	Mr. Thanongsith Csitho	WSSP	NES-LCG	54600579	
2	Cliff Massey	Environ. Specialist	LCG	23686355	
3	Mr Saygoune WAI	NPP HP	o WSP.	20335044 7	
4	...	...	...	23851888	
5	...	...	...	58880370	
6	...	...	...	22347227	
7	...	...	...	55665043	
8					
9					
10					
11					
12					
13					
14					
15					

ຜູ້ບັນທຶກ

Appendix D: Checklist for Project Environmental Safeguards Monitoring

1. INTRODUCTION AND PROJECT OVERVIEW

PROJECT NUMBER AND TITLE:	
REPORTING PERIOD:	This section can include, among others, the following: • Activities of Proponent • Progress of Work (% physical completion) • Changes of Surrounding Environment • Status of Permits
MONITORING PERIOD COVERED	
KEY SUB-PROJECT ACTIVITIES IMPLEMENTED SINCE LAST REPORT:	
REPORT PREPARED BY:	

2. ENVIRONMENTAL PERFORMANCE MONITORING

A. STATUS OF COMPLIANCE WITH EMP REQUIREMENTS (ENVIRONMENTAL PERFORMANCE)

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
I. PRE-CONSTRUCTION PHASE			
Impact on land acquisition and community assets Loss of community assets due to land acquisition and damage to properties.	Implement the land acquisition and compensation plan that was approved by the ADB for the subproject. Design access roads to minimum necessary width and installation of pipelines within the Right-of-Way when feasible.	External LACP monitoring report	
Impact of location of raw water intake on other water users Downstream river uses such as irrigation, bathing, washing, and fishing will be affected if excessive water abstraction will occur.	The toal abstraction rate for the water supply subproject will be limited to the 11,300 m^3/day capacity of the WTP. There is minimal conflict with other water users of Houay Hin Dam, Houay Hin Men or Nam Xam because there is still enough water in the rivers that will meet the irrigation demand and other river uses at the downstream.	River level assessments at the intake on a monthly basis	
Impact to Natural resources and protected areas	Cutting of trees will be undertaken as per approved design and only upon approval. Avoid cutting of trees s much as possible and	N/A	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Impact on natural resources and protected areas from cutting/clearing of trees and other vegetation.	minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash in accordance with the approved Land Acquisition and Compensation Plan		
Impact on Historical and Archaeological Sites Damage to relics and artifacts during the conduct of the works.	The Contractor will ensure that the workforce are briefed that in the event of accidental finds relics they should immediately cease any works in the area and promptly report the find to their supervisor.	Accidental finds	
II. CONSTRUCTION PHASE			
Temporary disruption of existing community roads, pathways, and accesses Pipe laying will cause temporary disruption of community services and access to properties. Particularly at pipe road crossings, construction activities along narrow roads may lead to temporary blockage or closure of roads and hamper movement of vehicles and people in the community. Community access to areas in the vicinity of the WTP, pump station, reservoir, and intake will be affected. Community access to areas in the vicinity of schools, temples, village offices, market places and meeting halls will be affected during construction of public latrines.	Walking access will be maintained to affected properties and access routes will be temporarily lined with timber or similar material. Particular attention will be given to ensuring safety along roads and paths used by school children. Side street parking of construction vehicles on prolonged basis will not be allowed. Install barriers and safety warning signs on road sections and if necessary deploy traffic aides/ flag persons at affected locations. Information boards at blocked roads will provide information about the temporary closure of roads, schedule of works and the traffic-rerouting plan. Require the contractor to immediately rehabilitate the excavated areas and any damaged road and path sections. Enclose the WTP; pump station, reservoir, and intake perimeters so that pathway use and stream access remains unimpeded. Enclose the latrine construction site to prevent access and limit disruption for the use of the schools and public buildings.	Contract documents to include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	
Air pollution	Require the contractor to cover materials with tarpaulin or other	Contract documents to	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Dust and air emissions from earthworks and movement of vehicles can pose nuisance to nearby communities	suitable materials while in transit to avoid spillage of materials. Moisten earthen roads during dry and dusty conditions, particularly roads near residences and through the town core area. Impose speed limits on construction vehicles. Conduct regular maintenance on construction equipment and vehicles to control air emissions during vehicle operation.	include the EMP with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	
<u>Noise</u> Operation of construction equipment such as jackhammer will cause excessive noise resulting in nuisance to communities.	Limit construction activities, particularly operation of noise generating equipment at night. Position any stationary equipment that produce high noise levels such as diesel generators as far as practical from sensitive receptors. Erect temporary barriers around construction sites especially near schools, hospitals, and houses. Install noise suppression devices to noise generating equipment. Require drivers to minimize blowing of horn and to comply with speed limits. Provide information to community on schedule of construction activities through billboard/signs.	Include EMP in bid documents and contract. Report any complaint received from the community to PIU.	
<u>Impact of borrow materials</u> Quarrying of aggregates on Nam Xam river will cause siltation and affect the ecological condition of the river.	The contractor will be prohibited from quarrying materials directly from Nam Xam. Construction materials will be procured from Government-permitted sources / suppliers only.	Include EMP in bid documents and contract. Report any complaint received from the community to PIU.	
<u>Impact on ecological resources</u> Construction workers may undertake hunting of wildlife and cutting of wood upstream of the intake.	The contractors will prohibit activities such as cutting wood for cooking, hunting, or wildlife trade.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Clearing of vegetation Poor planning and execution of tree clearing/vegetation removal at project facilities and along pipeline alignments can result in loss of vegetation and general landscape	Cutting of trees will be undertaken as per approved design and only upon approval of relevant authorities. Avoid cutting of trees as much as possible and minimize damage to native vegetation. Trees that need to be cut in private land will be compensated in cash accordance with the approved Land Acquisition and Compensation Plan. Roads and paths to the intake, WTP, and reservoir will only be sufficiently wide to accommodate construction vehicles/equipment to minimize land take. Manual labor will be utilized in sloping terrain where use of heavy equipment would cause unnecessary damage. Steep exposed slopes will be graded and covered with bush and grass to minimize erosion. Implement landscaping and planting of trees/vegetation at WTP site.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	
Water pollution - Sediment runoff Sediment runoff undertaken during excavation, earthworks and grading in the rainy season will cause siltation of rivers	Construct silt traps, deviation channels, mounting barriers or trenches around the stockpiles of materials.	Include EMP in bid documents and contract Report any complaint received from the community PIU.	
Water Pollution - Worker's camp Domestic wastewater from worker's camp would result to the discharge of sewage into drainage canals. Unsanitary conditions at the worker's camp will occur without the provision of necessary sanitation arrangements.	Provide adequate water supply and temporary toilet facilities at the worker's camp.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	
Water pollution - Generation of residual chlorine during pipeline and reservoir disinfection	Follow the recommended dosage of chlorine during the disinfection of pipes and reservoir. Discharge of water with high chlorine concentration to soil at the end of	Include EMP in bid documents and contract	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Prior to commissioning, disinfection will be undertaken on the pipeline and reservoir. Discharge of residual chlorine above the allowable limits is toxic to fish and other aquatic life.	pipelines to be controlled to minimize soil erosion. Use chlorine test kit and use 10x15x dilution with distilled water or use high range chlorine test kit with high range tablets to detect chlorine residual before flushing.		
<u>Generation of construction waste - Generation of excavated soil</u> Generation of excavated materials during pipe laying and foundation works for WTP tanks and reservoirs.	During pipe laying, excavated material will be utilized to backfill the trench. The contractor will be required to properly reinstate the excavated trench after completion of pipe laying. Surplus excavated material/cut soil from construction of the WTP and reservoir will be used as backfill material for low-lying areas that have been identified by the village authority.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	
<u>Generation of construction wastes – Solid, Inert and Hazardous Wastes</u> Solid wastes, inert construction wastes, and hazardous wastes during construction will result to pollution of land and receiving water bodies.	Provide appropriate segregation bins or areas for construction wastes. Secure and control storage of all hazardous materials including fuels. Reuse recyclable construction wastes such as wood, steel, and scaffoldings or sell to junk shops. Solid waste to be collected and disposed in approved disposal site of the District. In cases where existing equipment is to be replaced under the rehabilitation part of the subproject, it is to be segregated according to material type and disposed of/recycled in a manner to be approved by the Engineer and at licensed facilities.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	
<u>Community health and safety</u> Community may be exposed to dangers of open excavation	Install barricades/barriers and sturdy plate covers in open excavations during non-working time. Install warning signs in the area.	Include EMP in bid documents and contract Report any complaint received from the community to PIU.	
<u>Occupational health and safety</u>	Require the contractor to implement the construction health	Contract documents to include the EMP	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Construction activities may pose hazards to workers because of the use of heavy equipment, lifting of heavy loads, and exposure to open excavations and chemicals. Potential conflict with local people will occur if migrant workers will be brought to the site.	and safety plan in accordance with the World Bank EHS Guidelines (http://www.ifc.org/ehsguidelines) as a minimum standard. The contractor will appoint an environment, health and safety officer to ensure implementation of the plan. The plan will at minimum include: • Provision of first-aid facilities readily accessible by workers. • Provision of personal protective equipment (PPEs) such as hard hats, gloves, rubber boots, etc., • Wearing of PPEs while working onsite will be a mandatory requirement for workers. • Posting of safety signs/reminders in strategic areas within the construction area. • Installation of sufficient lighting at night. • Employ only trained personnel in handling chlorine during the line disinfection process. • Ensure that vehicle and equipment operators are properly licensed and trained. • Provide staff with communicable disease and HIV-related awareness training. The contractor will be required to provide priority hiring of qualified construction workers from the villages and to consult with the local to avoid conflict if migrant workers will be brought to the site.	with health and safety provisions monitoring through the Construction Supervisor's reports. Report any complaint received from the community to PIU.	
III. OPERATION PHASE			
<u>Generation of incremental wastewater and increased burden on drainage systems</u> Increased water supply to public buildings and households will generate additional quantities of wastewater.	As project policy, water connection will be provided only if the household has an approved sanitation facility to cope with the increased wastewater generated. This policy and the public awareness raising initiatives was presented to the villages under the Village Environmental Improvements (VEI) component.	Monitor the number of households with latrines and with water connections, population served, and billed water volume. Monitor that the service and management	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
	The public institution shall sign a service and management agreement before construction and have sufficient funds to maintain the facility.	agreements are followed and facilities are properly maintained.	
<u>Deterioration of water quality</u> Potential deterioration in quality of raw water supply and of treated water Potential risk on public health in deterioration of treated water quality due to use of poor quality treatment chemicals	Monitor community activities in the catchment area to check activities at the upstream that may cause contamination of raw water quality. Provide laboratory test equipment and training to allow the PNP to conduct regular monitoring of raw and treated water quality parameters. Follow O&M standard operating procedures in accordance with the water treatment plant manuals. Use of potable grade chemicals, especially PAC, and request a Supplier product specification data sheet signed off by a reputable external laboratory.	Monitor the following parameters: Daily at the inlet to the treatment plant: turbidity, pH Daily after the reservoir: pH, turbidity, residual chlorine, temperature Weekly at several locations in the network: residual chlorine, pH, turbidity Annually after Clearwater tank: chloride (Cl), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), sodium (Na), sulfate ion, zinc (Zn), conductivity, total hardness as CaCO3	
<u>High Pressure and Leaks on the Pipeline</u> The proposed distribution network will have sections located at low elevations which may experience high water pressure which may potentially result in leakages in the line and ultimately water loss	This risk will be minimized by: (i) the use of durable standard pipes for the main and secondary (rider mains) lines, (ii) use of pressure reducing valves for the rider mains, (iii) careful construction supervision by the Project Implementation Assistance Consultants PIA to ensure that pipe laying and jointing is done to the highest standard by the contractor, and (v) regular inspection of the network and prompt isolation and repair when leaks occur.	Daily visual monitoring of pipelines.	
<u>Disposal of backwash water and sediments from WTP</u> Backwash water and sludge from the sedimentation tanks will be generated from the cleaning of filters and tanks.	Filter backwash water and periodic discharges from the sedimentation tanks will be collected to a detention pond to separate the concentrated waste sludge or sediments. Land application of wastes with high dissolved solids	Check condition of detention ponds; report frequency/schedule of backwashing	

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	MONITORING	COMPLIANCE
Backwash water and sludge contain high total suspended solids.	concentrations from the detention pond is preferred over discharge to a landfill.		
Occupational health and safety Potential hazards to WTP workers due to accidental release of chlorine	Provide secure, dry and well ventilated storage facilities for chlorine and other hazardous chemicals. Use chlorine compounds in power form, which is safer than gas. Training of staff and allocation of responsibility to ensure that materials are properly handled..	Training undertaken for staff on chemicals handling and monitoring and reporting of incidents	
Generation of Sludge from Detention Ponds Increased volume of sludge in detention ponds.	The sludge that will be generated from the detention ponds will be dredged and disposed as backfill material in low-lying areas to be identified by the village leaders. No land application of the generated sludge without the required approval by the village authorities.	Quarterly check on the volume of sludge in the detention ponds.	
Community health and safety Potential hazards to residents and school children near the WTP site.	Facilities (Intake, WTP and Laboratory, Office and Reservoir) properly fenced and secured and watchmen/security personnel to be employed on a 24 hour basis.	Daily log of security personnel	

Summary of EMP Compliance Status: _____

_____

_____

B. RESULTS OF ENVIRONMENTAL MONITORING

- PNP operational report
- Complaints resolution
- EMP implementation
- Water quality
- River level
- Backwashing activities
- Training/capacity building

C. ISSUES FOR FURTHER ACTION

ISSUE	REQUIRED ACTION	RESPONSIBILITY AND TIMING	RESOLUTION
OLD ISSUES FROM PREVIOUS REPORTS			
List of EMP measures or activities not completed (last			

column of previous table)			
NEW ISSUES FROM THIS REPORT			

3. CONCLUSION

- Important results from the implementation of EMP monitoring
- Recommendations to improve EMP management, implementation, and monitoring

4. ATTACHMENTS

- Permits
- Monitoring data (water quality, etc.)
- Photographs
- Maps

Appendix E: Semi-Annual Integrated Safeguards Monitoring Report Template

Safeguards Monitoring Report

Semiannual Report

xxx {month} 20xx

Lao PDR: xxx {Project name}, xxx {sub-project name, if report covers only one sub-project}

Prepared by the Project Management Unit of {complete name of Implementing Agency} for the {complete name of the borrower} and the Asian Development Bank.

NOTE

(ii) In this report, "$" refers to United States dollars.

This safeguards monitoring report is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area.

1. EXECUTIVE SUMMARY

1. *{Read and delete: Provide short summary of the following items:*
2.

- **Summary of EMP/RP Implementation**
- **Description of monitoring activities** carried out (e.g. field visits, environment effect monitoring, survey questionnaire, public consultation meetings, focus group discussions, etc)
- **Key issues**, any **corrective actions** already taken, and any **grievances**
- Key activities planned in the next reporting period
- Recommendations

Use the paragraph numbering format provided below throughout the report}

1. xxx

2. xxx

2. PROJECT OVERVIEW, GENERAL SAFEGUARD MATTERS

2.1 PROJECT OVERVIEW

{Read and delete: Briefly describe project objectives, scope and components – can be taken from PAM or other relevant document}

3. xxx

4. xxx

2.2 PROJECT PROGRESS

{Read and delete: Using most recent project progress report, describe status of project implementation, including full list of contracts, status of contract awarding and implementation, name of contractor, Engineer, Project Supervision Consultant.}

5. xxx

6. xxx

Table 1: Project Overview, Snapshot of Project Progress

Project Number and Title:		
Safeguards Category	Environment	
	Indigenous Peoples	
	Involuntary Resettlement	
Reporting period:		
Last report date:		
Key sub-project activities since last report:	*{Read and delete: This section should include, among others, the following:}* • Contract awarding • Progress of Work (% physical completion) • Status of Safeguard Approvals / Permits / Consents	
Report prepared by:		

2.3 SAFEGUARD PLANS IMPLEMENTATION ARRANGEMENTS

{Read and delete: Describe institutional arrangements and responsibilities for EMP and RP implementation, internal and external monitoring, and reporting, defining roles of PMU, Engineer, Implementation Consultant, Contractors. (Table format as needed)}

7. xxx

8. xxx

2.4 UPDATED EMPS AND RPS, INCORPORATION OF SAFEGUARDS REQUIREMENTS INTO PROJECT CONTRACTUAL ARRANGEMENTS

{Read and delete: Define manner by which EMP and RP requirements are incorporated into bidding documents, contracts.

Indicate when updated EMPs and RPs were submitted for approval to ADB (Table format appropriate).}

9. xxx

10. xxx

3. ENVIRONMENTAL PERFORMANCE MONITORING

3.1 STATUS OF EMP IMPLEMENTATION (MITIGATION MEASURES)

{Read and delete: Summarize main mitigation/protection measures implemented in the reporting period (narrative section). Structure in accordance to phases (detailed design, construction preparation, construction, and operation).}

11. xxx

12. xxx

{Read and delete: Include EMP table or updated EMP table if applicable. Assess compliance of environmental management activities with the original or updated EMP. For that purpose, include additional columns entitled "Compliance Status", "Comment or Reasons for Non-Compliance", and "Issues for Further Action". Example is provided below.}

Table 2: Compliance with EMP Requirements (Environmental Performance)

EMP Requirements	**Compliance Status** **(Yes, No, Partial)**	**Comment or Reasons for Non-Compliance**	**Issues for Further Action**
Use environmental impact as main heading and EMP as listing (see example below)	Use EMP list as basis for rating/evaluating compliance (see example below)		
Rise of employment opportunities: • Job openings of the project should give priority to local communities. • Recruitment of local laborers should be stipulated in the contract for construction	• Field inspections and interviews with communities - DONE • Note each complaint case in the field – 3 COMPLAINTS RECEIVED • Set up grievance centre and report as part of monitoring action plan – NOT DONE		

Table 3: Issues for Further Action

Issue	**Required Action**	**Responsibility and Timing**	**Resolution**

Old Issues from Previous Reports			
List of EMP measures or activities not completed (last column of previous table)			
New Issues from This Report			

3.2 HEALTH AND SAFETY

{Read and delete: Provide narrative of occupational and community health and safety issues that occurred during the reporting period. Any accident involving injury or death of workers or community members must be reported. Include investigation report of DOLISA as attachment to the report. Provide details in the Table below}.

13. xxx

14. xxx

Table 4: Health and Safety Issues

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
New Issues from This Report			

3.3 ENVIRONMENT EFFECT MONITORING

15. **Monitoring plan.** xxx *{Read and delete: Present the environment effect monitoring plan as defined in the EMP or the updated monitoring plan. Refer to Table 4. Describe monitoring responsibilities}*

16. **Monitoring activities in the reporting period.** Xxx *{Read and delete: Describe the environment effect monitoring activities in the reporting period, including number of monitoring campaigns, number of samples, etc. Confirm compliance with the monitoring plan, or justify any deviation from the plan}*

Table 4: Environment Effect Monitoring Results in the Reporting Period

{Read and delete: Present monitoring result in a Table (see example below, adjust as needed). Any non-compliance should be highlighted for attention and follow-up.}

Location	Parameter	Date	Monitoring value	Relevant government standard, standard value

17. **Assessment.** *Xxx {Read and delete: Compare monitoring results with baseline conditions (if baseline data is available) and relevant government standards in qualitative terms. Additional explanatory comments should be provided as necessary. Possible reasons for non-compliance should be identified.}*

4. INVOLUNTARY RESETTLEMENT PERFORMANCE MONITORING

{Read and delete: Provide narrative of status of implementation of the RP(s), including but not limited to: status of RP or Resettlement Framework updating; number of households relocated during the reporting period; outstanding resettlement activities; etc}.

18. xxx

19. xxx

Table 6: Summary of Compliance with RP Requirements

RP Requirements	Compliance status Yes/No/Partial	Comment or Reasons for Compliance, Partial Compliance/Non-Compliance	Issues for Further Action[14]
Establishment of personnel in PMU/PIU			
Public consultation and socialization process		*Provide information on:* • *Public consultation, participation activities carried out* • *Inclusive dates of these activities* *To be elaborated on in Item 5*	
Land area to be acquired is identified and finalized			
Resettlement plan(s) updated after detailed design			
Land acquisition completed			
Establishment of Resettlement Site(s)		*Please state:* • *Number of AHs to be relocated as per agreed RP* • *Number of AHs already relocated* • *Number of houses built* • *Status of installation of community facilities to be provided as per agreed RP*	
Compensation payments for affected assets is completed		*Please state:* • *Total Number of Eligible AHs and APs (as per agreed RP)* • *Number of AHs and APs compensated as*	

[14] To be elaborated further in table 3.b (Issues for Further Action)

		of this monitoring period • *Total Budget allocation as per agreed RP* • *Total budget disbursed to AHs as of this monitoring period*	
Transport assistance for relocating affected households		*As above*	
Additional assistance to vulnerable affected household		*Please state:* • *Total Number of vulnerable AHs and APs (as per agreed RP)* • *Agreed forms of assistance as per RP* • *Number of AHs and APs assisted as of this monitoring period*	
Income Restoration Program		*Please state progress per income restoration feature/activity and actual period of implementation*	
Temporary impacts have been addressed (affected properties restored to at least pre-project conditions)		*Please state:* • *Total Number of AHs affected by temporary impacts as per agreed RP* • *Actual Number of AHs and total area affected by temporary impacts (if this differs from the projected number, such as in cases of unforeseen project impacts)* • *Status of restoring affected property*	
Capacity building activities			

Table 7: Issues for Further Action

Issue	Required Action	Responsibility and Timing	Resolution
Old Issues from Previous Reports			
List of RP activities not completed (last column of previous table)			
New Issues from This Report			

5. COMPLIANCE WITH SAFEGUARDS RELATED PROJECT COVENANTS

{Read and delete: List all environment and resettlement related loan covenants, and assess project's compliance with the covenants (Table format is appropriate, with concluding statement on compliance, partial compliance or non-compliance, and corrective actions as needed)

Schedule	Para No.	Covenant	Remarks/Issues (Status of Compliance)
Schedule 5	xxx		Complied with / Partially complied with / Not complied with. *{Identify reason for partial or non-compliance}*

6. PUBLIC CONSULTATION, INFORMATION DISCLOSURE, CAPABILITY BUILDING

{Read and delete: Describe public consultation activities during the reporting period. Confirm compliance with consultation plan defined in the IEE/EMP and the RP(s), or justify deviation from these plans. Present planned consultation activities in next reporting period. Use Tables as appropriate.}

- Field Visits (sites visited, dates, persons met)

- Public Consultations and meetings (Date; time; location; agenda; number of participants disaggregated by sex and ethnic group, not including project staff; Issues raised by participants and how these were addressed by the project team)
- Training (Nature of training, number of participants disaggregated by gender and ethnicity, date, location, etc.)
- Press/Media Releases
- Material development/production (e.g., brochure, leaflet, posters)
- Information disclosure

7. GRIEVANCE REDRESS MECHANISM

{Read and delete: Describe mechanisms established to address and redress public complaints and grievances related to social and environment safeguards. Summarize grievances received, if any, and measures implemented to redress them.}

- Number of new grievances, if any, since last monitoring period: ____
- Number of grievances resolved: _____
- Number of outstanding grievances: _____

3.

Type of Grievance	**Details** **(Date, person, address, contact details, etc.)**	**Required Action, Responsibility and Timing**	**Resolution**
Old Issues from Previous Reports			
New Issues from This Report			

8. CONCLUSION

{Read and delete: Highlight important results from the implementation of EMP and RP monitoring; recommendations to improve EMP and RP management, implementation, and monitoring; key activities planned in next reporting period}.

20. xxx

21. xxx

9. ATTACHMENTS

- Consents / permits
- Monitoring data (water quality, air quality, etc.)
- Inspection checklists
- Photographs
- Others

Appendix F: District IEE Environmental Compliance Certificate

Lao People Democratic Republic
Peace Independence Democratic Unity Prosperity

Huaphan Province
Department of Natural Resources and Environment

No:1593/DONRE.HP
Huaphan; Date: .5.. December 2017

Certificate
Compliance On IEE, EMP,LACP for WSSP of Xamnuea district

- Based on Law on Environment Protection, No. 29/NA, dated 18 December 2012.
- Based on Decree on Compensation and Resettlement of People Affected by Development Projects No. 84/PO, dated 05 April 2016.
- Based on Decree on the Environmental Impact Assessment of Lao PDR, No. 112/ PO, dated 16 February 2010.
- Based on Request Letter of Department of Public Work and Transport (DPWT) of Huaphan Province (Provincial Nam Papa, PNP) No2454/dpwt. HP, dated 05 December 2017
- Based on the Updated Initial Environment Examination (IEE) and Environmental Management Plan (EMP) for the proposed subproject works in Xamnuea district town, Huaphan Province, under the Small Towns Water Supply and Sanitation Sector Project, October 2017.
- Based on the Updated Land Acquisition and Compensation Plan (LACP) for the proposed subproject works in Xamnuea district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2017.

Department of Natural Resources and Environment of Huaphan Province:

1. Agree to approve the Updated Initial Environmental Examination (IEE) and Environmental Management Plan (EMP) for the proposed subproject works in Xamnuea district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2016.
2. Agree to approve the Updated Land Acquisition and Compensation Plan (LACP) for the proposed subproject works in Xamnuea district town, Huaphan Province, under the Water Supply and Sanitation Sector Project, October 2016.
3. The subproject must be implemented in accordance with the following:

   - Take up responsibility on the study and information indicated in the study for the initial environmental examination impact and implement all solution to solve the impacts as indicated in the environmental management plan. In case of environmental problems that were not studied in the report, the subproject must take up additional responsibility to improve the EMP and provide solutions to solve these problems and ensure the budget is sufficient.
   - Take up responsibility on the study and information indicated in the study for the LACP and implement all solutions to solve all issues indicated in LACP. In case of LACP issues that were not studied in the report, the subproject must take up additional

responsibility to improve the LACP and provide solutions to solve these problems and ensure the budget is sufficient.

- More attention of waste removal from site clearance, building construction and other facilities such as: machine oil, vehicles, dust generation, erosion, natural water resources and forest protection on project area. For clearing, cleaning after construction and other activities is needed to comply to the technical specification and as approved on project boundary to avoid negative affect.
- After clearance and site working is done that should be improved and rehabilitated situation of the area to existing condition.
- In case of people affected by the subproject, they must receive reasonable and adequate compensation, based on strong community awareness and participation with regulation before implementing the subproject.
- Establish monitoring system for environmental and social impact with highly efficient reporting to project management and official management.
- Establish quarterly report concerning the environment and social impacts throughout the implementation period of the subproject, and submit the finding to the Department of Natural Resource and environment and other concerned agencies in Huaphan Province.
- The department of natural resource and environmental Huaphan Province should cooperate with other concerned agencies of Xamnuea district administration to follow up on the monitoring and implementation of the EMP and LACP for Xamnuea subproject works in Huaphan Province. The Project Coordination Unit shall determine the amount and source of the budget fund for monitoring and implementation of the plans, in accordance with the regulations.

This certificate is used only during project implementation of the subproject from the date of signing, will remain valid during implementation period.

Director of DONRE
of Huaphan Province

Signed and Steam

ສະຫງ່ ອັນມະສຸກ

CC:

DONRE	2 sets
Huaphan NREO	1 set
DPWT	1 set
Other related offices	1 set