Initial Environmental Examination

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NEP: Third Small Towns Water Supply and Sanitation Sector Project
— Nirmal Pokhari (Kaski District) Subproject

Prepared by Third Small Town Water Supply and Sanitation Sector Project, Ministry of Water Supply and Sanitation, Government of Nepal for the Asian Development Bank.

INITIAL ENVIRONMENTAL EXAMINATION (IEE)

Project No. TSTWSSSP/NCB/17
October 2016

NEP: Third Small Towns' Water Supply and Sanitation Sector Project- Nirmal Pokhari Bagmara Town Subproject, Kaski

Prepared by the Ministry of Water Supply and Sanitation, for the Asian Development Bank

ABBREVIATIONS

ADB	Asian Development Bank
AP	Affected Person
C-EMP	Contractor's Environmental Management Plan
DI	Ductile Iron
DMA	District Metering Area
DSMC	Design, Supervision and Management Consultant
DRTAC	Design Review and Technical Audit Consultant
DWSS	Department of Water Supply and Sewerage
EARF	Environmental Assessment and Review Framework
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMR	Environmental Monitoring Report
EPA	Environment Protection Act
EPR	Environment Protection Rules
EO	Environmental Officer
ES	Environmental Specialist
ESA	Environmental Safeguard Assistant
ESE	Environmental Safeguard Expert
GI	Galvanized Iron
GoN	Government of Nepal
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
HHs	Households
HDPE	High Density Polyethylene
ICG	Implementation Core Group
IEE	Initial environmental examination
MoPE	Ministry of Population and Environment
MoWSS	Ministry of Water Supply and Sanitation
NDWQS	National Drinking Water Quality Standard
NPR	Nepalese Rupees
PMO	Project Management Office
RPMO	Regional Project Management Office
ROW	Right of Way
REA	Rapid Environmental Assessment
STWSSSP	Small Towns' Water Supply and Sanitation Sector Project
SPS	Safeguard Policy Statement
SDG	Sustainable Development Goal
2ndSTWSSSP	Second Small Towns' Water Supply and Sanitation Sector Project
TSTWSSSP	Third Small Towns' Water Supply and Sanitation Sector project
ToR	Terms of Reference
USD	United States Dollar
VDC	Village Development Committee
WTP	Water Treatment Plant
WHO	World Health Organization
WSSDO	Water Supply and Sanitation Divisional Office
WUSC	Water Users' and Sanitation Committee

WEIGHTS AND MEASURES

C	Celsius/centigrade
dBA	decibel audible
Ha	hectare/s
Km	kilometer/s
Kph	kilometer/s per hour
M	meter/s
Kph	kilometer/s per hour
M	meter/s
m^3	cubic meter/s
Amsl	Above mean sea level
mg/l	milligram/s per liter
Mm	millimeter/s

NOTES

This Initial Environmental Examination (draft) 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. The draft IEE and its environmental management plans will be updated during project implementation.

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.

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EXECUTIVE SUMMARY

The Third Small Towns Water Supply and Sanitation Sector Project (TSTWSSSP) will support the Government of Nepal's 15-year Development Plan for Small Towns. The project will improve water supply and sanitation service delivery in small-scale urban and semi-urban centers across Nepal over a period of five years (2015- 2020).

Nirmal Pokhari Bagmara town sub project is one of the subprojects proposed under TSTWSSSP. The sub Project VDCs are served by Brihat water supply systems, bore wells, dug wells and spring water sources. However, all these systems do not sufficiently meet the needs of the people, both in terms of quantity and quality. Water is supplied through public taps. Long hours are spent by people in queuing for water, and with some queuing their pails way ahead of expected operating hours. This indicates the meager access to water supply in Nirmal Pokhari and Bharat Pokhari and the hardship that people face each day to have water. The water sample has been collected from the proposed new source, Phusre Khola during the dry and wet seasons and has been analysed. The results of the test have shown that chemical quality of water generally meets NDWQS standards but microbial quality shows that there is contamination in the water. The turbidity is generally low and within acceptable standard but it is found to increases significantly for short time after heavy rain. Access to sanitation facilities is satisfactory. Majority of the households have their own water-sealed and flush latrines. VDCs have not any public toilet.

The socio-economic condition of project area is moderate. Majority of the people depend on agriculture as their source of income, followed closely by those depending on the business and service sectors of economy. The community has good ethnic diversity, with people from various ethnic groups living together. This IEE report is based on the prepared Detail Design report and approved ToR for IEE of this project from Ministry of Water Supply and Sanitation, which is attached as Annex 1 of this report.

Categorization: Nirmal Pokhari Bagmara town subproject is classified as Environment Category B as per the SPS- 2009 as no significant impacts are envisioned. Initial Environmental Examination (IEE) as per EPR-1997 of Schedule-1 has been prepared and assesses the environmental impacts and provides mitigation and monitoring measures to ensure no significant impacts because of the subproject.

Subproject Scope: The subproject is formulated under TSTWSSSP to improve water supply and sanitation service delivery in Bharat Pokhari & Nirmal Pokhari VDCs & additional service area of settlement of Dobilla (Ward no. 17 of Pokhara SMC) . Investments under this subproject includes; i) construction of piped water supply system (intake/collector well, main sump well, water treatment plant, ground reservoirs, construction of transmission mains, distribution main and household

connections), ii) construction of public toilets, and iii) establishment of septage disposal site

Implementation Arrangements: The Ministry of Water Supply and Sanitation is the executing agency. The Department of Water Supply and Sewerage (DWSS) is the implementing agency. Implementing activities will be overseen by a separate Project Management Office (PMO) which will be established in DWSS head office in Kathmandu and two Regional Project Management Offices (RPMOs) in the eastern region. A team of technical, administrative, and financial officials including safeguard specialists will be provided at the PMO to implement, manage and monitor project implementation activities. The RPMO will be staffed by qualified and experienced officers and will be responsible for the day-to-day activities of project implementation in the field, and will be under the direct administrative control of the PMO. Consultant teams are responsible for subproject planning and management and assuring technical quality of design and construction; and designing the infrastructure and supervising construction and safeguards preparation.

Description of the Environment: The subproject components are located in two VDCs namely Nirmal Pokhari, Bharat Pokhari VDC & ward no. 17 of Pokhara SMC. The subproject components will be located in WUSC sites, public road right-of-way (ROW) and community managed forests (that are not declared as protected areas). There are no protected areas, wetlands, mangroves, or estuaries in or near the subproject locations.

Environment Management: An environmental management plan (EMP) is included as part of this IEE, which includes i) mitigation measures for environmental impacts during implementation, ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting, iii) public consultation and information disclosure, and iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents. Locations of the proposed infrastructures were considered to further reduce impacts. The concepts considered in the design of sub project are: i) demand for new piped water supply; ii) maximum population coverage mostly in residential areas and areas of high growth rate; iii) avoidance of water-use conflicts, iv) locating pipelines within ROWs to reduce acquisition of land; v) locating pipelines at least 10 meters away from latrines, septic tanks and any main drains to avoid contaminations; vi) locating tube wells at least 30 m upstream from sanitation facilities, vii) locating household and public latrines and septic tanks at least 30 meters downstream from the nearest drinking water source; viii) piloting controlled disposal of septage to reduce the likelihood of uncontrolled disposal as currently practiced; ix) ensuring all planning and design interventions and decisions are made in consultation with local communities and reflecting inputs from public consultation and disclosure for site selection. During the construction phase, impacts mainly arise from the need to dispose of moderate

quantities of waste soil; and from the disturbance of residents, businesses, and traffic. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. These are common temporary impacts of construction in urban work and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during pipe laying on busy roads. The total EMP implementation cost is NRs. 19,140,000.00. It includes air quality, noise level monitoring, capacity building, man power costs, administrative costs and other costs including public consultation and information disclosure, GRM implementation and any unanticipated impact due to project implementation as per Table IX-4 whereas environmental impact mitigation measures implementation costs is covered under civil work contract and the contractor is fully responsible to implement all the mitigation measures given in EMP therefore environmental impact mitigation implementation cost is not given in Table IX-1. PMO, RPMO and DSMC are responsible to monitor the EMP implementation at construction sites.

Environmental Impacts, Mitigation and Monitoring

During construction there will be few adverse impacts of significant magnitude. However, these will be temporary, short-term and are expected to be local, confined within the active work sites and their immediate vicinities. Existing transmission mains and distributions pipes in the mid hill area of project sites have remained stable and are not exhibiting signs of erosion, potential erosion may occur when moderately to highly sloping terrains are disturbed for the installation of transmission mains and distribution pipes. With proper mitigation measures in place, such as, among others: (i) special care taken at sensitive locations, e.g., sensitive slopes, water body crossings, works close to health care and educational institutions and populated area; and (ii) ensuring that, when practicable, works are properly phased, segmented and organized so that the bulk of works are completed (or at least almost complete) prior to the commencement of another phase/segment, and prior to the onset of the rainy season, the potential adverse impacts during construction would be minimized and kept highly site-specific. On other hand trenching and excavation, run-off from stockpiled materials and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures in place such as preparation and implementation of spoils management plan, prioritize will be given for re-use of excess spoils and materials in construction activities. If spoils will be disposed, consultation will be made with the district development committee on designated disposal areas. All earthworks will be conducted during the dry season to avoid difficult working conditions that prevail during the monsoon season such as problems from runoff, location for stock yards for construction materials will be identified at least 300m away from water courses. Storage areas will be located for fuels and lubricants away from any drainage leading to water bodies, All precautions will be taken to minimize wastage in the construction activities. Measures will be provided to prevent waste water entering

into streams, watercourses, or irrigation channels. Open burning of solid waste generated from workers camp will be strictly prohibited. Better solid waste management practices will be adopted such as collection, segregation, reuse and recycling activities within the construction site and workers camp.

During operation, the delivery of unsafe water is a crucial concern that can be mitigated with good operation and maintenance, prompt action on leaks, and complying with the required monitoring of the supplied water quality as prescribed in the National Drinking Water Quality Standards Directives. The WUSC, as operator, requires capacity development in water quality monitoring. Monitoring kits and laboratory rooms will be provided, however, this provision is not necessarily a guarantee that WUSC can handle monitoring appropriately. This capacity development need can be addressed through a "learning-by-doing" program in the first years of operation under the expert guidance of a licensed laboratory, with a continuing periodic capacity strengthening thereafter.

An EMP has been formulated. It contains sets of mitigation measures and monitoring activities, outlines the roles and responsibilities of key institutions in the environmental management of the Subproject, and recommends training and capacity development.

The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. After approval from MoWSS the IEE will be made available at public locations in the town and will be disclosed to a wider audience via the ADB and TSTWSSSP websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation.

The project areas currently have intermittent supplies of water and people have not been able to receive private connections due to a shortage of piped water. With the rapid urbanization of the municipality, people are now demanding improved levels of water supply and sanitation services. In order to meet the aspirations of the people, Nirmal Pokhari Bagmara Water supply and sanitation subproject has been formulated. The objective of this Subproject is to: a) augment the water source and improve water supply service to all parts of the project area in terms of quantity and quality and b) to provide medium to high level water supply service to all people based on a cost recovery basis.

Consultation, Disclosure, and Grievance Redress: Public consultations were done in the preparation of the project and IEE. On-going consultations will occur throughout the project implementation period. A grievance redress mechanism is described within the IEE to ensure that public grievances are addressed quickly.

Monitoring and Reporting: The PMO, RPMO and DSMC will be responsible for environmental monitoring. The RPMO with support from DSMC will submit monthly monitoring reports to PMO. The PMO will consolidate the monthly reports and will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports to its website.

Conclusions and Recommendations: Nirmal Pokhari Bagmara small town water supply and sanitation project will bring a series of benefits to the local people. However, there are some risks in commencement of the project on time and sustainability of the project which requires to be identified and measures taken to mitigate them. But the analysis shows that project benefits outweigh the risks and these potential risks can be overcome through proper planning, coordination and management. Therefore the proposed subproject is unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009).

1. INTRODUCTION

1.1 Name and Address of the Individual Institution Preparing the Report

Name of the Proposal

The Name of the Proposal is Nirmal Pokhari Bagmara Small Town Water Supply and Sanitation Project

Name and Address of the Proponent

The Project proponent, Third Small Town Water Supply and Sanitation Sector Project (TSTWSSSP) of the Government of Nepal, Department of Water Supply and Sewerage (DWSS), Ministry of Water Supply and Sanitation (MoWSS), is responsible for the preparation of the IEE report.

Name of Proponent

Project Management Office
Third Small Towns Water Supply and Sanitation Sector Project
Department of Water Supply and Sewerage
Ministry of Water Supply and Sanitation
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Consultant Preparing the Report

TAEC Consult P. Ltd. *Joint Venture with* **Integrated Consultants Nepal (P) Ltd.**is responsible in preparing this IEE report.

1.2 Background

In January 2000 the Government of Nepal (GoN) endorsed the 15-year Development Plan for Small Towns' Water Supply and Sanitation in order to improve the health, economic and environmental living conditions of the people in small towns in Nepal. The project embraces the community managed demand responsive approach, where the community is involved in all aspects of planning and implementation of the town projects. The Asian Development Bank (ADB) has been providing financial assistance to this sector project. The Department of Water Supply and Sanitation (DWSS) is the implementing agency whereas the Ministry of Water Supply and Sanitation (MoWSS) is the executive agency.

The first phase of the Project, whose duration was 2001-2008, has already been completed and the people of 29 small towns have been benefitted by the Project. Upon the completion of the first phase and after finding positive impacts of the Project, the Government of Nepal decided to implement the second phase, namely

the Second Small Town's Water Supply and Sanitation Sector Project. Simultaneously after the successful completion of second phase DWSS. The Third Small Town's Water Supply and Sanitation Sector Project (TSTWSSSP) is under implementation. For the implementation, formulation, and operation and maintenance of the Project, TSTWSSSP aims to have full participation of the users of the respective towns. The cost will also be shared by the users and GON.

The Project has many stakeholders such as WUSC, Project Management Office (PMO) of DWSS, Water Supply and Sanitation Division/ Sub-division Office, Regional Project Management Office (RPMO), Town Development Fund (TDF), Design and Supervision and Management Consultant (DSMC) who are responsible for social mobilization, health and hygiene programs and preparation of social profiles.

Both the Nepali law and ADB policy require that the environmental implications of individual developments are taken into account in the planning and decision making process and that action is taken to reduce the adverse impacts to acceptable levels. This is done through the environmental assessment process, which has become an integral part of lending operations and Project development and implementation.

1.3 Project Area Description

The Project area of Nirmal Pokhari Bagmara Subproject lies in Kaski District, Gandaki Zone in the Western Development Region of Nepal. The project area includes ward no. 1,5, 6, 8 & 9 of Nirmal Pokhari VDC; ward no. 1,2,3 & 4 of Bharat Pokhari VDC & additional service area of settlement of Dobilla (Ward no. 17 of Pokhara SMC). Geographically, the project area lies in the hilly region lies between 28^0 4' 38" N to 28^0 10' 27" latitude N to 83^0 57' 46" E to 84^0 5' 28" E longitude.

The project area is bounded towards the north by Pokhara SMC (Sub Metropolitan City) and Lekhnath Municipality and to the east by Lekhnath Municipality and Dulegauda VDC, to the south by Dhorphirdi, Phirphire and Taksar VDC and to the west by KristinachneChaur VDC. The boundary between Pokhara SMC, Lekhnath Municipality and the project area is separated by the Phusre Khola (River Phusre).

The project area VDCs are in hilly region with altitudes ranging between 500 m to 1144 m above mean sea level (amsl) for Bharat Pokhari VDC and 580 m to 1160 m amsl for Nirmal Pokhari VDC. The climate of the project area is sub-tropical with the temperature ranging between a maximum of 33^oC in summer to minimum of about 6^oC in winter. The annual rainfall in the area is about 3,370 mm.

The project area is located about 500 m from Prithivi Highway and is connected to Pokhara Sub-Metropolitan City by asphalt road. It is about half an hour drive from Pokhara city area to Bharat Pokhari VDC. A new road has been built through Bharat Pokhari VDC and up the hill to Nirmal Pokhari by Rural Access Improvement and

Decentralization Project (RAIDP) in 2012. As Pokhara is connected to all parts of the country through airlines and road networks, the project area also has easy accessibility to all parts of the country.

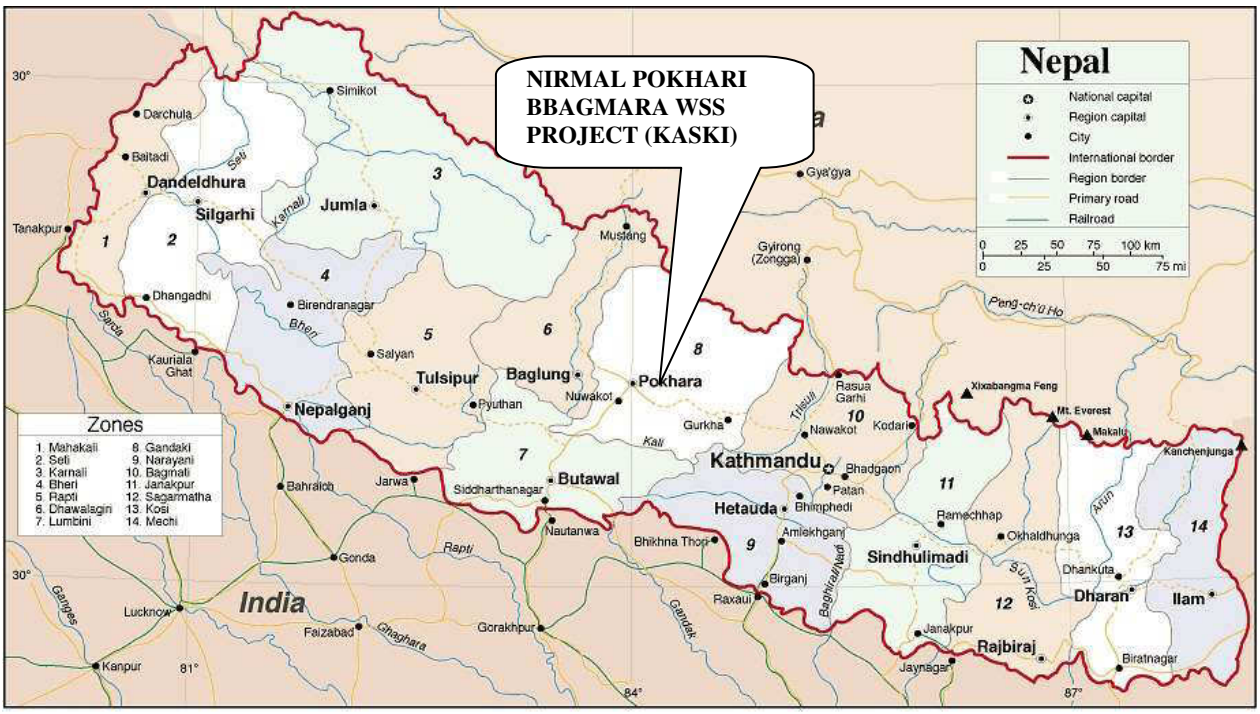

Figure 1-1: Location Map of the Project Area

1.4 Purpose of the IEE

The IEE was conducted to ensure the environmental sustainability of the Subproject, to integrate environmental considerations into the Subproject preparation process, and provide for environmental management during Subproject implementation. ADB and GoN require all projects to undergo environmental assessments. All projects funded by ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. The rapid environmental assessment using ADB's REA Checklist has indicated that the Subproject is a Category B undertaking, requiring an IEE. On the GoN side, the statutory requirement that has to be adhered to is the Environment Protection Act (1997), and Environment Protection Rules (1997) and as amended in 1999 and 2007). Based on EPR Schedule 1, the Subproject is within the threshold of activities under the water supply and sanitation sector that will require an IEE. This IEE fulfils the policy requirements of both ADB and GoN.

The IEE Report primarily:

i. Provides information on the Subproject and its environmental requirements;
ii. provides the necessary baseline conditions of the physical, ecological, cultural and socio-economic environments and/or resources in and surrounding the Subproject's area of influence;
iii. identifies and assesses potential impacts arising from the implementation of the Subproject on these environments and/or resources;
iv. recommends measures to avoid, mitigate, and compensate for the adverse impacts;
v. presents information on stakeholder consultations and participation during Subproject preparation
vi. recommends a mechanism to address grievances on the environmental performance of the Subproject;
vii. provides an environmental management plan.

1.5 Need for the Subproject

Nirmal Pokhari and Bharat Pokhari VDCs are facing huge water scarcity throughout the year except in monsoon season. These VDC are served by Kristi Nirmal Pokhari Bharat Pokhari Brihat Khanepani Project which has the intake at Bhageri Khola of ward no 9 of Pumdi Bhumdi VDC of Kaski district. However, the project does not sufficiently meet the needs of the people, both in terms of quantity and quality. Each day, water is supposed to be supplied or made available from the taps about 25-30 liters each household which is not sufficient. Long hours are spent by people in queuing for water, and with some queuing their pails way ahead of expected operating hours.

Bharat Pokhari and Nirmal Pokhari VDCs are first declared as ODFs VDC in Kaski district. The percentage of households with water borne toilets outside the house is about 91 while about 9% households have toilets inside the house and only about 0.2% of households have pit latrine.

Considering the water demand and condition of the existing system, there is a need for a new system with a new water source to meet the growing demand for private connections and to make drinking water available to the people of the service area throughout the year.

1.6 Relevancy of the Project

The proposed water supply and sanitation project is need to be studied from the environmental point of view as per EPA 1996 AD and EPR 1997 AD, 2054 BS (Amendments1999 AD and 2007 AD). The Proposed Water Supply and Sanitation Project is intended to serve drinking water in ward no. 1,5, 6, 8 & 9 of Nirmal Pokhari VDC; ward no. 1,2,3 & 4 of Bharat Pokhari VDC & additional service area of settlment of Dobilla (Ward no. 17 of Pokhara SMC). The project is expected to benefit a base year population of about 8,228 populations (2014) & design populations of 13,129 populations (2037).

The proposed project shall be using surface water sources. As the proposed project falls within the definitions provided in the EPR 1997(Amendments 1999 and 2007) Annex 1 (G) for drinking water projects; only an IEE should be done. The regulation stated in Annex 1 (H) shall only be applicable, if the proposal does not fall under categories (A) through (H) of Annex 3.

Table 1-1: Criteria for Requirement of IEE and/or EIA for Drinking Water Supply Projects as per Annex 1 and Schedule G and Annex 3 Schedule H of Environment Protection Regulation 1997, Amendment 2007

S.N.	Condition described in the Act and Regulations	IEE Required as per the Regulation Annex 1 g	EIA Required as per the Regulation Annex 3 h	Conditions in the project
1	River Control (training)	Up to 1 kilometer	Over 1 kilometer	NA
2	Channeling Water from one Watershed to Another	Applicable	Applicable	NA
3	Rain Water Collection and Use of spewing Wetland	Up to 200 hectares	More than 200 hectares	NA
4	Supply of Water in Dry Season from Surface Water Source with a safe yield of	Up to 1 cusec and utilizing up to 50 % of the available quantity	More than 1 cusec and utilizing the total available quantity	NA
5	Ground Water Recharge	Up to 50 % of total aquifer	More than 50 % of aquifer	NA
6	Water Treatment	Up to 25 liter per sec		Within 25 liter per sec
7	Construction of Tunnel for Channeling Drinking Water	Tunnel constructed		Not constructed
8	Water Resource Development which Displaces People Permanent Residents)	25 to 100 people	Over 100 people	Not done
9	Settlement of People Upstream of Water Source	Settlement of up to 500 people	Settlement of above 500 people	Not done
10	Supply of water to a population of	5, 000 to 50, 000	Over 50, 000	The water supply system is designed for distribution of water to a total of 13,129 population
11	Connection of New Source to Supply Water to existing water supply system for a population of	10, 000 - 100, 000	More than 100, 000	The base year population is 8,228 in 2014 and the project is designed for a final population of 13,129 in 2037
12	Operation of a drinking water supply system with inclusion of sewage disposal system with sewage treatment system	Installed	Installed	On site sanitation with sludge drying bed is proposed to install within the VDCs itself.
13	Extraction of ground water from sources which are located at point	Not done	Applicable	No non-point and point sources of pollution in

S.N.	Condition described in the Act and Regulations	IEE Required as per the Regulation Annex 1 g	EIA Required as per the Regulation Annex 3 h	Conditions in the project
	and non-point sources of biological and chemical pollution and/or their influenced areas.			the vicinity of the water source
14	Operation of water supply project included in a multipurpose project utilizing a source of 25 litres per sec water. (Construction of Multiple Purpose Reservoir Required)	Not operated	Operated	This is not a multipurpose project and is solely for water supply

1.7 Overview of the Subproject

The Subproject will improve the water supply system of the project area includes ward no. 1,5, 6, 8 & 9 of Nirmal Pokhari VDC; ward no. 1,2,3 & 4 of Bharat Pokhari VDC & additional service area of settlement of Dobilla (Ward no. 17 of Pokhara SMC)

The Project Management Office (PMO) of the Department of Water Supply and Sanitation (DWSS) is the proponent of the proposed Nirmal Pokhari Bagmara Town Water Supply and Sanitation Subproject. The implementation period will be two years, including operation and maintenance.

1.8 Methodology Adopted

The IEE study team conducted a preliminary exercise to solicit information from planners, policy makers, project components, concerned authorities, the user community and affected population. It reviewed the relevant documents on water supply and sanitation in the country, PPTA report and the feasibility report. Similarly, the reports on hydrology, meteorology, geology and others related to the environment were also reviewed.

The study team visited the site to identify the potential impacts, both positive and negative, of the project. During the visit, the team met local people of different sectors and conducted meetings, brainstorming sessions, field examinations, and data gathering. The team also made walk through surveys of the project area to assess the baseline environment and potential environmental impacts of the project during construction and operation phase.

A checklist was prepared and the findings and mitigation measures required, where necessary, have been described. The major parameters of concern were identified and their significance evaluated.

The consultant has addressed the environmental aspects by furnishing information on the Physical, Biological, Socio-economic and Cultural Environments.

Physical Environment Assessment: Existing environment constraints and potential impacts in the project area were studied through field surveys,

complemented by secondary information from reports and interviews with some of government officials, schools and representatives of the local bodies.

Biological Environmental Assessment: The information on the biological environment was gathered through a reconnaissance survey of the project site and surrounding area. Due attention were paid on vegetation, wildlife and aquatic life of the project area and its surroundings. The methods used for the collection of biological information are as follows:

- Collection of ethno-botanical information on socio-economically important plant species through consultation with local informants.
- Ethno-zoological data have been obtained by conducting interviews and discussion with local informants.
- Information on local uses of aquatic biota, fish spawning sites, migration patterns, weedy aquatic plants etc. were obtained through interviews/discussions with local informants.

Socio-economic and Cultural Environment Assessment: Social assessment has attempted to determine the social implications in terms of assumed positive and negative impacts. Primary data for the Initial Social Assessment, which is an integral part of the Initial Environment Examination (IEE), were obtained mainly through Focus Group Discussions with communities. Additional data were collected from general documents on the districts and household survey questionnaires.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Nepal's Environmental Policy and Legal Framework

The Constitution of Nepal defines that each person shall have the right to live in a healthy and clean environment (Clause 1 of Article 30). The victim of environmental pollution and degradation shall have the right to be compensated by the pollutant as provided for by law (Clause 2 of Article 30).It prescribes for the State to give priority to the protection of the environment and prevention of its further damage due to physical development activities. Proceeding from, and conformable to, the Constitution, the Government of Nepal has passed a series of environmental laws, policies and implementing regulations and standards. Among these, the basic legislation that provides the framework within which environmental assessment is carried out in Nepal is the:

Environmental Protection Act (EPA), 1997, which requires a proponent to undertake IEE or environmental impact assessment (EIA) of the proposed project and have the IEE or EIA report approved by the concerned sector agency or Ministry of Population and Environment (MoPE), respectively, prior to implementation. The EPA: (i) sets out the review and approval process of IEE and EIA reports, that involve informing and consulting stakeholders; (ii) stipulates that no one is to create pollution that would cause significant adverse impacts on the environment or harm to public life and health, or to generate pollution beyond the prescribed standards; (iii) specifies for the Ministry in charge of environment (currently the MoPE) to conduct inspection of approved projects to ensure that pollution prevention, control or mitigation is carried out according to the approved IEE or EIA report; (iv) provides for the protection of objects and places of national heritage and places with rare plants, wildlife and biological diversity; and (v) states that any person/party affected by pollution or adverse environmental impact caused by anybody may apply to the prescribed authority for compensation to be recovered from the polluter/pollution generator.

Environmental Protection Rules (EPR), 1997, and its amendments in 1999 and 2007, define the implementing rule and regulations of the IEE/EIA process, elaborating the provisions in the EPA. The preparation, review and approval of IEE and EIA reports are dealt with in Rules 3 to 7 and 10 to 14. Schedules 1 and 2 list down the projects of activities that are required IEE and EIA, respectively, as amended in 2007.

Other environmental Act, Rules, Plan, Policies, Guidelines that are relevant to the Subproject are presented in Table 2-1.

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Table 2-1:Other Relevant Environmental Act, Rules, Plan, Policies, and Guidelines of Nepal

Act/ Rule Policy/Law/Guideline	Year	Relevant Provisions	Remarks
Water Resources Act	1992	A comprehensive law on the development, use and conservation of water resources in Nepal, it aims to minimize damage to water bodies by requiring the conduct of EIA & preparation of EIA Report before granting license to use water resources for any purpose.	GoN IEE has been approved. Use of water resource has been granted by the District Office.
		Proponents shall make sure that the beneficial use of water resources does not cause damage to other water uses/users (Article 4).	
		Article 17 requires proponents to apply for any necessary land acquisition accordingly;	Sites for main structures have been acquired accordingly. Unidentified sites for office building, guard house, guard house cum building, will be acquired accordingly.
		Article 18 requires the compliance to quality standards in making use of water resources. Article 19 prohibits the pollution of water resources. Under the Act are two regulations for drinking water purposes: (i) Water Resources Regulation, 1993, setting out the implementation procedures for the Act; and (ii) the Drinking Water Regulation, 1998, which specifies compliance with the drinking water quality standards and control of water pollution (or sanitation) as it affects drinking water.	EMP prescribes the compliance with NDWQS and its Directives during operation.
Forest Act	1993	The Act prohibits the extraction of boulders, rocks, pebbles, sand or soil from national forests, defined as all forests, excluding private forests, whether marked or unmarked with forest boundary, to include waste or uncultivated lands, or unregistered lands surrounded by the forest or situated near adjacent forests as well as paths, streams rivers, lakes, riverine lands within the forest.	No trees will be cut. EMP stipulates no illegal quarrying of natural aggregate materials.
Local Self-Governance Act	1999	The Act gives Local Government the functions, duties & powers to: (i) conserve & protect their local environment & natural resources; (ii) plan, implement &/or operate &maintain local WS projects; (iii) implement or arrange for implementation local sanitation/sewerage & drainage projects; (iv) protect cultural heritage & religious sites; &/or (v) monitor project activities within their respective jurisdictions.	Provides basis for Local Government to monitor the environmental performance of the subprojects. EMP provides the responsibilities of LGs in EMP implementation.
Labor Act	1992	The Act emphasizes on occupational health and safety of workers and stipulates provision of necessary safety gears and adopting necessary	

Act/ Rule Policy/Law/Guideline	Year	Relevant Provisions	Remarks
		precautionary measures against potentially hazardous machine/equipment in the workplace. It also stipulates to make arrangements such as removal of waste accumulated during production process and prevention of dust, fume, vapor and other waste materials, which adversely affect the health of workers.	
Solid Waste Management Act	2011	Article 4 provides that the management of hazardous, medical, chemical or industrial waste rests upon the generators of such wastes. Management should be as prescribed in the Act. Article 5 provides that individuals and entities have the duty to reduce the amount of solid waste generated while carrying out work or business.	EMP prescribes eco-friendly management of solid and hazardous wastes.
Child Labor Prohibition and Regulation Act	2001	The section 3 of the act prohibits a child from engaging in work, sub clause 1 of the clause 3 states "Nobody shall engage in work a child who has not completed fourteen years of age as a labor and sub clause 2 states "Nobody shall engage a child in a risk full occupation or .work set forth in the Schedule". The section 4 states "Child not to be engaged in work against his will by temptation or fear or pressure or by any other means".	
Local Self-Governance Rules	2000	The rules states for Impact Assessment of the Project In assessing the impact of a project, the local government shall have to pay attention to the following factors:- (a) Social impact : Whether or not there is rise in the awareness, change in the living style, thinking and culture and growth in the social and moral activities of the local people; (b) Economic Impact : Whether or not there is growth in the opportunity of employment or self employment, in the business transaction, in purchasing power and in the overall economic activities of the local people; (c) Services and Facilities: Quality of the services provided by the project, reaction of the people who have or who have not enjoyed the services and the needs to increase qualitative and quantitative growth of the services. (d) Environmental Impact : Whether or not, after launching the project there occurs deluge, draught, floods, landslides, soil-erosion and the like natural calamities	Provides basis for Local Government to monitor the environmental performance of the subprojects. EMP provides the responsibilities of LGs in EMP implementation.
National Environmental Policy and Action Plan	1993	Of its five objectives, most relevant to the Project are to: (i) mitigate adverse environmental impacts; and (ii) safeguard national & cultural heritage & preserve biodiversity, within & outside protected areas.	Subproject will not impact on physical cultural heritage & biodiversity. EMP provides measures to mitigate impacts.

Act/ Rule Policy/Law/Guideline	Year	Relevant Provisions	Remarks
(NEPAP)			
National Water Supply and Sanitation Policy	1998	The Policy requires the: (i) monitoring of water quality supplied by completed WSS projects; and (ii) evaluation of their benefits in improving health (e.g., reducing water-borne diseases) and in relieving the sufferings of women and other disadvantaged groups in carrying out their responsibilities over water collection and maintenance of sanitation and hygiene.	Monitoring of the quality of supplied water is prescribed in the EMP following the NDWQS Directives.
National Urban Policy	2007	Policy gives importance to environment conservation while carrying out urban development works and natural resource use; thus, supporting the required environmental conservation and protection in donor-assisted development projects.	ADB IEE is conducted to ensure environmental conservation and protection.
National Urban Water Supply and Sanitation Sector Policy	2008	The Policy requires the IEE or EIA of proposed WSS projects in accordance with the EPA/EPR to: (i) incorporate consultations with key stakeholders, including end-point users; & (ii) specify measures to mitigate environmental impacts prior to, during construction & operation, as well as corrective measures.	GoN IEE has been approved. This ADB IEE will be submitted to ADB for review and approval.
Updated 15-Yr Development Plan for Small Towns Water Supply and Sanitation Sector	2009	The Plan defines the population threshold of “small towns” to be in the range of 5,000 to 40,000. Reference to Schedules 1 and 2 of the EPR, as amended in 2007, places water supply projects in small towns under Schedule 1 or within the threshold of water supply projects requiring only an IEE. The Plan emphasizes monitoring and evaluation as an important component of a project to determine the overall impact of a project.	EMP prescribes environmental effects and performance monitoring.
Implementation Directives for the National Drinking Water Quality Standards	2005	It sets out the water sampling, testing, analysis, monitoring and surveillance procedures to certify that the quality of supplied drinking water conforms to the National drinking Water Quality Standards.	Monitoring of the quality of supplied water is prescribed in eth EMP following the NDWQS Directives.
National EIA Guidelines	1993	Chapter 3 of this guidelines described an Initial Environmental Examination report must be prepared for those projects which may cause significant impact on environment, whose impact may be known easily and for which mitigation measures may be revealed easily, as mentioned in Schedule-1	EMP prescribes environmental impact and mitigation measures and their performance monitoring.

Nepal is party to the following international environmental agreements that have broad relevance to works and environmental assessment of works under the Project: (i) World Heritage Convention, in 1978; (ii) Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention), in 1987; (iii) Convention on Biodiversity, in 1992, (iv) Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol and subsequent London Amendment, in 1994, and (v) Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and Their Disposal, in 1996. The relevance of the aforementioned environmental agreements to the Subproject are on their emphasis for human activities (such as development projects) to: (i) take on/institute measures to protect the local, as well as global, natural resources and/or environment; (ii) prevent and/or reduce the causes of climate change; and (ii) anticipate and mitigate the adverse impacts of climate change. The country is also committed to the Millennium Development Goals, the seventh goal of which is to "ensure environmental sustainability" targeting the reverse of loss of forest and environmental resources, reduction of biodiversity loss, and increase in the proportion of population with sustainable access to safe drinking water and basic sanitation.

The Nirmal Pokhari Bagmara Water Supply and Sanitation Project does not and will not break or go against Nepal's commitment to these international agreements. It supports the country's effort to meet its committed target for SDG 6th.

2.2 Environmental Assessment Requirements

The Project is subject to the environmental safeguard requirements of both the ADB and Government of Nepal.

2.3 Environmental Assessment Requirements of ADB

All projects funded by the ADB must comply with the Safeguard Policy Statement (SPS) 2009 to ensure that projects funded under ADB loan are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. With respect to the environment, the SPS 2009 is underpinned by the ADB Operations Manual, Bank Policy (OM Section F1/OP, 2010). The policy promotes international good practice as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.1

ADB's Environmental Safeguards policy principles are defined in SPS (2009), Safeguard Requirements as per Table 2-2 and the IEE is intended to meet these requirements.

[1] New Version of the "World Bank Group Environmental, Health, and Safety Guidelines", April 30, 2007, Washington, USA. http://www.ifc.org/ifcext/enviro.nsf/Content/EnvironmentalGuiidelines

Table 2-2:SPS 2009 Safeguard Requirements

SPS 2009 - Safeguard Requirements	Remarks
Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment (EA) so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.	REA has been undertaken, indicating that the Subproject is **NOT**: (i) environmentally critical; and (ii) adjacent to or within environmentally sensitive/critical area. The extent of adverse impacts is expected to be local, site-specific, confined within main and secondary influence areas. Significant adverse impacts during construction will be temporary & short-term, can be mitigated without difficulty. There is no adverse impact during operation. Hence, IEE is sufficient.
Conduct EA to identify potential direct, indirect, cumulative, & induced impacts and risks to physical, biological, socio-economic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary global impacts, including climate change.	IEE has been undertaken to meet this requirement. (Section VI). No transboundary & global impacts, including climate change.
Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.	Analysis of alternatives is presented in Section III.
Avoid, and where avoidance is not possible, minimize, mitigate, &/or offset adverse impacts and enhance positive impacts by means of environmental planning & management. Prepare an EMP that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.	An EMP has been prepared to address this requirement. Section IX
Carry out meaningful consultation with affected people &facilitate their informed participation. Ensure women's participation. Involve stakeholders, including affected people & concerned NGOs, early in the project preparation process & ensure that their views & concerns are made known to & understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to EA. Establish a GRM to receive & facilitate resolution of affected people's concerns & grievances on project's environmental performance.	Key informant and random interviews have been conducted. . A grievance redress mechanism for the resolution of valid Project-related social and environmental issues/concerns is presented in Section VIII.
Disclose a draft EA (including the EMP) in a timely manner, before project appraisal, in an accessible place & in a form & language(s) understandable to affected people & other stakeholders. Disclose the final EA, & its updates if any, to affected people & other stakeholders.	The draft IEE will be disclosed on ADB's website prior to Project appraisal. The GoN has approved the IEE Report. Copies of both SPS-compliant IEE and GoN-approved IEE will be made available at the offices of the PMO, ICG and WUSC for public consultation.
Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.	EMP implementation, reporting and disclosure of monitoring reports are in this IEE.
Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability	The subproject does not encroach into areas of critical habitats. No tree will be cut. However, ground cover and low shrubs in the subproject

SPS 2009 - Safeguard Requirements	Remarks
to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.	footprint and some work easement will have to be removed for the transmission main. Although in due time, ground cover is expected to naturally grow over the backfilled affected area, EMP recommends seeding of the re-surfaced area to accelerated re-growth.
SPS 2009 - Safeguard Requirements 1	**Remarks**
Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase-outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.	This requirement is only minimally applicable to the Subproject in the aspect of waste generation, e.g., effluent from septic tanks and generated sludge and sludge disposal from water supply and sanitation structures. The Subproject will not involve hazardous materials subject to international bans/phase outs.
Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.	EMP provides measures to mitigate health and safety hazards during construction and operation.
Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.	The Subproject will not affect any physical cultural resource. The EMP recommends the measure/s to mitigate adverse impact on PCRs in case of chance find.

2.4 Environmental Impact Assessment Requirements of Nepal

The Environmental Protection Rules (EPR) defines the environmental impact assessment process that should be followed in the preparation, review and approval of environmental assessment reports. The process applicable to the Subproject is summarized in Table 2-3 below. The key environmental quality standards applied in the GoN IEE (as well as in the ADB IEE) are listed in Table 2-4 and their details featured as Annex A.

Table 2-3:The GoN IEE Report Preparation, Review, Approval and Implementation Process

Steps in the Process	Remarks
Proponent refers to EPR Schedules 1 & 2 for the required environmental assessment (IEE or EIA) to carry out.	Subproject requires an IEE.
If proposed project requires an IEE, Proponent prepares an IEE schedule of work/ToR using the format prescribed in Schedule 3 of the EPR and submit this to the CSA for approval.	Subproject has secured an approved ToR.
Proponent carries out IEE according to the approved work schedule/ToR and prepares an IEE Report following the format prescribed in EPR Schedule 5 and incorporating stakeholders' feedback applying the consultation procedure specified in the EPR.	Subproject carried out the IEE and prepared the IEE Report accordingly.
Proponent submits 15 copies of the IEE Report along with the project proposal and recommendation of the concerned VDC or VDCs to the CSA.	Subproject submitted documents accordingly for review and approval.
CSA conducts review and grants approval of IEE Report.	Subproject's IEE Report has been approved, without having
If review reveals project implementation to have no substantial adverse impact on the environment, CSA grants approval within 21 days from receipt of report.	To undertake EIA.
If review reveals the necessity to carry out an EIA, Proponent conducts an EIA following the prescribed EIA process.	
Proponent implements approved IEE Report and any terms and conditions given with the approval.	Subproject has not started implementation.
CSA monitors and evaluates impact of project implementation. When necessary, issue directives to the Proponent to institute environmental protection measures.	Subproject has not started implementation.
MoPE conducts environmental audit after two years of project commissioning/operation.	Subproject has not started implementation.

CSA: Concerned Sector Agency
EPR: Environmental Protection Rules, 2054 (1997), with amendments in 1999 and 2007
MoPE: Ministry of Population and Environment VDC: Village Development Committee

Table 2-4: Relevant Environmental Quality Standards

Particular	National Standard	International Standard
Ambient air quality	National Ambient Air Quality Standards, for Nepal, 2003	WHO Air Quality Guidelines, Global Update, 2005
Emission standard for diesel generator discharge to ambient Air	Emission standard for diesel generator	EPR-15, 1997
Noise	National Noise Standard Guidelines, 2012	WHO Guideline Values on Noise Level
Drinking water quality	National Drinking Water Quality Standards, 2006	WHO Guidelines for Drinking-water Quality, Fourth Edition, 2011

**For surface and ground water quality monitoring, the National Drinking Water Quality Standard shall be applied since these resources are used for drinking.*

3. ANALYSIS OF ALTERNATIVES

3.1 With- and Without-Subproject Alternatives

Nirmal Pokhari & Bharat Pokhari are the neighbourhood VDCs of Pokhara Sub Metropolitan City and Lekhnath Municipality although these VDCs are facing significant development challenges: (i) The capacity of the existing water supply system is insufficient for its rapidly increasing population and urban development. (ii) Incidents of water-borne diseases are on the rise due to poor access to safe and potable water supply; and (iii) Public places are in need of community toilets.

Without-subproject' or 'do-nothing' alternative: Doing nothing about these challenges would be allowing the VDCs to further develop as "under-serviced", Put the health of its residents and the general public at more risks, and worsen its living environment. This would impede: (i) further social and economic development of two VDCs and (ii) Nepal's delivery of its commitment to SDG 6th to increase the proportion of population with sustainable access to safe drinking water and basic sanitation.

With subproject' alternative: With the Subproject, 1,582 households (2014) will have convenient access to reliable and adequate safe and potable water supply and the local people will have easy access to sanitation at public places so that it helps to improve the health and sanitation. As a result, good hygiene and sanitation practices will be promoted & there will be reduced health and safety risks. Overall, the 'with subproject alternative' will bring about enhanced public health and living environment that will contribute to improved quality of life in project the municipality. Improved water supply and sanitation will create an enabling environment for local economic development and improved social services that communities within the sphere of influence of the VDCs will benefit from; thus, contributing to the overall local economic development of the District.

The 'with subproject' alternative will contribute to the realization of the Updated 15-Yr Development Plan for Small Towns Water Supply and Sanitation Sector and to the delivery of Nepal's commitment to SDG 6.

3.2 Alternatives Relative to Planning and Design

Alternative Sources

There are no alternative sources available in nearby vicinity to meet the overall demand of this project.

Water Quality

Water samples were collected from different sources and tested during the feasibility study stage. The tests revealed quality of water from the four sources to be within the National Drinking Water Quality Standards and WHO Guidelines for Drinking-water Quality except for Total Coliform and E. Coli. The different physical/chemical parameters of four sources water samples are shown in Table 3-1.

Table 3-1: Result of Water Quality of Potential Water Sources

Parameters	Unit	Samples					NDWQS
		Kalika Deep Boring (Res.)	Kalika Deep Boring (Well)	Phusre Khola (Intake side) (12.6.2014)	Phusre Khola (Main Flow) (12.6.2014)	Phusre Khola (25.7.2014)	
pH (27^{o}C)	-	7.1	7.1	7.5	7.8		6.5-8.5
Turbidity	NTU	ND (<1)	ND (<1)	ND (<1)	2		5 (10)
Total Hardness as $CaCo_3$	mg/l	34	34	106	109		500
Chloride	mg/l	ND (<1)	ND (<1)	1	ND (<1)		250
Ammonia	mg/l	ND (<0.05)	ND (<0.05)	0.4	ND (<0.05)		1.5
Nitrate	mg/l	0.3	ND (<0.2)	1.9	2.0		50
Iron (Fe)	mg/l	0.08	ND (<0.05)	0.1	0.06		0.3 (3)
Manganese (Mn)	mg/l	ND (<0.05)	ND (<0.05)	ND (<0.05)	ND (<0.05)		0.2
Arsenic (As)	mg/l	ND (<0.05)	ND (<0.05)	ND (<0.05)	ND (<0.05)		0.05
Total Coliform		+ ve	+ ve	+ ve	+ ve		0
E. coli		- ve	- ve	+ ve	+ ve		0

Source: Feasibility Report of Nirmal Pokhari Bagmara Water Supply and Sanitation Subproject, 2016

3.3 Water Supply System

Nirmal Pokhari Scheme consists of high head pumping of more than 520 m from Maspatan to Kristinachne Chaur. The operation cost, therefore is a major cause of concern for long term sustainability of the project. The design of the scheme has been done with utmost consideration for this aspect. In order to serve all service area, four stage pumping have been proposed with pump stations and reservoir at WTP (clear water reservoir) at Maspatan, RVT1 at Ambote, RVT2(intermediate) also at Ambote and RVT3 at Shivalaya. The reservoirs at Ambote RVT1, Shivalaya RVT3 and Bhagabatisthan (RVT4) act as service reservoir. The total pumping head required to lift water from WTP to RVT4 is about 585 m including dynamic head. The total pumping head of first stage, second stage, third stage and fourth stage pumping will be 125 m, 150 m, 160 m and 150 m respectively. The reservoir at Ambote and Shivalaya act both as service reservoir and sump well while the reservoir at Bhagawatisthan will be used exclusively as service reservoir. RVT2 at Ambote will be used for intermediate pumping station and will act as sump well only.

The following option analysis has been carried out to come up with optimum capital and O & M cost and analyze technical as well as financial viability of various arrangements for discussion and to decide on the most feasible option for the project.

Option 1 (Full Project Area served by new Scheme along with Existing systems):
The first option considered is to serve all the population of service area by new scheme only. The WUSC has stressed that they do not want to connect new system with existing system and facilities. So service reservoirs RVT1, RVT3 and RVT4 will serve all the service area of the project. The service reservoir at Ambote (RVT1) will serve all the areas under its catchment (Area 1). The total population of this service area in base year is estimated to be 9385 with this population projected to rise to 13,746 in the design year. The total water demand in the area is estimated to be 891 m3 in the base year and 1,525 m3 in the design year.

The second part of the population below the level of Shivalaya area (Area 2) will be served by Shivalaya reservoir (RVT 3). The population of service area in the base year is estimated to be 5,254 which is projected to rise to 6,385 in the design year 2035. The water demand of this service area is estimated to be 499 m3 in 2015 and 708 m3 in the design year 2035.

The third service reservoir (RVT4) located at Bhagawatisthan serves the population located above the service area of Shivalaya reservoir in Nirmal Pokhari VDC and the population of KristinachneChaur VDC wards 3 and 7. The population of service area of RVT4 is estimated to be 2197 in the base year 2015 which is expected to rise to 2,888 by the end of design year. The water demand of service area is estimated to be 208 m^3 in the base year and 320 m^3 in the design year.

Option 2:
The Option 2 is the modification of Option 1 with downsizing of project and curtailing the service area of the project to service area of Ambote reservoir only, which covers ward 1-4 of Bharat Pokhari VDC and parts of wards 1, 5, 6, 8 and 9 of Nirmal Pokhari VDC. This option excludes all pumping from RVT1 to higher levels. The assumption in this option is that the lower part of the project served by Ambote reservoir will be constructed in this project and the remaining part which requires further pumping will be constructed at a later stage when such area become more urbanized and the project become more financially feasible. The design of components in this option however has taken into consideration future expansion of system to include all areas of the project. The transmission mains and the water treatment plant has been designed for full design capacity except few components of WTP like slow sand filter bed and horizontal flow roughing filter which can be constructed in phases and can be added at later stage as required.

The size of transmission line and RVT1 proposed in this option II is 300 mm dia. DI pipe and 500 m^3 reservoir as in option I but the number of slow sand filter bed and Roughing filter bed has been reduced to limit the treatment capacity to 1550 m^3/day.

This option does not take into consideration integration of proposed project with existing system. The existing systems will continue to run parallel with proposed system.

Option 3:
This Option 3 is modification of Option 2 with maximum use of existing water supply facilities. The service area, the water treatment and transmission system will remain same as for option 2. In this option, it has been proposed to integrate existing Chisapani tube-well system and Kalika deep tube-well system located in wards 3 and 4 of Bharat Pokhari VDC with the new proposed system. The reservoirs of these systems will be used as service reservoir for new system and the existing tube-wells are proposed to be improved and used as stand-by water sources. The integration of other small system are not feasible and so have not been considered.

The pipeline from RVT1 to reservoirs in Chisapani and Kalika will be used both as transmission as well as distribution line. The location of reservoirs near the consumers will reduce the size of transmission main and is expected to optimize the system more effectively. Moreover, there will be more reliability that the people will use new system for their water supply requirement.

Option 4:
The option 4 is same as option 1 but with use of existing systems in Bharat Pokhari and Nirmal Pokhari VDC. This option makes use of reservoirs located at Chisapani, Sisne and Jibredhunge in Bharat Pokhari VDC. The existing Brihad Nirmal Pokhari Bharat Pokhari gravity water supply system has however not been integrated with the new proposed system as this system only have community tap stands and will continue to serve poor population in the service area.

3.4 Selected Alternative Scheme

Option 3 is recommended as most preferred option among 4 alternatives analyzed in feasibility report of the project (August, 2014). This is modification of Option 2 with maximum use of existing water supply facilities. The service area, the water treatment and transmission system will remain same as for option 2. In this option, it has been proposed to integrate existing Chisapani tube-well system and Kalika deep tube-well system located in wards 3 and 4 of Bharat Pokhari VDC with the new proposed system. The reservoirs of these systems will be used as service reservoir for new system and the existing tube-wells are proposed to be improved and used as stand-by water sources. The integration of other small system is not feasible and so has not been considered.

4. DESCRIPTION OF THE SUBPROJECT

4.1 Subproject Site

The service area of the proposed projects covers partial wards of two VDCs Nirmal Pokhari (ward no. 1,5, 6, 8 & 9); Bharat Pokhari (1,2,3 & 4) & settlement of Dobilla (Ward no. 17 of Pokhara SMC) of Kaski district.

The service area delineation has been done in consultation with WUSC, WSSDO and project site local stakeholders.

4.2 The Subproject Components

The Nirmal Pokhari sub-project has been conceptualized as a combined system of gravity and pumping of surface water.

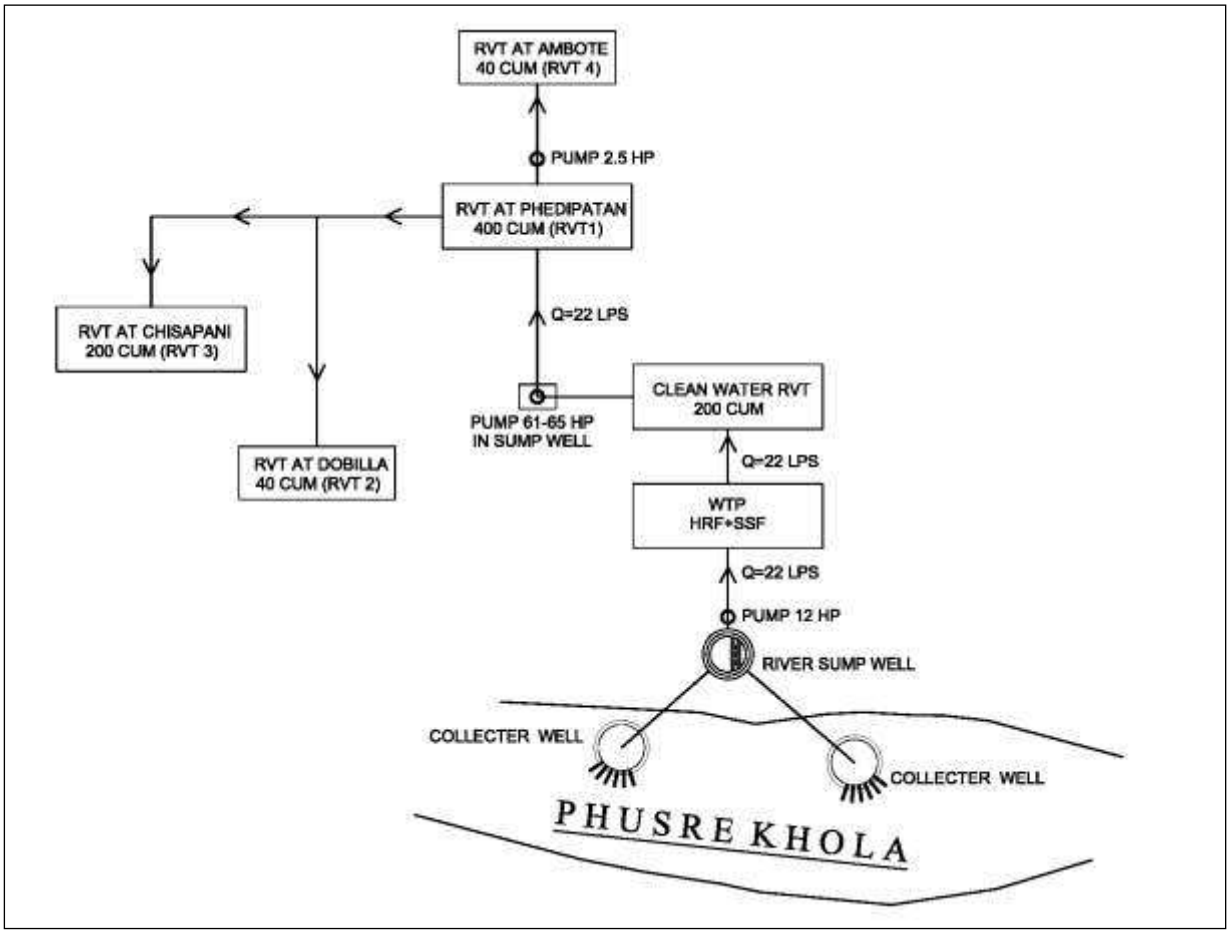


Figure 4-1: Schematic Map of the Project

Water Source and Protection

The source of water for the project is Phusre Khola. The location of intake has been identified about 400 m downstream of the tailrace discharge point of Fewa Power Plant. The intake comprises of arrangement of infiltration gallery with collector well. The collector well collect water in and transfer water to river sump well at the bank of the Khola. Water will be

pumped from river sumpwell to WTP. Although the required capacity of intake is about 22 lps, two collector well have been proposed to incresase reliabilty of the system even in during maintenance period of the collector well. Infiltration pipes around the collector well used to choke frequently. They need though cleanning periodically. Another two set os same type of collector wells and infiltration gallerie arrangement has been proposed to extend water supply services in upper belt of the Nirmal Pokhari separately. This has been done to avoid construction of new sump well in same location in order to extend service to elevated service area which have potential development in future and.

The water shall be pumped from river sump well to water treatment plant located about 200 m downstream in a plain area in Maspatan.

There is no hydrological station in Phusre Khola near to the intake site and so no data exists about the water flow in Phusre Khola near intake site. The total flow in the river consist of flow from Phusre Khola source, flow from Pardi Khola originating from Fewa Lake and the discharge from the tailrace of Fewa Power Plant. The minimum flow in Phusre Khola is estimated to be several times the flow requirement for the project.

One of the sources of Phusre Khola is Fewa Lake water. The water quality report shows that there may be contamination in the river due to disposal of wastewater into the river in upstream area. The major contamination may take place in Fewa Lake where the people may have connected sewers to the lake unlawfully. Due to this the project has proposed construction of a wastewater treatment plant on the other bank of Phusre River (on Pokhara side) about 100 m upstream of proposed water supply intake point.

The major sub-components of the subproject with their characteristic features are described in the sections below.

Intake

The proposed intake is on right bank of the river. Intake structure is located at same location proposed by the PPTA team. The proposed location is safe during flood due to natual rocky exposure just upstream of the proposed location. As the bank is natural safe area, minor river training works is required for bank protection.

A simple infiltration intake with a combination of collector and sump well has been proposed. Infiltration galeries has been proposed to collect water from river through collection pipes. These pipes move the water into collector well. This collector well transfer collected water to sump well which is at right bank of the river Phusre.

Electrical Facilities

Pumping station at Maspatan, where WTP is located, comprises of pumping room in generator house. This premise at Maspatan is comparatively closer to 11 kV transmission line. The three phase line has to be tapped from Birauta, Pokhar SMC WN 17, which is near to Fewa Power House (Joyti Vocational Tranning centre) and streches about 1000 m crossing Phusre Khola at Damsadi Ghat Bridge. A transformers 11kVA/0.4 has been

proposed of 125 kVA capacity at Maspatan WTP/Pump house premises. The transis used to step down the 11 kV voltage to 400/230 V. The three-phase, 50 Hertz, oil-immersed, natural-cooled transformers suitable for outdoor installation are proposed.

In case of power failure, a stand by deisel generator set of 125 KVA has been proposed.

Pumping from River Sump Well to WTP

Water from sump well at river has been transported to WTP at Maspatan area with the help of submerssible pump for gross head of 22 m and pipe length of 200m. A 12 HP pump has been provided with arrangement with Non Return Valve and presssure release valve. A nonslamming double orifice air valve has been also provided.

Two submerssible pumps has been fixed in the river sumpwell. Only one unit of pump will be operated at a time and next unit will be operate as a stand-by

In order to minimise surge pressure, various combination of available pipe diamater and discharge have been tried so that the velocity in the pipe sahll be about 1 m/s and surge pressure can be managed by PN 16 rating pressure relase valve. The pipe used in this stretch is C-40 ISO Ductile Iron Pipes which can resist pressure up to 400m.

Water Treatment Plant

It has been assumed that with arrangement of proper infiltration galleries with colletion well and sump well the turbidity of water would be less than 5 NTU. It is also recommendable to pump water from river sump to water treatment plant. As it has been mentioned earlier that the turbidity is generally low and within acceptable standard in Phusre Khola but it has been reported that it increases significantly high for short duration after heavy rain. The control of tubidity can been kept low by closing operation of pump from river sump well to WTP for a few hours. The low turbid water could be treated with roughing filter.

Water sample of source river collected during rainny season. As stated earlier and reported by local people, source river will be turbid for the short period of time only.

The water treatment plant will consist of following components: a) Horizontal flow roughening filter; b) Slow sand filter; c) Clean water reservoir.

A clean water reservoir of 200 cum capacity has been provided to collect clean water from WTP. The capacity of 200 has been fixed in order to maintain demand of service area for atleast two hours in case of maintainence pumping mains to WTP and WTP itself.

Pumping from Clean Water WTP to Main Reservoir at Phedipatan (RVT1)

Water collected from clean water reservoir will be pumped to Phedipatan. Submerssible pumps located at sump well near Clean water RVT has been designed to lift total gross head of about 118 m and the length of the pipe is about 920 m.

A 61 to 65 HP pump has been provided with arrangement with Non Return Valve and presssure release valve . A nonslamming double air valve has been also provided of PN16 rating . Two submerssible pumps has been fixed in the sumpwell. Only one unit of the pump will be operated at a time and next unit will be operated as a stand by.

In order to minimize surge pressure, various combination of available pipe diamater and discharge have been checked so that the velocity in the pipe shall be around 1 m/s and surge pressure can be managed by easily available pressure realse valve.

Pumping from Phedipatan RVT1 to Ambote RVT4

Water collected in Phedipatan reservoir will be pump to Ambote Area. Submerssible pumps located at sump well near the reservoir has been designed to lift total gross head of about 56 m and the length of the pipe is about 1000 m.

A 2.5 HP pump has been provided with arrangement with Non Return Valve and presssure release valve . A nonslamming double air valve has been also provided of PN16 rating . Two submerssible pumps has been fixed in the sumpwell. Only one unit of the pump will be operated at a time and next unit will be operated as a stand by.

A surge pressure of about 178 bar will be developed (see design calculation in appendix) during sudden power failure therefore a PN 16 rating pressure realese valve has been recommended as Heavy Class GI pipe with welding has been reccomended in these segments.

Thrust Blocks, Saddle Blocks and Thrust Beam

Thrust blocks has been proposed for DI pipes (both transmission and distribution mains) from being moved by forces exerted within the pipe arising from the internal pressure of the pipeline or the flow of water hitting bends, tapers and closed or partially closed valves. Typical Thrust Blocks for horizontal bend, vertical bend, tee have been design for pressure of 18 kg/sq cm for both transmission line (pumping mains and BDS) and distribution line.

Similarly, Thrust Beam and Saddle Blocks are proposed for DI Pipes laid up in sloppy area and un-buried portion. All saddle block are proposed to be anchored with concrete at the centre of each pipe to prevent movement.

Provision of Thrust Beam for stretches of buried DI pipe line which are laid-up in sloppy area has been made to prevent pipe movement.

Service Reservoir

The total capacity of service reservoir provided in the Nirmal Pokhari water supply sub-project is about 680. The reservoir sizing for all sub-component has been carried out and shown calculation in appendix. A minimum of 40 cum capacity has been provided for all reservoir.

As the system do not incorporate existing facilities, all reservoir has to be constructed.

Bulk Distribution Mains

The BDS comprises of DI Spigot-Socket Pipe from 150 mm to 200 mm diameter, PE pipes of 200 mm and medium class galvanized Iron pipe.

Distribution Main

The distribution system comprises of a pipe network, which are looped in certain cases and branched in other. The network has been analyzed using EPAnet, a design analytical software tool. The entire system has been designed using Polyethylene (PE), Ductile Iron

(DI) and Galvanised Iron (GI) pipes. The size of DI pipes is 150 mm and above. In order to proper saddle arrangement at household connection in distribution pipe, minimum diameter of distribution pipe has been adopted as 50mm.

Three types of pipes has been used in the distribution network; Ductile Iron (DI), Galvanised Iron Pipe and PE pipes. However, uses of GI pipes has been limited. The total pipe length of the proposed distribution system works out to 57.890 km.

House Connection

Three type of house connection has been envasiged in the project. Thery are about 70 number of house conection from DI pipes, about 1344 number of house connection from PE pipes and about 330 number of house connection from GI pipes. This will make total household connection of 1,744 in the project area. Most of the connection will be private.

The house connection shall comprise of about 12 m pipe PE or GI Pipe (as per requirement) and water meter. The house connetion pipe shall be PE-100, 20mm OD diameter pipe of rating PN-16 for tapping from DI or PE pipes. In case of tapping from GI pipes, the house connetion pipe shall be medium class GI of 15 ND. Tapping of household connection in PE pipe has been proposed from PE saddle with ferrule and in case of DI pipe, DI saddle shall be used with ferrule without touching DI pipe by ferrule. Tapping from GI pipes has been proposed from PE saddle with ferrule

Dry dial volumetric rotary piston type water revenue meter for all house connections are proposed. These household water meters have 15 mm ND and have been recommended.

Appurtenances

These shall primarily comprise of valve chambers to house flow control valves, control valves for controlling flow etc. Altogether 40 valve chambers are expected in the system. The RCC valve chamber has been proposed on carrigae way and simple Brick type is proposed in other place where vehicular traffic are not expected.

Guard Quarter and Boundary Wall

A building for office and guard quarter is proposed in a single two storey building made of RCC frame structure at Kalikasthan, Bharat Pokhari area. The building comprises of big meeting hall, water quality laboratory, administrative rooms, store for household meter and other small gadgets in addition to guard room, kitchen and bathroom for guard.

In order to safeguard storage tanks and RVT from vandalism as well as contamination, bounday wall and barbed wire fencing has been proposed. A galvanized chain link fencing over 450 mm high parapet wall has been proposed from aesthetic and economic consideration for boundary wall and barbed wire with concrete post has been proposed for fencing.

DMA Establishment

One increasingly common principle of managing a large water network is to sub-divide it into a number of areas, typically of between 500 and 3000 connections, each established area having a defined and permanent geographical and/or hydraulic boundary. Such an area is

known as a District Management Area or, more commonly, a District Meter Area (DMA). Ideally each DMA has a single source of supply to maximize accuracy of data, with a strategically placed and suitably sized meter installed on the inlet that is capable of accurately measuring flow into the area. In this way it is possible to regularly quantify the leakage level in each DMA so that the leakage location activity is always directed to the worst parts of the network.

An important factor in lowering and subsequently maintaining a low level of leakage in a water network is pressure control. The division of the network into DMAs facilitates the creation of a permanent pressure control system, thus enabling pressure reduction in DMAs which reduces the level of background leakage, the rate of flow of individual bursts and the rate of the annual burst frequency. In order to manage NRW in the proposed system, total system divided into 4 DMA aaccording to serving reservoir.

Sanitation Components

The proposed public sanitation requirement of the project area is construction of toilets for various educational institution and public areas for betterment of facilities in these area. These facilities also inculcate behavior of toilet use among students and general public.

Public Toilet

Two public toilets are proposed at two different places. The unit proposed at both places comprises of bathing facilities also and therefore considered as lavatory. These lavatory building comprises of two compartments for ladies and men. The ladies compartment comprises of two WC and one bathing cubicle with washbasin facilities. Similarly gents' compartment would be facilitated with additional urinal facilities with one cubicle for WC and one for bathing. Washbasin facilities have been proposed in this compartment also.

Similarly, all toilet buildings have been duly secured by tie beams at DPC level and roof beams to provide safety against earthquake.

These toilets is requested at Bhagwati Chautari (Bharat Pokhari-4) & at Kalikasthan (Bharat Pokhari-3).

Septic Tank & Soak Pit

The toilet septic tank and soak pit has been proposed according to numbers of envisaged users. The Septic tank and soak pits are constructed by brick masonry. The technical design of septic tank and soak pit is shown in below Figure 4-2.

SEPTIC TANK DESIGN

TOILET AT GUARD QUARTER/OFFICE		
Number of Residentail Users (RU)	4	
Number of Non-Residentail Users (NRU)	24	
Equivalent Users	10	Assuming factor 1 for RU and .25 for NRU
LPCD Used	80	
Return factor of 80%	80%	
Loading	64	
Period of Cleaning	2	
Space For Settling	0.008	Cum
Space Req for Digetion Space	0.425	Cum (@.045 cum per capita)
Space req for Sludge (cum)	0.708	0.0708 cum/capaita forabove said C. Years
Total Space Required	1.141	Cum
Provide space of	1.5	Cum
Provide free Board of		
Free Board (fb)	0.3	m
Provide Length (L) m	2.8	m
Prove Width (B) m	1	m
Provide Height (H) m	1	m
	1.96	OK

SOAK PIT DESIGN

FOR GUARD QUARTER/OFFICE TOILET				
Soil Type		Medium Sand		
Infiltration rate	iR	40.00		Lit/sqm/day
wastewater loading	Q	640		LPD
Infiltration Area	iA	Q/iR		Sqm
Infiltration Area Req.	iA	16		Sqm
Diamter	d	2.5		m
Ht	h	2.04		m
Adopt Effective Height	He	2.1		m

SEPTIC TANK DESIGN

TOILET FOR PUBLIC/INSTITUTION		
Number of Residentail Users (RU)	0	
Number of Non-Residentail Users (NRU)	50	
Equivalent Users	10	Assuming factor 1 for RU and .2 for NRU
LPCD Used	80	
Return factor of 80%	80%	
Loading	64	
Period of Cleaning	2	
Space For Settling	0.008	Cum
Space Req for Digetion Space	0.425	Cum (@.045 cum per capita)
Space req for Sludge (cum)	0.708	0.0708 cum/capaita forabove said C. Years
Total Space Required	1.141	Cum
Provide space of	1.5	Cum
Provide free Board of		
Free Board (fb)	0.3	m
Provide Length (L) m	2.8	m
Prove Width (B) m	1	m
Provide Height (H) m	1	m
	1.96	OK

SOAK PIT DESIGN

FOR PUBLIC/INSTITUTION TOILET				
Soil Type		Medium Sand		
Infiltration rate	iR	40.00		Lit/sqm/day
wastewater loading	Q	640		LPd
Infiltration Area	iA	Q/iR		Sqm
Infiltration Area Req.	iA	16		Sqm
Diamter	d	2.5		m
Ht	h	2.04		m
Adopt Effective Height	He	2.1		m

Figure 4-2: Technical Design of Septic Tank & Soak Pit

Septage disposal site

The selection for septage dispsoal site & it's design will be according to Pokhara Sub-metropolitan City (SMC) and Lekhnath Municipality.

4.3 Salient Feature of the Project Area

The detail salient features of the project is shown in Table 4-1.

Table 4-1:Salient Feature of the Project

S.N.	Items	Description
1	Name of Project	Nirmal Pokhari Bagmara Town Water Supply and Sanitation Project
2	Type	Pumping/Gravity System
3	Study Level	Detail Engineering Design Report
4	Location Area	
	Region	Central Development Region
	Zone	Gandaki
	District	Kaski
	VDC/Municipality	Pokhara Sub-metropolitan City (SMC) and Lekhnath Municipality
	Ward	W. No. 27 of Pokhara SMC (W. No. 1, 5, 6, 8 and 9 of Nirmal Pokhari VDC) W. No. 16 of Lekhnath Municipality (W. No 1 and 2 of Bharat Pokhari VDC), W. No. 17 of Lekhnath Municipality (W. No. 4. 5 and 6 of Bharat Pokhari VDC.) and ward no 17 of Pokhara SMC.
5	Available Facilities	
	Road	Road connecting from Pokhara and Lekhnath
	Supply Water System	DWSS/WUSC and local sources
	Electricity	Available
	Communication	Available
	Health Services	Available
	Banking Facilities	Available
6	Source Characteristics	
	Source Name	Phusre Khola
	Source Type	Surface Water
	Source Location	Maspatan, Pokhara SMC 27
	Safe Yield (lps)	>200 lps
7	Type of Structures	
	Intake / Collector well (CW)	2 Nos CW. for This project +Additional 2
	Main Sump well	1 Nos
	Electricity line, Transand Generator	Electricity line-11 kV, Transformer- (1-125 kVA) & Generator 125 kVA
	Ground Reservoir	Maspatan WTP 1- 200 cum, Phedipatan 1-400 cum, Chisapani 1-200 cum, and 3- 40 cum at Ambote and Dobilla and one additional Clean water Reservoir of 200 cum.

S.N.	Items	Description
	Valve Chamber (Bricks/RCC)	30/10
	Office	1
	Generator House	1
	Household Connection	1,582
	Bulk Distribution Line (m)	9,871
	Distribution Network (m.)	58,017
	Survey Year's Population (2014)	8,228
	Base Year Population (2017)	8,739
	Design Year Population (2037)	13,129
	Weighted Growth Rate %	2.052
9	Total Cost of WS Scheme (Inclusive of all) NRs.	356,124,093.43
10	Cost Sharing Arrangement	
	GON Component (70 %)	249,286,865.40
	TDF Loan (25 %)	89,031,023.36
	WUSC's Contribution for upfront (Cash 5 %)	17,806,204.67
11	Per Capita Cost for W/S component	
	Per Capita Cost (for base year pop.)	40,751.13
	Per Capita Cost (for design year pop.)	27,125.00
12	Tariff	
	Average Household	1,165
	Low Income Household	581
	Poor Household	356
13	Environment	
	ADB Category	B, Only IEE necessary
	IEE finding	No significant adverse impact.
12	Sanitation Cost (Inclusive of all) NRs.	13,278,429.53
	GON Contribution (85 %)	11,286,665.10
	Local Authority / Users' (15 %)	1,991,764.43
13	Per Capita Cost for Sanitation component	
	Per Capita Cost (for base year pop.)	1,519.44
	Per Capita Cost (for design year pop.)	1,011.38

Source: Detail Design of Nirmal Pokhari Bagmara Town Water Supply and Sanitation Subproject, 2016

4.3.1 The IEE Study Area

The IEE study area covers the environment that will potentially be affected by the installation of the transmission mains and distribution pipes and construction/installation of collector well, main sump well, pumps, treatment units, ground reservoir tanks (RVT)and appurtenances such as office building, laboratory unit, guard house and generator house. All the project components are located in the Direct Impact Zone (DIZ) considering the environmental as well as socio-economic impacts.

The covered areas are ward no. 1,5, 6, 8 & 9 of Nirmal Pokhari VDC; ward no. 1,2,3 & 4 of Bharat Pokhari VDC & additional service area of settlement of Dobilla (Ward no. 17 of Pokhara SMC). The study area is also referred to as 'Subproject's area of influence', covering component sites, areas within 200 m from their edges are in the Indirect Impact Zone (IIZ) where environmental and socio-economic impacts will be less.

4.3.1 Environmental Category and Requirements

Environmental Category and Environmental Assessment Requirements: Under ADB classification, the Subproject is of Category B, which needs an initial environmental examination (IEE). Under GoN policy, the scope/scale of the Subproject is within the threshold of subprojects requiring an IEE as listed in Schedule 1 of the EPR. The GoN has approved the Subproject's Terms of References (ToR) for IEE study.

Other Approval/Clearance/Permit Requirements: The Subproject has acquired the following: (i) approval to use/extract groundwater from the District Office; (ii) Trees in the affected community will be cut; hence, permission from Community Forests & from District Forest Office are needed; (iii) A recommendation letter for the construction of the project from Local bodies (VDC, Municipality/DDC etc.).

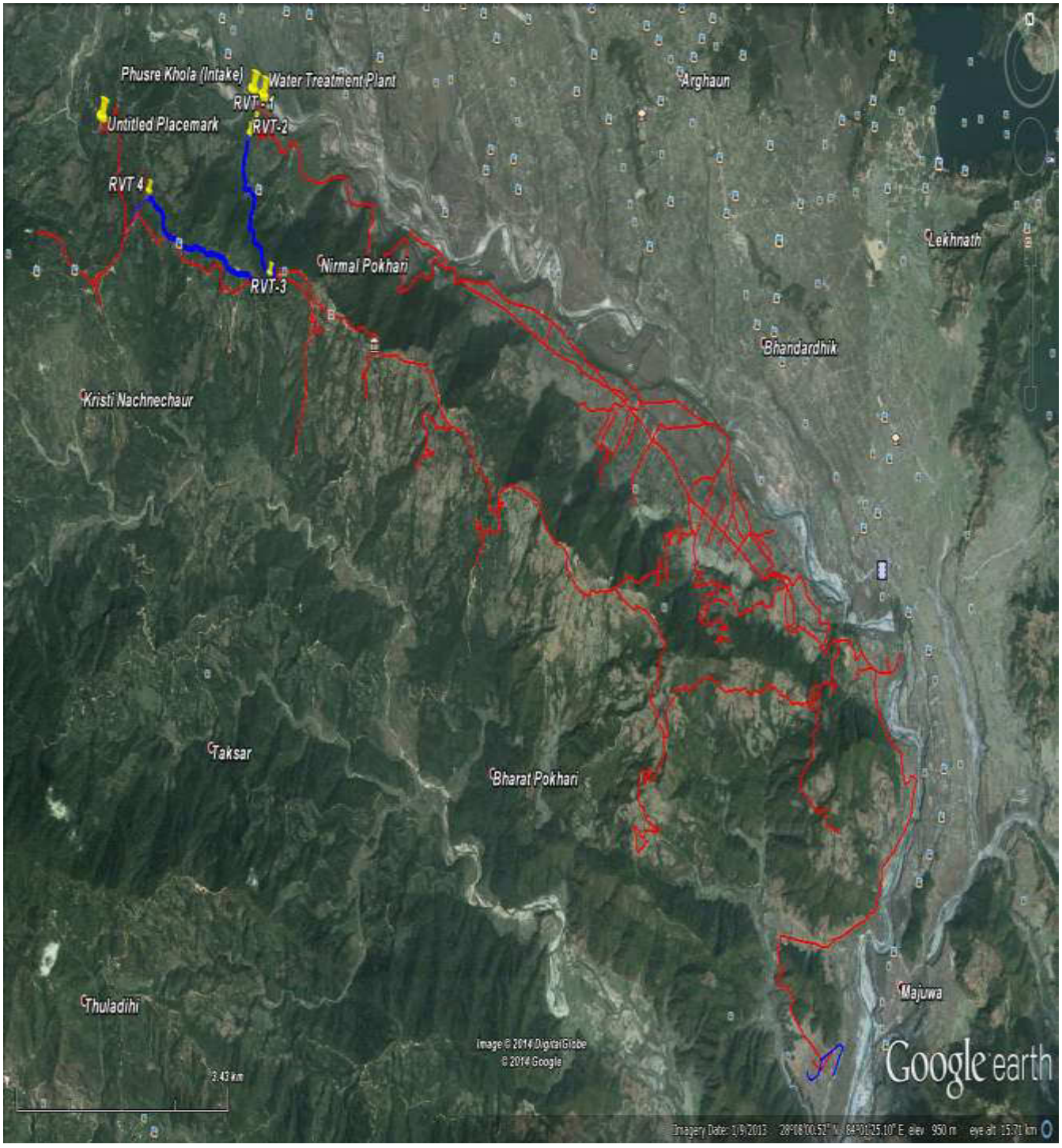


Figure 4-3: Subproject Layout within the Service Area of Proposed Project in Google Map.

5. DESCRIPTION OF THE ENVIRONMENT

5.1 Physical Environment and Resources

i. Landforms and Topography

The Project area lies in hilly region. It lies between 28^0 4' 38" N to 28^0 10' 27" latitude N to 83^0 57' 46" E to 84^0 5' 28" E longitude. It is at an altitude of 500-1545 meter from the mean sea level.

ii. Geology and Soils

The project area comprises of clay soil along with boulders, gravels & sand. The project area has flat alluvial land consisting of 1-1.5 m thick soil underlain by gravel, cobble and boulder of about 25.0 to 30.0 m thick in the center and slightly thinning outward to the foothills around the Srinagar valley and followed by bed rock such as quartzite and feld spathic mica schist, boulders, gravels and sand.

iii. Climate

The district has a subtropical to mild temperate climate and is heavily influenced by the monsoon (July-September). Lumle 25 miles from the Pokhara City receives the highest amount of rainfall (>5600 mm/year). Snowfall is not observed in the valley but some days hills experience occasional snowfall in the winter. Summers are humid and mild, most precipitation occurs during the monsoon season (July-September). Winter and spring skies are generally clear and sunny.

iv. Water Quality

The physical and chemical quality of water of the existing sources is generally good within the NDWQS standards. However the microbial quality does not always meet the NDWQS standards.

v. Air Quality

There are some industries in the project area. Air pollution is caused by fugitive dust from vehicle movements particularly over unpaved roads, construction activities, and wind action on unpaved exposed surfaces and due to some small industrial emissions. Gas emissions come from household cooking, open burning, and moving vehicles. Emissions from these sources are scattered both in terms of locations and timing. From field observation, the ambient air quality of the area is considered to be within the National Air Quality Standard of Nepal

vi. Acoustic Environment

The sources of noise in the Project area is from the construction activities and vehicle movements and industrial activities. The anthropogenic noise is confined in few clustered settlements and in market places only in the daytime; noise level in the Project area is within the national and international permissible standards.

5.2 Ecological Environment and Resources

i. Flora

Kaski District is blessed with natural beauty of floral diversity. The most dominant species include Uttis (*Alnus nepalenesis*), Kattus (*Castonopsis indica*), Sal (*Pinus roxburghii*), Jamun (*Syzygiumcuminii*), Churee (*Bassiabutyracea*). The forests are mainly categorized as government forest and community forest. People of the district are mainly dependent on the forest for NTFP products. The forests provide timber, wood, agriculture implements, fuel wood, fodder, animal beddings, fruits, food items, forage for grazing, medicines and so many other products and services. In Kaski, Chirpine forests are important resources of livelihood to local people. Its major products are timber and resin, firewood, twigs and needles for animal bedding and mulching especially for ginger, torch light from heartwood (locally called diyalo or jharko). It can grow on dry, low fertile and degraded lands where other broadleaf species rarely grow. Pump 1 and the RVT-1 will be sited in the Maspatan Community Forest. The transmission main from Pump 1 to Pump 2 will cross through the same community forest. The community forest is well protected and no such hazards were noted within the boundary of community forest. The construction works will not involve cutting of trees. The transmission main alignment is sparsely treed.

ii. Fauna

The District reports, Chituwa /common leopard (*Pantherapardus*), Ratuwtuwa/Barking deer (*Montiacumsuntjac*), Rabbit *(Leporid Aecuniculas*), Jackal (*Canis Aureus*), Jungle Cat (*FelisBengalensis*), Bandar/Monkey (*Rhesus Monkey*), Nyauri/Mongoose (*Herpestesfuscus*), Dumsi (porcupine) to be some of the fauna that can be found in Kaski District. Bird species includeKoili/Asian Koel *(Eudynamysscolopacea*), Fisto/Dusky Leaf warbler (*Phylloscopusfuscatus*), Kaag/House crow (Corvussplendens), Bhangera/house sparrow (*Passierdomesticus*), Kanthe Dhukur/Eurasian Collared Dove (*Streptopeliadecaocto*), Bakulla/cattle egret (*Bulbulcus ibis*).

The Phusre Khola is habitat for such fish species as Asala (*Schizothoraichthys*), Raj Bam (*Angulliabengalensis*), Buduna (*Schizothoraxplagiostomus*), Cabre (*Pseudecheneissulcatus*), Jhingay, Charungoo, Potay, Chilnay, Garela, Jhojo according to the local respondents near Phusre Khola and its tributaries. The common butterflies in the project area include, among others, common sailor (Neptishylas), common peacock (*Achillidespolyctor*), small grass yellow (*Euremabrigitta*), common mormon (*Papiliopolytes*).

iii. Protected Area

The Subproject will not encroach into, or be in close proximity to, any protected area. Maspatan Community Forest lies in the Sub Project area and distribution pipelines will be taken through some community forest that lies on Nirmal Pokhari VDC and Bharat Pokhari VDC.

5.3 Socio-economic and Cultural Environment

i. Population and Household

The total population of Nirmal Pokhari and Bharat Pokhari VDCs as per census of 2011 is 4,027 and 9,806 respectively. The average household size is 3.89. The population of these VDCs in 2001 were 4729 and 10115. The analysis of census population shows that both of these VDCs have declining population growth in last one decade. The rate of population decline in Nirmal Pokhari VDC is 1.59% while in Bharat Pokhari VDC, it is about 0.31%. Only wards 3 and 4 of Bharat Pokhari VDC have positive growth of 2.32% and 0.11% during last one decade.

In spite of declining population, the total households in both of these VDCs have increased and the average household size decreased from 4.59 to 3.89. The population and households of Bharat Pokhari and Nirmal Pokhari VDCs and the ward-wise average growth rate is presented in Table below:

Table 5-1: Population of the Project Area

VDC Name	Ward Area (Ha)	Ward No	No. of HHs	Population		Population per HHs in 2011	Average Annual G. Rate
			2011	2001	2011		
Bharat Pokhari	857.99	1	369	1,702	1525	1.78	-1.09
	458.74	2	251	1,155	1041	2.27	-1.03
	566.74	3	768	2,497	3142	5.55	2.32
	566.74	4	369	1,443	1459	2.58	0.11
	445.29	5	138	689	523	1.18	-2.72
	655.99	6	146	638	572	0.88	-1.09
	489.31	7	209	899	768	1.57	-1.56
	153.66	8	106	508	388	2.53	-2.66
	350.25	9	112	584	388	1.11	-4.01
Total	**4544.72**		**2,468**	**10,115**	**9,806**	**2.16**	**-0.31**
Nirmal Pokhari	241.12	1	216	913	791	3.29	-1.42
	117.59	2	84	407	344	2.93	-1.67
	146.72	3	94	423	355	2.42	-1.74
	175.34	4	69	322	264	1.51	-1.97
	345.13	5	148	575	571	1.66	-0.07
	195.13	6	131	491	435	2.23	-1.2
	120.50	7	48	249	179	1.49	-3.25
	246.84	8	155	740	537	2.18	-3.16
	245.92	9	143	609	551	2.25	-1
Total	**1834.27**		**1,088**	**4,729**	**4027**	**2.2**	**-1.59**
W.N 17 of PSMC (Dobilla)	770		6974	12706	26752	34.75	7.73

Source: CBS, 2011

ii. Settlement pattern

The settlements in project area is generally scattered and is located in small clusters. In each ward of VDC, there are two to ten clusters of settlement. There are altogether 43 cluster settlements in Bharat Pokhari VDC and 34 cluster settlements in Nirmal Pokhari VDC.

Wards 3 and 4 are more densely populated area in Bharat Pokhari VDC whereas wards 1, 5, 6, 8 and 9 are comparatively more densely populated wards of Nirmal Pokhari VDC. The settlement is more scattered in most areas of Nirmal Pokhari VDC. In Bharat Pokhari VDC, new settlements are emerging in wards 3 and 4. The settlement is dense in the lower belt of the project area.

iii. Ethnicity and caste

The project area is populated by mixed ethnic and caste groups. They can be categorized into nine ethnic groups. The dominant ethnic groups is Brahmin constituting about 50.7% of the total population followed by Chhetri (13.9%) and indigenous people like Magar, Rai, Gurung and Newar (16.0%). Scheduled castes like Damai, Kami, and Sarki constitute about 13.2 % of the total population.

About 13 % of the households are headed by female and about 54.9 % of such household are from Brahmin caste.

iv. Education

There are 18 educational institutions in the project area. The total number of students enrolled in these schools is 2,703. The number of teachers is 231 with the total people in educational establishments to be 2,934.

The overall literacy rate of the people in the project area is more than 85%. There is not much variation in literacy rate in the different settlements.

v. Health and sanitation

There are various health institutions such as health posts, government hospitals, and private clinics near the project towns which provide health services. There is one health post in Bharat Pokhari – 3 (ward 17 of Lekhnath Municipality) and one Sub-Health post in Nirmal Pokhari VDC area (Ward No 27 of Pokhara SMC). Kaski district has been declared as an open defecation free area (ODF) and that means every household has a toilet and sanitation condition is good. It has been found that majority of the households have pour flush/ water seal type of toilet

vi. Economic Activities

Most households in the project area have more than one source of income. However, the socio-economic survey shows that main occupation of the people is still agriculture which accounts for 47 % of total households. The service sector (government or private sector) is the second largest occupation (30%) followed by trade and business (15%).

There is one finance company and few cooperatives operating in the project area. There are only two hotels/restaurants in the project area. But there is scope for development of hotels and resorts in the area.

vii. Poverty Situation

The majority of the sampled households (48 %) have a mean income of more than NPR 25,000 per month. About 27% of the households earn between NPR 5,000 to NPR 25,000 per month. About 10 % households reported that they have less than NPR 7,000 income per month. Table presented below shows the income range of sampled households in the project area.

Table 5-2: Distribution of mean monthly household income

VDC	Ward No	Income category (NPR/ month in thousands)				Total HHs
		<7	7-15	15 - 25	>25	
Bharat Pokhari	1	-	6	7	10	23
	2	-	5	11	10	26
	3	6	8	14	40	68
	4	3	2	9	18	32
	Total	9	21	41	78	149
Nirmal Pokhari	1	8	3	5	12	28
	5	2	1	2	7	12
	6	2	1	3	3	9
	8	-	3	5	3	11
	9	2	3	4	3	12
	Total	14	11	19	28	72
Grand Total	No.	23	32	60	106	221
	%	10.4	14.5	27.1	47.0	100

Source: PPTA Socio-economic survey May-June 2014

More than 75 % of the houses in the project area are semi-pakki construction (made with stone/brick with mud mortar) and about 24 % are Pakki (made with brick walls, cement floor, RBC/RCC roof). Kachchi houses (rural hut made of wood, bamboo, or stone with mud mortar and thatched roof) are found in the slum area in Bharat Pokhari. Most people in the slum area prefer to have a community connection for water supply.

viii. Willingness to pay

Most people in the project area are willing to pay more than NPR 9,000 for a water supply connection. 31.7 % of the households in the project area are found to be willing to pay more than NPR 15,000 for connection charges. Similarly 39 % of households are willing to pay between NPR 9,000 to NPR 15,000. Those who are willing to pay less than NPR 1,500 were 5 % of the total households.

ix. Existing Sanitation Situation

Sanitation Facilities

Kaski District was declared ODF by the Government in 2012. This entails that all households in the district have latrines in their home. Former Bharat Pokhari VDC and former Nirmal Pokhari VDCs are the first VDCs which were declared as ODF VDC in the district. The percentage of households with water borne toilets outside the house is about 91% while about 9% households have toilets inside the house and only about 0.2% of households have pit latrine. Table 5-3 presents the type of toilets in use in the project area:

Table 5-3: Type of Toilets in use in Project Area

Former VDC	Total No of Surveyed HHs	Type of Toilet in Use					
		Dry pit latrine	%	Water-borne (inside house)	%	Water-borne (outside house)	%
Bharat Pokhari	1695	5	0.3	217	12.8	1473	86.9
Nirmal Pokhari	783	0	0	5	0.6	778	99.4
Total	2478	5	0.2	222	9.0	2251	90.8

Source: Socio-economic survey June 2014 by PPTA

There are no public toilets in the project area.

x. Drainage Facilities

Storm water drainage is not a major problem in the project area because of its hilly nature and availability of steep gradients. Road side drains have been constructed along the main asphalt roads. There are no other drains constructed. The construction of drains will be required wherever new roads are constructed

xi. Wastewater Management Practices

There is no wastewater system in the service area. Many houses have constructed biogas plant which uses waste from toilets and generate biogas in conjunction with use of cow dung. The generated bio gas is used for cooking purposes. More than 834 houses have constructed biogas plants in former Bharat Pokhari VDC . Only about 11 HHs have constructed septic tank and soak pit.

In former Nirmal Pokhari VDC, more than 509 houses have constructed biogas plants and are using gas produced from the plant for cooking purposes. About 520 houses have constructed septic tank and soak pit for wastewater disposal.

xii. Solid Waste

There is no proper system of solid waste collection and disposal in project area. The people usually dispose of solid waste in the pit around the house. Only few houses (about 3%) have private collectors collecting the solid waste.

xiii. Existing Institutional Situation

Existing Institutions involved in Water Supply and Sanitation Field

The main institutions involved in water supply and sanitation in project area are Division and Sub-division Offices of the Department of Water Supply and Sewerage, various water users and sanitation committees and some national and international NGOS who have been involved in assisting the implementation of water supply project area.

The Water Supply and Sanitation Division Office of Kaski District is the government department responsible for water supply and sanitation services in project area. The district office carries out planning and provides technical support to WUSCs and implements the projects funded by the Government.

There are a number of Water User and Sanitation Committee in the project area as listed earlier and each committee managing water supply systems serving small parts of project area. These WUSCs are responsible for operation and maintenance of the system and financing O&M costs by collecting water tariff from consumers.

A South Korean NGO is active in Bharat Pokhari area and has assisted in construction of a water supply scheme in ward 7 of former Bharat Pokhari VDC. The construction has been carried out with its local partner, Global Peace Association under the Nepal High Hope Village Program.

6. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

6.1 Positive Environmental Impacts and Benefits

There will be opportunities for local employment and increased earnings of local enterprises during construction. When completed, the Subproject will bring about the following environmental benefits, impacts and outcomes:

i. Water supply
- The benefit of having access to reliable and adequate supply of safe and potable water;
- Promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts;
- Enhanced public health, improved quality of life and safe communities.

ii. Sanitation
- The benefit of public commuters having access to improved sanitation facility;
- Promotion of good hygiene and sanitation practices and reduced health and safety risks
- Enhanced public environment enhanced public health and safe communities

Overall, the Subproject will lead to enhanced public health and urban environment, significantly contributing to the qualitative improvement in the Quality of life of Nirmal Pokhari & Bharat Pokhari VDCs residents.

To sustain the positive outcomes, effective operation and maintenance guided by an O&M manual that contains Water Safety Guide, among others, is essential. Continuing hands-on training of WUSC in EMP implementation particularly water quality monitoring is necessary.

6.2 Impacts/Issues/Concerns and Mitigation Measures during Design Phase

The impacts/Issues/Concerns & Mitigation Measures during design phase is illustrated in Table 6-1.

Table 6-1: Impacts & Mitigation Measures during Design Phase

Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility
Detailed design			
Incorporation of sloped areas in project design	Soil erosion and slope instability	• Incorporate measures and sites for handling excessive spoil materials • Incorporate drainage plan in final design	PMO,RPMO & DSMC
Manual preparation	Health and safety of community and workers	• Prepare training manuals in Nepali with sketches on community health and safety and potential occupational health and safety	PMO,RPMO & DSMC
Construction of reservoirs in high earthquake zone	Cracking of structure leading to facility failure and hazard to public	• Design all reservoirs and structures under the project to for appropriate seismic resistance	PMO,RPMO & DSMC
Location of pipes and photographs of sites and existing utilities prior to construction, particularly in heritage areas	False claims from people; water quality changes due to construction. Interference with other utilities and photo record of existing character of heritage areas to avoid impacts to heritage structures during construction	• Place water pipes away from existing utilities during design • Provide budget for restoration/replacement of damaged utilities • Avoid placing alignment near heritage buildings • Photograph all sites within heritage areas to enable before and after comparison (note: all roads are to be reinstated to original character especially in heritage areas) • Ensure compliance with any Department of Archaeology (DOA) rules during design period including preparation of Archaeological Impact Assessment, or other agreed document by DOA if required .	PMO,RPMO & DSMC /Contractor
Construction of tube-wells	Risk of pollution of raw water supply (deep tube well water)	• Safe intake sites with minimum risk of pollution shall be selected. • Adequate source and intake protection measures shall take place. • The well point should be located at a slightly higher elevation from a drainage point of view. • The annular space between the drilled hole and well casing should be sealed off and provision for grouting the well casing - the depth would depend on the hydro-geological conditions encountered during construction - should be made. • After completion of the construction, the well should be capped tightly. • The deep well bored should be well protected with a concrete platform so that surface water does not enter the well.	PMO,RPMO & DSMC

Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility
		• It should be made sure that once the boring is completed, the well must be chlorinated according to the standards so as to disinfect the pipes and screen that have been placed underground.	
Sludge disposal	Inadequate disposal of sludge from reservoirs and treatment plant will cause nuisances to affected properties.	• Design of sludge disposal sites should be made at designated sites approved by the municipalities..	PMO,RPMO & DSMC

6.3 Impacts/Issues/Concerns and Mitigation Measures during Construction

i. Non-Compliance with Relevant Environmental Legislation

This issue/concern will arise when there is lack of awareness among Project and Subproject staffs and management on environmental safeguard requirements, compliance with the requirements and/or conditions specified in the IEE Report. Measures to mitigate these concerns include: (i) capacity strengthening of the PMO Environmental Officer and his/her counterpart at the subproject level; and (ii) ensuring that necessary additional approval/permit/registration is obtained.

ii. Erosion & land surface disturbance

Excavation and digging of trenches during construction has the potential to cause erosion and cave in thereby causing soil erosion, silt runoff and unsettling of street surfaces. Unorganized disposal of the excavated earth can disturb the street surface and decrease the value of the area where it is disposed. The activity as such will be discomfort to the road users and inhabitants.

The proposed area is in hilly region, the chances of slope disturbances and landslides are maximum while digging trenches for the distribution line.

During construction, precautionary measures will be taken, proper backfilling trenches will be done and the excavated soil will be placed against erosion. Temporary diversions and sign boards for pedestrians will be provided.

In additional quarrying and burrowing activities to supply the aggregate demand of the Subproject would involve land disturbance that could cause erosion and/or landslide. The contractor must coordinate with DDC & RPMO on restrictions in quarrying and the legitimacy of extraction operations of identified sources. The contractor must secure permits to quarry/burrow to extract aggregates and implement a quarry site restoration plan, which should be part of the EMP.

iii. Impacts on Air Quality

Dust will be generated from inadequately managed or haphazard: (i) earthworks such as clearing, grubbing, excavations and drilling; (ii) demolition works; (iii) stockpiling of natural aggregates, excavated materials and spoils; (iii) transport, loading and unloading of natural aggregates; (iv) movement of construction-associated vehicles; and (v) on-site rock crushing and concrete mixing. Some mitigation measures include: (i) confining earthworks according to a Excavation Segmentation Plan that should be part of the EMP; (ii) watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, as necessary; (iii) if re-surfacing of disturbed roads cannot be done immediately, spreading of crushed gravel over backfilled surfaces; (iv) during demolition, watering of exterior surfaces, unpaved ground in the immediate vicinity and demolition debris; (v) signage at active work sites in populated areas; (vi) requiring trucks delivering aggregates and cement to have tarpaulin cover and (vii) limiting speed of construction vehicles in access roads and work sites to maximum of 30 kph.

Odor and gas emissions: There will be a salient impact during demolition of existing community toilets and septic tanks at the public places. To mitigate odor and gas emissions, prior to demolition: (i) clean and disinfect the existing community toilet.

iv. Noise

Noise-emitting construction activities include earthworks, rock crushing, concrete mixing, demolition works, movement and operation of construction vehicles and equipment, and loading and unloading of coarse aggregates. The significance of noise impact will be high in areas where noise-sensitive institutions such as health care and educational facilities are situated.

Some mitigation measures include: (i) using equipment that emit the least noise, well-maintained and with efficient mufflers; (ii) restricting noisy activities to daytime and overtime work to avoid using noisy equipment; (iii) limit engine idling to a maximum of 5 minutes; (iv) spread out the schedule of material, spoil and waste transport; and (v) minimizing drop heights when loading and unloading coarse aggregates.

v. Damage to the Existing facilities

During the construction phase, while excavating the earth, water supply distribution pipelines will get damaged in few places particularly in bazaar area, therefore a repair team consisting plumber will be kept standby so that immediate repair will take place.

To avoid damage to telephone / telecom line coordination with the office will be setup. Layout drawing if possible will be received from concerned office to avoid possible damage.

vi. Impacts on Water Resources

Impacts on Surface Water Quality

Some sections of the distribution pipeline will cross water bodies, exposing these resources to risks of pollution caused by: i) poorly managed construction sediments, wastes & hazardous substances; and ii) poor sanitation practices of construction works. Polluted water bodies will be detrimental to aquatic life as well as to the health of people relying mainly on the river and streams as sources of water for drinking and other domestic uses.

Mitigation measures will be implemented prior to the construction stage to prevent the contamination of drinking water source and other environmental receptors from worker camps and construction site toilets septage. Appropriate design of septage disposal will minimize the risks to public health. The appropriate design of toilets includes septic tanks that are designed as per national standards and codes to allow for maximum retention of septage. This includes ensuring septic tanks are sealed and water tight. Septage disposal pit will be designed and constructed in accordance to international best practice and acceptable standards. This will include, locating disposal pits at least 300 m away from the nearest dwelling and 30 m downstream of the drinking water source, The pits will be installed on relatively flat land with no more than 8 % slope and sites selected for locating of pits will not be where food crops are grown. The sanitation condition will be maintained to deter flies, mosquito breeding, free from odor. The septage disposal site will ensure no disturbances to nearby community forests.

In additional to this, other mitigation measures include: i) disposing of spoils or excess soils as free filling materials as soon as possible; ii) locating temporary storage areas on flat grounds and away from main surface drainage routes; iii) shielding temporary storage areas with sandbags iv) implementing eco-friendly solid and hazardous waste management, disposing them promptly; and v) providing adequate water supply and sanitation facilities at work sites.

Impacts on River Morphology and Hydrology: Quarrying from riverbeds could cause the alteration of the river's morphology and hydrology.

A suggested mitigation measure is to coordinate with DDC & RPMO and local authorities regarding restrictions in quarrying from rivers. As much as possible, alternative sources should be identified. The contractor should be required to obtain aggregates only from sources with environmental clearance and licenses to operate.

vii. Impacts on Flora and Fauna

The proposed project will have impacts on biodiversity. The parts of the project area where construction activities will take place within Community Forest Area. The project components require a very small area of land for implementation; environmental impacts on the vegetation & natural eco-system seems to be significant.

No, terrestrial fauna & birds species in the community forests will be affected. For mitigation impacts on flora and fauna, hunting and poaching by workers will be strictly prohibited.

Haphazard site clearing, parking and movement of construction vehicles and equipment, stockpiling, and Illegal harvesting of nearby community forest resources as fuel for cooking by workers will result in unnecessary loss of vegetation beyond Subproject footprints.

The proposed water supply project will require to construct ground reservoirs & laying of pipe lines within the area of Community Forests area. This results, the cut down of about seven trees within the Community Forest Area.

During construction disturbances will occur. Some of the mitigation measures include: (i) installing clear signage and markers to direct traffic movement in sites; (ii) designating stockpiling areas; (iii) re-vegetating disturbed slopes and grounds, as applicable; and providing alternative fuel to workers for cooking. Hunting and poaching by workers will be strictly prohibited; (iv) plantation of 175 tree saplings for the loss of 7 trees in and around the project area.
The tree-feeling permit, recommendation letters from District Forest Office and Community Forests will be obtained prior to start of construction works for the project.

viii. Impacts on Physical Cultural Resources

The subproject will not encroach into, or be in close proximity to physical cultural resources.

ix. Impacts on the Socio-Economic Environment and Resources

These will result from excavation works, stockpiling, movement and parking of construction vehicles and equipment, and/or accidental damage of existing utilities (e.g., power supply poles, open drains and water taps or hoses). Nuisance and safety hazards are the indirect impacts.

Some mitigation measures include: (i) preparing a traffic management scheme jointly with local authorities; (ii) posting of traffic flagmen during the entire working hours; (iii) providing safe compensation to affected properties; (iv) managing stockpiling; (v) leading pumped water from excavations to drains or storing in drums for use in watering dry surfaces; (vi) coordinating the relocation of affected power supply poles, embedded private water hoses prior to excavation; and (vii) in case of accidental damage to existing utilities, advise the concerned authority at once.

Community health and safety hazards: Overall, communities will be exposed to cross-cutting threats from construction's impacts on air and water quality, ambient noise level; mobility of people/goods/services; accesses to properties/economic activities/social services; service disruptions; and potential fire and explosion, among others. Construction workers may potentially bring communicable and transmittable diseases into the community. Mitigation measures include: (i) Contractor's implementation of EMP; (ii) adequate lighting, temporary fence, reflecting barriers and signage at active work sites; (iii) Contractor's preparedness in emergency response; and (iv) adequate dissemination of GRM and Contractor's observance/implementation of GRM.

Workers' Health and Safety Hazards: Workers will also be exposed to the cross-cutting threats of the aforementioned impacts during construction. Inadequate supply of safe/potable water and inadequate sanitation facilities; poor sanitation practices on site; poor housing conditions; the handling and operation of construction equipment; handling of hazardous substances; exposure to extreme weather and non-observance of health and safety measures, pose additional threats to the health and safety of construction workers. Construction workers may also be potentially exposed to communicable and transmittable diseases in the community and in the workforce.

Mitigation measures includes (i) strictly enforce workers to use personal protective equipment (PPE) (ii) provide safe access to and from work sites; (iii) provide adequate water supply and sanitation facilities at camp and work sites; (iv) provide health care and emergency care of workers.

Impacts on the Sustainability of Works: During construction, seismic events may occur, causing damage to unsettled/unfinished/uncured and/or completed structures and affecting their structural integrity. After every seismic event, the contractor must conduct engineering investigation of built structures and implement the necessary corrective actions immediately.

6.4 Impacts/Issues/Concerns and Mitigation Measures during Operation

Non-compliance with relevant environmental legislation: This issue/concern will arise when there is lack of awareness of Project staff and management on environmental safeguard requirements, compliance with the requirements and/or

conditions specified in IEE Report approvals and registration for use of water resource. Measures to mitigate this concern include: (i) capacity strengthening of the WUSC and continuing capacity strengthening of Project staff; and (ii) ensuring compliance with EPA/EPR, NDWQS, applicable conditions in IEE approvals and registration for use of water resources.

Delivery of Unsafe Water: Unsafe water delivered due to any one or combinations of the following will impact on public health: (i) accidental human error in chlorine dosing; (ii) accidental spill of hazardous substances; (iii) leaks in the system; (iv) lack of environmental quality monitoring; (v) inadequate maintenance and housekeeping; and (vi) deteriorating quality of groundwater resource without parallel upgrade of water treatment. Some mitigation measures include: (i) ensuring competent/cautious handling and storage of Calcium Hypochlorite and qualified persons to implement/oversee disinfection; (ii) providing safe storage for chemicals; (iii) ensure capacity to implement quick response to hazardous substance/waste spills; (iv) implement SPS-compliant EMP; (v) monitor raw water quality.

Non-sustainability of Services or Completed Works: This issue will arise with the Operator's disregard of the impacts of the following during operation: (i) climate change-induced drought; and (ii) seismic events. To mitigate, WUSC to monitor yield closely especially in the dry season and during a climate-change induced drought. After every seismic event, WUSC should conduct engineering investigations of completed works and implement the necessary corrective actions without delay.

Occupational Health and Safety Hazards: Worker's exposure to, and/or mishandling of chemicals and other hazardous substances pose health and safety hazards. Mitigation measures include: (i) installation of clear, visible signage in premises on observance of safety measures; and (ii) setting up of mechanism for quick response to spills of chemical and hazardous substances.

6.5 Indirect, Induced and Cumulative Impacts

During Construction

Indirect and Induced Impacts: The volume of vehicle movements that will be generated from the simultaneous construction at subproject component sites will create traffic jams in narrow access roads and slow down mobility of people, good and services, particularly in the bazaar areas. A greater number of people will be exposed to safety hazards from the constricted road space. Coupled with disruption of economic activities and social services from extended interrupted power supply due to relocation of power poles and/or likely accidental damages, production outputs will suffer some slowdown. Severe dust on rice plants and other crops in the vicinity of subproject footprints would have some effect on the crops' yields. Apart from the applicable mitigation measures from among those mentioned for direct impacts, proper coordination with the relevant ward authorities, social service

institutions and businesses should enable further mitigation of indirect and induced the impacts.

Cumulative Impacts: There are no known ongoing or proposed developments in Nirmal Pokhari & Bharat Pokhari VDCs as well as planned extension of the subproject as yet. Hence, cumulative impacts will arise mainly from the construction of the main Subproject components and associated facilities. The Subproject's "main area of influence covers component sites, i.e. footprints and areas within 200 m from their edges, considering the potential reach of noise, dust and socio-economic impacts; "Point works" refer to such main components as pumps, RVTs, intakes/treatment units/ancillaries, public markets; "Horizontal works" refer to the transmission main and distribution pipes; the "Construction period" (excluding O&M) for horizontal works is estimated to be 1 year, for collection chamber and water treatment plant and RVT & intake unit/ancillaries is six months.

Assuming all components are started simultaneously or almost simultaneously, without mitigation, cumulative impacts will be "significant" in magnitude during the peak construction period (for the first four months of the construction period). After this the magnitude of cumulative impacts will lessen to "moderate" magnitude. The sensitiveness of the resources, natural and artificial, within the main areas of influence has been taken into account, together with the types of works involved and their intensities. Considering all these:

The potential moderate and high cumulative impacts would be dust, noise, road space limitation leading to slow mobility, access blocking, disruption of social services and economic activities, community and workers' health and safety hazards, generation of solid wastes and spoils.

To reduce the cumulative impacts down to acceptable levels:

- Civil works must be well planned, strategized and completed promptly;
- The contractor should implement the C-EMP fully; and key institutions should act their roles in EMP implementation effectively;

There must be adequate consultations with stakeholders, including bus operators, and local authorities and coordination, particularly regarding expected cumulative impacts. Bus operations should temporarily adjust to the circumstances to relieve some road space limitations and for public safety and convenience.

The grievance redress mechanism should be disclosed (through public meetings, display at strategic places and media) to the communities affected by the cumulative impacts.

During Operation

The indirect and induced impact of a reliable and sufficient water supply would be increased generation of wastewater and sullage. If inadequately managed, this situation would lead to contamination of the water supplied through leaks or broken pipes in the distribution system. Mitigation measures would be: (i) prompt action to repair broken pipes/leaks; and (ii) monitoring incidence of water-borne disease in the dry and wet seasons.

With reliable and sufficient access to safe and potable water, the indirect positive impacts will be improved public hygiene and sanitation, leading to the overall improvement in public health and quality of life. Enhancement measures include ensuring the quality of supplied water meets NDWQS through implementation of quality monitoring as prescribed in the EMP. Induced impacts of improved water supply system include rural–urban migration and more land conversion from rural to urban uses. Adequate projections of these induced changes must be incorporated in the design for sustainability of works. The cumulative impact would be the rapid urban growth due to the existing water supply system and future urban growth that will be driven by the proposed improved water supply. Measures to mitigate the adverse impacts of rapid urban growth would be rational land use planning of the VDC and District & incorporating environmental management for sustainable growth.

In summary, the subproject is not likely to cause significant adverse impacts in the environment. The potential environmental impacts are site-specific, insignificant & short duration for the construction phase so it can be mitigated by good engineering practice and mitigation measures specified in the EMP.

7. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

Stakeholder consultation and participation was an essential process in project preparation. The process in engaging stakeholders and affected people involved key informant interviews, on-site discussions with WUSC, and random field interviews of stakeholders. Table 7-1lists the persons consulted during the IEE.

Table 7-1:Lists of People Consulted During IEE Study

S.N.	Name of Person	Designation
1	Mr. Keshar Prasad Nirdosi	Chairman
2	Mr. Mukti Nath Poudel	Vice Chairman
3	Mr. Padam Bahadur Chhetri	Secretary
4	Mrs. Rama Acharya	Treasurer
5	Mrs. Rishimaya Lamichanne	Member
6,	Mr. Raghu Parajuli	Member
7.	Mr. Purna Bahadur Thapa Magar	Member
8.	Mrs. Bindu Khadka Magar	Member
9.	Mr. Tara Nath Archaya	Member
10.	Mr. Kiran Poudel	User Group
11.	Mrs. Reeta Sunuwar	User Group
12.	Mr. Shyam Shrestha	User Group
13.	Mr. Tek Jung Gurung	User Group
14.	Mrs. Gita Karki	User Group
15.	Mr. Raman Chhetri	User Group

Summary of the Consultations Outcomes

The focus group discussion was organized (21st of September, 2016) at the WUSC office Nirmal Pokhari Bagmara for the discussion of the environmental impacts due to construction of Nirmal Pokhari Bagmara Subproject.

The local people concerned /issues regarding to the construction of Subproject is summarized below:

Common Issues raised by Stakeholders:

The common issues raised by the local stakeholders during IEE Study are as follows:

- The construction of project mustn't affect flora and fauna of nearby Community Forests
- The contractor must bring construction related materials (sand, gravel & boulder) from DDC approved crusher plant for the project.
- The extraction of sand, gravel & boulder from Phurse Khola must be prohibited.
- Local peoples must be given priority for construction related jobs.

- The safe disposal of solid waste management plan must be developed by the project
- The compensatory plantation for the loss of seven trees must be within the project construction period.

Issues addressed by the Study Team:

- The Community Forests within and nearby of the projects will be protected by awareness and capacity building programmes for the CFUGs
- The law and order & site specific EMP of the project will compel the contractor to bring construction related materials (sand, gravel & boulder) from DDC approved crusher plant for the project.
- The law and order of the project area during construction phase will be strictly monitored by DDC, RPMO etc.
- The safe disposal of solid waste management plan will be developed for the construction phase of the project
- As far as possible local workers from affected VDCs i.e. Nirmal Pokhari & Bharat Pokhari will be given more priority to employment process.
- The compensatory plantation of 175 tree saplings for the loss of 7 trees in and around the project area will be within the first phase of the project.

Figure 7-1: Photographs of consultation and FGD meeting of stakeholders

Stakeholder consultations will continue throughout the implementation of the subprojects. All stakeholders must be invited and encouraged to participate in community consultations. To facilitate the engagement of stakeholders, the PMO and ICG will maintain good communication and collaboration with WUSC and the Municipality. PMO, ICG, Contractors and/or WUSC will be open to the public to contact on matters concerning the progress of the subprojects, adverse impacts, mitigation measures and environmental monitoring and grievances. Future stakeholder consultations will be as follows:

- During the construction stage , if there would be a major change in design/alignment/location, the PMO and ICG will hold at least one public

consultation meeting early on in the construction period to solicit perceived impacts, issues, concerns and recommendations from affected communities;

- Prior to construction, the PMO and ICG will conduct an intensive information, education and communication (IEC) campaign to ensure sufficient level of awareness/information among the affected communities regarding the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of the PMO and ICG, and status of compliance with the Government's environmental safeguard requirements, among others, are attained/provided. Billboards about the subproject, implementation schedule and contact details of the executing agency, PMO-ES, ICG-ESA and Contractors will have been set up at strategic locations within the subprojects' main areas of influence. The grievance redress procedure and details will have been posted at the offices of the ICG, WUSC and Municipality;
- During construction, regular random interviews will be conducted by the ICG-ESA every month to monitor environmental concerns of subproject communities;
- The continuous consultations as per IEE/EMP's plans will be conducted to assess the environmental concerns of the subproject communities . These concerned environmental issues will be included for the implementation in the semi-annual report.
- During operation, periodic random interviews will be conducted by the ICG and WUSC to monitor the environmental concerns of subproject communities;
- The public consultations and information disclosure will be continuous throughout the project cycle. PMO and ICG will be responsible for designing and implementing such aspects on the ground.

The GoN-approved IEE Report (in English), will be available at the offices of the PMO, ICG and WUSC for the perusal of interested parties. Copies may be made available upon formal request. The IEE and environmental monitoring reports will be disclosed on the ADB's and TSTWSSSP website.

8. GRIEVANCE REDRESS MECHANISM

8.1 Purpose of the Grievance Redress Mechanism

The establishment of Project-specific grievance redress mechanism (GRM) is to receive, evaluate and facilitate resolution of affected person concerns complaints & grievances. This is meant for persons seeking satisfactory resolution to their complaints on the social and environmental performance of the subprojects under the 3STWSSP. The mechanism, developed in consultation with key stakeholders, will ensure that: (i) the basic rights and interests of every person adversely affected by the social and environmental performance of a Subproject are protected; and (ii) their concerns are effectively and timely addressed.

8.2 Proposed Set-Up

The MoWSS, as the Project executing agency, will establish the GRM and its support system, including setting up the Grievance Redress Committee (GRC) at the subproject level. The GRC will comprise of the: (i) Chief of the WSSDO; (ii) members of the WUSC; (iii) two representatives of affected persons, a male and a female; (iv) a member of IP community, preferably female; (v) a representative of a non-government organization or community-based organization actively involved in IP development/other backward communities in the area, if any; (vi) local government representatives, i.e., VDCs and DDC; (vii) DSMC social safeguard expert; and (viii) DSMC Environmental Safeguard Expert (ESE). The environmental safeguard assistant (ESA) of the ICG will oversee the implementation/observance of the mechanism for environmental complaints at the subproject level. He/she will be technically advised, supported and trained by DRTAC environmental specialist and the DSMC ESE. PMO's Environmental Officer will oversee the implementation/observance of the GRM in all subprojects. Representatives of affected persons (APs), civil society and eminent citizens will be invited as observers during GRC meetings. Contractors and WUSCs (as Operators) will be required to designate their respective counterpart GRM staff.

The GRM will accommodate both informally- and formally-lodged, but Project-related, valid grievances. Informally-lodged grievances are those received by the Contractors during construction or WUSCs during operation. Formally lodged grievances are those received at the ICG office. The ICG, GRC and PMO maintain records of all grievances, informally- and formally-lodged, valid and invalid, and appealed. The ICG will immediately inform the PMO, as necessary, particularly when an appeal is made by an AP in court. PMO will in turn immediately inform the ADB of the same. The observance/implementation of the GRM will be reported by the: (i)ICG ESA in the subproject's monthly progress reports, semi-annual subproject environmental monitoring report (EMR) during construction and annual subproject EMR during operation; and (ii) PMO EO in the Project's monthly progress report,

semi-annual Project EMR during construction and annual Project EMR during operation.

Sufficient support system, including well GRM-oriented staff of Contractors and WUSCs, communication/documentation/recording and reporting system, funds, posters declaring contact details and displayed at strategic locations, among others, will be in place to sustain the effective implementation of the mechanism.

8.3 Access to the Mechanism

Any person who has environmental concerns/issues pertaining to the subprojects during detailed design, construction and operation phases will have access to the mechanism free of charge. The PMO EO and ICG ESA will ensure that:

The public, especially the residents and regular passers-by, in the main areas of influence of the subprojects, are aware of their rights to access, and will have access to, the GRM free of administrative and legal charges; and

The GRM is fully disclosed prior to Notice to Proceed for construction is given: (a) in public consultations and social/community preparations, (b) through posters displayed in the offices of the ICG, VDCs, DDC and at strategic places within the main areas of influence of subprojects (posters to include names and contact details of the EO of the PMO and ESA of the ICG).

8.4 GRM Steps and Timeframe

Informal Approach: Informally, APs can lodge complaints directly to the Contractor during construction or Operator (WUSC) during operation. Contractor/Operator will document and screen the complaint immediately. If screening reveals the complaint as Project-related and valid, the Contractor/Operator will act on the complaint within three days from receipt of complaint. Otherwise, the Contractor/Operator will direct the AP with non-Project-related and/or invalid complaint to the ICG. The Contractor/Operator will secure a confirmation of completion of action from the AP. For at least a week after confirmation of completion, the ICG will monitor the effectiveness of the action/resolution taken. After which, ICG will secure a written confirmation of satisfaction from the AP. The Contractor/Operator shall report to the ICG all complaints received, eligible or ineligible, actions agreed on and taken and confirmation of completed action.

Formal Approach: If a complaint is eligible but is not acted on within three days from the receipt of the complaint, or if AP is not satisfied with the resolution undertaken by the Contractor/Operator, he/she can access the formal mechanism, as follows: (Figure 8-1)

First Level: The access point will be the ICG. The steps are detailed below.(Figure 8-2)

Step 1 - Lodging a Complaint (Day 1): AP lodges complaint with the ICG, verbally or in writing.ICG documents/registers lodged complaint, makes sure these are duly referenced and provides AP with a copy of the referenced complaint.

Step 2 - Screening of Complaint (Day1): ESA screens the complaint if it is Project-related and valid and informs the AP immediately of the screening results. An AP with complaint screened as non-Project-related and/or invalid will be advised that he/she may raise complaint to the second level of the GRM, and ICG will forward the complaint to the GRC.

Step 3 - Investigations, Discussion and Agreement (Day 1): ICG, together with the Contractor/Operator and AP, will investigate and discuss the complaint at the site. Agreement on actions and measures and time involved will be made with the AP. Agreement will be properly documented and filed; ICG, AP, Contractor/Operator will have copies.

Step 4 - Implementing the Agreed Action

- If the required action is minor, i.e. not requiring further investigation and would be quick and easy to implement, the Contractor/Operator will immediately implement the agreed action. (Day 2/Day 3)
- If required action is major, i.e. requiring further investigation and/or procurement of supplies/parts, the Contractor/Operator will: (i) immediately provide the most suitable interim measure to reduce the magnitude of the impact (Day 2/Day 3); and (ii) start work on the major action within 5 days from discussion (or not later than Day 8 since receipt of complaint).
- AP will be advised by the ICG that his/her complaint may be raised to the second level of the GRM, if he/she so prefers when: (i) minor action is not implemented within 2 days from discussion; (ii) interim measure prior to major action is not implemented within 2 days from discussion; or (iii) major action is not started within 5 days from discussion.

Step 5 - Confirmation of Completed Action: Contractor/Operator will secure a written confirmation of completed action from the AP and furnish the ICG a copy.

Step 6 - Confirmation of Satisfaction (1 week after confirmation of completed action): The ICG will monitor the effectiveness of the resolution for at least a week after receipt of confirmation of completed action from the Contractor/Operator. After which, ICG will secure a written confirmation of satisfaction from the AP.

Second Level: The AP will be notified by the ICG when complaint is forwarded to the GRC. The GRC will call for a hearing, if necessary, where AP can present his or her concerns or issues. The GRC will suggest corrective action/measure at the field level and assign clear responsibilities for implementing its decision within 7 days of

receipt of complaint by GRC. If GRC decision is not acceptable to the AP, if the suggested corrective action/measure is not started within 7 days, the matter/AP will be referred to the third level.

Third Level: The ICG will refer AP and its unresolved complaint or major issues to the PMO EO who will act within 15 days.

Fourth Level: For extremely major issues that will go beyond the third level, these will be referred to the project steering committee (PSC), to be resolved within 30 days. Environmental complaints (other than those that will involve the legal system) are expected to be mainly resolved at the second level, and to a lesser extent at the third level.

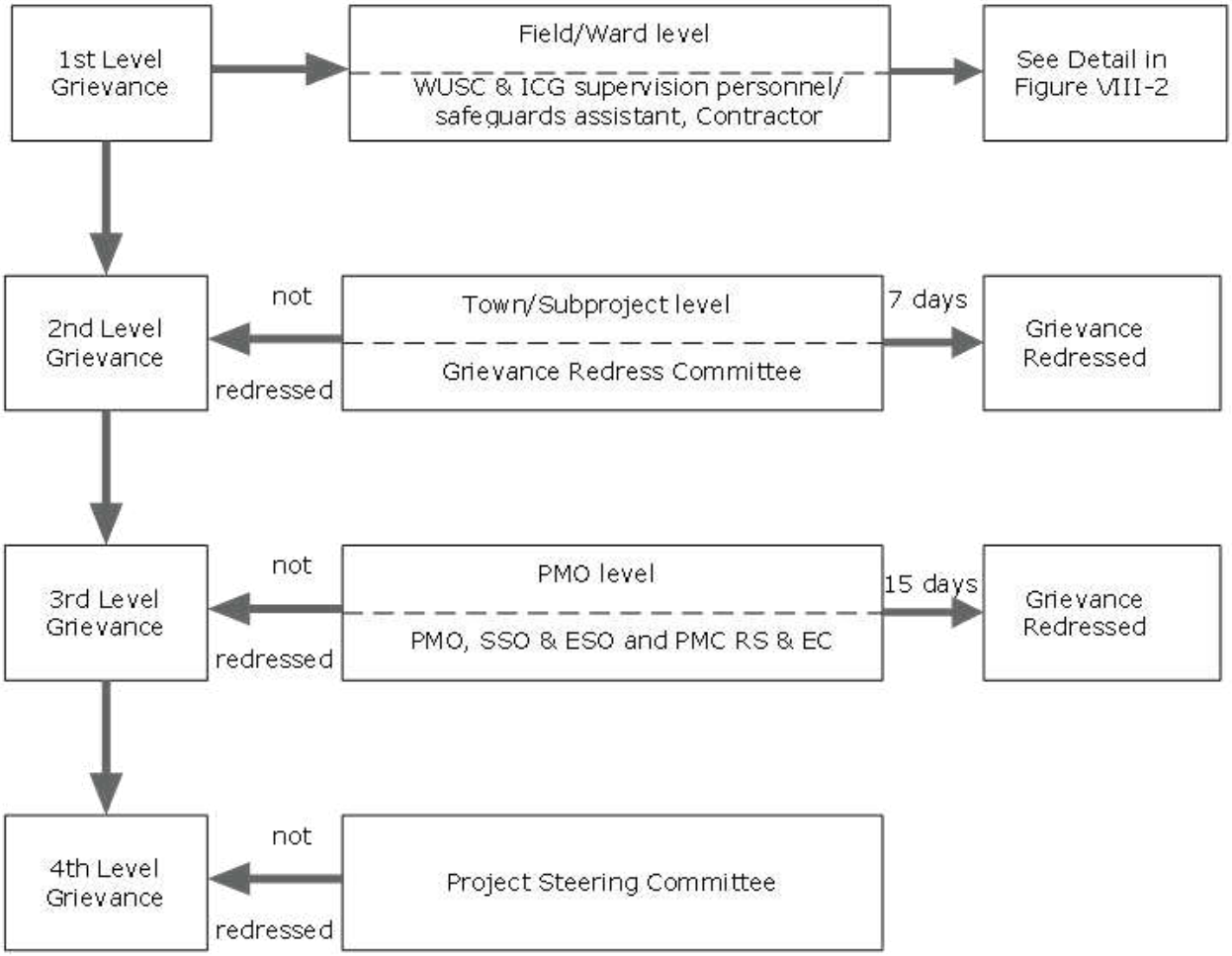
Despite the GRM, an AP will have access to the country's legal system at any stage. Accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB Nepal Resident Mission. The complaint can be submitted in the country's language. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the GRM.

Capacity building trainings/activities: The RPMO & DSMC will provide capacity building trainings/activities to GRC. This will help them to address project related social and environmental grievances/complaints of the project area.

Record keeping and disclosures: The PMO, GRC, ICG will keep records of all lodged and documented/referenced complaints, actions/resolutions taken, AP's written confirmations of completed action and satisfaction, complaints raised to higher levels and lessons learned. The number of grievances recorded and resolved and the outcomes will be displayed at the offices of WSSDO, ICG, Town LGU, PMO and WUSC and reported in the monthly progress reports, semi-annual EMR during construction and annual EMR during operation, submitted to ADB.

Periodic review and documentation of lessons learned: The PMO EO will do periodic review of the effectiveness of the GRM in each town and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address complaints.

Figure 8-1: Grievance Redress Mechanism (Formal Approach)



ES- Environmental Specialist

ESO- Environmental Safeguards Officer

ICG- Implementation Core Group

PMC- Project Management Consultant

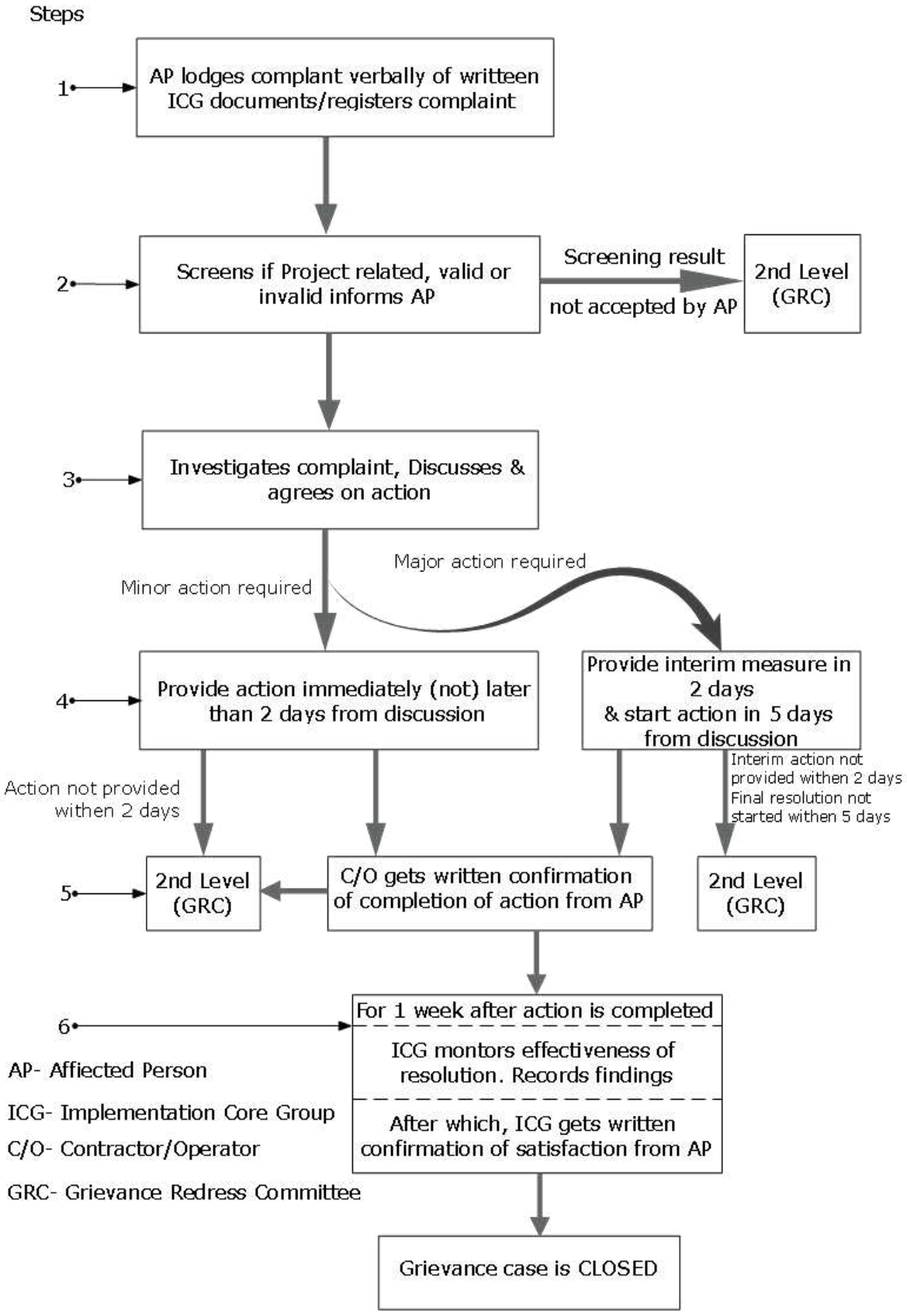
PMO- Project Management Office

RS- Resettelment Specialist

SSO- Social Safeguard Officer

WUSC- Water Users and Sanitation Committee

Figure 8-1: GRM First Level



9. ENVIRONMENTAL MANAGEMENT PLAN

The purpose of the environmental management plan (EMP) as per Table 9-1: is to ensure that the activities are undertaken in a responsible, non-detrimental manner with the objectives of: (i) providing a proactive, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on-site; (ii) guiding and controlling the implementation of findings and recommendations of the environmental assignment conducted for the project; (iii) detailing specific actions deemed necessary to assist in mitigating the environmental impacts of the project; and (iv) ensuring that safety recommendations are complied with.

A copy of the EMP must be kept on work sites at all times. This EMP will be included in the bid documents and will be further reviewed and updated during implementation. The EMP will be made binding on all contractors operating on the site and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

9.1 Institutional Arrangement

Executing and implementing agencies: The Ministry of Water Supply and Sanitation (MoWSS) will be the executing agency with the responsibility of subproject execution with the responsibility of subproject execution delegated to the Department of Water Supply and Sewerage (DWSS). The Water Supply and Sanitation Division/Sub-division Office (WSSDOs) are the subproject implementing agencies. Water User's and Sanitation Committees of participating towns are the implementing agencies.

The key responsibilities of the executing and implementing agencies are as follows:
Prior to construction:

- MoWSS will deputize a qualified staff to act as the Environmental Safeguard Officer of the Project management office (PMO).
- MoWSS will establish the grievance redress mechanism, including setting up the Grievance Redress Committee.
- The Water Supply and Environmental Division of the MoWSS will be responsible for reviewing and approval of the IEE Report.
- DWSS will review the IEE Report prepared by the Design, Supervision and Management Consultant Team's Environmental Safeguard Expert (DSMC-ESE) prior to forwarding this to MoWSS.
- DWSS will prepare the ToRs for the Environmental Safeguard Specialist that will engage to support the PMO and for the Environmental Safeguard Specialists of the two Design, Supervision and Management Consultants that will be appointed to prepare the subprojects.

9.2 During construction and operation

i. Safeguard Implementation Arrangement

Project Management Office (PMO): The safeguard officers (environmental safeguard officer and social safeguard officer) of PMO will receive support from safeguards experts (environmental and social) of the Project Management Consultants (DRTAC) as specified below:

- Confirm existing IEEs/EMPs are updated based on detailed designs and that new IEEs/EMPs are prepared in accordance with the EARF and government rules;
- Confirm whether EMPs are included in bidding documents and civil works contracts;
- Provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by regional project management offices (Eastern RPMO and Western RPMO) and contractors;
- Establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;
- Facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant;
- Supervise and provide guidance to the RPMOs to properly carry out the environmental monitoring and assessments as per the EARF;
- Review, monitor and evaluate the effectiveness with which the EMPs are implemented, and recommended necessary corrective actions to be taken as necessary;
- Consolidate monthly environmental monitoring reports from RPMOs and submit semi-annual monitoring reports to ADB;
- Ensure timely disclosure of final IEEs/EMPs in project locations and in a form accessible to the public; and
- Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

Regional Project Management Offices (Eastern and Western RPMOs)

The regional DWSS engineers and social development officers of the RPMOs will receive support from; (i) the PMO safeguards officers (environmental and social); and (ii) the safeguards specialists (environmental and social), the social mobilizers and environmental management plan (EMP) monitors of the design, supervision and management consultant (DSMC) teams as specified below:

- Prepare new IEEs/EMPs in accordance with the EARF and government rules;
- Include EMPs in bidding documents and civil works contracts;
- Comply with all government rules and regulations;
- Take necessary action for obtaining rights of way;
- Oversee implementation of EMPs including environmental monitoring by contractors;
- Take corrective actions when necessary to ensure no environmental impacts;
- Submit monthly environmental monitoring reports to PMO, and;

- Address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

Civil Works Contracts and Contractors: EMPs are to be included in the bidding and contract documents and verified by the PMO and RPMOSs. The contractor will be required to designate an environment supervisor to ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contracts. The Contractors will be required to submit site-specific Environmental Management Plan (EMP) based on approved EMP in the IEE. The government will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labor laws and core labor standards on (a) prohibition of child labor as defined in the national legislation for construction and maintenance activities, (b) equal pay for equal work of equal value regardless of gender, ethnicity or caste (c) elimination of forced labor; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project site.

Capacity Building: The DRTAC safeguards experts (environmental and social) will be responsible for training the; (i) PMO's safeguards officers (environmental and social); (ii) RPMOs' engineers and social development officers. Training modules will need to cover safeguards awareness and management in accordance with both ADB and government requirements as specified below:

Sensitization;

- Introduction to environment and environmental consideration in water supply and wastewater projects;
- Review of IEEs and integration into the project detailed design;
- Improved coordination within nodal departments; and
- Monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites.

Water Users and Sanitation Committees (WUSCs): WUSCs are the eventual operators of the completed subprojects. The key tasks and responsibilities of the WUSCs are, but not limited to:

Prior to construction

- Facilitate public consultation and participation, information dissemination and social preparation.
- Provide available data to the DSMC-ESS during the conduct of the IEE
- Assist in securing the tree-cutting permit and/or registration of water source.
- Participate in capacity development programs.

During construction

- Assist in the observance of the grievance redress mechanism.
- Actively participate in the monitoring of Contractor's compliance with the IEE and its EMP and the conditions set out with Government's approval of the IEE Reports.
- Facilitate public consultations, as necessary.

During operation

- Implement EMP and the Water Safety Plan.
- If applicable, actively work with the engaged licensed and accredited laboratory in water quality monitoring.
- Prepare the environmental monitoring report as per IEE.
- Ensure observance of the grievance redress mechanism.

Licensed and accredited laboratory: It is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring in the first few years of operation and to train WUSC. The laboratory will ensure that while carrying out the water quality monitoring as prescribed in the National Drinking Water Quality Standard and its Directives, 'hands-on' training is provided to WUSC.

9.3 Environmental Management Plan (EMP)

Table 9-1: Environmental Management Plan Matrix

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
1. Prior to Construction Activities					
Consents, permits, clearances, no objection certificate (NOC), etc.	Failure to obtain necessary consents, permits, NoCs, etc can result to design revisions and /or stoppage of works	- Obtain all of the necessary consents, permits, clearance, NOCs, etc. prior to start of civil works. - Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. - Include in detailed design drawings and documents all conditions and provisions if necessary	PMO, RPMOS,& DSMC	Incorporated in final design and communicated to contractors	Prior to award of contract
Existing utilities	Disruption of services	- Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction activities - Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. - Require contractors to prepare spoils management plan (see Annex D for outline).	DSMC, RPMOS	List of affected utilities and operators; Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (see Annex D for outline).	During detailed design phase Review of spoils management plan: Twice (once after first draft and once before final approval)
Drinking water supply	Extraction of unsatisfactory raw water quality Delivery of unsafe water to the distribution system Inadequate protection of intake well	- During the detailed engineering design stage, water samples from deep tube well & shallow well were tested. Tests revealed iron content and coliforms as beyond standards limits. This information has guided design of water treatment and depth of well. However verification on the yield through borehole tests need to be carried out and confirmed before award of contract. - Design proposes basic treatment using lime dosing, pressure filter and disinfection using Ca (CIO)2 and provisions for lab unit and kits. This IEE proposes "hands on" training by a licensed	PMO, RPMOS & DSMC	Incorporated in final design and communicated to contractors	Prior to award of contract

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	Health Hazards arising from inadequate design of facilities for receiving, storing and handling of CI & other chemicals	& accredited laboratory for the first two years of operation under the Water Safety Plan included in the subproject design & continuing training thereafter. - Intake well has adequate land for perimeter fencing to keep animals away from grazing nearby. Appropriate casing of tube wells including the installation of screens. Intake well to be located at least 30m upstream from sanitation facilities. Where this cannot be maintained; (i) septic tanks will need to be sealed (water tight) and emptied as per the design requirements; (ii) tube wells to be cased appropriately and installation of a screen; and (iii) a test pit should be established and water quality monitoring should be conducted regularly (at least once every quarter). Disinfection of the tube well should be conducted prior to commissioning and after repairs - Design has included a "housed" dosing unit with appropriate ventilation, bonding and training for staff in handling as per material, safety data sheets (MSDS).			
Sanitation (Toilets and septage disposal)	Contamination of drinking water source and other environmental receptors from household and community toilets Risk to public and	- The design of toilets includes septic tanks that are designed as per national standards and codes to allow for maximum retention of septage. This includes ensuring septic tanks are sealed and water tight. Toilets will be established at least 30m downstream of the drinking water source. - The septage disposal pit (similar to sludge drying bed technology) is to be designed and constructed in accordance to international best practice and acceptable standards (e,g US EPA standards etc). This includes; (i) locating disposal pits at least 300m away from the	PMO, RPMOS, & DSMC	Incorporated in final design and communicated to contractors	Prior to award of contract

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	environmental health due to inappropriate sitting and design of septage disposal pit	nearest dwelling, and 30 m downstream of the drinking water source; (ii) pits are to be only established in relatively flat land with no more than 8% slope; and (iii) site selected for establishment of pits should not be where food crops are grown. - The sanitation condition will be maintained to deter flies, mosquitos, and other vectors for breeding, free from odor and aesthetically pleasing. - A proper septage management shall be developed and followed.			
Construction work camps, stockpile areas, storage areas, and disposal areas	Disruption to traffic flow and sensitive receptors	- Determine locations prior to award of construction contracts	DSMC, RPMOS	List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas, and disposal areas. Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land	During detailed design phase
Waste generation	Generation of solid waste, wastewater from labor camp and other construction waste may cause pollution	- Mechanism of safe disposal such as - Construction waste will be developed in the project site before the actual commencement of work - Prohibition of unwanted littering and discharge of waste. - Proper management of solid waste will be done using pits for waste disposal	Contractor	Contractor records. visual inspection	Visual inspection by RPMOS & DSMC-ESS on monthly basis
Sources of materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution	- Prepare list of approved quarry sites and sources of materials	DSMC, RPMOS	List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of quarry sites	During detailed design phase, as necessary with discussion with detailed design engineers and PIUs suitability of sources and permit for additional quarry sites if necessary.

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
EMP Implementation Training	Irreversible impact to the environment, workers, and community	- Project manager and contractors should undergo EMP implementation including spoils management for construction works; standard operating procedures (SOP) for construction works as it is a method of identifying a work process and breaking it into the specific step by step procedure needed to successfully execute the process right from the beginning and result to greater quality via conforming to proven steps therefore, the written SOP provide instruction for less experience workers and benefits to the contractor is it serves as a benchmark for all workers on how a work process is to be completed ; health & safety (H&S), core labor Act (1992), applicable environmental laws, etc. -	PMO, RPMOs and DSMC. Contractor's Environmental Supervisor	Record of completion (safeguards Compliance Orientation) Contractor records for EMP implementation at worksites	During detailed design phase prior to mobilization of workers to site
2. During Construction Activities					
A. Physical Characteristics					
Topography landforms, geology and soils and/or river morphology and hydrology	Significant amount of sand, gravel or crushed stone will be required for this subproject. Extraction of natural aggregate materials may cause localized changes in topography and landforms (if on land) or river morphology and hydrology (if on river). The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures	- Contractor's should be required to first utilize readily available sources with environmental clearance and license to and that still have a high ratio of extraction capacity over loss of natural state. - Borrow areas and quarries (if these are being opened up exclusively for the subproject) must comply with environmental requirements, as applicable. No activity will be allowed until formal agreement is signed between PIU, landowner and contractor. - Coordinate with DDC, and local authorities regarding restrictions in quarrying from rivers. As much as possible, alternative source should be identified.	Contractor	Records of sources of materials	Monthly by RPMOS
Water quality	Trenching and excavation, run-off from stockpiled materials and chemical contamination	- Prepare and implement a spoils management plan. - Prioritize re-use of excess spoils and materials in construction activities. If spoils will be	Contractor	Areas for stockpiles storage of fuels and lubricants and waste materials; Number of silt traps installed	Visual inspection by RPMOS and DSMC-ESS on weekly basis Frequency and sampling

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term , site-specific within a relatively small area and reversible by mitigation measures	disposed, consult with district development committee on designated disposal areas. - All earthworks must be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. - Location for stock yards for construction materials shall be identified at least 300m away from water courses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies - Take all precautions to minimize the wastage of water in the construction activities - Take all precautions to prevent entering of waste water into streams, watercourses, or irrigation system. Install temporary silt traps or sediment basins along the drainage leading to the water bodies. - Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas. - While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and cross drainage channels. - Monitor water quality according to the environmental management plan.		along trenches leading to water bodies; No visible degradation to nearby drainage, water bodies due to construction activities	sites to be finalized during detailed design stage and final location of subprojects components
Air quality	Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants (such as carbon, monoxide, sulphur oxides,	- Water dry exposed surfaces and stockpiles of aggregates at least twice daily, or as necessary. - If re-surfacing of distributed roads cannot be done immediately, spread of crushed gravel over backfilled surfaces - Hoarding active work sites in populated areas - Require trucks delivering aggregates and cement to have tarpaulin cover and maintain a	Construction Contractor	Location of stockpiles; Number of complaints from sensitive receptors; Heavy equipment and machinery with air pollution control devices; Certification that vehicles are compliant with air quality standards.	Visual inspection by RPMOS & DSMC-ESS on monthly basis Frequency and sampling sites to be finalized during detailed design stage and final location of subproject components

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. The impacts are negative but short-term, site specific within a small relatively small area and reversible by mitigation measures	minimum of 2" free board - Limit speed of construction vehicles in access roads and worksites to maximum of 30kph. - Use of vehicles complying with NVMES, 2069 enforcement and green sticker standards and prohibition of open burning of solid waste. - Arrangements to control dust through provision of win DSMC screens, water sprinklers,			
Acoustic environment	Construction activities will be on settlements along and near schools, and areas with small-scale businesses. Temporary increase in noise level and vibrations may be caused by excavation equipment, and the transportation of equipment materials, and people. However, the proposed subproject will follow existing ROW alignment and impact is short-term, site specific and within a relatively small area. The impacts are negative but short-term, site specific within a relatively small area and reversible by mitigation measures.	- Involve the community in planning the work program so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times. - Plan activities in consultation with local administration (Chief district office), local police/traffic office so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. - Restrict noisy activities to daytime. Overtime work should avoid using noisy/high noise generating equipment. - Minimize drop heights when loading and unloading coarse aggregates. - Spread out schedule of materials, spoil & waste transport - Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; - Utilize modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensure that these are maintained to manufactures' specifications at all times. - All vehicles and equipment used in construction shall be fitted with exhaust silencers. Use silent	Contractor	Number of complaints from sensitive receptors; Use of silencers in noise-producing equipment and sound barriers; Equivalent day and night time noise levels	Visual inspection by RPMOS & DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		type generators (if required) - Monitor noise levels. Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10m or more from the vehicle/s. - If it is not practicable to reduce noise levels to or below noise exposure limits, the contractor must post warning signs in the noise hazard areas. Workers in a posted noise hazard area must wear hearing protection. - Identify any building at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.			
Aesthetics	Removal of aesthetics values	- Prepare a debris disposal plan. - Remove all construction and demolition wastes on a daily basis - Coordinate with district development office for beneficial uses for excess excavated soils or immediately dispose to designated areas. Avoid stockpiling of any excess spoils. - All vehicles delivering fine materials to the site and carrying debris for disposal shall be covered to avoid spillage. All existing roads used by vehicles of the contractor, shall be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. - Lightning on construction sites shall be pointed downwards and away from oncoming traffic and nearby houses. - In areas where the visual environment is particularly important or privacy concerns for surrounding building exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction. - The site must be kept clean to minimize the	Contactor	Number of complaints from sensitive receptors; Worksite clear of hazardous wastes such as oil/fuel Worksite clear of any wastes, collected materials from drainages, unutilized materials and debris Transport route and worksite cleared of any dust/mud	Visual inspection by RPMOS & DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		visual impact of the site. Manage solid waste according to the following preference hierarchy; reuse, recycling and disposal to designated areas.			
B. Biological Characteristics					
Biodiversity	Activities being located in WUSC acquired area. There are no protected areas in or around subproject sites.	- Tree-cutting will be required during detailed design stage. In this case prior coordination and approval from the CFUG will be obtained. Such records will be kept.	Contractor	PIU and PMO to report in writing the number of trees cut and planted (during detailed design stage) Number of complaints from sensitive receptors on disturbance of vegetation, poaching fishing, etc.	Visual inspection by RPMOS & DSMC-ESS on monthly basis
C. Socio-economic Characteristics					
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Hauling of construction materials and operation of equipment onsite can cause traffic problems. However, the proposed subproject will follow existing ROW alignment. The impacts are negative but short-term, site specific within a relatively small area and reversible by mitigation measures.	- Ensure appropriate transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. - Maintain safe passage for vehicles and pedestrians throughout the construction period. - Schedule truck deliveries of construction materials during periods of low traffic volume. - Erect and maintain barricades including signs, markings, flags and flagmen informing, diversions and alternative routes when required. - Notify affected sensitive receptors by providing sign boards informing nature and duration of construction activities and contact numbers for concern/complaints. - Leave spaces for access between mounds of soil. - Provide walkways and metal sheets where required to maintain access across for people and vehicles. - Increase workforce in front of critical areas such as institution, place of worship, business establishment, hospitals, and schools. - Consult business and institutions regarding operating hours and factoring this in work	Construction Contractor	Traffic route during construction works including number of permanent signs, barricades and flagmen on worksite; Number of complaints from sensitive receptors; Number of signage placed at project location. Number of walkways, signage, and metal sheets placed at project location	Visual inspection by RPMOS & DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		schedules. Ensure there is provision of alternate access to businesses and institutions during construction activities, so that there is no closure of these shops or any loss of clientage. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.			
Socio-economic status	Manpower will be required during the construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long term.	- Priority hiring of labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problem from workers housed in poorly serviced camp accommodation. - Secure construction materials from local market.	Construction Contractor	Employment records; Records of sources of materials Records of compliance to Nepal Labor Act(1992), district wages	Visual inspection by RPMOS &DSMC-ESS on monthly basis
Other existing amenities for community welfare	Although construction of subproject components involves quite simple techniques of civil works, the invasive nature of excavation and the subproject sites being in built-up areas of town where there are a variety of human activities, will result impact to the sensitive receptors such as residents, businesses, and the communities. Excavation may also damage existing infrastructure (such as water distribution pipes, electricity pylons, etc.) located alongside the roads. The impacts are negative but short-term, site specific within a	- Obtain details from nature and location of all existing infrastructure, and plan excavation carefully to avoid any such sites to maximum extent possible; - Integrate construction the various infrastructure subprojects to be conducted in town (roads, water supply, etc.) so that different infrastructure is located on opposite sides of the road where feasible and roads and inhabitants are not subjected to repeated disturbance by construction in the same area at different times for different purposes. - Consult with local community/district development committee/local administration to inform them of the nature, duration and likely effects of the construction work, and to identify any local concerns so that these can be addressed. - Existing infrastructure (such as water distribution pipes, electricity pylons, etc.) shall be relocated before construction starts at the	Construction contractor	Utilities Contingency Plan Number of complaints from sensitive receptors	Visual inspection by RPMOS & DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	relatively small area and reversible by mitigation measures.	sub project sites. - Prior permission shall be obtained from respective local authority for use of water for construction. Use of water for construction works shall not disturb local water users. - If construction work is expected to disrupt users of community shall be served 7 days in advance and again 1 day prior to start of construction. - Ensure any damage to properties and utilities will be restored or compensated to pre work conditions.			
Community health and safety	Construction works will impede the access of residents and business in limited cases, these impacts are negative but short-term, site specific within a relatively small area and reversible by mitigation measures.	- Contractor's activities and movement of staff will be restricted to designated construction areas. - Consult with district development committee on the designated areas for stockpiling of soils, gravel, and other construction materials. - If the contractor chooses to locate the work camp/storage area on private land, he must get prior permission in writing from the land owners and approval from the DSMC. - Use small mechanical excavator to attain faster trenching progress. - Construction of temporary latrines for workers with proper pit to avoid contamination of water sources. - Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. - A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for tem, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); (iv) no	Contractor	Number of permanent signs, barricades and flagmen on worksites as per Traffic Management Plan (see Annex for sample); Number of complaints from sensitive receptors; Number of walkways, signs, and metal sheets placed at project location Agreement between landowner and contractors in case of using private land as work camps storage areas etc.	Visual inspection by RPMOS & DSMC-ESS on weekly basis Frequency and sampling sites to be finalized during detailed design stage and final location of sub project components

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		fires permitted on site expect if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff , no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action as per environment management specialist's instruction. - The contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the PIU within 48 hours of receipt of such complaint/grievance.			
Workers Health & safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are	- Comply with requirements of Labor Act (1992) of GoN and standards on workers' health and safety (H&S). - Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. - Produce and implement a site H&S plan which include measures as: (i) excluding the public	Contractor	Site –Specific H&S plan Equipped first-aid stations Medical insurance coverage for workers Number of accidents Records of supply of uncontaminated water Condition of eating areas of workers Record of H&S orientation trainings Availability of personal protective equipment at	Visual inspection by RPMOS (monthly) and DSMC-ESS on weekly basis. Frequency and sampling sites to be finalized during detailed design stage and final location of sub project components

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	negative and long-term but reversible by mitigation measures.	from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (vests/cloths with reflectors, footwear, gloves, goggles and masks) at all times; (iii) providing H&S trainings for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. - Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances - Maintain necessary living accommodation and ancillary facilities in functional and hygienic manner in work camps. - Ensure (i) uncontaminated water for drinking, cooking and washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; and (iii) sanitation facilities are available at all times. - Provide medical insurance coverage for workers; - Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection , and preventing injuring to fellow workers; - Provide visitor orientation if visitors to the site can gain access to areas where hazardous condition or substances may be present. - Ensure also that visitor's do not enter hazard areas unescorted; - Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; - Ensure moving equipment is outfitted with		construction site % of moving equipment outfitted with audible back-up alarms Signage for storage and disposal areas Condition of sanitation facilities for workers	

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		audible back-up alarms; - Mark and provide sign boards for chemical storage areas and areas for material storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate; and - Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.			
D. Historical, Cultural, and Archaeological Characteristics					
Physical and cultural heritage	There are no scheduled or unscheduled archaeological, paleontological, or architectural sites of heritage significance listed by local and/ or national authority and/or internationally (UNESCO) within or adjacent to sub project sites.	- Stop work immediately to allow further investigation if any finds are suspected.	contractor	Records of chance finds	Visual inspection by RPMOS and DSMC-ESS on Monthly basis.
E. Others					
Submission of EMP implementation Report	Unsatisfactory compliance to EMP	- Appointment of environment supervisor to ensure EMP implementation - Timely submission of monitoring reports including pictures.	Contractor	Availability and competency of appointed supervisor Monthly report	Monthly monitoring report to be submitted by RPMOS to PMO PMO to submit semi-annual monitoring report to ADB
Post Construction Activities	Damage due to debris, spoils, excess construction materials	- Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and - All excavated roads shall be reinstated to original condition. - All disrupted utilities should be restored - All affected structures rehabilitated /compensated	Contractor	RPMOS/PMO report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is	Prior to turn-over of completed works to WUSC

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		- The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. - All hardened surfaces within the construction camp area shall be ripped, all imported materials removed reinstraining to original condition. The contractor must arrange the cancellation of all temporary services. - Request PMO/PIU to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.		satisfactory.	
Environmental legislation compliance	Lack of awareness amongst project managers and WUSC in operating systems as per required legislation and IEE requirements	- Capacity strengthening of the WUSC and continuing capacity strengthening of Project staff; and ensuring compliance with NDWQS, applicable conditions in IEE approvals and license for use of water resource.	PMO, RPMOs, DSMC and WUSC	Monitoring reports and checking operations against O&M manuals and permits/clearances	After commissioning of systems and semi annually
Drinking water supply system	Delivery of unsafe Water	- The operations and maintenance plan and training for staff will cover; (i) competent/cautions handling and storage of calcium Hypochlorite and qualified persons to implement/oversee disinfection and treatment; (ii) providing safe storage for chemicals; (iii) ensure capacity of WUSC to implement quick response to hazardous substance/waste spills; (iv) implement SPS-complaint EMP and a water safety plan; and (v) monitor water quality.	PMO, RPMOs, DSMC and WUSC	Water Quality reports WTP records in the log book	During O&M of the system Quarterly monitoring
	Excessive algal growth in reservoirs.	- The water tanks are designed to be closed. In addition; (i) maintenance of chlorine residual in the system at all times including the cleaning of reservoirs as per the O&M schedule.	WUSC	Water quality results	During O&M of the system. Daily maintenance of chlorine residual, cleaning.
Mishandling of chlorine	Excessive exposure to chlorine, hypochlorous acid, and hypochlorite ion and intake of a small quantity of bleach	- All disinfection chemicals require proper storage and handling practices: ii) providing safe storage for chemicals; iii) ensure that the person is hired, with knowledge of chlorine use for	WUSC	Water quality test	

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	generally results in irritation of the oesophagus, a burning sensation in the mouth and throat, and spontaneous vomiting.	disinfection process during operation iv)Ensure use of PPE while using chemicals; v) Use of chlorine guideline as per WHO (Annex 6)			
Sanitation facilities (toilets and septage disposal site)	Contamination to land or water ways due to overflow of septic tanks and/or uncontrolled dumping of septage	- The subproject incorporates a pilot for controlled disposal of septage. This is to reduce the likelihood of uncontrolled septage disposal to land and local water ways (nallas) which is currently practiced. Further septic tanks will be designed to ensure maximum retention is achieved and will be emptied at the required frequency (min every 3 years). Households will be educated on the above to further reduce the likelihood of septic tank overflows and uncontrolled dumping of septage .	WUSC, DSMC, RPMOs and PMO for education campaign	Sanitary inspection reports. Water quality re[orts from test pits near tube well sites	During O&M of the system.

9.4 Environmental Monitoring Program

Environmental monitoring will be done during construction on three levels:

(i) Monitoring development of project performance indicators by the PMO-ESS;
(ii) Monitoring implementation of mitigation measures by the Contractor; and
(iii) Overall regulatory monitoring of environmental issues by the PMO.

In addition to regular monitoring onsite (at town level) by the ICG and DSMC-ESS on the EMP implementation of the mitigation measures, monitoring of key environmental parameters is proposed. Table 9-2 presents the indicative environmental monitoring plan for the subproject which includes relevant environmental parameters, with a description of the sampling stations, frequency of monitoring, applicable standards, and responsible agencies. This will be updated during detailed design to ensure EMP and monitoring program is commensurate to the impacts of the subproject.

Table 9-2: Environmental Monitoring Program

SN	Field	Stage	Parameters	Location	Frequency	Standards	Responsibility
1.	Air quality	Prior to construction to establish baseline Construction phase	PM10 SO2 NOx	Bhagwati Chautari (Bharat Pokhari-4); Kalikasthan (Bharat Pokhari-3); Dobilla (Pokhara-17); Phedipatan (Nirmal Pokhari-8)	24-hour monitoring once in a season (except monsoons) for the construction period	National Ambient Air Quality Standards, 2003	Contractor
2.	Noise and vibration levels	Prior to construction to establish baseline Construction phase	Equivalent day and night time noise levels	Bhagwati Chautari (Bharat Pokhari-4); Kalikasthan (Bharat Pokhari-3); Dobilla (Pokhara-17); Phedipatan (Nirmal Pokhari-8);	Once in a season (except monsoons) for the construction period	National Noise Standard Guidelines, 2012	Contractor
3.	Water quality	Prior to construction to establish baseline Construction phase	TDS, TSS, pH, hardness, BOD, fecal coliform, total nitrogen, total phosphorus, heavy metals, temperature, DO, hydrocarbons, mineral oils, phenols, cyanide, temperature	Kalika Deep Boring (Reservoirs and Well) Phurse Khola (Intake and Main flow)	Twice a year (pre-monsoon and post-monsoon) for the entire period of construction	National Drinking Water Quality Standards, 2006	Contractor
4.	Survival rate of landscaping, tree plantation	O&M phase	Survival rate	Potential Tree Plantation Areas (Daur Community Forest Area; Phedi Patan Community	Twice a year for 2 years	None	WUSC

SN	Field	Stage	Parameters	Location	Frequency	Standards	Responsibility
				Forest Area; Mas Patan Community Forest Area; Aadarsha Community Forest Area)			

9.5 Institutional Capacity Development Program

Considering the limited capability of the Project's key players in environmental management, technical assistance from environmental specialists and capacity development during loan implementation will be needed. Capacity development will consist of hands-on training in implementing the responsibilities in EMP (as well as in EARF) implementation, complemented with a short-term series of lectures/seminars on relevant topics.

WUSC does not have the capacity to monitor the quality of supplied water as prescribed in the NDWQS and its Directives. Although monitoring kits and laboratory rooms will be provided, this would not guarantee WUSC can handle monitoring appropriately. DWSS has five regional laboratories; however some are not functioning fully due to lack of human resources. Considering that public health is a critical concern associated with water supply, it is recommended that a licensed and accredited laboratory be engaged to conduct water quality monitoring for at least the first 2-3 years of operation with the WUSC actively participating to develop its capacity. Water quality monitoring should be carried out in such a way that WUSC will be "learning by doing". After the engagement period, there should be continuing periodic training of new persons to ensure that the capacity of WUSC is sustained. The cost for monitoring during operation is based on the assumption that a licensed laboratory will be engaged for both the monitoring requirements and to train WUSC. A Water Safety Plan is included in subproject design and will oblige the operator to carry out water quality monitoring accordingly. The amount of NPR 500,000 will be provided annually to implement the Plan. There will be sufficient fund to include training by the licensed and accredited lab, while monitoring water quality.

The DRTAC-ESS will be responsible for trainings on environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply and wastewater projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. The proposed training project along with the frequency of sessions is presented in Table 9-3.

Table 9-3: Training Program for Environmental Management

Items	Pre-construction/prior to construction	Construction	
Training Title	Orientation workshop	Orientation program/ workshop for contractors and supervisory staff	Experiences and best practices sharing
Purpose	To make the participants aware of the environmental safeguard requirements of ADB and GON and how the project will meet these requirements	To build the capacity of the staff for effective implementation of the designed EMPs aimed at meeting the environmental safeguard compliance of ADB and GON	To share the experiences and best practices aimed at learning lessons and improving implementation of EMP
Contents	Module 1: Orientation ADB Safeguards Policy Statement Government of Nepal Environmental Laws and Regulations Module 2: Environmental Assessment Process ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements Review of environmental assessment report to comply with ADB requirements Incorporation of EMP into the project design and contracts	Roles and responsibilities of officials/contractors/consultants towards protection of the environment Environmental issues during construction Implementation of EMP Monitoring of EMP implementation Reporting requirements	Experiences on EMP implementation – issues and challenges Best practices followed
Duration	1 day	1 day	1 day on a regular period to be determined by PMO, ICGs, and (provide if PMC or DSMC)
Participants	Executing and implementing agencies, PMO, and PMO staff (technical and environmental) involved in the project implementation	PMO ICGs Contractors	PMO ICGs Contractors

9.6 Staffing Requirement and Budget

Costs required for implementing the EMP will cover the following activities:

(i) Updating IEE, preparing and submitting reports and public consultation and disclosure;
(ii) Application for environmental clearances; and
(iii) Implementation of EMP, environmental monitoring program and long-term surveys.

Environmental monitoring during construction will also be straightforward and will involve periodic site observations and interviews with workers and others, plus checks of reports and other documents. This will be conducted by PMO-ESS assisted by the PMO environmental safeguard officer. Therefore, no separate budget is required for the PMO-ESS.

The cost of mitigation measures and surveys during construction stage will be incorporated into the contractor's costs, which will be binding on him for implementation. The surveys will be conducted by the contractors.

The operation phase for mitigation measures are good operating practices to mitigate the environmental impacts of this phase &he responsibility remains to WUSC. All monitoring during the operation and maintenance phase will be conducted by WUSC. The Water Safety Plan, included in each subproject design, will allocate NPR 500,000 annually for operation and maintenance particularly water quality monitoring. If a licensed laboratory will be engaged for the first 2-3 years of operation for training purposes, the cost can be accommodated under the Water Safety Plan.

Cost of awareness program & WSP during contract period is NPR 480,000.00 under provisional sum.

The indicative costs of EMP implementation are shown in Tables 9-4 and 9-5 (by source of funds).

Table 9-4: Indicative Cost of EMP Implementation

SN	Particulars	Stages	Unit	Total Number	Rate (NPR)	Cost (NPR)	Cost covered by
A.	Monitoring Measures						
1.	Air quality monitoring	- Pre-construction - Construction	Per location	3	150000.00	450,000.00	Civil works contract
2.	Noise levels monitoring	- Pre-construction - Construction	Per location	3	30000.00	90,000.00	Civil works contract
B	Capacity Building						
1.	(i) Orientation workshop for officials involved in the project implementation on ADB Safeguards Policy Statement, GoN environmental laws and regulations, and environmental assessment process; (ii) induction course contractors, preparing them on EMP implementation and	Module 1 – immediately upon engagement of the (provide if DRTAC or DSMC) environmental specialists Module 2 – prior to award of civil works contracts (twice a year for	lump sum	1 8	Module 1 – 300000.00 Module 2 – 100000.00 Module 3 – 200000.00	300,000.00 800,000.00 200,000.00	DRTAC

SN	Particulars	Stages	Unit	Total Number	Rate (NPR)	Cost (NPR)	Cost covered by
	environmental monitoring requirements related to mitigation measures; and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation; and (iii) lessons learned information sharing	4 years) Module 3 – prior to start of Phase 2 and upon completion of the project					
C.	Human Resources Costs						
1	PMO Environment Safeguards Officer	Construction phase	1	20	65000.00	1300000.00	Budget covered through DRTAC
2	ICG Environment Safeguard Assistants	Construction phase	2	20	25000.00	1,000,000.00	Budget covered through DSMC
3	PMO Environmental Safeguard Specialist	Responsible for environmental safeguards of the project at PMO level	person months (spread over entire project implementation period)	24	350000.00	8,400,000.0	Remuneration and budget for travel covered in the DRTAC contract
4	DSMC Environmental Safeguard Specialist	Responsible for environmental safeguards of the project at ICG level	person months (spread over entire project implementation period)	20	300000.00	6,000,000.0	Remuneration and budget for travel covered in the DSMC contract
D.	Administrative Costs						
1.	Legislation, permits, and agreements	Permit for excavation, tree-cutting permits, etc	Lump sum		XXX	XXX	These consents are to be obtained by contractor at his own expense.
		Environmental assessment and environmental clearances as per EPA 1996 and EPR, IEE presentation at review committee related expenses	Lump sum	1	50,000	50,000	50,000
E.	Other Costs						
1.	Public consultations and information	Information disclosure and	As per requirement	Lump sum		350,000	Covered under

SN	Particulars	Stages	Unit	Total Number	Rate (NPR)	Cost (NPR)	Cost covered by
	disclosure	consultations during preconstruction and construction phase, including public awareness campaign through media					DSMCcontract
2.	GRM implementation	Costs involved in resolving complaints (meetings, consultations, communication, and reporting/information dissemination)		Lump sum		200,000	PMO cost
3.	Any unanticipated impact due to project implementation	Mitigation of any unanticipated impact arising during construction phase and		Lump sum	Contractor's liability	As per insurance requirement	Civil works contract – contractor's insurance defect liability period
					TOTAL	19,140,000	

However provisional amount of NPR 500,000.00 has been provided to execute all necessary environmental mitigation measures during entire construction period. Cost for tree cutting and uprooting under provisional sum is NPR 500,000.00.

9.8 Implementation Schedule

Environmental management will be implemented from the detailed design phase through to procurement, construction and operation. Table 9-5 presents the indicative timeframe of key EMP activities in relation to subproject implementation schedule. Similarly, 9-6 presents training for capacity building programmes for the project.

Table 9-5:Environmental Management Implementation Schedule

Activity			Indicative Time Frame
SUBPROJECT IMPLEMENTATION			
	Detailed Design & Bidding Documents		
	Procurement		
	Construction		
	Defects Liability Period		
	Operation and Maintenance		
ENVIRONMENTAL MANAGEMENT			
	Overall		
	1.	Design Review and Technical Audit Consultant of Environmental Specialist	Starting (4 yrs of intermittent inputs)
	2.	PMO's submission of Environmental Monitoring Report (EMR)	
		Monthly EMR for Subproject's Monthly Progress Report	8th day after effective month
		Semi-Annual EMR during construction for submission to ADB	8th day after effective 6-mo. period
		Annual EMR for submission to ADB	8th day after effective year
	Prior to Construction Mobilization		
	1.	Finalization of EMP, (if applicable) revision of IEE	
	2.	ADB review & approval of revised IEE & EMP.	
	3.	Obtaining Government's approval of IEE Report	
	4.	Community preparation (including disclosure of Final IEE & its EMP)	
	5.	Establishment of baseline data (as set out in the EMP)	(shall have been done prior to award of contract)
	6.	Preparation of C-EMP by selected Contractor, review of C-EMP	before start of works on site
		against SPS-compliant EMP.	or establishment of construction-related facilities.
	Construction Period		
		Mobilization to Demobilization	
	1.	Implementation of mitigation measures and conduct of environmental effects monitoring following the C-EMP.	
	2.	Submission of Environmental Monitoring Report (EMR)	
		Monthly, by Contractor	5th day of the month following the effective month
		Quarterly, by Contractor or by Licensed Laboratory	3rd day of the month following the effective quarter
	Operation Period (potentially could start even before DLP is over)		
	1.	Implementation of mitigation measures & monitoring activities as	Starting Q/Q Y
		specified in the EMP	
	2.	Submission of EMR	Starting Q/Q Y
		Monthly, by Operator	5thday of the month following the effective month
		Quarterly, by Operator or (if applicable) by Licensed Laboratory	3rd day of the month following the effective quarter

Table 9-6: Proposed Topics for Capacity Building/Training

Topic				Target Participants	Timing
1.	By Environmental Specialists				
	1.1	Legal Framework		DWSS, PMO,	Early stage
		▪	Relevant national laws, regulations & standards on EA & management	WSSDO, ICG,	of Output 2
		▪	ADB SPS 2009	RMSO, WUSC (15-18)	
		▪	EA & review procedure under the Project		
	1.2	Environmental Assessment			
		▪	Rapid environmental assessment		
		▪	Initial environmental examination		
	1.3	Some Aspects of EA Process & Environmental Management			
		▪	Meaningful consultation & info disclosure		
		▪	Grievance redress mechanism		
		▪	Environmentally responsible procurement		
		▪	Occupational & community health and safety		
	1.4	EMP Implementation, part 1		DWSS, PMO,	Early stage
		▪	Institution arrangements & responsibilities	WSSDO, ICG,	of Output 2
		▪	Environmental quality monitoring	RMSO, WUSC,	
		▪	Emergency response	(15-18)	
	1.5	EMP Implementation, part 2			
		▪	Performance monitoring & indicators		
		▪	Environmental monitoring report		
2.	By External Experts				
	2.1	Other relevant topics, such as:		MWSS, DWSS,	During
		A	Good engineering and construction practices as mitigation measures	PMO, ICG,	Project's
		B	Climate change adaptation (applicable to eligible activities/works under the Project)	WSSDO, RMSO, DSMC (30)	Capacity Devt. Program
			B.1 Climate change impacts on infrastructure		
			B.2 Climate-proofing of infrastructure		
		C	Strategic environmental assessment of WSS sector policy, development plans and programs		
		D	Other relevant topics that may be suggested by MWSS, DWSS, PMO, ICG & WSSDO		

10. MONITORING AND REPORTING

RPMO will monitor and measure the progress of EMP implementation. The monitoring activities will correspond with the project's risks and impacts, and will be identified in the IEEs for the projects. In addition to recording information on the work and deviation of work components from the original scope PMO, ICGs will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

RPMO will submit monthly monitoring and implementation reports to PMO, who will take follow-up actions, if necessary. PMO will submit semi-annual monitoring reports to ADB. The suggested monitoring report format is in Annex F. Subproject budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the annual basis. Monitoring reports will be posted in a location accessible to the public.

For subprojects likely to have significant adverse environmental impacts, PMO will retain qualified and experienced external experts to verify its monitoring information. PMO-ESS will document monitoring results, identify the necessary corrective actions, reflect them in a corrective action plan, and for each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the PMO-ESO, with support from the PMO-ESS ADB will review project performance against the MoWSS's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

i. Conduct periodic site visits for projects with adverse environmental or social impacts;
ii. Conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
iii. Review the periodic monitoring reports submitted by EAs to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
iv. Work with EAs to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and
v. Prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

11. CONCLUSION AND RECOMMENDATION

The proposed subproject is not an environmentally critical undertaking. The IEE indicates that:

The proposed subproject, its components, are not within or adjacent to environmentally sensitive areas.

The extent of adverse impacts is expected to be local, confined within the subprojects' main areas of influence, quarry or burrowing sites, waste disposal sites, and the routes to and from these sites. Except during windy days and heavy rainfall, fugitive dust, fine aggregates, sediments and/or wastes would not be the transported beyond the aforementioned sites. With mitigation measures in place and ensuring that the bulk of earthworks are completed prior to the onset of the rainy season, the potential adverse impacts during construction would be highly/more site-specific.

The few adverse impacts of high magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction periods). These will not be sufficient to threaten or weaken the surrounding resources. Simple/uncomplicated mitigation measures, basically integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are known to Contractors. Hence, mitigation measures would not be difficult to be implemented.

During operation, the potential delivery of unsafe water can be mitigated with good operation and maintenance, prompt action on leaks, and complying with the required quality monitoring of supplied water as prescribed in the National Drinking Water Quality Standards Directives.

The proposed subproject will bring about: (i) the benefits of access to reliable supply of safe and potable water; (ii) promotion of good hygiene and sanitation practices and reduced health and safety risks as positive impacts; and (iii) enhanced community health, improved quality of life and safe communities as outcomes.

Based on the above findings, the classification of the Nirmal Pokhari Bagmara Water Supply and Sanitation Project Category B is confirmed, and no further special study or detailed EIA needs to be undertaken.

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