Initial Environmental Examination

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NEP: Urban Water Supply and Sanitation (Sector) Project – Charikot Sanitation Subproject Sewer Network and Decentralized Wastewater Treatment

Package No. W-19

Prepared by Ministry of Water Supply, Government of Nepal for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 2 July 2018)

Currency unit	-	Nepalese rupee (NRe)
$1.00	=	NRs109.821
NRe1.00	=	$0.009

ABBREVIATIONS

ADB	–	Asian Development Bank
DEWAT	–	decentralized wastewater treatment
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
EHS	–	environment, health and safety
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMR	–	environmental monitoring report
EPA	–	Environmental Protection Act
EPR	–	Environmental Protection Rules
ESO	–	environmental safeguards officer
ESS	–	environmental safeguards specialist
ESA	–	environmental safeguard assistant
GRM	–	grievance redress mechanism
ICG	–	implementation core group
IEE	–	initial environmental examination
MOWS	–	Ministry of Water Supply
NDWQS	–	National Drinking Water Quality Standards
OHS	–	occupational health and safety
PMO	–	project management office
RPMO	–	regional project management office
ROW	–	right-of-way
SEMP	–	site-specific environmental management plan
SPS	–	safeguard policy statement
SDG	–	Sustainable Development Goal
UWSSSP	–	Urban Water Supply and Sanitation (Sector) Project
TOR	–	terms of reference
WHO	–	World Health Organization
WSSDO	–	Water Supply and Sanitation Divisional Office
WUA	–	water users association
WUSC	–	water users' and sanitation committee

WEIGHTS AND MEASURES

amsl	-	above mean sea level
m^3	-	cubic meter
°C	-	degree Celsius
dBA	-	decibel audible

km	-	kilometer
kph	-	kilometer per hour
lps	-	liter per second
lpcd	-	liter per capita per day
m	-	meter
mg/l	-	milligram per liter
mm	-	millimeter

NOTE

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

CONTENTS

EXECUTIVE SUMMARY

The Urban Water Supply and Sanitation (Sector) Project (UWSSP) will support the Government of Nepal in expanding access to community managed water supply and sanitation (WSS) in 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by the Asian Development Bank (ADB). The project will finance climate-resilient and inclusive WSS infrastructure in project municipalities and strengthen institutional and community capacity, sustainable service delivery, and project development. The project will be implemented over a five-year period (indicative implementation period is 2018 to 2023) and will be supported through ADB financing using a sector lending approach.

The project will have the following impact: quality of life for urban populations, including the poor and marginalized, improved through the provision of sustainable WSS services. The project will have the following outcome: inclusive and sustainable access to WSS services in project municipalities achieved. The project will have two outputs: (i) water supply and sanitation infrastructure in project municipalities improved; and (ii) institutional and community capacities strengthened.

The Ministry of Water Supply (MOWS) is the executing agency and Department of Water Supply and Sewerage (DWSS) the implementing agency. The project management office (PMO) will be responsible for the overall management, implementation and monitoring of the project. There will be regional PMOs (RPMOs) to manage day-to-day project implementation at the subproject/municipality level. After construction including a one-year operation and maintenance (O&M) period by the contractor, subprojects will be operated by the water users' and sanitation committee (WUSC) or municipality.

Subproject Municipality. Charikot town or municipality is one of the project towns proposed under UWSSP (for this subproject, the locality names "Charikot" and "Bhimeswor" would refer to only one project town or municipality in Nepal). Among these subprojects is the decentralized wastewater treatment (DEWAT) system that will serve selected areas of the municipality, where sanitation facilities are in unsatisfactory condition and need priority attention. Some of these areas are congested with residential and commercial establishments, and there are no places to construct proper septic tanks with soak pits and other required components for good sanitation.

Subproject Scope. The subproject is demand-driven by municipality and water users' association (WUA), and selected based on transparent criteria, including population growth, poverty index, existing WSS infrastructure, formed WUA, community willingness for cost sharing and long-term O&M contract. The sanitation subproject will include: (i) conveyance system or sewer network that will convey sewage and wastewater from households and establishments to the DEWAT plants; and (ii) two DEWAT plants that will be constructed in two locations.

Environmental assessment has been conducted for the Charikot sanitation subproject, which was selected based on (i) preliminary design in the draft sanitary masterplan of Charikot town, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklist and a "no mitigation measures scenario" checklist developed for UWSSP. The environmental assessment of the subproject shows that there are environmental impacts associated with the design and location, construction and operation of the proposed subproject components. However, these impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can already be addressed during the final detailed design stage, and the other impacts can be mitigated with uncomplicated measures that are commonly used at construction sites and known to civil works contractors.

Therefore, Charikot sanitation subproject is classified as Category B for environment per ADB Safeguard Policy Statement (SPS), 2009. This initial environmental examination (IEE) report has been prepared based on preliminary detailed design and following requirements of ADB SPS and Government of Nepal Environment Protection Rules where the subproject is listed under Schedule-1 requiring an IEE. However, this draft IEE will be updated based on the final detailed design of all components of the subproject. The updated IEE will be submitted to ADB for final review and disclosure.

Description of the Environment. The subproject components are in Bhimeswor Municipality, which is situated in Dolakha district in Janakpur Zone of the Eastern Development Region of Nepal. The municipality is in a hilly region with an average altitude of 1,554 meters (m). The subproject components will be constructed in municipality-owned sites and right-of-way (ROW) of public roads. There are no protected areas, forests, wetlands, mangroves, or estuaries in or near the subproject locations. The average temperature in Charikot ranges from 7.5°C in January and 19.3°C in July. Similarly, the average rainfall in Charikot ranges from 10 millimeters (mm) in January to 543 mm in July.

Potential Environmental Impacts and Mitigation Measures. Assessment of the preliminary design as presented in this draft IEE shows that the two DEWAT facility locations and designs need final determination and will be included in the final detailed design. This draft IEE will be updated based on the final detailed design, which will ensure compliance with the subproject selection criteria in the project administration manual (PAM) and environmental assessment and review framework (EARF) of UWSSP. Likewise, during the detailed design stage, all environmental impacts that can be avoided or mitigated through improvement in the engineering designs of the DEWAT facility components will be taken into account. Recommendations for consideration in the final detailed design of the subproject are provided in this draft IEE.

During construction stage, environmental impacts will be minimal because all civil works will involve straightforward construction and operation, so impacts will be mainly localized, and there are no significant sensitive environmental features in the subproject sites although careful attention needs to be paid to minimizing disruption to the community. Impacts will likely arise from the need to dispose moderate quantities of soil; and the disturbance to residents, businesses, and traffic. These temporary impacts are common for construction activities in urban areas, and there exist well-developed methods for their effective mitigation. Mitigation measures are discussed in the environmental management plan, such as, among others, (i) traffic management will be implemented during pipe laying on busy roads; (ii) earthworks will be conducted during the dry season to avoid difficult working conditions that prevail during the monsoon; (iii) location of stockyards will be identified at least 300 m away from watercourses; (iv) fuel and lubricant storage areas will be located away from drainage; (v) precautions will be taken to minimize construction wastes; (vi) measures will be provided to prevent wastewater entering into streams, watercourses, or irrigation channels; (vii) open burning of solid wastes generated from the workers camp will be strictly prohibited; and (viii) better solid waste management practices will be adopted such as collection, segregation, reuse and recycling activities within the construction site and workers camp.

An O&M manual including standard operating procedures for operation and maintenance will be developed with guidance from internationally recognized references, such as the World Bank Environmental, Health and Safety Guidelines on Water and Sanitation, Bremen Overseas Research and Development Association's "Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide", and United States Environmental Protection Agency's "Manual on Constructed Wetlands Treatment of Municipal

Wastewaters", among others. The O&M will be used to impart necessary training; safety and personal protection equipment for workers, measures to maintain the efficiency of the sewer network and DEWAT facilities. WUSC, as operator of the DEWAT plants, will be provided with capacity training on DEWAT facility operations, including wastewater monitoring. Monitoring kits and laboratory rooms will be provided to WUSC, and the enhanced capacity development will be met through a "learning-by-doing." An expert will be engaged in the first year and periodic capacity strengthening after that will be undertaken for the successful operation of the facilities.

Environment Management. This draft IEE includes an environmental management plan (EMP) which describes and addresses the potential impacts and risks identified by the environmental assessment. The EMP included proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. This draft IEE with the corresponding EMP will be included in bidding and contract documents with specific provisions requiring contractors to (i) comply with all other conditions required by ADB; and (ii) to submit a site-specific environmental management plan (SEMP), including (a) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (b) specific mitigation measures following the approved EMP; (iii) monitoring program per SEMP; and (iv) budget for SEMP implementation. A copy of the EMP and approved SEMP will be kept on site during the construction period at all times.

The budget for EMP and SEMP implementation includes costs for conducting ambient air quality monitoring, noise level measurements, capacity building, workforce, administrative support, public consultation and information disclosure, grievance redress mechanism implementation and actions for any unanticipated impacts encountered. The implementation costs of mitigation measures are covered separately under civil work contract. The contractor will be responsible for implementing the applicable mitigation measures given in EMP and SEMP. PMO, RPMO, and design, supervision and management consultants (DSMCs) are responsible for monitoring the EMP implementation.

Consultation, Disclosure, and Grievance Redress Mechanism. The stakeholders were involved during the environmental assessment activities through discussions on site and public consultations. The views expressed by stakeholders were incorporated in this draft IEE and subproject design. This draft IEE will be made available to the public through the ADB and UWSSP websites. The consultation process will continue during subproject implementation to ensure that stakeholders are fully engaged in the subproject and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within this draft IEE to ensure that public grievances are addressed quickly.

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

Conclusions and Recommendations. Charikot sanitation subproject comprising sewer network and DEWAT facilities will bring a series of benefits to the local people. Based on the IEE findings, there are no significant impacts, and the classification of the subproject as Category B per ADB SPS is confirmed. To conform to Government regulations, permits and clearances will be obtained prior to award of works contract. This draft IEE will be submitted to ADB for concurrence and disclosure.

This draft IEE will be updated based on the final detailed design of all components of the subproject. The updated IEE will be prepared by the Government through the PMO and submitted to ADB for final review and disclosure.

This draft IEE provides the following recommendations that should be adopted in the finalization of the detailed design of components of DEWAT plants, including the reed bed technology or constructed wetland that is included in the proposed preliminary design:

(i) As discussed in Subsection C of Section II, use internationally recognized best practice in the design, implementation and operation of DEWAT facilities worldwide, such as the "Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide", designed and produced by Bremen Overseas Research and Development Association (BORDA). Additional useful references include the conference paper on the "Standardization of Design and Maintenance of DEWATS Plants in India" and academic paper on "Operation of Decentralized Wastewater Systems (DEWATS) under tropical field conditions";

(ii) As discussed in Subsection C of Section II, use internationally recognized guidelines on the construction and operation of constructed wetlands as part of the DEWAT treatment plant, such as the "Manual on Constructed Wetlands Treatment of Municipal Wastewaters" of the United States Environmental Protection Agency; and

(iii) As discussed in Subsection B of Section VI, draft a comprehensive O&M manual for the DEWAT plants by integrating the documented solutions to problems encountered in the operation of existing DEWAT facilities worldwide.

I. INTRODUCTION

A. Background

1. The Urban Water Supply and Sanitation (Sector) Project (UWSSP) will support the Government of Nepal in expanding access to community-managed water supply and sanitation (WSS) in 20 project municipalities by drawing on experiences and lessons from three earlier projects funded by the Asian Development Bank (ADB).[1] The project will finance climate-resilient and inclusive WSS infrastructure in project municipalities and strengthen institutional and community capacity, sustainable service delivery, and project development. Subprojects will be demand driven by water users' associations (WUAs) and project municipalities and selected based on transparent criteria[2] including population growth, poverty index, existing WSS infrastructure, community willingness for cost sharing, and long-term operation and maintenance (O&M) contract.[3]

2. The project will build upon the on-going efforts of the Government of Nepal in providing WSS services in urban areas of Nepal. It will help the country to meet Sustainable Development Goal (SDG)-6 to ensure availability and sustainable management of water and sanitation for all by 2030 and it is aligned with sector objectives laid out by the government's Fourteenth Plan, National Urban Development Strategy, and updated 15-year Development Plan for WSS in Small Towns, which is to improve water supply and sanitation service delivery in urban areas across Nepal.

3. The project will have the following impact: quality of life for urban populations, including the poor and marginalized, improved through the provision of sustainable WSS services.[4] The project will have the following outcome: inclusive and sustainable access to WSS services in project municipalities achieved. The project will have two outputs: (i) water supply and sanitation infrastructure in project municipalities improved and (ii) institutional and community capacities strengthened.

4. The Ministry of Water Supply (MOWS) is responsible for planning, implementation, regulation, and monitoring of WSS. The Department of Water Supply and Sewerage (DWSS) under the MOWS supports the provision of WSS facilities in municipalities where large utilities do not exist, and these are operated by water users' and sanitation committees (WUSCs)[5] or municipalities.[6] Shortage of investment funds, skilled personnel, and inadequate O&M budgets, hinders municipalities from providing adequate, cost-effective services. The Local Governance Operation Act, 2017, established municipalities as autonomous government institution with responsibility for WSS services. While municipalities' capacity is being built, the government and residents have been receptive to the decentralized, participatory, and cost-sharing service provision model by WUAs. Development support for municipal WSS has been channeled through a combination of (i) government grants through DWSS, (ii) loans by the Town Development Fund

[1] ADB. Nepal: Small Towns Water Supply and Sanitation Sector Project Nepal: Second Small Towns Water Supply and Sanitation Sector Project; and Nepal: Third Small Towns Water Supply and Sanitation Sector Project.

[2] Subproject selection criteria are detailed in the Project Administration Manual (PAM). Selection of future investments to be designed under the project will follow same criteria, with preference for investments located in Kathmandu Valley, provincial headquarters, and strategic border municipalities.

[3] Procurement can only commence after DWSS and municipality sign management agreement with WUSC for 20 years O&M service. The municipality will own the system and the WUSC will be the operator.

[4] Government of Nepal. 2009. *Urban Water Supply and Sanitation Policy*. Kathmandu.

[5] The WUSCs, formed under the Nepal Water Resource Act, 1992, are the elected executive bodies of the water users' association.

[6] The DWSS assists in preparation of investment plans, project design, and establishing sustainable service delivery.

(TDF), and (iii) contributions from municipalities and beneficiaries. The TDF also supports WUAs in institutional and financial management including the introduction of tariffs.

5. The project will be implemented over a five-year period (indicative implementation period is 2018 to 2023) and will be supported through ADB financing using a sector lending approach. The MOWS is the executing agency and DWSS the implementing agency. The project management office (PMO) established under ongoing Third Small Towns Water Supply and Sanitation Sector Project (footnote 1) will be responsible for the overall management, implementation and monitoring of the project. There will be regional PMOs (RPMOs) to manage day-to-day project implementation at the subproject/municipality level. After construction including a one-year O&M period by the contractor, subprojects will be operated. by the WUSC or municipality.

6. **Subproject Municipality.** Charikot town or municipality is one of the project towns proposed under UWSSP (for this subproject, the locality names “Charikot” and “Bhimeswor” would refer to only one project town or municipality in Nepal). The municipality does not have any sewage or domestic wastewater treatment system in place, including its most densely populated area. The wastewater and septic tank effluent coming from households and establishments are discharged directly to canals or receiving bodies of water without treatment. This situation constitutes both an environmental issue and public health issue that will be addressed under the proposed Charikot town sanitation subproject comprising conveyance or sewer network and decentralized wastewater treatment (DEWAT) facilities.

B. Name and Address of the Institution Preparing the 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
Government of Nepal

Address of the Proponent:
Panipokhari, Kathmandu
Tel: 977 1 442388, 977 1 4412348
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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.

C. Purpose of the Initial Environmental Examination

7. All projects funded by ADB must comply with its Safeguard Policy Statement (SPS) to ensure that projects are environmentally sound, designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards. Environmental assessment has been conducted for the Charikot sanitation subproject. This subproject has been assessed based on (i) preliminary design taken from the

draft sanitary masterplan of Charikot town, and (ii) most likely environmentally sensitive components. The environmental assessment used ADB's rapid environmental assessment (REA) checklists (Appendix 1) and a "no mitigation measures scenario" checklist developed for UWSSP (Appendix 2). The environmental assessment of the subproject shows it is not likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed with uncomplicated measures commonly used at construction sites and known to civil works contractors.

8. Therefore, Charikot DEWAT subproject is classified as Category B for environment per ADB SPS. This initial environmental examination (IEE) report has been prepared based on detailed design and following requirements of ADB SPS and Government of Nepal Environmental Protection Act (EPA) and Environmental Protection Rules (EPR) where the subproject is listed under Schedule-1 requiring an IEE.

9. This draft IEE report primarily:

(i) provides information on the subproject and its environmental requirements;
(ii) provides the baseline physical, ecological, cultural and socioeconomic environments and resources in and surrounding the subproject's area of influence;
(iii) identifies and assesses potential environmental impacts arising from the implementation of the subproject;
(iv) recommends measures to avoid, mitigate, and compensate the adverse impacts;
(v) presents information on stakeholder consultations and participation during subproject preparation;
(vi) recommends a mechanism to address grievances; and
(vii) includes an environmental management plan.

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

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

12. This draft IEE will be updated based on the final detailed design of all components of the subproject. The updated IEE will be prepared by the Government through the PMO and submitted to ADB for review and disclosure.

II. DESCRIPTION OF THE SUBPROJECT

A. Need for the Subproject

13. The municipality is an attraction for internal migration from remote hilly regions. Because of its strategic location, the municipality will tend to grow moderately in the future. Similar to the water supply issue, the generation of wastewater from domestic sources has been increasing and there is no sufficient facility to treat this wastewater before discharging to the environment.

Currently, wastewaters from households and overflows from existing septic tanks are discharged untreated directly to receiving water bodies. This situation justifies the need for a comprehensive sanitation project for the municipality.

B. Relevance of the Subproject

14. The proposed DEWAT subproject has been studied from the environmental point of view as per EPA 1996 and EPR 1997 (as amended in 1999 and 2007). The subproject will be able to provide sanitation services in densely populated Ward No. 10 of Bhimeshwor Municipality. The subproject is designed to benefit a population of about 22,755 people as of 2018 and projected population of 34,610 in 2038, by providing a reliable sanitation service including collection and treatment of wastewater of the proposed service area. The subproject may not cover the entire municipality. However, the subproject will serve as a pilot facility which could be replicated in the future for the other areas of the municipality.

15. **Subproject Selection.** The Charikot DEWAT subproject is demand driven by WUA or municipality, and selected based on transparent criteria, including population growth, poverty index, existing WSS infrastructure, formed WUA, community willingness for cost sharing and long-term O&M contract.[7]

C. Description of the Subproject

16. The subproject is a proposed sewer network and decentralized wastewater treatment (DEWAT) in Charikot municipality. The sewer network and DEWAT facilities will partially serve Ward No. 10 of the municipality and expected to improve the sanitation infrastructure of Charikot by providing the target communities with the basic and sustainable sewage/wastewater collection and treatment system for their generated domestic sewage and wastewater.

17. The subproject will have the following components:

(i) Conveyance system or sewer network with length of 9.028 kilometer (km) that will serve about 500 households or 2,500 persons; and
(ii) Two DEWAT systems to be constructed in two locations, namely: Deurali (Gaunde) Danda and Shatinagar (Ramkot).

1. Conveyance System or Sewer Network

18. The sewer network will be constructed to convey sewage or wastewater from domestic sources to the two DEWAT plants. The draft sanitation masterplan of Charikot town suggested design based on the following parameters: (i) current population and expected growth; (ii) sewage/wastewater quantity; (iii) flowrate; (iv) hydraulic pressure; (v) land contours and configuration; (vi) spatial distribution of sources such as residential and commercial establishments; and (vii) other engineering design parameters as may be determined during the final detailed design stage. These parameters were gathered from the results of review of engineering design works conducted by various agencies in the past for the Charikot and other similar towns. In addition, some other basic data were gathered to help in designing the components of the subproject as discussed below.

[7] Subproject selection criteria are defined in the PAM. Procurement of services can only commence after the DWSS and municipality sign a management agreement with the WUSC for O&M of services for 20 years. The municipality will own the system, while WUSC will be the operator.

19. **Design Population.** The existing highest population densities of the municipality as per Nepal's Central Bureau of Statistics (CBS) 2011 is about 11 persons per hectare in Ward No. 10. As the CBS data do not reflect population and population densities in concern area, existing maps and land use are used for the estimation of the population.

20. The design population for the wastewater treatment system has been calculated from the existing population density and envisaged population density based on prevailing land-use and potential land-use. Since the population projection does not show the actual spatial coverage for the design for the purpose of calculation of discharge, the population is calculated from the density of the coverage area for the respective sewer lines and junctions.

21. The population densities of the main core area to peripheral area have been estimated to be 160 persons per hectare in core area and 50 persons per hectare in the peripheral area. At the end sections of the conveyance system, the population density has been estimated to be 25 persons per hectare only.

22. The population estimation was made for different systems (i.e., Deurali Danda and Shantinagar). Table 1 below shows the density assumed or calculated and the area coverage of the respective density. This shows that still there will be vast open spaces and lands within the service area of the municipality and these areas have not been covered for the purpose of wastewater system.

Table 1: Sanitation Population Densities

	Shantinagar System		**Deurali Danda System**	
Density (persons per ha)	**Gross Area** (ha)	**Net Density Area** (ha)	**Gross Area** (ha)	**Net Density Area** (ha)
160	16.19	12.15	6.92	5.20
100	6.91	5.19	13.07	9.81
75			2.69	2.02
50			9.03	6.78
25			10.20	7.65
Total	23.1	17.34	41.91	31.46

23. **Average Per Capita Water Consumption.** For the purpose of the design, the per capita water consumption was estimated to be 100 liters per capita per day (lpcd), which was taken from the calculation and design of the proposed Charikot Water Supply System under the Third Small Town Water Supply and Sanitation Sector Project (footnote 2).

24. **Return Factor.** This defines the percentage of total water consumption that will be discharged as wastewater. It is often assumed to be 80% or 85%, although there are indications that lower return factors may be appropriate in some areas. The wastewater flow from an area will be equal to the water consumption in the area multiplied by the return factor. The return factor for the proposed wastewater system has been taken as 80%.

25. **Peak Wastewater Flow Factor.** This is required to allow for the fact that the wastewater flow varies through the daytime, reaching a peak when people get up in the morning and falling to almost nothing during the night. The peak flow in any wastewater line can be taken as the average flow in that wastewater line multiplied by the peak factor. Peak factors tend to decrease as the population contributing to the flow increases. The peak factor of 2.5 has been taken for the design of the proposed wastewater system.

26. **Allowance for Stormwater.** As the most of the roads have roadside drain in the municipality and numerous natural river, stream and rivulets (Nalas) are readily found in the municipality, storm water drainage problem would not be that significant as wastewater. In addition to that, the cross gradient of land is steep enough to minimize storm water problem. The proposed sewer network and DEWAT facilities will not accommodate any stormwater. Therefore, any allowance for storm water has not been included or considered in the design.

27. **System Layouts and Bottlenecks.** The design of the sewer network has been planned in order to cover most of the densely occupied bazaar areas of the municipality so as to keep the length of the major lines to a minimum and utilize least cost for such purpose. There are three major sewer lines namely #SN-1, #DD-1, and #DD – 2. Sewer line #SN-1 is directed to the Shantinagar DEWAT plant, and Sewer lines #DD-1 and #DD-2 are directed to the Deurali Danda DEWAT plant. The Shatinagar DEWAT and Deurali Danda DEWAT plants are the two plants to be constructed under the subproject (see Part C in this section for the discussions).

28. **Groundwater infiltration.** The groundwater table in the proposed area is more than 10 meters below the ground due to hilly terrain. With this depth, no direct groundwater infiltration is expected as all sewer lines will be laid far above the groundwater table. Standard quality of sewer pipes and fittings will be used for the sewer network to ensure stability and no leakages will occur in the future.

29. **Quantity of Wastewater.** The consumption of water has been taken, as per the discussion made above as 100 lpcd and 80% of it has been estimated as return factor. The layout plan of wastewater coverage area has been separated into different zones in terms of density and connection with the wastewater lines, and the contribution of all the zones have been collected by the major trunk wastewater lines. The Deurali Danda system comprises of two conveyance systems (i.e., Outlet- 2A and Outlet 2B), whereas the Shantinagar system comprises only one outlet system (i.e., Outlet- 1). Using the parameters mentioned above to sum up the sewage quantity, the design flow for the various lines have been as follows:

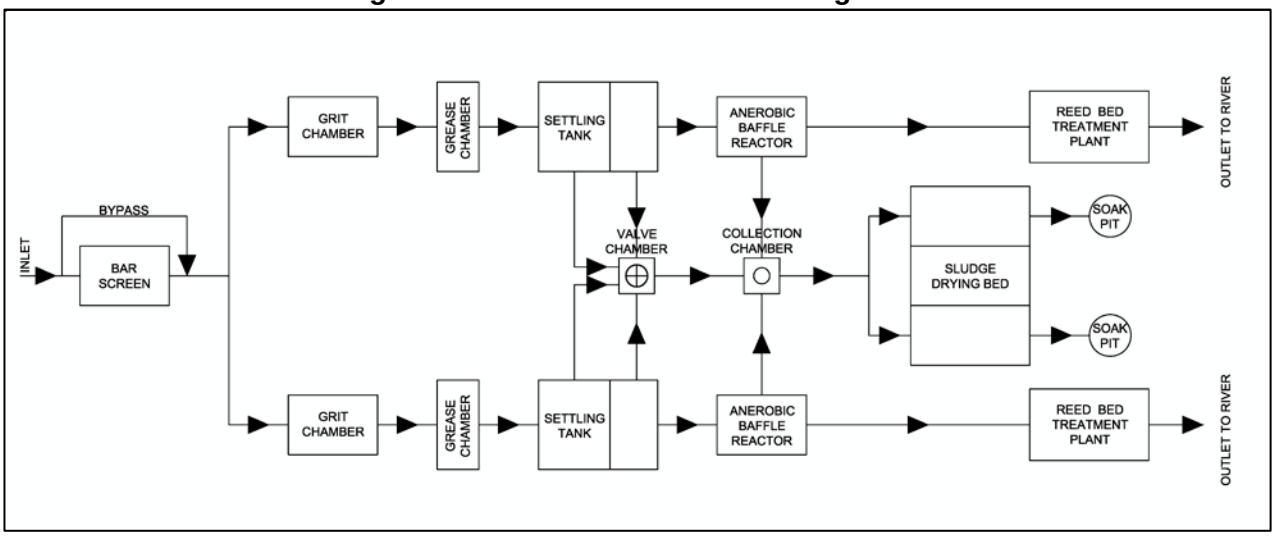
(i) Shantinagar # SN- 1 = 5.70 liter per second (lps)
(ii) Deurali Danda # DD-1 = 3.22 lps
(iii) Deurali Danda # DD-2 = 1.87 lps

30. As the wastewater line DD-1 and DD-2 finally discharges into treatment plant, the combined flow to the treatment plant has been estimated as 5.09 lps.

2. Decentralized Wastewater Treatment System

31. The DEWAT systems that will be constructed in Deurali Danda and Shantinagar are based on the draft sanitation masterplan of Charikot town. The design is conceptual in nature and the treatment will employ the conventional treatment processes for organic wastes. It will have the following components: (i) bar screens; (ii) grit chamber; (iii) grease/oil separation chamber; (iv) settling tank; (v) anaerobic baffle reactor; (vi) sludge drying bed; and (vii) reed bed treatment system. Indicative process flow diagram is shown in Figure 1.

Figure 1: DEWAT Process Flow Diagram



32. The finalization of detailed design of the DEWAT components of the subproject will be guided by international best practices in DEWAT planning, construction and operation, such as the "Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide", designed and produced by Bremen Overseas Research and Development Association (BORDA).[8] Based on this guide, the subproject will select the appropriate technical configuration of the DEWAT components in view of the following factors:

(i) Volume of wastewater;
(ii) Quality of wastewater;
(iii) Local temperature;
(iv) Underground conditions;
(v) Land availability;
(vi) Costs;
(vii) Legal effluent requirements;
(viii) Cultural acceptance and social conditions; and
(ix) Final handling of the effluent (discharge or reuse).

33. The subproject will also refer to other published documents on DEWAT system in order to support the final detailed design of the DEWAT components of the subproject. Examples are the (i) conference paper on the Standardization of Design and Maintenance of DEWATS Plants in India;[9] and (ii) academic paper on Operation of Decentralized Wastewater Systems (DEWATS) under tropical field conditions,[10] and (iii) UNESCAP presentation on wastewater management and sanitation promoting DEWATS in South-East Asia.[11]

34. **Deurali (Gaunde) Danda DEWAT Facility**. The DEWAT plant in Deurali (Gaunde) Danda will be designed based on the estimated inflow of 5.09 lps of sewage/wastewater. It will be constructed in a government-owned land with an area of 1,500 square meters (m^2). The actual

[8] B. Gutterer et al. 2009. *Decentralised Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide*.
[9] R. Subbaian et al. 2012. *Standardisation of Design and Maintenance of DEWATS Plants in India*.
[10] N. S. Reynaud. 2014. *Operation of Decentralised Wastewater Treatment Systems (DEWATS) under tropical field conditions*.
[11] UNESCAP. E-learning Course on Water Security Asia and the Pacific. *Module-1 -Wastewater Management & Sanitation, promoting Decentralized Wastewater Treatment Systems (DEWATS) in South-East Asia*.

footprint of the plant will be 750 m^2 which will be located within this land. A layout of the plant showing the proposed components, including the proposed reed bed component, will be included in the final detailed design and updating of this IEE. A location/vicinity map of the subproject site showing the access road, main road, receiving bodies of water, and other receptors around this location is in Figure 2. The nearest receptor (a school for the deaf) is at about 200 m from the proposed site. The final detailed design will consider moving this location at least 300 m from the nearest receptor. The final layout of the facility will be designed in such a way that the odor-producing components are placed at the farthest end relative to the location of the nearest receptor.

Figure 2: Google Earth Map of Deurali Danda Decentralized Wastewater Treatment Facility

Source: Google Earth.

35. **Shantinagar (Ramkot) DEWAT Facility**. The DEWAT plant in Shantinagar (Ramkot) will be designed based on the estimated inflow of 5.70 lps of sewage/wastewater. It will be constructed in a government-owned land with an area of 1,000 m^2. The actual footprint of the plant will be 650 m^2 which will be located within this land. A layout of the plant showing the proposed components, including the proposed reed bed component, will be included in the final detailed design and updating of this IEE. A location/vicinity map of the subproject site showing the access road, main road, receiving bodies of water, and other receptors around this location is in Figure 3. The nearest receptor is at about 200 m from the proposed site. The final detailed design will consider moving this location at least 300 m from the nearest receptor. The final layout of the facility will be designed in such a way that the odor-producing components are placed at the farthest end relative to the location of the nearest receptor.

Figure 3: Google Earth Map of Shantinagar Decentralized Wastewater Treatment Systems Facility

Source: Google Earth.

36. **The Reed Bed System or Constructed Wetlands**. Constructed wetland is a biological wastewater treatment technology designed to mimic processes found in natural wetland ecosystems. The system has great potential as a clean-up technology for a variety of wastewaters. It is an innovative and inexpensive treatment approach with the potential to treat organic and inorganic compounds in wastewater from a range of sources, including domestic wastewater.

37. The inclusion of reed bed system or constructed wetlands in the Deurali Danda and Shantinagar DEWAT plants will follow international best practice guidelines on constructed wetlands, such as the "Manual on Constructed Wetlands Treatment of Municipal Wastewaters" of the United States Environmental Protection Agency (USEPA).[12] The subproject will refer to this manual in designing the constructed wetlands component of the DEWAT plants. The manual discusses issues that will be useful for the finalization of the design, such as, among other useful information, the following:

(i) the capabilities of constructed wetlands, functional design approach;
(ii) the management requirements to achieve the designed purpose; and
(iii) the proper perspective on the appropriate use of constructed wetlands.

38. Consistent with the draft sanitary master plan of Charikot town and the USEPA manual on constructed wetlands (footnote 12), the reed bed component of the DEWAT plants will be designed based on the following factors:

(i) characteristics of partially treated wastewater entering the system;
(ii) organic matter loading rate;

[12] USEPA. 2000. *Agency Constructed Wetlands Treatment of Municipal Wastewaters*.

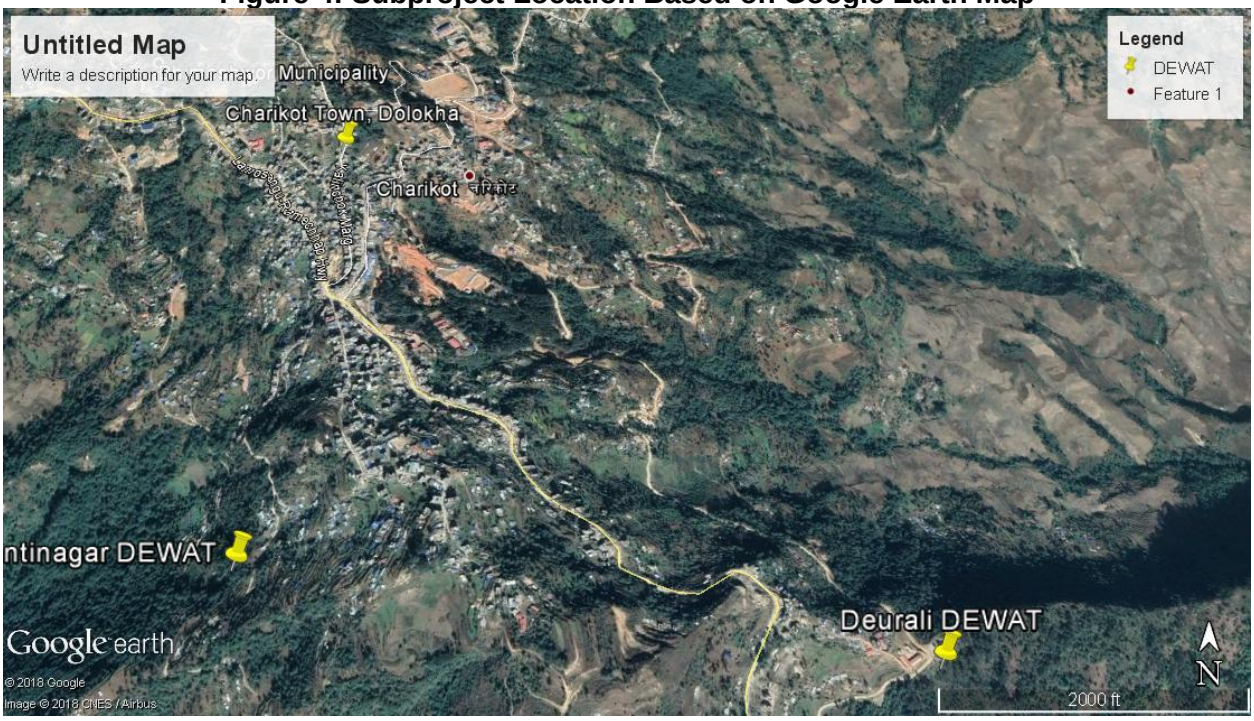
(iii) hydraulic loading rate;
(iv) hydraulic retention time;
(v) climatic conditions;
(vi) type of reed;
(vii) land and space availability;
(viii) potential breeding grounds for pests; and
(ix) other factors discussed in the USEPA manual on constructed wetlands (footnote 12).

D. Subproject Area Description

39. The subproject will be located in Bhimeshwor Municipality, which is situated in Dolakha district in Province No.3 of Nepal. It lies between 27º37' 58" N to 27º44' 42" N latitude to 85º5' 12" E to 85º 59' 31" E longitude. The municipality is in a hilly region with an altitude ranging between 950 to 2560 m above mean sea level with an average altitude of 1554 meters.

40. The Charikot Municipality is bounded by Baileshwor Rural Municipality in the east, Sindhupalchok District in the west, Kalinchok RM in the north and Sailung RM in the south. The Lamosanghu-Jiri road passes through the Bhimeshwor Municipality. Lamosanghu is located on the Arniko Highway (also referred as Kodari Rajmarga). The subproject area is approximately 139 km far from the Kathmandu. Regular local and express bus services are available from Kathmandu. The subproject area is in a hilly region. The Municipality has a subtropical to a temperate climate and is heavily influenced by the monsoon (June-September) with an average annual rainfall of about 1,710 mm.

Figure 4: Subproject Location Based on Google Earth Map



Source: Google Earth.

III. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

A. ADB Safeguard Policy Statement

41. ADB SPS 2009 requires borrowers to meet a set of requirements (Safeguards Requirements 1) when delivering environmental safeguards for projects supported by ADB. The objectives are to ensure the environmental soundness and sustainability of projects, and to support the integration of environmental considerations into the project decision-making process. Hence, UWSSP is required to comply with these requirements. Summary of the step by step process is discussed below in this section. Detailed discussions are provided in the ADB SPS.[13]

42. **Screening and Categorization.** Subprojects are to be screened for their expected environmental impacts, and are assigned to a specific category.[14] Categorization is to be based on the most environmental sensitive component. However, for subproject(s) with component(s)

[13] ADB. 2009. *Safeguard Policy Statement*. Manila.

[14] A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories: (i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required; (ii) **Category B**. A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required; (iii) **Category C**. A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed; and (iv) **Category FI**. A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary.

that can trigger Category A or with potentially significant adverse impacts that are diverse, irreversible, or unprecedented, PMO shall examine alternatives to the subproject's location, design, technology, and components that would avoid, and, if avoidance is not possible, minimize adverse environmental impacts and risks, and to meet Category B categorization. The rationale for selecting the subproject location, design, technology, and components will be properly documented, including, cost-benefit analysis, taking environmental costs and benefits of the various alternatives considered into account. The "no action" alternative will be also considered.

43. **Environmental Assessment.** Environmental assessment shall include description of environmental and social baseline to provide an understanding of current conditions forming the benchmark against which subproject impacts are assessed. Environmental impacts and risks will be analyzed for all relevant stages of the project cycle, including design and planning stage, construction, operations, decommissioning, and post-closure activities such as rehabilitation or restoration. The structure and composition of the typical IEE report is provided in Appendix 4 of the environmental assessment and review framework of UWSSP.

44. **Environmental Planning and Management.** The PMO and RPMOs shall prepare environmental management plan (EMP) to be included in the IEE report. The EMP shall describe and address the potential impacts and risks identified by the environmental assessment. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the subproject's impact and risks. The EMP shall include the proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

45. **Public disclosure**. MOWS, through PMO, shall submit the following documents to ADB for disclosure on ADB website so affected people, other stakeholders, and the public can provide meaningful inputs into the subproject design and implementation:[15]

(i) final IEE upon receipt;
(ii) a new or updated EIA/IEE and corrective action plan prepared during subproject implementation, if any; and
(iii) environmental monitoring reports submitted during subproject implementation upon receipt.

46. **Consultation and Participation.** The PMO and RPMOs shall carry out meaningful consultation[16] with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

47. **Grievance Redress Mechanism.** The MOWS, through PMO, shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and

[15] Per ADB SPS, 2009, prior to disclosure on ADB website, ADB reviews the "borrower's/client's social and environmental assessment and plans to ensure that safeguard measures are in place to avoid, wherever possible, and minimize, mitigate, and compensate for adverse social and environmental impacts in compliance with ADB's safeguard policy principles and Safeguard Requirements 1-4."

[16] Per ADB SPS, 2009, meaningful consultation means a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

grievances about the subproject's environmental performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject. As of the ADB loan processing for UWSSP, a Grievance Redress Mechanism has been established and discussed in detail in Section VIII below.

48. **Monitoring and Reporting.** The PMO shall monitor, measure and document the progress of implementation of the EMP. If necessary, PMO will identify the necessary corrective actions, and reflect them in a corrective action plan. PMO will prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with implementation of the EMP and compliance issues and corrective actions, if any. For subprojects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis until ADB issues a project completion report.

49. **Unanticipated Environmental Impacts.** Where unanticipated environmental impacts become apparent during subproject implementation, PMO shall update the environmental assessment and EMP or prepare a new environmental assessment and EMP to assess the potential impacts, evaluate the alternatives, and outline mitigation measures and resources to address those impacts.

50. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the subproject the PMO and RPMOs shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. These standards contain performance levels and measures that are normally acceptable and applicable to subprojects. When the Government of Nepal regulations differ from these levels and measures, the executing agency shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, the executing agency will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS 2009.

51. **Occupational Health and Safety.** The PMO[17] shall ensure that workers[18] are provided with a safe and healthy working environment, taking into account risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. PMO shall ensure to take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by (i) identifying and minimizing, so far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

52. PMO shall ensure to apply preventive and protective measures consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.[19]

[17] In case where responsibility is delegated to subproject contractors during construction phase, PMO shall ensure that the responsibilities on occupational health and safety as described herein are included in the contract documents.

[18] Including nonemployee workers engaged by the borrower/client through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.

[19] World Bank Group, 2007. *Environmental, Health, and Safety General Guidelines.* Washington, DC.

53. **Community Health and Safety.** The PMO shall ensure to identify and assess the risks to, and potential impacts on, the safety of affected communities during the design, construction, operation, and decommissioning of the subproject, and will establish preventive measures and plans to address them in a manner commensurate with the identified risks and impacts.

54. **Physical Cultural Resources**. The PMO is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. Such resources likely to be affected by the subproject will be identified, and qualified and experienced experts will assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. When the proposed location of a subproject component is in areas where physical cultural resources are expected to be found as determined during the environmental assessment process, chance finds procedures shall be included in the EMP.

55. **Environmental Audit.** When the subproject involves existing activities or facilities, PMO is responsible to ensure that relevant external experts will perform environmental audits to determine the existence of any areas where the subproject may cause or is causing environmental risks or impacts. If the subproject does not foresee any new major expansion, the audit constitutes the environmental assessment for the subproject.

56. **Bidding and Contract Documents.** The IEEs and EMPs are to be included in bidding and contract documents and verified by the RPMOs. The PMO and RPMOs shall also ensure that bidding and contract documents include specific provisions requiring contractors to (i) comply with all other conditions required by ADB,[20] and (ii) to submit to RPMO, for review and approval, a site-specific environmental management plan (SEMP), including (a) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (b) specific mitigation measures following the approved EMP; (c) monitoring program as per SEMP; and (d) budget for SEMP implementation. No works can commence prior to approval of SEMP. A copy of the EMP or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP or SEMP constitutes a failure in compliance and shall require corrective actions.

57. **Conditions for Award of Contract and Commencement of Work.** PMO shall not award any Works contract for a subproject until (i) relevant provisions from the EMP are incorporated into the Works contract; (ii) the IEE is updated to reflect subproject's detailed design and PMO has obtained ADB's clearance of such IEE; and (iii) MOWS-approved IEE (i.e. IEE in compliance with EPR, 1997) and other necessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMO shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the Works contract; and (ii) the IEE is updated to reflect subproject's detailed design and PMO has obtained ADB's clearance of such IEE.

B. Government Environmental Impact Assessment Law

[20] Contractors to comply with (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

58. **Environmental Protection Act (EPA), 1997.** This Act 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 (CSA)[21] or Ministry of Science, Technology and Environment (MOSTE)[22], respectively, prior to implementation.

59. **Environmental Protection Rules (EPR), 1997, and its amendments in 1999 and 2007**. The Rules defines implementing rule and regulations of the IEE or 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 require IEE and EIA respectively, as amended in 2007. Table 2 presents the required environmental assessment for activities/works under the subproject.

Table 2: Required Environment Assessment for Activities of the Subproject Per EPR

S.N.	Schedule 1: Activities Requiring IEE Only	Schedule 2: Activities Requiring EIA	Minimum Environmental Assessment Required for Subproject
1	Operation of sewerage scheme providing services to population between 5,000 and 400,000	Operation of sewerage scheme providing services to population of more than 400,000	IEE only. PMO to follow the steps in EPR in order to comply with the national requirement for IEE.

60. **Compliance of the Subproject with EPR 1997 (as amended in 1999 and 2007).** The subproject falls under Schedule 1 activities and therefore requires an IEE. In compliance with this requirement, the PMO needs to prepare an IEE report following the procedures in the EPR and submit the report for approval to MOWS, which is the CSA (footnote 21) for the subproject. PMO needs to obtain an approved IEE from MOWS prior to award of any contracts under the subproject. PMO may opt to use one IEE report for compliance with ADB and government's environmental clearance requirements, provided that the IEE report complies with both ADB SPS and EPR 1997 requirements.

61. **Status of Securing Ministry of Water Supply−Approved Initial Environmental Examination.** The PMO is currently in the process of securing MOWS-approved IEE in compliance with the EPR. PMO will ensure that the MOWS-approved IEE will be secured prior to the award of any contract under the subproject. A copy of the approval document from MOWS will be attached in the updated version of this IEE that will be submitted to ADB for final review and disclosure.

C. Other Relevant National Laws, Policies and Guidelines

[21] The CSAs are responsible for the: (i) review of applications for EIA scoping and approval of IEE schedules of work and TORs; (ii) review of submitted IEE or EIA Reports; (iii) approval of IEE Reports; (iv) forward of reviewed EIA Reports together with its review opinions and suggestions to MOSTE; and (v) monitoring and evaluation of project implementation impacts.

[22] MOSTE is responsible for the: (i) approval of EIA schedules of work and TORs; (ii) approval of EIA Reports; and (iii) conduct of environmental audit of completed project after two years of operation.

62. Table 3 below summarizes all other relevant national laws, policies and guidelines that will be complied with under the subproject. As the subproject will avoid components with potential triggers for Category A classification per ADB SPS, all laws, policies and guidelines governing these types of projects are already excluded in the table.

Table 3: Other Relevant National Laws, Policies, and Guidelines of Nepal

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 environmental impact assessment (EIA) and preparation of EIA Report before granting license to use water resources for any purpose. Proponents shall make sure that the beneficial use of water resources does not cause damage to other water uses/users (Article 4). Article 7 ranks "drinking and domestic use" as first in the priority order of use of water resources, which will be one of the bases of decision in case of water use dispute Article 17 requires proponents to apply for any necessary land acquisition accordingly; Article 18, 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.	Relevant to the subproject. Initial environmental examination (IEE) required for grant of use of water resources. The design of the decentralized wastewater treatment (DEWAT) facilities will ensure to comply with the tolerance limits for effluent to inland water bodies.
Labor Act	1992	Chapter 5 stipulates health and safety provisions at work places, keeping work premises clean and safe, e.g., (i) with provisions for solid waste, sewage and hazardous substance management; (ii) instituting measures to prevent dust, fumes and other impure materials that would adversely affect health; (iii) with supply of potable water and water for emergency situations; (iv) with arrangements for the use of protective devices and wears; (v) with fire safety arrangements; and (vi) measures for protection from hazardous machines/equipment and from physical injury or harm from lifting of heavy weights.	Environmental management plan (EMP) provides measures to mitigate workers' health and safety hazards. It includes the application of international best practices and standards set in the World Bank's Environmental, Health and Safety (EHS) guidelines on occupational health and safety.
National Environmental	1993	Of its five objectives, the most relevant to Urban Water Supply and Sanitation Sector Project	EMP implementation is the overall measure

Policy/Law/ Guideline	Year*	Relevant Provisions	Remarks
Policy and Action Plan (NEPAP)		(UWSSP) are to: (i) mitigate adverse environmental impacts of projects; and (ii) safeguard national and cultural heritage and preserve bio-diversity, within and outside protected areas.	to mitigate adverse impacts. Heritage sites and protected areas shall be avoided.
National Sanitation Policy	1994	The policy emphasizes safeguarding water supplies and sustaining sanitation for the protection of environment. It aims to create awareness and impart knowledge on sanitation and hygiene among all levels of community, including focus on women's group and children to bring about attitudinal and behavioral changes. The overall objective is framed at achieving sanitation coverage, including the setting of institutional arrangements for implementing the activities to achieve such objective, among others.	Continuing meaningful consultations during implementation of the DEWAT subproject will help achieve the objectives of the policy. During O&M, monitoring of effluent from DEWAT facilities will meet the policy's requirements.
Local Self-Governance Act	1999	The Act gives local government the functions, duties and powers to, among others: (i) conserve and protect their local environment and natural resources; (ii) plan, implement and/or operate and maintain local water supply projects; (iii) implement or arrange for implementation of local sanitation/sewerage and drainage projects; (iv) protect cultural heritage and religious sites; and/or (v) monitor subproject activities within their jurisdictions.	The DEWAT subproject will comply with all local government rules and regulations, and will be subject to inspection and other monitoring activities of the local government to ensure compliance with the Act.
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.	The DEWAT subproject will ensure compliance with the policy. The EMP provides all necessary measures to ensure the conservation and protection of the environment at all stages of subproject implementation.
National Urban Water Supply and Sanitation Sector Policy	2008	The Policy requires the conduct of IEE or EIA of proposed WSS projects per Environmental Protection Act (EPA) and Environmental Protection Rules (EPR). Such assessments are to: (i) incorporate consultations with key stakeholders, including end-point users; and (ii) specify measures to mitigate environmental impacts prior to and during construction and during operation, as well as corrective measures.	The DEWAT subproject will comply with the conduct of IEE in compliance with both ADB and EPA/EPR requirements, which include the conduct of meaningful consultations. The EMP includes all necessary measures to mitigate

Policy/Law/ Guideline	Year*	Relevant Provisions	Remarks
			environmental impacts at all stages of subproject implementation.
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 shall 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.	The DEWAT subproject to manage generated solid wastes accordingly. EMP provides all measures necessary to mitigate the impact of materials handling and solid waste generation at all stages of subproject implementation.

* (Year) - Year last amended.

63. Table 4 below shows the national tolerance limits for effluent that will be complied with by the DEWAT facilities. In addition to compliance with these effluent standards, the World Bank's Environmental, Health and Safety (EHS) Guidelines on Water and Sanitation[23] requires that the effluent from the DEWAT facility will not upset or overwhelm the assimilative capacity that may degrade the quality based on the most sensitive use or classification of the receiving body of water.

Table 4: Tolerance Limits for Wastewater to be Discharged into Inland Surface Waters from Combined Wastewater Treatment Plant, 2004[a]

Parameters	Unit	Tolerance Limit[b]
TSS	mg/L	50
Particle size of suspended particles		Shall pass 850-micron sieve
pH		5.5 – 9.0
Temperature		Shall not exceed 40 °C in any section of the stream within 15 m downstream from the effluent outlet.
BOD5 at 20°C	mg/L	50
Oil & grease	mg/L	10
Phenolic compounds	mg/L	1
Cyanides (as CN)	mg/L	0.2
Sulphides (as S)	mg/L	2
Radioactive materials Alpha emitters Beta emitters	 c/ml c/ml	 10^{-7} 10^{-8}
Insecticides		Absent
Total residual chlorine		1
Fluorides (as F)	mg/L	2
Arsenic (as As)	mg/L	0.2
Cadmium (as Cd)	mg/L	2
Hexavalent Chromium (as Cr^{+6})	mg/L	0.1
Copper (as Cu)	mg/L	3

[23] World Bank Group. IFC. 2007. *Environmental, Health, and Safety Guidelines for Water and Sanitation*.

Parameters	Unit	Tolerance Limit[b]
Lead (as Pb)	mg/L	0.1
Mercury (as Hg)	mg/L	0.01
Nickel (as Ni)	mg/L	3
Selenium (as Se)	mg/L	0.05
Zinc (as Zn)	mg/L	5
Ammoniacal nitrogen	mg/L	50
COD	mg/L	250
Silver	mg/L	0.1

[a] Environmental Protection Act, 1997 (as implementing rules on effluent standards). Summary table lifted from the Compendium of Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

[b] The parameters to be used during monitoring and sampling activities will be dependent on the capacity of WUA/WUSC or municipality to do the test, including the availability of laboratory facilities to do the test in the country.

64. Following requirements of ADB SPS, PMO and RPMOs shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in EHS Guidelines. When the Government of Nepal regulations differ from these levels and measures, the executing agency shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS. In view of this, Table 5 and Table 6 show the ambient air quality standards and noise level standards to be followed by the subproject.

Table 5: Ambient Air Quality Standards

Parameter	Averaging Period[a]	Nepal's Ambient Air Quality Standard, 2003[b] ($\mu g/m^3$)	WHO Air Quality Guidelines ($\mu g/m^3$)		Standard Values to be Followed by the Subproject[e] ($\mu g/m^3$)
			Global Update[c] 2005	Second Edition[d] 2000	
TSP	Annual	-	-	-	
	24-hour	230	-	-	230
PM_{10}	Annual	-	20	-	20
	24-hour	120	50	-	50
PM_{25}	1-year	-	10	-	10
	24-hour	-	25	-	25
SO_2	Annual	50	-	-	50
	24-hour	70	20	-	20
	10-minute	-	500	-	500
NO_2	1-year	40	40	-	40
	24-hour	80	-	-	80
	1-hour	-	200	-	200
CO	8-hour	10,000	-	10,000	10,000
	15-minute	100,000	-	100,000	100,000
Pb	1-year	0.5	-	0.5	0.5
Benzene	1-year	20	-	-	20

[a] Due to short term duration of civil works, the shortest period will be more practical to use.

[b] As implementing rules on ambient air quality standards under the Environmental Protection Act, 1997. Summary available from Environment Statistics of Nepal 2011, Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, Kathmandu, Nepal.

[c] Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

[d] Source: Air Quality Guidelines for Europe, Second Edition, 2000; WHO Regional Office for Europe, Copenhagen.

[e] If less stringent levels or measures are appropriate in view of specific project circumstances, the PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS; Subject to capacity of executing agency to do the test, including the availability of facilities to do the test in the country.

Table 6: Noise Level Standards

Receptor/ Source	National Noise Standard Guidelines, 2012[a] (dB)		WHO Guidelines Value For Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)		Standard Values to be Followed by Subproject[c] (dB)	
	Day	**Night**	**07:00 – 22:00**	**22:00 – 07:00**	**Day**	**Night**
Industrial area	75	70	70	70	70	70
Commercial area	65	55	70	70	65	55
Rural residential area	45	40	55	45	45	40
Urban residential area	55	50	55	45	55	45
Mixed residential area	63	55	55	45	55	45
Quiet area	50	40	-	-	50	40
Water Pump	65		-		65	
Diesel generator	90		-		90	

[a] Environmental Protection Act, 1997 (as implementing rules on noise standard guidelines). Source: Government of Nepal National Planning Commission Secretariat, CBS. 2014. *Environment Statistics of Nepal 2013.*

[b] Guidelines for Community Noise, WHO, 1999**.**Source: Environmental, Health and Safety General Guidelines, 2007. International Finance Corporation, World Bank Group.

[c] If less stringent levels or measures are appropriate in view of specific project circumstances, the PMO will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

D. International Environmental Agreements.

65. Table 7 below lists the relevant international environmental agreements that Nepal is party to, and their relevance to the subproject.

Table 7: International Environmental Agreements Relevant to the Subproject

International Environmental Agreement	Year*	Relevant Provisions	Remarks
World Heritage Convention	1978	Parties to ensure the protection and conservation of the cultural and natural heritage situated on territory of, and primarily belonging to, the State	The decentralized wastewater treatment (DEWAT) subproject and the UWSSP as a whole will help the Government of Nepal comply with this agreement. The subproject will not undertake activities that will negatively impact cultural and natural heritage at the subproject areas, if any.
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)	1987	Parties to conserve and wisely use wetlands (i.e., maintaining their ecological character) as a contribution towards achieving	The DEWAT subproject and UWSSP as a whole will help the Government of Nepal comply with this agreement. The subproject will not locate

International Environmental Agreement	Year*	Relevant Provisions	Remarks
		sustainable development locally and throughout the world	any component in wetlands and other protected areas at the subproject sites, if any.
Convention on Biodiversity	1992	Parties to require the environmental assessment of projects that are likely to have significant adverse effects on biological diversity with a view of avoiding or minimizing such effects	The DEWAT subproject and the UWSSP as a whole will help the Government of Nepal comply with this agreement. The subproject will not undertake activities that will impact biodiversity in the subproject areas, if any.
UN Framework Convention on Climate Change	1992	Parties to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.	The DEWAT subproject and UWSSP as a whole will help the Government of Nepal comply with this agreement. The subproject will ensure implementation of relevant measures in the EMP to minimize the causes of climate change. The designs of the subproject infrastructures will ensure to include adaptation to the impacts of climate change.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	1996	Parties to, among others, minimize the amount and toxicity of hazardous waste generated, manage the hazardous and other wastes they generate in an environmentally sound manner and as close as possible to the source of generation.	The DEWAT subproject and UWSSP as a whole will help the Government of Nepal comply with this agreement. The subproject will ensure implementation of the relevant measures in the EMP to avoid or minimize the generation and disposal of hazardous wastes.

* (Year) - Year last amended.

IV. ANALYSIS OF ALTERNATIVES

66. Bhimeshwor Municipality is facing significant development challenges, including: (i) lack of wastewater treatment from the septic tank as well as outlets of the individual households and community toilets; and (ii) increasing incidents of water-borne diseases due to poor management of wastewater in the town.

67. **'Without subproject' or 'do-nothing' Alternative**. Doing nothing about these challenges would be allowing the municipality to remain underserviced. This will put the health of its residents and the public at more risks and further degrade the living environment. This option would impede (i) further social and economic development of the municipality, and (ii) delivery of Nepal's commitment to UN Sustainable Development Goal (SDG) 6 to increase the proportion of the population with sustainable access to basic sanitation.

68. **'With subproject' Alternative**. With the subproject, the 2,500 population (as of 2018) of the town will have the following benefits:

(i) Convenient access to reliable, safe and easy access to disposal of wastewater to the sewer line. As a result, good sanitation practices will be promoted and there will be reduced health and safety risks;
(ii) Improved public health and living environment that will contribute to improved quality of life in the project municipality;
(iii) Contribute to local economic development of the municipality; and
(iv) Contribute to the realization of the National Sanitation Development Plan of Nepal and the delivery of Nepal's commitment to UN SDG 6.

69. **Alternative Designs and Treatment Processes.** The subproject considered three alternatives from the Sanitation Development Master Plan that was prepared for Charikot. These are: (i) combined storm drainage, (ii) fecal sludge management, and (iii) DEWAT facility. Based from the investment decision made, the DEWAT system was selected. DEWAT system is found to be effective, reliable, cost efficient and custom-made wastewater treatment systems, which are perfectly suited for small to medium-size communities or municipalities like Charikot.

V. DESCRIPTION OF THE ENVIRONMENT

A. Physical Environment and Resources

1. Landforms and Topography

70. The subproject is located in Bhimeshwor Municipality, which is situated in Dolakha district in Janakpur Zone of the Eastern Development Region of Nepal. It lies between 27º37' 58" N to 27º44' 42" N latitude to 85º05' 12" E to 85º59' 31" E longitude. The municipality is in a hilly region with an altitude ranging between 950 to 2,560 m above mean sea level with an average altitude of 1,554 m.

71. The Charikot Municipality is bounded by Baileshwor Rural Municipality in the east, Sindhupalchok District in the west, Kalinchok RM in the north and Sailung RM in the south. The Lamosanghu-Jiri road passes through the Bhimeshwor Municipality. Lamosanghu is located on the Arniko Highway (also referred as Kodari Rajmarga).

72. The subproject area is approximately 139 km from Kathmandu. Regular local and express bus services are available from Kathmandu. The subproject area is in a hilly region. The Municipality has a subtropical to a temperate climate and is heavily influenced by the monsoon (June-September) with an average annual rainfall of about 1,710 mm.

73. About 2% of Dolakha District with an altitude of 300 to 1,000 m consists of upper tropical climatic zone. About 26% of the district with an altitude of 1,000 to 2,000 m consists of subtropical climatic zone. About 29% of the district with an altitude of 2,000 to 3,000 m consists of temperate climatic zone. About 17% of the district with an altitude of 3,000 to 4,000 m consists of subalpine climatic zone. About 9% of the district with an altitude of 4,000 to 5,000 m consists of Alpine climatic zone. About 17% of the district with an altitude of over 5,000 m consists of Nival climatic zone.

2. Geology and Soils

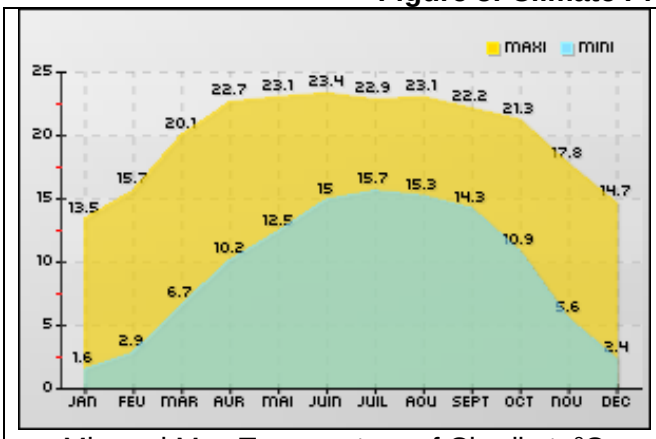
74. Dolakha District is characterized by Ulleri and Seti formations of the Midland Group. In the subproject area, rocks of the Ulleri Formation are represented by augen gneiss and feldspathic schist whereas the rocks of the Seti Formation are mainly composed of grey to greenish-grey phyllites and quartzite. Colluvial deposits and rocks are predominantly found on the surface. The subproject area also has weathered rocks of phyllite to gneiss and colluvium to alluvium deposits. Thickness of colluvial range 2 to 5 m and alluvial deposits more than 5 m.

3. Climate

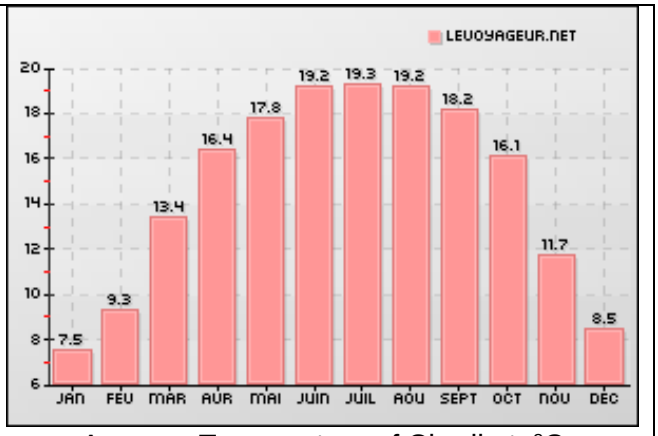
75. The average temperature in Charikot, Dolakha ranges from 7.5°C during January (the coldest month of a year) and 19.3°C during July (the hottest month of a year). Similarly, the average rainfall in Charikot, Dolakha ranges from the most dry month of January with 10 mm to the most wet month of July with 543 mm. Figure 5 shows the climate profile in Charikot.

76. Dolakha is ranked as highly vulnerable district to climate change on NAPA's "Climate Change Vulnerability Mapping for Nepal" (GON/NAPA 2010). GLOF is the biggest threat to the people in Dolakha with very high vulnerability index. Tsho Rolpa Lake is among the 20 potentially dangerous glacial lakes in Nepal (Mool 2001). Beside GLOF, Dolakha is also highly vulnerable for drought and rainfall/temperature hazards. Data from Jiri agro-meteorological station shows increasing trend for average annual maximum temperature while average annual minimum temperature is decreasing (0.011ºC/year) over the 30 years period (1981-2010). In case of rainfall, the average annual rainfall is increasing (11mm/year) over the same period with inter-annual variability. Figure 6 shows the rainfall profile in Charikot.

Figure 5: Climate Profile in Charikot



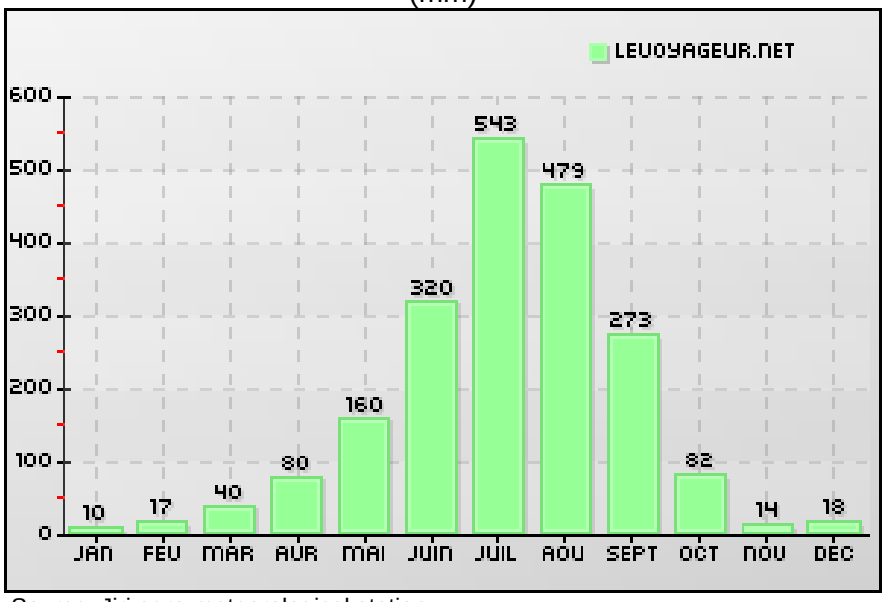
Min and Max Temperature of Charikot, ºC



Average Temperature of Charikot, ºC

Figure 6: Rainfall in Charikot

(mm)



Source: Jiri agro-meteorological station.

4. Water Quality

77. The consumer or users get water virtually without any treatment in many systems. The socio-economic survey 2015 shows that the perception of water users about water quality is divided into good (21%), moderate (78 %) and bad (1 %), respectively.

78. Water withdrawn by the communities from major systems undergoes occasional disinfection using conventional bleaching powder. On 22 April 2016, water samples collected from different sources were tested for various physical, chemical and parameters. The results of the tests are shown in Appendix 3. All water quality parameters are within the permitted values of National Drinking Water Quality Standards (NDWQS) and WHO guideline values, except for total hardness and cadmium. A separate subproject under UWSSP will improve the drinking water supply infrastructure, including treatment that will ensure compliance with the NDWQS and WHO guideline values for drinking water.

79. The subproject will not impact any river system used for drinking water supply. The discharge points of the DEWAT facilities are far downstream the river system used as source for drinking water. Prior to construction activities, the subproject will establish a baseline data on water quality at the upstream and downstream portions relative to the discharge points of the DEWAT facilities. Water quality monitoring will continue throughout the implementation of the subproject as indicated in the EMP.

5. Air Quality

80. There are few industries in the subproject area. Air pollution is caused by fugitive dust from vehicle movements e.g. old and over smoky buses, tractor, heavy and overloaded trucks, old jeeps particularly over unpaved roads, construction activities, and wind action on unpaved exposed surfaces. Other air emissions come from household cooking and open burning. Emissions from these sources are scattered in the municipality. However, the magnitude of emissions from these area sources is perceived to be not severe. The subproject will establish a

baseline data on air quality prior to construction activities. Air quality monitoring will continue throughout the implementation of the subproject as indicated in the EMP.

6. Acoustic Environment

81. The sources of noise in the subproject area are from the construction activities, vehicle movements, and industrial activities. The anthropogenic noise is confined in few clustered settlements and market places only in the daytime.

B. Ecology, Environment and Resources

1. Flora and Fauna

82. There are no critical habitats in and around the subproject sites. The common species of plants within and around the proposed subproject area are shown in Table 8. None of these plants are considered endangered or critically endangered.

Table 8: List of Plants in the Subproject Area

S.No.	Scientific Name	Local Name	Family
1	*Vepris bilocularis*	Ainselu	Rosaceae
2	*Emblica offficinalis*	Amala	Euphorbiaceae
3	*Pieris ovalifolia*	Angeri	Ericaceae
4	*Cedrealla toona*	Tuni	Meliaceae
5	*Lagerstroemia indica*	Ashare phul	Lythraceae
6	*Adhatoda vasica*	Asuro	Acanthaceae
7	*Melia azedarach*	Bakaino	Meliaceae
8	*Ficus bengalensis*	Bar	Moraceae
9	*Terminalia bellirica*	Barro	Combretaceae
10	*Aegle marmelos*	Bel	Rutaceae
11	*Rhus wallichii*	Bhalayo	Anacardiaceae
12	*Populus ciliate*	Bhote Pipal	Salicaceae
13	*Lagerstroemia Parviflora*	Bot Dhayaro	Lythraceae
14	*Schima wallichii*	Chilaune	Theaceae
15	*Bassia butyracea*	Chyuri	Sapotaceae
16	Berberis aristata	Chutro	Berberidaceae
17	*Debregeasia salicifolia*	Daar	Urticaceae
18	*Garuga pinnata*	Dabdabe	Burseraceae
19	*Mussaenda macrophylla*	Dhobeni	Rubiaceae
20	*Colebrookea oppositifolia*	Dhursul	Labiatae
21	*Dioscorea bulbifera* L.	Githa	Dioscoreaceae
22	*Callicarpa macrophylla*	Guyanlo	Verbenaceae
23	*Lannea coromandelica*.	Hallunde	Anarcardiaceae
24	*Terminalia chebula*	Harro	Combretaceae
25	*Syzygium cumini*	Jamun	Myrtaceae
26	*Phoebe lanceolata*	Jhankri syaula	Lauraceae
27	*Ficus lacor*	Kabro	Moraceae
28	*Anthocephalus chinensis*	Kadam	Rubiaceae
29	*Myrica esculenta*	Kafal	
30	*Adina cordifolia*	Karam	Rubiaceae
31	*Acacia catechu*	Khayar	
32	*Ficus semicordata*	Khanayo	Moraceae

S.No.	Scientific Name	Local Name	Family
33	*Sapium insigne*	Khirro	Euphorbiaceae
34	*Morus alba*	Kimbu	Moraceae
35	*Litsea monopelata*	Kutmiro	Lauraceae
36	*Duabanga grandiflora*	Lampate	Lythraceae
37	*Engelhardtia spicata*	Mauwa	Juglandaceae
38	*Erythrina stricta*	Phaledo	Leguminosae
39	*Ficus religiosa*	Pipal	Moraceae
40	*Pinus roxiburghii*	Sallo	Coniferae
41	*Terminalia tomentosa*	Saj	
42	Bombax ceiba	Simal	Bombacacea
43	*Vitex negundo*	Simali	Verbenaceae
44	*Mallotus philippensis*	Sindure	Euphorbiaceae
45	*Albizia chinensis*	Siris	Leguminosae
46	*Dalbergia sisoo*	Sisoo	
47	*Bauhinia vareigata*	Tanki	Leguminosae
48	*Alnus nepalensis*	Uttis	Betulaceae

Source: IEE Field Visit Survey, 2016.

83. Some of the mammals reported to be present in the nearby forests are listed in Table 9. The subproject will not impact any habitats of these animal species as the subproject sites will not be located in these areas. The DEWAT facilities will be located at the community forests where none of these animals thrive.

Table 9: Mammals in the Subproject Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Canis Lupus*	Gray Wolf	Bwanso	LC
2	*Panthera pardus*	Common Leopard	Chituwa	VU
3	*Histrix indica*	Indian Crested Porcupine	Dumsi	Not available in IBAT
4	*Vulpes vulpes*	Red Fox	Rato Fyauro	LC
5	*Canis aureus*	Golden Jackal	Syaal	LC
6	*Mus Musculus*	House Mouse	Musa	Not available in IBAT
7	*Felis Chaus/Prionailurus bengalensis*	Jungle Cat	Ban Dadhe	LC
8	*Funambulus Pennantii*	Five Stripped Palm Squirrel	Paanch Dharke Lokharke	LC
9	*Taphozous longimanus*	Long-winged Tomb Bat	Chamera	Not available in IBAT
10	*Martes flavigula*	Yellow Throated Marten	Malsapro	LC
11	*Macaca mulatta*	Rhesus Monkey	Rato Badar	LC
12	*Semnopithecus schistaceus*	Nepal Grey Langur	Langure Badar	LC

Note: Though 'Common Leopard' falls under VU category, the project activities will not affect the habitat of this species.
Source: IEE Field Visit Survey, 2016.

84. Some of the birds reported in the forest areas are listed in Table: 10. The subproject will not impact these bird species including their habitat. The nature of subproject activities will not endanger the existence of these species.

Table 10: List of Birds in the Subproject Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Eudynamys Scolopaceus*	Western Koel	Koili	LC
2	*Tyto alba*	Barn owl	Gothe Latokoshero	LC
3	*Turnix Sylvaticus*	Common Quail	Battai	LC
4	*Passer domesticus*	House Sparrow	Bhangera	LC
5	*Ciconia espiscopus*	Asian Woollyneck	Bhudi Phor	VU
6	*Pellorneum ruticepa*	Puff-throated Babbler	Bhyakur	LC
7	*PsilopogonAsiaticus/Megalaima australis*	Blue Throated Barbet	Kuthurke	LC
8	*Ictinaetus malaiensis*	Black Eagle	Chil	LC
9	*Arborophila torqueola*	Hill Patridge	Chyakhura	LC
10	*Acridotheres tristis*	Common Myna	Dangre Rupi	LC
11	*Streptofelia sp*	Oriental Turtle Dove	Tame Dhukur	LC
12	*Bubo Bengalensis*	Rock Eagle Owl	Huchil	LC
13	*Cuculus micropterus*	Indian Cuckoo	Kafal Pakyo	LC
14	*Pycnotus cafer*	Red- Vented Bulbul	Jureli	LC
15	*Corvus macrorhynchos*	Large Billed Crow	Kaalo Kaag	LC
16	*Lophura leucomelans*	Kalij Pheasant	Kalij	LC
17	*Caprimulgus macrurus*	Large Tailed Night Jar	Lampuchhre	
18	*Bubo nipalensis*	Spot Bellied Eagle Owl		LC
19	*Megalaima Virens/Psilopogon Virens*		Nyauli	LC
20	*Psittacula cyanocephala*	Plum Headed Parakeet	Tuisi Suga	LC

Note: Though 'Asian Wollyneck' falls under VU category, the project activities will not affect the habitat of this species.
Source: IEE Field Visit Survey, 2016.

85. The commonly found reptiles and amphibians observed in the subproject area are presented in Table 11. The subproject will avoid impacting these species. During construction activities, hurting or killing these species will be avoided when there is encounter. The EMP provides for this measure.

Table 11: List of Reptiles and Amphibians Found in the Subproject Area

S. No.	Scientific Name	English Name	Local Name	Status
1	*Ptyas mucosus*	Rat Snake	Dhaman	Not available in IBAT
2	*Ovophis monticola*	Chinese Mountain Pit Viper	Andho Sarpa/ Chhirbire Sarpa	LC
3	*T. albolabris*	Green Pit Viper	Hariyo Sarpa	Not available in IBAT
4	*Calotes versicular*	Garden Lizard	Chheparo	Not available in IBAT
5	*Hemidactylus brookii*	Common Lizard	Mausuli	Not available in IBAT
6	Bufo melanostictus	Common toad		
7	Rana cyanophylectis	Stream frog		

Source: IEE Field Visit Survey, 2016.

86. Similarly, common fishes found in the subproject area are given in Table 12. The subproject will not impact any bodies of water used for breeding and fishing. The discharge points of the DEWAT facilities are streams that are not connected to any of these bodies of water. As such, the subproject will not impact any of the fish species.

Table 12: List of Fishes Found in the Subproject Area

SN	Scientific Name	Local Name	Migratory species	Economic Importance
1	*Barilius Vagra*	Faketa	R	Food
2	*Garra* sp	Buduna	R	Food
3	*Glyptothorax* sp	Kabre	R	Food
4	*Heteropneustes fossilis*	Singhi	R	Food
5	*Neolissocheilus hexagonolepis*	Katle	MM	Food
6	*Noemacheilus* sp	Gadela	R	Food
7	*Psilorhynchoides pseudecheneis*	Tite (Endemic)	R	Medicinal
8	*Schizothoraichthys sp*	Asala	R to MM	Food
9	*Channa gachua*	Hile	R	Food
10	*Tor*	Sahar	R to MM	Food

Source: IEE Field Visit Survey, 2016.

2. Protected Area

87. The subproject will not encroach into, or be near, any protected area. No protected forest will get affected from the proposed subproject intervention.

3. Community Forest

88. The community forests within and nearby of the proposed subproject are Chandrawati Community Forest, Suppa Community Forest, Gaurasoara Community Forest and Khorthali Community Forest. These community forests are not protected forests of the country and are managed by the communities for their own use. The DEWAT plants will be constructed within the community forest and the effluent from the plant may be utilized by the farmers of the community forest and required land for treatment plant will be provided by them. However, the WUA or municipality shall ensure that quality of the effluent that may be used by farmers should comply with the government irrigation standards. See Appendix 4 for the Nepal Water Quality Guideines for Irrigation Waters. Furthermore, the WUA or municipality will ensure to follow the guidelines and precautions provided in the WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater, Volume 2: Wastewater use in agriculture.[24]

C. Socioeconomic and Cultural Environment

1. Settlement Pattern

89. The spatial distribution pattern of settlements in Bhimeshwor Municipality is found to be scattered in the agricultural village areas and agglomerated in the accessible commercial areas, tended to be clustered in the main road area. There is a dense linear settlement in the main Charikot Bazaar. The rural area of the Village Develoment Committee is gradually shifting towards the urban area with emerging market along the main roads and settlements, however such urban growth has been hindered by limited population growth and steep terrain of the area.

2. Population and Demographic Characteristics

90. The total population of Bhimeshwor Municipality as per census of 2011 is 22,537. The population of this municipality in 2001 was 21,916. The analysis of census population shows that

[24] WHO. 2006. *Guidelines for the Safe Use of Wastewater, Excreta and Greywater*.

the overall annual growth rate of the municipality is only 0.28%. Many wards have declining population growth in last one decade.

91. The average household size of the area has decreased from 4.46 in 2001 to 3.71 in 2011. Ward 1 of the municipality, the old Charikot bazaar area, is the only comparatively densely populated ward. The population density of this ward is slightly high. The overall population density of the subproject area increased from 3.77 persons per hectare in 2001 to 3.87 persons per hectare in 2011.

3. Beneficiaries Households

92. A socioeconomic survey was conducted in 2018 at, the proposed service area. It shows that the total household to serve by small-bored sewer line is 500 and population of the service area is 2,500. Table 13 shows the coverage of population including beneficiaries' households in the subproject area.

Table 13: Beneficiaries households

Ward	Households	Base Year Population
10	500	2500
Total	500	2500

Source: Socioeconomic survey by IEE team in 2016.

4. Ethnicity and Caste

93. The survey revealed that Brahmin/Chhetri are the major caste group of the subproject area comprising about 49% of the total households where the Janajati comprises about 41%. Similarly, the Dalits and other caste groups (Mushalman and Madheshi etc.) are 10% and 1%, respectively.

5. Education and Health

94. **Education.** The institutional data shows that twelve educational institutions including two Multiple Campus one Nursing campus, eight higher secondary level schools as well as one children home was recorded in service area with 5363 people including students, staffs and teachers. Likewise, about 14 governmental, nongovernmental and financial institutions exist in the area and providing service to the community.
There are several educational institutes like schools and colleges in the Municipality. The socio economic survey of 2016 AD shows that the overall literacy rate is 90.73 %. About 9.27 % are still illiterate and only 6.77 % have graduated or reached above graduate level.

95. **Health.** Medical facilities for diagnosis and treatments are available in the service area. There are seven medical institutions including three hospitals, four Health post and polyclinic with 49 bed capacities was recorded.

6. Economic Activities

96. The economy of the municipality is extensively agrarian although most of the households in the subproject area depend on more than one occupation. During the course of household survey of subproject area, detail information data has been collected about the major occupation and economic activities of all household head. Because of the survey as illustrated in the table below shows that, highest number of population i.e. about 36% engaged in Agriculture, whereas

26.68% are service holders, about 24% depend on business about 7% are engaged in foreign employment, 3% are labor and 0.10% are dependents.

97. There are more than 10 hotels/lodges with 104 bed capacities and managed by 14 staff in the subproject area. Now, there are not many industries and business in Charikot. The survey shows that there are 4 industries operating in the subproject area. The type of industries operating in the municipality is rice mills, cotton, grill and carpet etc.

98. There are four public and private banks proving banking services to the people of the municipality. Similarly some cooperatives are also in operation in the service area.

99. There are 12 educational institutions and 18 government/nongovernment organization (NGO) offices. The major government offices are district-based offices and Municipality office.

7. Poverty Conditions

100. The survey revealed that main sources of household income of the service area are agriculture, service, remittance and wage labor, respectively. Among the total households 5.69% percent have monthly income less than NRs7,500 which is considered as poor household. About 8.66% of households have monthly income ranges of NRs7501 to NRs10,875. Similarly, 40.57% of households have income range of NRs10,875 to NRs20,000, 36.06% of household have income range of NRs20,001 to NRs50,000 and about 9.02% of households have income ranges above than NRs50,000 in a month.

101. Similarly, the survey shows that about 5.69% of total populations live below poverty level.

Table 14: Distribution of Mean Monthly Household Income

	Ward												Grand	
Income Range	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**13**	**Total**	**%**
<Rs.7500	47	82	18	23	16	81	31	57	0	48	14	20	437	11.37
Rs.7501-Rs.10875	40	34	18	15	24	95	54	62	0	73	16	32	463	12.05
Rs. 10876-Rs.20000	319	50	18	24	73	103	123	83	11	342	164	167	1477	38.44
Rs.20001-Rs.50000	468	25	13	5	95	56	79	32	21	304	84	59	1241	32.30
>Rs.50000	63	20	5	1	12	9	18	7	0	76	9	4	224	5.83
Grand Total	937	211	72	68	220	344	305	241	32	843	287	282	3842	100

Source: Socioeconomic survey by IEE team in 2016.

D. Existing Sanitation Situation

1. Existing Sanitary Situations

102. **Sanitary Facilities.** The overall sanitary condition of the municipality is found to be reasonably satisfactory. In the core area, almost all households have their private toilets whereas in isolated/semi-urban areas some people still practice open defecation. The socio-economic survey (2016) reported that 4% households still practice open defecation in subproject area and majority of households i.e. 63% have either water-sealed private toilets or improved pit latrines. Remaining 37% pit latrines has to be improved or modified.

Table 15: : Toilet Coverage (Households)

Type of Toilet	Service Area Ward No.10	Percentage of Toilets Types (%)
No toilet	22	2.61
Pit Latrine	21	2.49
Ventilated. Pit	270	32.03
Pour flush	527	62.51
Cistern flush	3	0.36
Grand Total	843	100.00

Source: Socioeconomic survey by IEE team in 2016.

103. The existing latrines in the houses as well as in the schools are not maintained properly. The community has very limited knowledge on the use of sanitary latrines and personal hygiene especially in the city periphery.

104. **Drainage Facilities**. There is no proper drainage system for storm water as well as for the domestic sewage in Bhimeshwor Municipality. The core area of the city along the highway has about 1 km of open surface drains on each side in ward 1 and other few stretches surface drain to avoid local poundage. As the terrain is mostly steep, people are less concerned about storm water drain.

105. **Wastewater Management Practices** There is no sewerage system in the subproject area. Wastewater from individual households is managed inside the house. The socio-economic survey conducted in 2016 shows that 100% households have their own toilet. Some of them have constructed septic tanks and some have pit and ventilated pit latrines. There is no wastewater treatment plant in the Municipality to treat domestic sewage/septage. The municipality is planning to organize separate unit for sewerage/septage and solid waste management. However, the survey shows that 99% of the sampled households showed an interest in improving the sewerage/septage management system and are interested to pay for it.

106. **Solid Waste** The major sources of waste generation in Bhimeshwor Municipality are households, hotels, hospitals, vegetable and fruits market, meat stores, groceries, clothing/ fancy stores/tailors etc. There has been no study about types and volume of solid wastes. The municipality does not have an integrated solid waste management infrastructures in place yet. Nonetheless, the municipality implements measures to minimize generation of wastes, such as the adoption of the reduce-reuse-recycle scheme.

2. Existing Institutional Situation

107. **Existing Institutions Involved in Water Supply and Sanitation Field.** The main institutions involved in water supply and sanitation sector in the subproject area are Bhimeshwor Municipality, Water Supply and Sanitation Division Office (WSSDO), Charikot water users' and sanitation committee, other WUSC Committees and some NGOs. WSSDO, Dolakha has been actively supporting most of the WUSCs to operate the existing water supply system and carry out different WASH activities in the subproject area. It has been providing both financial and technical support for large-scale maintenance and providing pipes, bleaching powder and human resource as and when needed basis.

108. **Water Supply and Sanitation Users' Association**. The Integrated Charikot Water Supply and Sanitation Committee consist of eight members representing from various WUSC and clusters within the service area. The executive committee consists of six male and two female members and two male members are in key positions of chairperson, vice chairperson and

secretary where as one female member is working as treasurer. According to the caste/ethnicity status of WUSC body, six members are from Brahman/Chhetri and 2 members are from Janajati women (Newar Community) groups respectively in Charikot WUSC.

109. The WUSC was registered in Water Resource Committee, Charikot in 2054 B.S. as per the Water Resource Act-2049 and Water Resource Rule 2050 and involved in management and improvement of the water supply and sanitation system in Dolkha Bazar. Similarly, renewal of WUSC and annual general meeting has been carrying out regularly. The name list and position of the existing WUSC are given in Table 16 below:

Table 16: Members of Charikot STWS Users and Sanitation Committee

S.N.	Name	Position
1	Mr. Ram Krishna K.C	Chairperson
2	Mr. Krishna Bahadur Khadka	Vice Chairperson
3	Mr. Dhurba Bashnet	Secretary
4	Ms. Anita Shrestha	Treasurer
5	Mr. Moti Prasad Chaulagai	Members
6	Mr. Ram Saran Thapa	Members
7	Ms. Kamala Maharjan	Members
8	Mr. Ram Sharan Thapa	Members

110. Consistent with the implementation arrangement under UWSSP, WUSC will assist the PMO to implement the proposed subproject and it will operate and maintain the sewer network and DEWAT facility. WUSC will be the operator of the subproject, which is managing the entire water supply and sanitation system of Bhimeshwor Municipality.

VI. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Beneficial Impacts

111. Availability of adequate sanitary facility is an important communal need in order to maintain good hygiene in the community and healthy living of the people. The development of sanitation facilities will have numerous beneficial impacts to individuals and communities. Improved sanitation needs will significantly improve the quality of life of the area. Some of the major beneficial impacts (Table 17) of the subproject are described below along with suggestions for achieving optimal benefits.

112. **Employment Generation.** The subproject will generate direct employment opportunities e.g. skilled and non-skilled work for the local people. Construction activities such as laying and joining of pipelines will create opportunities for about fifty local people. The earning will positively affect the local economy, thereby reducing the chances of seasonal migration of the local people. To obtain such benefits, priority will be given to employing local laborers. The impact is thus direct in nature, local in extent, medium in magnitude and short term in duration.

113. **Skills Enhancement.** The construction of the subproject will not only provide direct employment opportunities but also ensure the transfer of skills and technical proficiency to the local workforce. The subproject activities i.e. constructing mechanical treatment plants, surface drains, valve chambers and buildings will generate transferable skills. In future, these skills will be useful for locals to generate income as well as implement when the need arises. To obtain or augment such benefits, proper work plans and codes of conduct should be implemented during the construction. The impact is thus indirect in nature, local in extent, medium in magnitude and long-term in duration.

114. **Local Trade and Business Opportunity.** The proposed subproject creates business opportunities in the subproject area. Because construction work involves many workforces, sales from few shops with food items and agriculture and livestock products will increase around the construction site. This demand and supply chain will boost local trade and the business sector. The impact is thus direct in nature, local in extent, medium in magnitude and long-term in duration.

115. **Improved Health and Hygiene.** Deteriorating water quality and unsanitary conditions are often the causes of waterborne communicable diseases. After the implementation of the subproject, the hygiene of the local people will improve which will reduce the occurrence of waterborne diseases thereby improving the public health in the area. Regular maintenance of the subproject components needs to be carried out so that the subproject operates smoothly, and the benefits are kept intact. The impact is thus direct in nature, local in extent, high in magnitude and long-term in duration.

116. **Increased Economic Opportunity**. After the completion of the subproject, there might be increased rural-town migration due to better facilities and opportunities. The increased economic level may increase the value of the land, thereby uplifting the economic status of the local people. These benefits can be maximized by ensuring regular maintenance of water supply and sanitation components and by promoting land development activities in the area. The impact is thus indirect in nature, local in extent, medium in magnitude and long-term in duration.

117. **Women Empowerment.** Women and girls are mainly responsible for household activities. Improved water supply and sanitation will contribute towards better health and hygiene of women, girls and the entire household members. The beneficial impacts to women and girls can be augmented by conducting health and awareness programs to the local community. The impact is thus indirect in nature, local in extent, low in magnitude and long-term in duration.

118. Overall, the subproject will lead to improved public health and environment, significantly improving the quality of life of the Bhimeshwor Municipality residents.

119. To sustain the positive outcomes, effective operation, and maintenance guided by an O&M manual is essential. Continuing hands-on training of WUSC in EMP implementation particularly wastewater and effluent quality monitoring is necessary.

Table 17: Summary of Impact Matrix of Beneficial Issues of BWSSP

Beneficial Impacts	Impact Rating				
	Nature	Magnitude	Extent	Duration	Rating
Construction Phase					
Employment Generation	D	M (20)	L (20)	ST (5)	Significant (45)
Skill Enhancement	ID	M (20)	L (20)	LT (20)	Significant (60)
Local Trade and Business	D	M (20)	L (20)	LT (20)	Significant (60)
Operation Phase					
Improved Health and Hygiene	D	H (60)	L (20)	LT (20)	Very Significant (100)
Increased Economic Opportunity	ID	M (20)	L (20)	LT (20)	Significant (60)
Women empowerment	ID	L (10)	L (20)	LT (20)	Significant (50)

Note: Scoring is done by PMO/Third Small Towns Water Supply and Sanitation Project based on following:
Nature of Impact: D = Direct; IN = Indirect;
Magnitude, H = High (60); M = Medium/Moderate (20); and L = Low (10)
Extent, R = Regional (60), L = Local (20); and S = Site-specific (10)
Duration, LT = Long-term (20), MT = Medium-term (10); and ST = Short-term (5)
The points/scoring are taken from the National EIA Guidelines, 1993

Significance of Impact
Total Score: More than 75 : Very Significant
50-75 : Significant
Less than 50 : Insignificant

B. Assessment of Adverse Environmental Impacts

120. The nature of Charikot DEWAT subproject and scope of the civil works will generate impacts, issues and concerns prior to construction, during construction and during operation. The potential impacts, issues and concerns from the subproject using ADB REA Checklist for sewage treatment (Appendix 1) and "no mitigation measures scenario" checklist developed for UWSSP (Appendix 2) are presented in Table 18 below.

Table 18: Sanitation Subproject Potential Environmental Impacts, Issues and Concerns (No Mitigation Measures Scenario)

Design	Construction	O&M
• nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc. • disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups • impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage • overflows and flooding of neighboring properties with raw sewage • environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers • discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers • inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities • permanent or temporary change in land use or topography including increases in intensity of land use	• interference with other utilities and blocking of access to buildings • dislocation or involuntary resettlement of people • disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups • noise and vibration due to blasting and other civil works • risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards • road blocking and temporary flooding due to land excavation during the rainy season • noise and dust • traffic disturbances due to construction material transport and wastes • temporary silt runoff • population increase that causes increased burden on social infrastructure (such as sanitation system) • social conflicts between construction workers from other areas and community workers • risks to community health and safety due to the transport, storage, and use and/or disposal of materials	• nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc. • impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage • overflows and flooding of neighboring properties with raw sewage • environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers • risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards • discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers • noise • hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system • deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water • contamination of surface and ground waters due to sludge disposal on land

Design	Construction	O&M
	such as explosives, fuel and other chemicals • community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the subproject are accessible to members of the affected community or where their failure could result in injury to the community • clearance of existing land, vegetation or building • pre-construction investigations (boreholes, soil testing, etc.) • construction works • demolition works • temporary sites used for construction works or housing of construction workers • cut and fill or excavations • working in stream crossings • use of resources (materials, water, energy, etc.) • changes in occurrence of disease or affect disease vectors (e.g. insect or water-borne disease) due to worker's camp • solid wastes such as spoils, overburden, etc. • solid wastes from worker's camp • emission from burning of waste in open air (e.g. worker's camp, slash materials, construction debris)	• health and safety hazards to workers from toxic gases and hazardous materials which maybe contained in confined areas, sewage flow and exposure to pathogens in untreated sewage and unstabilized sludge • population increase that causes increased burden on social infrastructure (such as sanitation system) • risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals • community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the subproject are accessible to members of the affected community or where their failure could result in injury to the community • use of resources (materials, water, energy, etc.) • WTP sludge • positive impacts - employment to local people; safe and easy access to improved sanitation which will enhance people's health, and boost economic conditions of municipalities

121. **Location and Design.** The impacts, issues, concerns and mitigation measures during the design phase are given in Table 19. This IEE and the subproject descriptions are based on preliminary design. The location initially identified for DEWAT facility in Deurali Danda is about 200 m away from the nearest receptor (a school for the deaf), while the location for DEWAT facility in Shantinagar is also around 200 m away from nearest receptor (residential area). During the finalization of the location and detailed design, the subproject will identify alternative locations that are at least 300m away from the nearest receptors. The final layout of the facility will be designed in such a way that the odor-producing components are placed at the farthest end relative to the location of the nearest receptor. The design of these components will include mechanisms or devices that will help reduce leakage of odor to the surroundings.

122. Planning principles, subproject selection criteria as indicated in the PAM and EARF of UWSSP, and other design considerations will be incorporated into the final site identification and final detailed design of the DEWAT facilities. This draft IEE will be updated to include the final locations and final detailed design and ensure compliance with the PAM and EARF.

1. Impacts and Mitigation Measures during Design Phase

123. Apart from the above technical considerations in the design of the DEWAT facility, the other impacts, issues, concerns and mitigation measures during the design phase are illustrated in Table 19.

Table 19: Impacts and Mitigation Measures during Design Phase

Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility
Detailed design			
Incorporation of sloped areas in subproject design	Soil erosion and slope instability	• Incorporate measures and sites for handling excessive spoil materials • Incorporate drainage plan in final design	Project management office (PMO), regional project management office (RPMO) and design, supervision and management consultant (DSMC)
Location of pipes and photographs of sites and utilities before construction, particularly in heritage areas, if any.	False claims from people; water quality changes due to construction. Interference with other utilities and photo of heritage areas to avoid impacts to heritage structures during construction	• Place water pipes away from 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 including preparation of Archaeological Impact Assessment, or other agreed document by DOA if required.	PMO,RPMO and DSMC
Location of decentralized wastewater treatment (DEWAT) facilities, including constructed wetlands.	Nuisance to nearby receptors. Impacts to qualities of ambient air, surface water, groundwater, and land.	• Locate DEWAT plants, including constructed wetlands away from human receptors. • Adopt in the design the use of internationally accepted standards or guidelines, lessons learned and experiences in DEWAT facilities and constructed wetlands.	PMO,RPMO and DSMC

Project Activity	Potential Environmental Impacts	Proposed Mitigation Measures	Responsibility
		• Ensure compliance with national or international standards on noise, ambient air and effluent, whichever are more stringent.	
Operation and maintenance (O&M) Manual preparation	Health and safety of community and workers	• Prepare a comprehensive O&M manual to include lessons learned from global experiences of DEWAT operations. • Prepare training manuals in Nepali with sketches on community health and safety and potential occupational health and safety during construction. • Prepare training manual for DEWAT plant workers on the efficient implementation of the DEWAT O&M manual.	PMO,RPMO and DSMC
Sludge management and disposal	Inappropriate disposal of sludge from reservoirs and treatment plant will cause nuisances to affected properties. Inappropriate use of sludge as soil conditioner or fertilizer will affect quality of crops and soil, and potential contamination of groundwater and surface water.	• The design of sludge disposal sites will be made at designated sites approved by the municipalities. • A sludge management plan will be developed following internationally recognized standards such as the World Bank Environmental, Health and Safety (EHS) Guidelines on Water and Sanitation (footnote 23) and WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater, Volume 2: Wastewater use in agriculture (footnote 25).	PMO,RPMO and DSMC

2. Impacts During Construction Phase

124. Except the sewer pipelaying works, all other construction activities will be confined to the selected sites, and the interference with the public and community around is minimal. There will be temporary negative impacts, arising mainly from construction dust and noise, hauling of construction material, waste and equipment on local roads (traffic, dust, safety etc.,), mining of construction material, occupation health and safety aspects. Impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic by the construction work, safety risk to workers, public and nearby buildings due to trench excavations, especially in narrow roads, dust, access impediment to houses and business, disposal of construction waste, etc. These are all general impacts of construction in urban areas, and there are well developed methods of mitigation that are suggested in the EMP.

125. **Non-Compliance with Environmental Legislation.** This issue will arise when there is a lack of awareness among subproject staff and management of environmental safeguard requirements, compliance with the requirements, conditions specified in the IEE report, approval status, and consent.

126. Mitigation measures include (i) capacity strengthening of the PMO Environmental Officers and their counterpart at the town project level; and (ii) ensuring that necessary permit and registration are obtained.

127. **Erosion and Land Surface Disturbance.** Excavation and digging of trenches during construction has the potential to cause erosion and cave-ins 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 aesthetic and economic values of the area. The activity will be a discomfort to the road users and inhabitants. Quarrying activities operated to supply the aggregate demand of the Subproject may disturb land that could cause further erosion and landslides. The impact is thus direct in nature, local in extent, high in magnitude and short term in duration.

128. **Mitigation measures include proper backfilling of trenches.** Temporary access, diversions, and signboards for pedestrians will be provided. The exposed soil will be stabilized and revegetated to prevent further soil erosion. The contractor must coordinate with District Development Committee and the concerned Ministry on restrictions in quarrying and the legitimacy of extraction operations of identified sources. The contractor must secure permits for quarrying aggregates and implement a restoration plan, which is part of EMP.

129. **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; (iv) transport, loading and unloading of natural aggregates; (v) movement of construction-associated vehicles; and (vi) on-site rock crushing and concrete mixing; (vii) burning of firewood for cooking and heating in work and labor camps. The impact is thus indirect in nature, local to regional in extent, medium in magnitude and short term in duration.

130. Mitigation measures include:

(i) confining earthworks according to excavation segmentation plan that should be part of site-specific environmental management plan (SEMP);
(ii) watering of dry exposed surfaces and stockpiles of aggregates at least twice daily, or 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) place signage at active work sites in populated areas;
(vi) requiring trucks delivering aggregates and cement to have tarpaulin cover;
(vii) limiting speed of construction vehicles on access roads and work sites to a maximum of 30 kilometer per hour (km/h);
(viii) prohibit burning firewood in work and labor camps (promote liquified petroleum gas for cooking purposes and electric heater for heating purposes);
(ix) use of vehicles complying with Nepal Vehicle Mass Emission Standards (NVMES), 2069 enforcement, and green sticker standards; and
(x) prohibit open burning of solid waste.

131. **Noise.** Noise-emitting construction activities include earthworks, 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 higher in areas

where noise-sensitive institutions such as health care and educational facilities are situated. Noise levels should not exceed the national standards for noise or WHO noise level guidelines, whichever is more stringent, or result in increase in background noise level of 3 decibels at the nearest receptor location off-site.[25] The comparative illustration of national standards versus WHO guidelines is in Table 6 of Section III. The impact is thus direct in nature, local in extent, medium in magnitude and short term in duration.

132. Mitigation measures include:
- (i) using equipment that emits the least noise, well-maintained and with efficient mufflers;
- (ii) restricting noisy activities to day time;
- (iii) avoiding use of noisy equipment or doing noisy works at night time;
- (iv) limit engine idling to a maximum of one minute;
- (v) spread out the schedule of material, spoil and waste transport; and
- (vi) minimizing drop heights when loading and unloading coarse aggregates.

133. **Impacts on Water Resources.** Some sections of the sewer network may cross water bodies, exposing these water bodies to risks of pollution caused by: (i) poorly managed construction sediments, and waste materials; (ii) poor sanitation practices of construction workers; and (iii) improper storage of petroleum products or chemicals used during construction such as fuel, oil and lubricants. Polluted water bodies will be harmful to aquatic life and people that depend upon such contaminated sources. The impact is thus direct in nature, local to regional in extent, medium in magnitude and short term in duration.

134. Mitigation measures include:
- (i) excess spoils will be disposed per the Spoil Management Plan attached in Appendix 5;
- (ii) locating temporary storage areas on flat grounds and away from main surface drainage routes;
- (iii) shielding temporary storage areas with sandbags;
- (iv) providing adequate water supply and sanitation facilities at work sites;
- (v) providing impervious protective linings for storage areas of petroleum products used during construction, such as fuel, oils, and lubricants; and
- (vi) providing orientation and training to assigned workers on the correct handling of petroleum-based products, clean up of equipment, and response measures in case spills or emergencies.

135. For management and final disposal of solid wastes following mitigation, measures that will be applied are:
- (i) collection of recyclable solid wastes and supply to scrap vendors;
- (ii) ensure all the camp wastes and construction wastes are placed in the designated waste collection pits away from receiving water;
- (iii) establishment of separate bounded and lined areas for the collection and storage of all the toxic material wastes, including batteries, oil filters, mobil, burnt oils, etc. at the construction site;
- (iv) collection of biodegradable wastes in separate vessels and transfer to municipal waste disposal system; and

[25] World Bank Group. IFC. 2007. *Environmental, Health, and Safety (EHS) Guidelines. General EHS Guidelines: Environmental - Noise Management*.

(v) application of various waste disposal systems for diverse wastes produced on site per consultations with environmentalists.

136. **Impacts on River Morphology and Hydrology.** Quarrying from riverbeds could cause the alteration of the river morphology and hydrology. The contractor will obtain quarry materials from Government-approved areas or sources authorized by the Government to supply such materials. The impact is thus direct in nature, local in extent, high in magnitude and short term in duration.

137. To mitigate the negative impacts the contractor needs to coordinate with MOWS and local authorities for any quarry-related activities. Alternative sources should be identified, before finalizing any quarry site approval. An Aggregates Management Plan must be part of the SEMP. The contractors should be required to obtain aggregates only from sources with environmental clearances and licenses.

138. **Impacts on the Quality of Groundwater Resource.** The construction phase of the subproject components will not affect the quality of ground water resource. Any potential sources of groundwater contamination due to seepage of construction chemicals such as fuels. The depth of all excavation works will be shallow and will not reach the There are no private and community groundwater wells that will be affected by the subproject.

139. **Impacts on Flora and Fauna.** Haphazard site clearing, parking, and movement of construction vehicles and equipment stockpiling, will result in disturbance to the land in the subproject area. However, the subproject area does not include any forest, so the impacts to flora and fauna will be minimal. The impact is thus direct in nature, local in extent, low in magnitude and short term in duration.

140. **Traffic Disturbance.** During construction, few disturbances will occur. Mitigation measures include installing clear signages and markers to direct traffic movement in sites.

141. **Impacts on Physical, Cultural Resources.** The subproject will not encroach into, or be near physical, and cultural resources.

142. **Impacts on the Socioeconomic, Environment and Resources.** The impacts will result from excavation works, stockpiling, the operation of construction vehicles and equipment, and accidental damage to utilities (e.g., power supply poles, open drains, and water taps or hoses). Nuisance and safety hazards are the indirect impacts. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration.

143. Mitigation measures include:

(i) prepare a traffic management plan in collaboration with local authorities;
(ii) where traffic congestion will likely occur, place traffic flagmen during working hours;
(iii) provide compensation to affected people;
(iv) manage to stockpile;
(v) manage pumped water from excavations either to drains or drums for later use;
(vi) relocate the affected power supply poles, and
(vii) advise the concerned authority during accidental damage to utilities.

144. **Community health and safety hazards**. Communities will be moderately exposed to threats due to impacts on air and water quality, ambient noise level; mobility of people, goods,

and services; accesses to properties, economic activities, and social services; service disruptions, etc. Construction workers may potentially bring communicable diseases in the community. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration.

145. Mitigation measures include:

(i) contractor's implementation of SEMP;

(ii) contractor's inclusion in the SEMP the implementation of community health and safety plan following international best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines on Construction and Decommissioning Activities.[26] As a minimum and whichever is applicable, the community health and safety plan shall ensure the following:

(a) implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning;

(b) restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community;

(c) removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; and

(d) implement measure to prevent proliferation of vectors of diseases at work sites;

(iii) adequate space and lighting, temporary fences, shining barriers and signage at active work sites;

(iv) contractor's preparedness in emergency response; and

(v) adequate dissemination of GRM and contractor's observance and implementation of GRM; and

(vi) upon availability, local people should be given an opportunity for work in the subproject activities.

146. **Workers' health and safety hazards.** Workers will be exposed to the crosscutting threats of the impacts above during construction. Inadequate supply of safe and 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 be potentially exposed to communicable and transmittable diseases in the community and the workforce. The impact is thus indirect in nature, local in extent, medium in magnitude and short term in duration.

147. Mitigation measures include implementation of an occupational health and safety plan to include international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities (footnote 27). The occupational health and safety plan should be included in the SEMP. As minimum and whichever are applicable, the occupational health and safety plan shall ensure the following:

[26] World Bank Group. IFC. 2007. *Environmental, Health, and Safety (EHS) Guidelines - General EHS Guidelines: Construction And Decommissioning*.

(i) Communication and Training

(a) Training of all workers on occupational health and safety prior to construction works;
(b) Conduct of orientation to visitors on health and safety procedures at work sites;
(c) Signages strategically installed to identify all areas at work sites, including hazard or danger areas;
(d) Proper labeling of equipment and containers at construction and storage sites; and
(e) Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; firefighting equipment; and communication with nearest fire brigade station;

(ii) Physical Hazards

(a) Use of personal protective equipment by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, and ensure these are used properly;
(b) Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
(c) Use of bracing or trench shoring on deep excavation works;
(d) Adequate lighting in dark working areas and areas with night works;
(e) Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;
(f) Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
(g) Use of air pollution source equipment and vehicles that are well maintained and with valid permits;

(iii) General Facility Design and Operation

(a) Regular checking of integrity of workplace structures to avoid collapse or failure;
(b) Ensuring workplace can withstand severe weather conditions;
(c) Enough work spaces available for workers, including exit routes during emergencies;
(d) Fire precautions and firefighting equipment installed;
(e) First aid stations and kits are available. Trained personnel should be available at all times who can provide first aid measures to victims of accidents;
(f) Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
(g) Good working environment temperature maintained;
(h) Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply,

wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and

(i) Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur.

148. **Impacts on the sustainability of works.** During construction, seismic events may occur, causing damage to unsettled, unfinished, or uncured and completed structures and affecting their structural integrity. The impact is thus direct in nature, local in extent, medium in magnitude and short term in duration.

149. Mitigation measures include conduct engineering investigations of built structures and implement the necessary corrective actions immediately after any major seismic event.

3. Impacts, Issues, Concerns and Mitigation Measures during Operation

150. Based on global experiences, DEWAT is a low maintenance treatment system compared with other conventional centralized systems known in the industry today. However, the operation and maintenance of DEWAT system is crucial in terms of facility supervision, sustainability and costs.[27] It is also during the O&M stage that impacts to the environment are very critical that the mitigation measures need to be well managed.

151. **Lessons learned from global experiences in DEWAT plant operations and maintenance**. DEWAT is a low cost, efficient, medium technology and low maintenance system compared with expensive centralized system that requires high skilled maintenance; but the operation and maintenance is crucial that maintenance activities need be more frequent. The components of a DEWAT system should be designed appropriately based on the conditions and possible scenarios or situations they may face during the O&M stage. Table 20 shows some of the problems and solutions based from actual experiences of these DEWAT facilities already operating around the world (footnote 8). All these factors should be considered in the development of O&M manual for the DEWAT plants under the subproject.

Table 20: Documented Problems and Solutions of DEWAT Facilities

Problems	Solutions
1. Insufficient or excessive volume and extremely erratic quality of influent or raw wastewater. These situations upset the treatment process leading to partial treatment of the wastewater.	- Prevent uncontrolled inflow of groundwater or stormwater into the system. - Discourage accommodating wastewater volume beyond the design capacity. Install additional parallel treatment system if necessary.
2. Excessive accumulation of scum;	- Remove excess sludge or scum and maintain appropriate thickness or depth according to design. - Follow removal and handling procedure discussed in the guidelines.

[27] Internation Water Association World Water Congress. 2012. *Sustainable wastewater management – operation and maintenance management models*. Busan.

Problems	Solutions
3. Scum layers or floating materials on ponds. This can hinder some treatment processes.	- For anaerobic ponds: no measure needs to be taken. The scum layer helps to maintain the absence of oxygen, controls the temperature and prevents the release of bad odors. - For facultative ponds: remove scum layers, place scum into plastic bags and practice proper garbage disposal. Light and wind penetration of the pond surface should be ensured.
4. Scums and growth of algae and other terrestrial vegetations on ponds. This situation creates bad smells.	- For anaerobic ponds: Vegetation on internal or external slopes, as well as in shallow water should be removed completely and regularly. - For facultative ponds: remove excessive algal growth on the surface, which is prohibiting passage of light, with sieves. Remove excessive aquatic plants restricting the area flow and creating oxygen demand upon plant mortality. - For indicator ponds (polishing ponds): Algae should be removed from the walls by a brush every 14 days. - Install baffles at the effluent section of each pond to retain and remove algae. - Use multiple cells in series with shorter retention time.
5. Unexpected weather conditions and low temperatures in the area. This can reduce the treatment efficiency of the ponds;	- Reduce the depth of the facultative pond temporarily. If possible, put ponds in parallel operation.
6. Metal or concrete erosion in anaerobic reactors caused by insufficient ventilation.	- Check and remove obstructions to the ventilation system, including chamber connections.
Pump malfunctions. These will hinder wastewater flow in the system.	- If a pump is used, check for obstructions and remove them. Check whether the pump-level control is functioning and that the pump is adequately lubricated. Each pump differs slightly, so consult the maintenance manual for the pump for more information about pump maintenance.
Clogged or damaged pipes. This situation will affect various processes and will upset the whole treatment system.	- Mechanical and maintenance works such as: (i) removal of obstructions at manholes with a shovel and bucket until normal flow is achieved; (ii) opening of pipes at all maintenance openings to check for backlogged water; and (iii) clearing intermittent section of piping with boiling water, a drain snake or long pole. - The reason for pipe obstruction should be identified to prevent identical problems in the future. - Monitoring flow at various control openings helps to locate leaks. - Damaged pipes must be replaced. - The reasons for pipe damage should be identified to prevent identical problems in the future.
Stagnant water turns into a breeding ground for mosquitoes, which cause discomfort for those near the pond, and increase the likelihood of insect-borne diseases such as malaria.	- Increase flow, so that water does not become stagnant. - Alternatively, introduce lung-breathing fish into the pond (i.e. *Gambusia spp.*).

Problems	Solutions
Clogged anaerobic or gravel filters.	- Filter material must be washed with high hydraulic pressure. In most cases the filter material must be removed, cleaned and replaced. Personnel must wear mouth and skin protection. - A clogged filter is an indicator that prior treatment is insufficient and too many suspended solids reach the unit. To prevent identical problems in the future, the cause of insufficient treatment should be identified.
Incorrect retention time within the treatment units can create smell or effluent quality problems	- Adjustments of flow must be made. - Check inlets and distribution of flow to treatment units like ponds or wetlands: (i) Anaerobic ponds: distribution by perforated pipes on the bottom of the pond. (ii) Facultative ponds: create several inlets with uniform distribution to each. (iii) Wetlands: ensure influent distribution across the full width.

[a] Detailed discussions on problems and solutions are discussed in detail in the practical guide published by BORDA (footnote 8).

152. **DEWAT Facility Operation and Maintenance Manual**. The O&M manual will be developed based on the potential environmental impacts of the DEWAT plants as enumerated in column 3 of Table 18 above. In addition, the O&M manual will be made more comprehensive by integrating lessons learned from actual operation of existing DEWAT facilities worldwide and following guidance documents of international best practices in DEWAT operations, such as the "Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide", designed and produced by Bremen Overseas Research and Development Association (BORDA) (footnote 8).

153. **Non-compliance with relevant environmental legislation.** This issue will arise when there is a lack of awareness of subproject staff and management of environmental safeguards requirements, compliance with the requirements and conditions specified in the IEE Report and approvals and permits for the use of water resources. The impact is thus direct in nature, local in extent, medium in magnitude and long-term in duration.

154. Mitigation measures include:

(i) capacity strengthening of WUSC and continuing capacity strengthening of subproject staff; and

(ii) ensuring compliance with EPA/EPR, national effluent standards, applicable conditions in IEE approvals and necessary permits to operate the DEWAT facilities.

155. **Occupational health and safety hazards.** Mishandling of chemicals and other hazardous substances may pose health and safety hazards to the workers. The impact is thus indirect in nature, local in extent, medium in magnitude and long-term in duration.

156. Mitigation measures include:

(i) Following international best practices on DEWAT plant operation such as those in Section 2.0 of the WB General EHS Guidelines on Occupational Health and Safety;[28]

(ii) installation of clear, visible signage in premises on the observance of safety measures;

[28] World Bank Group. IFC. 2007. *Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Occupational Health and Safety*.

(iii) development of O&M manual to be used as reference of workers and management in ensuring efficient functioning of the DEWAT components and minimize safety hazards at the facility;
(iv) setting up of an emergency response manual to be used as reference during emergencies, such as mechanism for quick response to spills of chemical and hazardous substances, among others.
(v) wearing personal protective equipment such as masks and gloves when working around the DEWAT facilities; and
(vi) Setting up/construction of watchman's quarter in the odor free zone.

157. **Discharge of Untreated or Partially Treated Wastewater into the Receiving Water Body**. The Jilu Stream and Kali Chhahara are the discharge points of the proposed DEWAT facilities in Deurali Danda and Shantinagar, respectively. These bodies of water are not used for fishing, bathing or source for drinking water. Nevertheless, the effluent from the facilities will negatively impact these receiving bodies of water if discharged untreated or partially treated. In view of this and in accordance with ADB SPS, the subproject will apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's EHS Guidelines on Water and Sanitation (footnote 23). These standards contain performance levels and measures that are acceptable and applicable to the subproject. When the national standards differ from these levels and measures, the subproject will achieve whichever is more stringent.[29] Further, the discharge of effluent will not upset the assimilative capacity of the receiving body of water.[30] The impact is direct in nature, local in extent, medium in magnitude and long-term in duration.

158. Mitigation measures include:
(i) ensuring that the DEWAT facility components are functioning well according to design and treat the wastewater to comply with the tolerance limit for inland surface waters. For example, treated effluent should have an effluent BOD and COD concentrations of at maximum 50 mg/l and 250 mg/l respectively. (Note: The tolerance limit for BOD and COD concentrations of waste water discharge into land surface water for Nepal is 50 mg/l and 250 mg/l respectively);
(ii) in cases of DEWAT facility component shutdown or maintenance, ensuring that no untreated or partially treated effluent is discharged to the receiving water body and ensuring that raw wastewater or influent from the network is contained in holding tanks or lagoons; and
(iii) provision of standby holding tanks or lagoons sufficient enough to contain all wastewater from the sewer network during the duration of periodic DEWAT facility maintenance works or during sudden shutdowns for any reason.

159. **Contamination of Groundwater**. The operation of the DEWAT facility for a longer time may cause contamination of the ground water due to seepage of untreated wastewater.

160. Mitigation measures include:
(i) ensuring all components installed on ground are protected with impermeable layers or linings, such as clay or geo-membrane liner;

[29] If less stringent levels or measures are appropriate in view of specific project circumstances, the borrower/client will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in this document.
[30] See section on "General Liquid Effluent Quality: Discharge to Surface Water" of the General EHS Guidelines on Wastewater and Ambient Water Quality.

(ii) ensuring proper storm drainage system is constructed in the facility, which is separate from canals that will convey wastewater around the various components of the facility. These wastewater canals should be properly lined as well;
(iii) installation of monitoring wells around the DEWAT facility area.

161. **Nuisance from DEWAT Facility.** Bad odor and vectors of diseases such as insects or mosquitoes are potential nuisance to nearby households or communities. These types of nuisance are inherent in wastewater treatments and the duration of impact is long term.

162. Mitigation measures include:
(i) maintaining the facility in accordance with the O&M manual to ensure all components are functioning well;
(ii) cleaning of sand drying beds carried out routinely based on the O&M manual;
(iii) maintaining good housekeeping;
(iv) ensuring pest control measures are implemented at the facility and guided by ADB SPS policy on pesticide use and management; and
(v) planting of plant/tree species like Jasmine, Khayar, Tulsi, Vetiver, Nerium etc. around the treatment facilities for controlling odor impact.

163. **Use of Treated Wastewater for Irrigation**. One option of using treated wastewater is for irrigation. The treated wastewater may be diverted for irrigation especially during dry seasons, which could degrade or damage the quality of crops or plants and make them unsuitable for human consumption.

164. Mitigation measures include:
(i) ensuring the quality of treated wastewater comply with the Nepal Water Quality Guidelines for Irrigation Waters (see Appendix 4);
(ii) ensuring compliance with the guidelines and precautions provided by the WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater, Volume 2: Wastewater use in agriculture (footnote 25); and
(iii) using the treated wastewater to irrigate crops or plants that are not being consumed or eaten raw by human beings.

165. **Disposal of Sludge.** Sludge that will be generated by the DEWAT plants will be dried and stored on site or disposed in appropriate and authorized area to be identified in the sludge management plan. A sludge management plan will be developed and adopted by the operator (WUA or municipality) of the DEWAT facilities to ensure that the sludge will not cause any pollution to land or receiving water body due to mishandling.

166. After the construction of the sewer network and DEWAT facilities (including management of fecal sludge), then the sludge from the facilities may be utilized as either fertilizer or disposed in appropriate disposal site. A sludge management plan will be developed consistent with internationally recognized standards such as the World Bank EHS Guidelines on Water and Sanitation (footnote 23) and WHO Guidelines for the Safe Use of Wastewater, Excreta and Greywater, Volume 2: Wastewater use in agriculture (footnote 25). The Government does not have standards for disposal of sludge as soil conditioner. Therefore, the use of the dried sludge from DEWAT facilities as soil conditioner or fertilizer will have to comply with sludge management plan. The sludge management plan will identify all options that may be followed in handling the sludge generated, including identification of disposal sites. In addition to adhering with the sludge management plan, the use of sludge as soil condtioner or fertilizer will also have to seek

assistance/clearance from the Ministry of Agriculture, Land Management and Cooperatives or relevant national or local government office.

C. Indirect, Induced and Cumulative Impacts

167. **Indirect and induced impacts during construction.** The volume of vehicles that will be operated from the simultaneous construction at subproject component sites may create traffic jams on narrow access roads and hinder the mobility of people, goods, and services, particularly in the bazaar areas. A greater number of people may be exposed to safety hazards from the constricted road space. Coupled with disruption of economic activities and social services from extended interruption of power supply due to the relocation of power poles or likely accidental damages, production outputs will suffer a slowdown. Dust on crops nearby subproject area would have some effect on the crops' yields. Apart from the applicable mitigation measures, proper coordination with relevant ward authorities, social service institutions and businesses would further mitigate indirect and induced impacts.

168. **Cumulative impacts.** There is a Dolakha- Singati Road project ongoing in Charikot that connects Charikot with the rural area of Singati. The road also serves as the access road for one of the national pride project, the Upper Tamakoshi Hydroelectric Project. This road is one of the three priority roads in the recent earthquake affected districts considered for upgrading by ADB. The total length of the road is 35 km, which passes through various settlements, agricultural lands, and forests in Dolakha District. Out of the total 35 kilometers length of the roads, only a few kilometers lie within the Charikot area. Therefore, a cumulative impact is not expected in a magnitude that negatively affects the local environment.

169. The cumulative impacts will arise mainly from the construction of the subproject components and associated facilities. The subproject's main area of influence covers the component sites and areas within 200 m from their footprint boundaries. Potential impacts of construction noise, dust and socio-economic activities are expected within this area of influence. "Point works" refer to components of the DEWAT facility; "Horizontal works" refer to the sewer mains and pipes; the "Construction period" (excluding O&M) for the point works is estimated to be 1.5 years while for the horizontal works is estimated to be 1 year.

170. Assuming all components are started simultaneously, without mitigation, cumulative impacts will be "moderate" in magnitude during the peak construction (for the first four months of the construction). After this, the magnitude of cumulative impacts will lessen to "low" 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.

171. 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:

(i) civil works must be well planned, strategized and completed promptly;
(ii) the contractor should implement SEMP fully, and key institutions should act their roles in EMP implementation effectively;
(iii) there must be adequate consultations with stakeholders, including vehicle operators, and local authorities and coordination, particularly regarding expected cumulative impacts. vehicle operations should temporarily adjust to the circumstances to relieve some road space limitations and for public safety and convenience;

(iv) the GRM should be disclosed (through public meetings, display at strategic places and media) to the communities affected by the cumulative impacts.

VII. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

172. Stakeholder consultation and participation was an essential process during subproject preparation. The process of engaging stakeholders and affected people involved key informant interviews, on-site discussions with WUSC, and random field interviews of stakeholders. Table 21 lists the persons consulted during the IEE study.

Table 21: Lists of People Consulted During Initial Environmental Examination Study

1. Mr.Sanjaya Bahadur Rajlawat… Chairman
2. Mr. RamKrishna KC…Charikot Drinking Water
3. Mr. Krishna Bahadur Karki…Hattichahara Drinking Water
4. Mr. Krishna Bahadur Khadka… Charikot Drinking Water
5. Mr. Kailash Shreshta… Hattichahara Drinking Water
6. Mr. Dhruba Basnet… Hattichahara Drinking Water
7. Mr. Anil Shrestha…Dolakha Drinking Water
8. Mr. Ram Prasad Sapkota…Jilu Drinking Water
9. Mr. Dawa Sherpa…Charikot Drinking Water
10. Ms. Roma Karki…S.T.
11. Ms. Krishna Kumari Thapa
12. Ms. Rupa Bhujel (Shahi)
13. Ms. Geeta KC…Bhimeshwor Municipality-10, Taganagi
14. Ms. Suku Shrestha… Treasurer

,
Drinking water committee

15. Mr. Ram Das Shrestha…Bhimeshwor Municipality
16. Mr. Lalbahadur Khadka… Chairman,Taganagi
17. Mr. Kabindra Das Shrestha… Bhimeshwor Municipality-07, Jilu
18. Mr. Jhamak Bahadur Basnet
19. Mr. Yadav Prasad Dahal… Bhimeshwor Municipality-10, Taganagi
20. Mr. Dhan Bahadur Chaulagai…
21. Mr. Shree Krishna Neupane…Ramkot Drinking Water
22. Mr. Gokul Prasad Neupane… Ramkot Drinking Water
23. Mr. Manbir Dhanuke… Bhimeshwor Municipality-01
24. Mr. Taranath Chaulagai… Bhimeshwor Municipality-01
25. Mr. Bal Bahadur Shrestha… Bhimeshwor Municipality-07, Jilu
26. Mr. Gyan Bahadur Shrestha… Bhimeshwor Municipality-07, Jilu
27. Mr. Upendra Bahadur Khadka… Bhimeshwor Municipality-07, Jilu
28. Mr. Kumar Chaulagai…
29. Mr. Ram Bahadur KC…
30. Mr. Ganesh Bahadur KC…
31. Mr. Birsha Bahadur Budhathoki…
32. Mr. Mandhwoj Lama…Chothang
33. Mr. Tej Bahadur Shrestha
34. Mr. Badri Kumar Shrestha
35. Mr. Rajan Karki… Bhimeshwor Municipality-06
36. Mr. Ram Bahadur Karki… Bhimeshwor Municipality-06
37. Mr. Kamal Bahadur Thawa
38. Mr. Lalit Bhujel… Bhimeshwor Municipality-07
39. Mr. Sangdhwoj Lama… Bhimeshwor Municipality-01
40. Mr. Harihar Prasad Neupane…Ramkot
41. Mr. Durga Prasad Kafle…Charikot Drinking Water
42. Mr. Ranga Dhwoj Budhathoki… Bhimeshwor Municipality-06

43. Mr. Ganga Bahadur Budhathoki… Bhimeshwor Municipality-06 44. Mr. Ram Sharan Thapa…Charikot Drinking Water 45. Mr. Badri Kumar Shrestha…Hattichahara

173. **Preliminary Consultation.** A public meeting was organized on 27 April 2018 in the premises of Bhimeshwor Municipality Office for the discussion of the environmental impacts due to the construction of the DEWAT subproject, including other subprojects for Charikot town under UWSSP. The minutes of consultation meeting is attached as Appendix 6. The local peoples' concerns regarding the implementation of the DEWAT subproject are summarized below.

174. **Concerns Raised by Stakeholders.** The consultation outcome reveals positive feedback from the stakeholders. The following were the sentiments gathered during the consultation:

(i) Interest on the information that effluent from the waste water treatment system could be used for irrigation purposes; and
(ii) Acceptability of the DEWAT subproject because the findings show that establishment and eventual operation of the DEWAT subproject will not cause adverse environmental and social impacts.

175. The subproject envisages that meaningful consultations (footnote 16) will be undertaken during (i) the finalization of locations for the DEWAT facilities and detailed designs, (ii) subproject implementation period, and (iii) O&M phase. Concerned stakeholders will be invited and encouraged to participate. PMO and implementation core group (ICG) will maintain rapport with WUSC and municipality. PMO, ICG, Contractors, and WUSC will be open to the public to discuss concerning the progress of the projects, adverse impacts, mitigation measures and environmental monitoring and grievances.

176. **Future Consultations during Final Detailed Design Stage**. The stakeholder consultations during the final detailed design stage discuss the following important issues, among other standard topics:

(i) Final specific locations of the two DEWAT facilities by using maps that pinpoint the exact locations. The maps should also pinpoint all human receptors or residential areas, including institutional establishments, around the proposed sites;
(ii) Access routes or roads leading to the DEWAT facilities. The maps should also identify these routes or roads;
(iii) Final design and components of the DEWAT facilities;
(iv) Environmental impacts associated with the construction and operation of the DEWAT facilities, including the mitigation measures developed for the subproject to avoid or reduce the severity of impacts; and
(v) O&M activities to ensure that the DEWAT facilities will be maintained properly and will not cause significant adverse impacts to the environment and people.

177. **Future Consultations during Construction and O&M Phases**. The stakeholder consultations during the construction and O&M phases should discuss the following important issues, among other standard topics:

(i) During construction, if there is a change in design, alignment, and location, PMO and ICG will hold at least one public consultation to solicit perceived impacts, issues, concerns and recommendations from affected communities;
(ii) Before construction, PMO and ICG will conduct an information, education and communication (IEC) campaign among the affected communities about the upcoming construction, its anticipated impacts, the grievance redress mechanism, contact details and location of PMO and ICG, and status of compliance with the

Government's environmental safeguard requirements. billboards about the subproject, implementation schedule and contact details of the executing agency, PMO-ES, ICG- Environmental Safeguard Assistant (ESA) and contractors will be set up at strategic locations. the grievance redresses procedure and details will be posted at the offices of ICG, WUSC, and municipality;

(iii) During construction, regular random interviews will be conducted by ICG-ESA every month to monitor environmental concerns of subproject communities;

(iv) During operation, periodic random interviews will be conducted by ICG and WUSC to monitor the environmental concerns of subproject communities; and

(v) 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.

178. The MOWS-approved IEE report as compliance with EPR 1997 will be available at the offices of PMO, ICG, and WUSC for the perusal of interested parties. Copies may be made available upon formal request. A translation of the MOWS-approved IEE in the English language will also be made available. On the other hand, this IEE report and all environmental monitoring reports as compliance with ADB SPS will be disclosed on ADB and UWSSP websites.

VIII. GRIEVANCE REDRESS MECHANISM

179. A project-specific GRM will be established to receive, evaluate and facilitate resolution of affected persons' concerns, complaints, and grievances related to social, environmental and other concerns on the project. The GRM will aim to provide a time-bound and transparent mechanism to resolve such concerns. Grievances may be channelled through letters, emails, text messages (SMS), verbal narration, grievance boxes and registers. Suggested template for grievance redress form is in Appendix 7.

180. A common GRM will be in place for social, environmental or any other grievances related to the project. The GRM will provide an accessible forum for receiving and facilitating resolution of affected persons' grievances related to the project. Project will publish the sample grievance registration form on its website, and publish it in local language and/or indigenous people dialect, at the hoarding board of each of the participating WUA or municipalities' office. Every grievance shall be registered with careful documentation of process adopted for each of the grievance handled, as explained below. The environmental and social safeguards officer (ESO/SSO) at the project management office (PMO) will have the overall responsibility for timely grievance redress on environmental and social safeguards issues. The Social Safeguards Officer at the Regional Project Management Office (RPMO) will be the focal person for facilitating the grievance redress at the local level.

181. A municipal-level public awareness campaign will be conducted on a regular basis as per the communication strategy of the project to ensure awareness on the project and its GRM. The social and environmental safeguards experts of the project management and quality assurance consultant (PMQAC) and regional design, supervision and management consultants (RDSMCs) will support the WUA or municipalities in conducting municipality-wide awareness campaigns, which will ensure that all stakeholders including poor and vulnerable are aware of the GRM and project's entitlements.

182. A grievance redress committee (GRC) will be formed at the Municipality level, comprising the Mayor as Chairperson of GRC, and Regional Project Manager RPMO as Secretary. The GRC members will comprise of (1) WUSC Secretary; (2) RPMO Engineer; (3) RPMO social

/environmental (as relevant) officer, (4) representative of affected persons, (5) RDSMC's safeguards specialist (social/environment as relevant), (6) a representative of reputable and relevant CBO/SHG/organization working in the project area as invitee,[31] and (7) contractor's representative. The secretary of the GRC will be responsible for convening timely meetings and maintaining minutes of meetings. The concerned social safeguards expert of RDSMC will support the RPMO safeguard's officer and Project Manager of RPMO to ensure that grievances, including those of the poor and vulnerable are addressed. All GRCs shall have at least two women committee members. Along with representatives of the affected persons, civil society and eminent citizens can be invited as observers in GRC meetings.

183. The functions of the local GRC are as follows: (i) provide support to affected persons on problems arising from environmental or social disruption; asset acquisition (if necessary); and eligibility for entitlements, compensation and assistance; (ii) record grievances of affected persons, categorize and prioritize them and provide solutions within 15 days of receipt of complaint by WUA or local bodies; and (iii) ensure feedback to the aggrieved parties about developments regarding their grievances and decisions of the GRC. The GRM procedure is depicted in Figure 7, and is outlined below in detail, with each step having time-bound schedules and responsible persons to address grievances and indicating appropriate persons whose advice is to be sought at each stage, as required. If affected persons are not satisfied with the response they can elevate it to the next level:

(i) **First Level of GRM** (WUA level): The first-level, which is also the most accessible and immediate venue for quick resolution of grievances will be the contractors, RDSMC field engineers and RPMO supervision personnel, who will immediately inform the WUA. Any person with a grievance related to the project works can contact UWSSP to file a complaint. The municipal-level field office of the RPMO, in WUA's building, will document the complaint within 24 hours of receipt of complaint in the field, and WUA or local bodies will immediately address and resolve the issue at field-level with the contractor, supervision personnel of RPMO and RDSMC field engineers within 5 days of receipt of a complaint/grievance. The assigned RDSMC's Social Mobilizer will be responsible to fully document: (a) name of the person, (b) date of complaint received, (c) nature of complaint, (d) location and (e) how the complaint was resolved as well as to provide feedback to the complainant. If the complaint remains unresolved at the local level within 5 days, the WUA will forward the complaint to the municipality level GRM.

(ii) **Second Level of GRM** (Municipality level): The complainant will be notified by the WUA that the grievance is forwarded to the Municipality-level GRC. The Municipality-level GRC will be called for a meeting, called and chaired by the Mayor. The GRC will recommend corrective measures at the field level and assign clear responsibilities for implementing its decision within 10 days of receipt of complaint by WUA. If the grievance remains unresolved within 10 days of receipt of complaint by WUA, the matter will be referred to the third level. The RPMO Engineer will be responsible for processing and placing all papers before the GRC, recording decisions, issuing minutes of the meetings, providing feedback to complainants and taking follow up actions so that formal orders are issued and decisions are carried out.

(iii) **Third Level of GRM** (PMO Level)**:** Any unresolved or major issues at Municipality level will be referred to the PMO for final solution. A representative of the Nepal Foundation for Indigenous Nationalities (NEFIN) will be invited to attend any

[31] If the complaints are related with indigenous people/Dalits/other vulnerable groups, specific NGO/CBO that actively involved in development of these communities shall be involved.

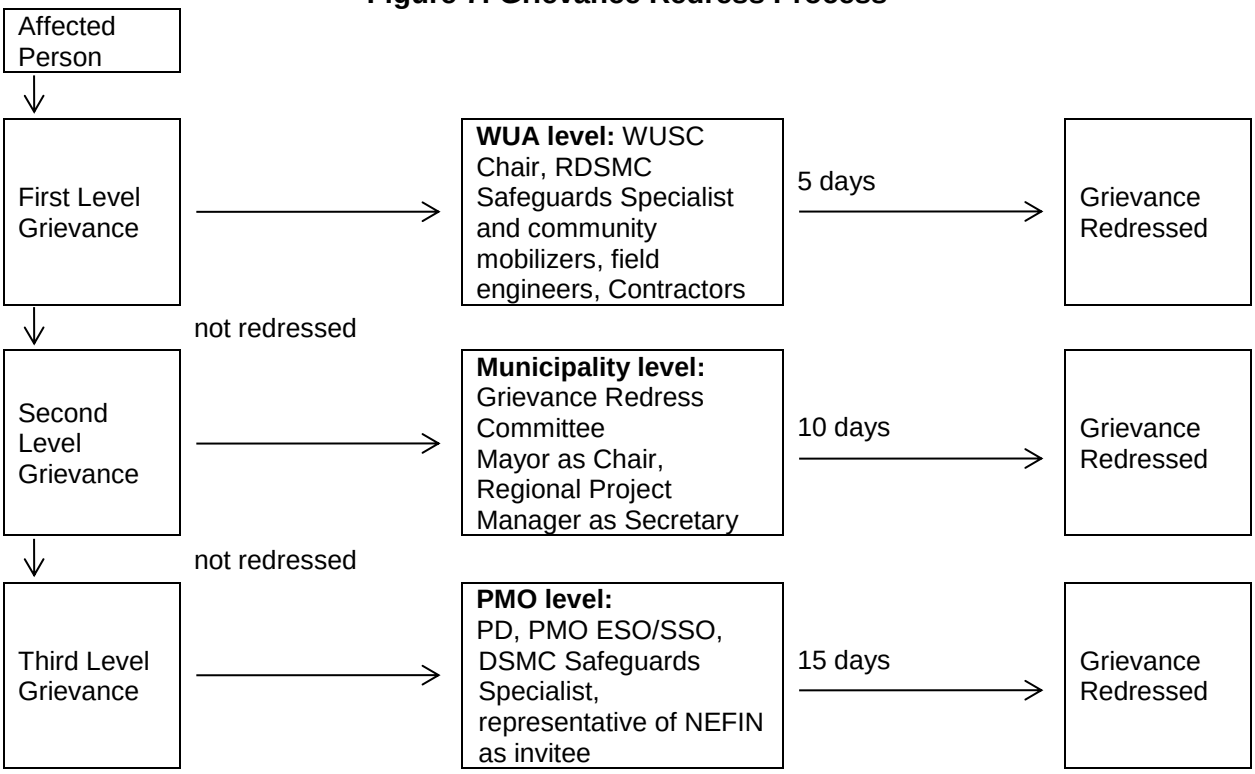
meetings related to resolution of Indigenous Peoples grievances. Decision has to be made within 15 days of receipt of complaint from the Municipality-level GRC. The Project Director will sign off on all grievances received by the PMO. The concerned Deputy Project Director (DPD) and environmental and social safeguards officers (ESO and SSO) of PMO will be involved with support from the PMQAC's social/environment safeguards experts. The SSO will be responsible to convey the final decision to the complainant.

184. All paperwork (details of grievances) needs to be completed by the WUA member secretary assisted by RDSMC and circulated to the WUA Chairperson and members. At Municipality level, the RPMO Engineer will be responsible for circulation of grievances to the Regional Project Manager, DWSS, Mayor and other GRC members, prior to the scheduled meetings. The RPMO's Engineer will be responsible for follow-through of all escalated grievances. All decisions taken by the GRC will be communicated to the affected persons by the RPMO's SSO.

185. Despite the project GRM, an aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

186. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use ADB's Accountability Mechanism 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 any of the official languages of ADB's developing member countries (DMCs). The ADB's Accountability Mechanism information will be included in UWSSP Information Datasheet (PID), to be published in web and distributed to the affected communities, as part of the project GRM.

Figure 7: Grievance Redress Process



DSMC = design, supervision and management consultant; ESO = environmental safeguards officer; NEFIN = Nepal Federation of Indigenous Nationalities; PD = project director; PMO = project management office; RDSMC = regional design, supervision and management consultant; SSO = social safeguards officer; WUA = water users' association; WUSC = water users' and sanitation committee.

187. **Record Keeping and Disclosure**. Records at the municipal-level will be kept by the concerned WUA or local bodies member secretary, assisted by RDSMC, of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date of the incident and outcome. The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the PMO office, WUA, and on the web, as well as reported in the safeguards monitoring reports submitted to ADB on a semi-annual basis. For any grievance escalated to RPMO/ Municipality level, the RPMO's Engineer assigned as GRM focal person will be responsible for record-keeping, calling of GRC meetings and timely sharing of information with WUA or municipalities. For grievances escalated to PMO and above, the PMO's SSO will be responsible for maintenance of records, sending copies to RPMO and WUA for timely sharing of information with the person filing complaint.

188. **Periodic Review and Documentation of Lessons Learned**. The PMO's SSO will periodically review the functioning of the GRM at municipality or WUA level and field level and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances. Indicators pertaining to grievance redress (no. of grievances received, no. redressed/resolved to be reported by Member Secretary, WUA to RPMO SDO, and by RPMO to PMO SSO) in monthly and quarterly progress reports.

189. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) at local (field/ward/municipal) level will

be borne by the concerned focal organizations at each level: WUA at local level, and municipality at municipal level; and PMO at central level. Cost estimates for grievance redress are included in resettlement cost estimates.

Table 22. Suggested Format for Record Keeping of Grievances

S. No.	Date of receipt of grievance	Name and contact details of complainant	Description of complaint	Nature of complaint	Decisions taken	Response given to complainant and date	Whether closed

IX. ENVIRONMENTAL MANAGEMENT PLAN

A. Institutional Arrangement

190. The Ministry of Water Supply (MOWS) will be the Executing Agency, working through the Department Water Supply and Sewerage (DWSS), which will establish a Project Management Office (PMO) for the project[32] headed by a Project Director. The DWSS will also establish two Regional PMOs (RPMOs).

191. The PMO will be responsible for overall project planning, management, implementation, monitoring and reporting for UWSSP. The PMO will also be responsible for screening the proposed subprojects in accordance with the subproject selection criteria for UWSSP,[33] assisting the municipalities in conducting feasibility studies,[34] reporting to and being point of liaison with ADB on UWSSP; quality control of detailed design and construction supervision; procurement of civil works contractors; support for capacity building; and overseeing safeguard compliance. The PMO will liaise with WUSCs or municipalities (Charikot Municipality for this Charikot DEWAT subproject) to sign the management agreement prior to the award of contract for each subproject. The PMO will also engage all consultants under UWSSP.

192. The RPMOs will be established using the existing infrastructure in (i) Itahari, Sunsari, for the eastern region, (ii) in Nepalgunj, Banke, for the western region, and (iii) PMO (Kathmandu) will act as RPMO for central region projects. The RPMOs will report to the PMO and be supported and monitored by PMO to implement UWSSPs in the field and manage contractors and consultants. The RPMOs will manage the detailed design and construction supervision with support from DSMC that PMO would engage (DSMCs for eastern, western, and central region each). Each of the DSMCs will be based at the respective RPMO. For each subproject, a dedicated implementation core group will be established in the field, at each WUA's office,[35]

[32] DWSS will continue the existing PMO established and operational for the Third Small Towns Water Supply and Sanitation Sector project.

[33] Subproject selection criteria (covering all aspects of a proposed subproject other than the specific subproject selection criteria for environment as discussed in this EARF) is attached as Appendix 1 of the PAM.

[34] TDF will assist the municipalities in conducting financial appraisal of the subprojects and advice DWSS on its outcomes prior to the start of detailed design process.

[35] The implementation core group, as a minimum, comprises of (i) an Engineer, a Social mobilizer, and an EMP monitor, RPMO; (ii) an Administration Staff, a Finance Staff, and an Engineer or Junior Engineer, WUSC.

headed by a qualified engineer from the RPMO to conduct day-to-day project management, planning and construction supervision. The TDF will coordinate with RPMOs, WUSCs and municipalities at least on monthly basis.

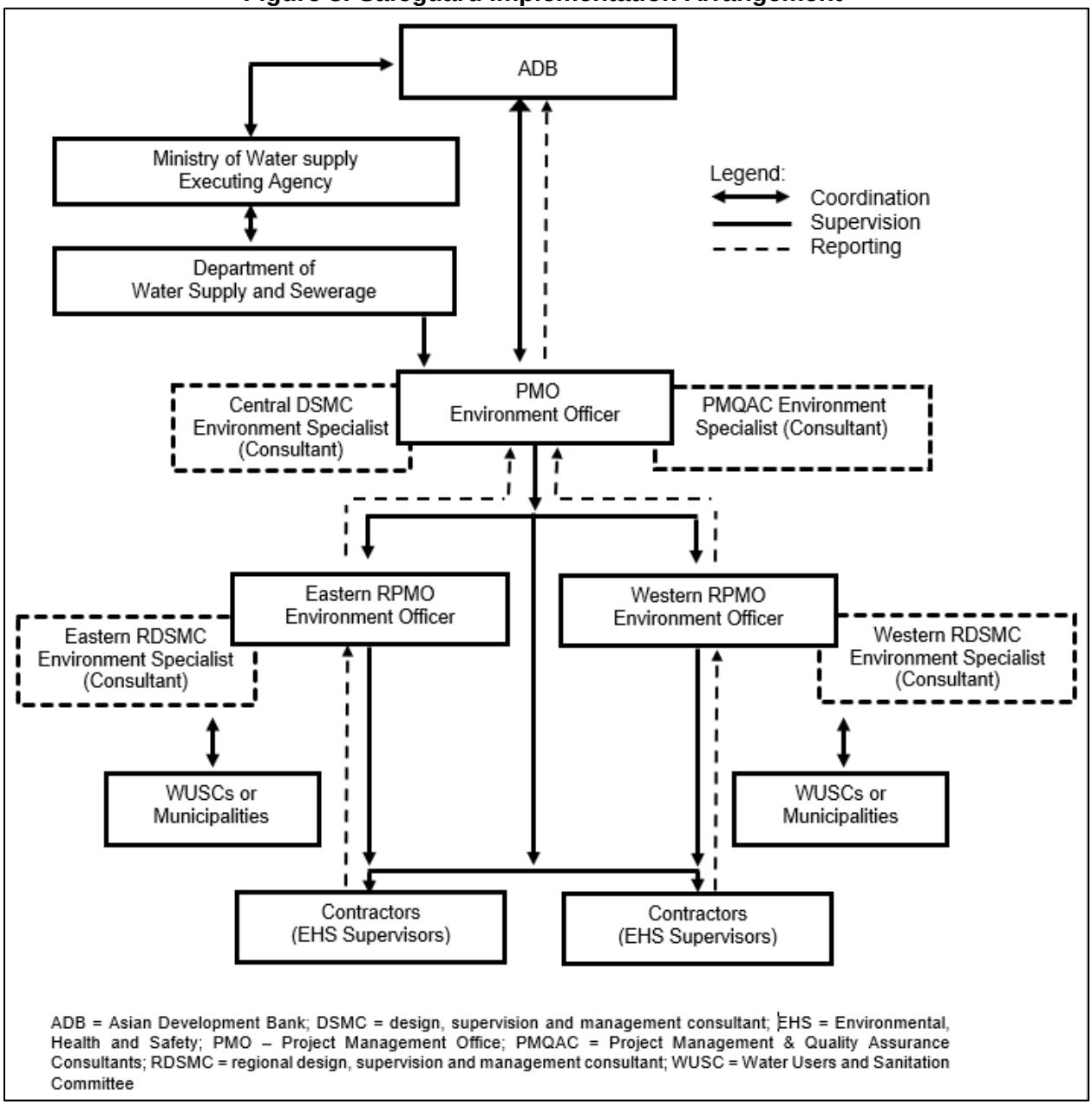
193. The WUSC, on behalf of the WUA[36] or the municipality[37] will be responsible for O&M of the water supply and sanitation facilities constructed, operating under a management agreement with DWSS. WUSCs consist of nine executive members,[38] at least three of whom are women. UWSSP will fund the WUA's minimum prescribed staffing and other resource requirement, as outlined in the management agreement with DWSS for sustainable operations of the system during UWSSP period. For the subprojects yet to be selected and where WUA does not exist initially, or when the municipality doesn't have the capacity and chooses to delegate the operation to user's representatives, an interim user committee (IUC) will be first established in the feasibility stage by representing potential consumers. The IUC will work with the RPMO and DSMC in undertaking a feasibility study, confirm the technical proposals and the boundaries of the service areas. WUAs will be developed from IUCs at the detailed design stage.

[36] WUAs are registered with the district water resources committee as a user association under the Water Resources Act (1992).

[37] As the project is a demand based open access project, the WUAs or the municipalities can apply for funding a proposed subproject that meets the subproject selection criteria.

[38] WUSCs will be formulated by ensuring proportional representation of gender, caste and ethnic groups. It shall include at least 33% representation of women.

Figure 8: Safeguard Implementation Arrangement



194. **Project Management Officer.** A project officer (Environment) will be engaged in PMO to ensure implementation of environmental safeguards. He/ she will be provided with necessary consultant support, and capacity development and training. The responsibilities of the Environment Officer are:

(i) review and confirm existing IEEs and EMPs are updated based on detailed designs, that new IEEs/EMPs prepared by DSMCs comply to exclusion criteria and project selection guidelines as stipulated in the EARF and Government rules; and recommend for approval to PMO;
(ii) approve subproject environmental category;
(iii) ensure that EMPs are included in bidding documents and civil works contracts;

(iv) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by RPMOs and contractors;
(v) establish a system to monitor environmental safeguards of UWSSP including monitoring the indicators set out in the monitoring plan of the EMP;
(vi) 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;
(vii) supervise and provide guidance to the RPMOs to properly carry out the environmental monitoring and assessments as per the EARF;
(viii) review, monitor and evaluate effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken;
(ix) consolidate monthly environmental monitoring reports from RPMOs and submit semi-annual monitoring reports to ADB;
(x) ensure timely disclosure of final IEEs/EMPs in project locations and in a form accessible to the public;
(xi) assist with ongoing meaningful consultation and assist in setting up of GRM in respect of environment concerns;
(xii) address any grievances brought about through the Grievance Redress Mechanism (GRM) in a timely manner as per the IEEs;
(xiii) undertake regular review of safeguards-related loan covenants, and the compliance during program implementation; and
(xiv) organize periodic capacity building and training programs on safeguards for project stakeholders, PMO, RPMOs, and WUAs.

195. **Regional Project Management Offices.** The environmental officer assigned by DWSS to the RPMOs will receive support from (i) the PMO environmental officer; (ii) environmental specialist from PMQAC; and (iii) the environmental specialist and EMP monitors of the regional DSMCs to carry out the following:

(i) prepare new IEEs and EMPs in accordance with the EARF and Government rules;
(ii) include EMPs in bidding documents and civil works contracts;
(iii) comply with all government rules and regulations;
(iv) take necessary action for obtaining rights of way;
(v) oversee implementation of EMPs including environmental monitoring by contractors;
(vi) take corrective actions when necessary to ensure no environmental impacts;
(vii) submit monthly environmental monitoring reports to PMO;
(viii) assist with ongoing meaningful consultation and assist in setting up of GRM in respect of environment concerns; and
(ix) address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs.

196. **Project Management and Quality Assurance Consultant.** The Project Management and Quality Assurance Consultants (PMQAC) will provide support to the PMO in the following areas. The detailed TORs are in the PAM:

(i) ensure that the quality of the designs and construction of all water supply and sanitation components implemented under UWSSP are to the required standards; and
(ii) assist the PMO with the overall planning, implementation and monitoring of UWSSP during all stages of implementation including adherence to all environmental and social safeguards' requirements.

197. **Regional Design, Supervision and Management Consultants.** The RDSMCs will provide support to the RPMOs in the following areas. The detailed TORs are in the PAM:

(i) prepare quality feasibility studies, detailed engineering designs, safeguards documents and bid documents;
(ii) provide effective construction supervision and contract management of all water supply and sanitation components implemented under UWSSP in its region;
(iii) assist the RPMOs with the overall planning, implementation and monitoring of each subproject during all stages of implementation including adherence to all environmental and social safeguards requirements;
(iv) work closely with the Water User and Sanitation Committees (WUSCs), respective project municipalities and communities to ensure that the citizens are aware of project benefits and their responsibilities; and
(v) ensure that poor and vulnerable groups will benefit equally from UWSSP.

198. **Civil Works Contracts and Contractors.** The contractor will be required to designate an Environment, Health and Safety (EHS) supervisor to ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract. The contractor will have the following responsibilities:

(i) submit to RPMO, for review and approval, a site-specific environmental management plan (SEMP) including (a) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (b) specific mitigation measures following the approved EMP; (c) aggregates management plan; (d) monitoring program as per SEMP; and (e) budget for SEMP implementation;
(ii) ensure compliance with all applicable legislations and requirements in relation to construction activities;
(iii) ensure that any sub-contractors or suppliers, who are utilized within the context of a contract, comply with the environmental requirements of the SEMP and EMP. The contractor will be held responsible for non-compliance on their behalf;
(iv) in coordination with RDMSC and RPMO, provide environmental training to staff and workers prior to any construction activities;
(v) borne the cost of any damages resulting from non-compliance with the SEMP and EMP;
(vi) receive complaints or grievances from the public and immediately implement the remedial measures, and report to RPMO and RDMSC; and
(vii) submit environmental monitoring reports to RPMO on monthly basis or as may be agreed with RPMO.

199. A copy of the EMP or approved SEMP will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP or SEMP constitutes a failure in compliance and will require corrective actions. The EARF and IEEs specify responsibilities in EMP implementation during design, construction and O&M phases.

200. The PMO and RPMOs will ensure that bidding and contract documents include specific provisions requiring contractors to comply with: (i) all applicable labor laws and core labor standards on (a) prohibition of child labor as defined in national legislation for construction and maintenance activities; (b) equal pay for equal work of equal value regardless of gender, ethnicity, or caste; and (c) elimination of forced labor; and with (ii) the requirement to disseminate information on sexually transmitted diseases, including HIV/AIDS, to employees and local communities surrounding the project sites.

201. **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 following both ADB and government requirements as specified below:

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

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

203. **Before Construction.**

(i) Facilitate public consultation and participation, information dissemination and social preparation;
(ii) Provide available data to DSMC-Environmental Safeguards Specialist (DSMC-ESS) during IEE;
(iii) Assist in securing tree-cutting permits and/or registration of water source; and
(iv) Participate in training programs.

204. **During Construction.**

(i) Assist in the observance of the grievance redress mechanism;
(ii) 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; and
(iii) Facilitate public consultations, as necessary.

205. **During Operation.**

(i) Implement the Environmental Management Plan and O&M manual;
(ii) If applicable, actively work with the engaged licensed and accredited laboratory in water quality monitoring;
(iii) Prepare the environmental monitoring report as per IEE; and
(iv) Ensure observance of the grievance redresses mechanism.

206. **Licensed and Accredited Laboratory.** It is recommended that a licensed and accredited laboratory be engaged to conduct influent and effluent quality monitoring in the first few years of operation and to train WUSC. The laboratory will ensure that while carrying out the influent and effluent quality monitoring, 'hands-on' training in the operation of the DEWAT facility is provided to WUSC.

B. Environmental Management Plan

207. An environmental management plan (EMP) has been developed to provide mitigation measures to reduce all negative impacts to acceptable levels.

208. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PMO, RPMO, PIUs, consultants and contractors. The

EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. The EMP includes a monitoring program to measure the environmental condition and effectiveness of implementation of the mitigation measures. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries.

209. The contractor will be required to (i) carry out all of the mitigation and monitoring measures set forth in the approved EMP; and (ii) implement any corrective or preventative actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE, EMP and site-specific EMP (SEMP). The contractor shall allocate budget for compliance with these IEE, EMP and SEMP measures, requirements and actions. The contractor will be required to submit to PIU, for review and approval, SEMP including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; and (iii) monitoring program per EMP. No works can commence prior to approval of SEMP.

Table 23: Environmental Management Plan Matrix

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
1. Before Construction Activities					
Consents, permits, clearances, no objection certificate (NOC), etc.	Failure to obtain necessary consents, permits, NOCs, etc. can result to design revisions and work stoppage	Obtain all of the necessary consents, permits, clearance, NOCs, etc. before the start of civil works. Include in detailed design drawings and documents all conditions and provisions, if necessary.	Project management office (PMO), regional project management offices (RPMOs),and design, supervision and management consultant (DSMC)	Incorporated in final design and communicated to contractors	Before 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. Require construction contractors to prepare a contingency and spoil management plan	DSMC, RPMOs	List of affected utilities and operators; Bid document to include a requirement for a contingency plan for service interruptions, e.g., provision of water if disruption is more than 24 hours, spoil management plan	During detailed design phase Review of spoils management plan: Twice (once after first draft and once before final approval)
Construction work camps, stockpile areas, storage areas, and disposal areas	Disruption to traffic flow and sensitive receptors	Determine locations before 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	During detailed design phase

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
				excess spoils to agricultural land	
Waste generation	Generation of solid waste, wastewater from labor camp and other construction waste may cause pollution	Follow the principle of "Reduce, Reuse, Recycle, and Recover" Prohibition of unwanted littering and discharge of waste. Solid waste is either managed in a pit or disposed in municipal collection system.	Contractor	Contractor records. Visual inspection	Visual inspection by RPMOs and 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, resulting 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 a discussion with detailed design engineers and project implementation units (PIUs) suitability of sources and permit for additional quarry sites if necessary.
Siting of DEWAT facilities	Nuisance to human receptors	Ensure that the location of the DEWAT facilities are located in areas and distance that will not impact or annoy human receptors due to odor or vector of diseases. Suggested distance is at least 300 m from nearest human receptor.	PMO, RPMOs, and DSMC.	Location map	During detailed design phase.
Quality of ambient air, surface water bodies, and noise	Construction activities and construction camps can impact the ambient quality of air, quality of surface water bodies, and level of noise in	- Conduct baseline data gathering for ambient air, surface water quality and noise level at all construction sites. - Compare all results of environmental quality monitoring during construction and O&M phases with these baseline data to determine any negative impact.	PMO, RPMOs and DSMC	Results of laboratory analyses	Once before construction works commence.

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	the areas of works.				
Environmental management plan (EMP) Implementation Training	Impact to the environment, workers, and community	Project manager and contractors should be trained on EMP implementation, spoils management, standard operating procedures (SOP), health and safety (H&S), Labor Act (1992)	PMO, RPMOs, and DSMC. Contractor's Environmental Supervisor	Record of completion (Safeguards Compliance Orientation) Contractor records for EMP implementation at worksites	During the detailed design phase before the mobilization of workers to site
Facility operations	Impact to the environment, workers, and community due to accidents, leaks, etc.	Development of O&M manual that is comprehensive by integrating lessons learned from actual operation of existing DEWAT facilities worldwide and following guidance documents of international best practices in DEWAT operations, such as the “Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide”, designed and produced by Bremen Overseas Research and Development Association (BORDA)	PMO, RPMOs, and DSMC.	Availability of final version of O&M manual	Ongoing basis until O&M manual is finalized, but prior to O&M phase.
2. During Construction Activities					
A. Physical Characteristics					
Topography landforms, geology, and soils and river morphology and hydrology	Sand, gravel or crushed stone will be required for this town project. Extraction of natural aggregate materials may cause localized changes in topography and landforms (if on land) or river morphology and	Utilize readily available sources with environmental clearance and license Borrow areas and quarries comply with environmental requirements Coordinate with local authorities for quarrying from rivers. Alternative sources should be identified.	Contractor	Records of sources of materials	Monthly by RPMOs

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	hydrology (if on the river).				
Water quality	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.	Spoils management plan. Reuse excess spoils and materials Disposal site in designated areas. Earthworks during dry season Stockyards at least 300m away from watercourses. Fuel storage area away from water drainage Take precautions to minimize the overuse of water Prevent wastewater into water sources. Ensure safe water diversion No obstruction in flowing water.	Contractor	Areas for stockpile storage of fuels and lubricants and waste materials; Number of silt traps installed along trenches leading to water bodies; No visible degradation to nearby drainage, water bodies due to construction activities	Visual inspection by RPMOs and DSMC-ESS on weekly basis Frequency and sampling sites to be finalized during detailed design and final location of town projects components
Air quality	Work at the dry season and transporting construction materials may increase dust, carbon, monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons in air environment	Use of physical controls, sprays, covers, compaction, screening, enclosure, windbreaks, binders and road surfacing Cover delivery trucks during transportation Construction vehicle's speed limited to 30kph. Use of vehicles complying with Nepal Vehicle Mass Emission Standards (NVMES), 2069 Prohibition of open burning of solid waste. Minimize stockpile height	Construction Contractor	Location of stockpiles; Number of complaints from sensitive receptors; Heavy equipment and machinery with air pollution control devices; A certification that vehicles are compliant with air quality standards.	Visual inspection by RPMOs and DSMC-ESS on monthly basis Frequency and sampling sites to be finalized during the detailed design stage and final location of Town project components
Acoustic environment	Temporary increase in noise level and vibrations by excavation equipment, and	Prepare work schedule with community consultation and local administration. Overtime work restricted low noise generating equipment. Minimize drop heights No horns until necessary	Contractor	Number of complaints from sensitive receptors; Use of silencers in noise-producing	Visual inspection by RPMOs and DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	the transportation of materials, equipment and people. However, the proposed town project will follow ROW alignment	Use modern vehicles and machinery with low noise emissions Maintain low noise levels Warning signs in noise hazard areas. Workers must wear hearing protection there. Identify vibration risk to nearby structures. Take caution working in such areas.		equipment and sound barriers; Equivalent day and night time noise levels	
Aesthetics	Interference with the enjoyment of the area and creation of unsightly or offensive conditions	Prepare a debris disposal plan. Minimize stockpile size Clear wastes regularly Avoid stockpiling of excess spoils. Cover delivery trucks during transportation. Clean roads. Use screening enclosure shade cloth, temporary walls Clean site regularly. Follow the principle of “Reduce, Reuse, Recycle, and Recover”	Contractor	Number of complaints from sensitive receptors; Worksite clear of hazardous wastes Worksite clear of any wastes unutilized materials, and debris Transport route and worksite cleared of dirt	Visual inspection by RPMOs and DSMC-ESS on monthly basis
B. Biological Characteristics					
Biodiversity	Activities in water users’ and sanitation committee (WUSC) acquired area. There are no protected areas in or around town project sites.	Tree cutting will be avoided, or minimized if total avoidance is not possible, for this subproject. Any encounter with nomadic animal species will ensure these creatures are not hurt or killed. Any unintentional catch of any species should be reported and surrendered to authorized authorities for proper handling.	Contractor	PIU and PMO to report in writing the number of trees cut and planted if any (during detailed design stage) Some complaints from sensitive receptors on disturbance of vegetation, poaching fishing, etc.	Visual inspection by RPMOs and DSMC-ESS on monthly basis
C. Socioeconomic Characteristics					

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
Existing provisions for pedestrians and other forms of transport	The road closure is not anticipated. Hauling of construction materials and operation of equipment on-site can cause traffic problems. However, the proposed town subproject will follow ROW alignment.	Prepare suitable transportation routes Safe passage for vehicles and pedestrians Schedule material deliveries on low traffic. Erect and maintain barricades if required Inform through display board about nature, duration of construction and contact for complaints Complete the work quickly nearby institution, place of worship, business, hospitals, and schools. Consult with business and institutions for work schedules. Restore damaged properties and utilities	Construction Contractor	Traffic route during construction works, including number of permanent signs, barricades, and flagmen on worksite; Number of complaints from sensitive receptors; Some signage placed at the subproject location. Number of walkways, signage, and metal sheets placed at subproject location	Visual inspection by RPMOs and DSMC-ESS on monthly basis
Socioeconomic status	Staffing will be required during construction. This can result in an increase in local revenue.	Engage the local workforce. 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 andDSMC-ESS on monthly basis
Other amenities for community welfare	Civil works may result in an impact to the sensitive receptors such as residents, businesses, and the communities. Excavation may also damage infrastructure located alongside the roads.	Identify location and nature of existing infrastructure before excavation Minimize repeated disturbance to locals by integrating other forms of infrastructures. Inform local about nature, duration and possible impacts of the construction and integrate their concerns Promptly relocate infrastructure materials Take prior permission from local authority for water use	Construction contractor	Utilities Contingency Plan Number of complaints from sensitive receptors	Visual inspection by RPMOs and DSMC-ESS on monthly basis

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Restore damaged properties and utilities to pre-work conditions.			
Community health and safety	Construction works will impede the access of residents and business in limited cases	Restrict work force in designated areas. Identify stockyard areas in consultation with local administration Work on private land requires written permission of landowners and DSMC. Prefer small mechanical excavator for trenching Construct gender friendly toilets for workers Prohibit alcohol and drugs on site Prevent excessive noise; Code of conduct for workers includes restricting workers in designated areas, no open defecation, no littering, no firewood collection, no fire except designated places, no trespassing, no residence at construction sites, and no obligation to potentially dangerous work Maintain a complaint logbook in workers camp and take action promptly of complaints	Contractor	The number of permanent signs, barricades, and flagmen on worksites as per Traffic Management Plan (see Appendix 9 for sample which can be modified according to applicability); Number of complaints from sensitive receptors; Number of walkways, signs, and metal sheets placed at the subproject location Agreement between landowner and contractors in case of using private land as work camps storage areas etc.	Visual inspection by RPMOs and DSMC-ESS on weekly basis Frequency and sampling sites to be finalized during detailed design and final location of sub-subproject components
Workers Health and 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	Comply Labor Act (1992) of Government of Nepal Follow the WB EHS Guidelines on Water and Sanitation (footnote 25). Train all site personnel on environmental health and safety Exclude public from worksites Provide personal protective equipment to workers and ensure their effective usage	Contractor	Site –Specific H&S plan Equipped first-aid stations Medical insurance coverage for workers Number of accidents Records of supply of uncontaminated water	Visual inspection by RPMOs (monthly) and DSMC-ESS on a weekly basis. Frequency and sampling sites to be finalized during detailed design and final location of sub-subproject components

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
	hazards, which can arise from working at height and excavation works.	Document procedures to be followed for site activities; and Maintain accident reports and records. Make first aid kits readily available Maintain hygienic accommodation in work camps. Ensure uncontaminated water for drinking, cooking and washing, Assure clean eating areas Make sure sanitation facilities are readily available Provide medical insurance coverage for workers; Provide orientation for guest visitors Ensure that visitors do not enter hazard areas unescorted; Require workers to wear high visibility clothes Ensure moving equipment is outfitted with audible backup alarms; Chemical and material storage areas need to be marked clearly Hearing protection equipment enforced in noisy environment		Condition of eating areas of workers Record of H&S orientation training Availability of personal protective equipment at construction site % of moving equipment outfitted with audible back-up alarms Signage for storage and disposal areas Condition of sanitation facilities for workers	
D. Historical, Cultural, and Archaeological Characteristics					
Physical and cultural heritage	There are no archaeological, paleontological, or architectural sites of significance listed by local, national aut hority and (UNESCO).	- Stop work immediately to allow further investigation if any findings are suspected.	Contractor	Records of chance finds	Visual inspection by RPMOs and DSMC-ESS on Monthly basis.
E. Others					
Submission of EMP	Unsatisfactory compliance to EMP	Appointment of EMP supervisor Timely monitoring reports with field photographs	Contractor	Availability and competency of appointed supervisor	Monthly monitoring report to be

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
implementation Report				Monthly report	submitted by RPMOs to PMO PMO to submit semi-annual monitoring report to ADB
3. During Post Construction Activities and Operation and Maintenance					
Post construction site clearing activities	Damage due to debris, spoils, excess construction materials	Remove spoils wreckage, rubbish, or temporary structures no longer required; All excavated roads shall be reinstated to original condition. All disrupted utilities should be restored All affected structures rehabilitated /compensated The construction camp needs to clear of spills e.g. oil, paint, etc. and other pollutants after dismantling All hardened surfaces shall be ripped; all imported materials shall be removed, and all temporary services shall be cancelled Request PMO/PIU in writing that worksites and camps are vacated and restored to pre-project conditions	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 cleanup is satisfactory.	Before turnover of completed works to WUSC
Environmental legislation compliance	Lack of awareness in project managers and WUSC about legislations and IEE requirements	Strengthen capacity of WUSC and project staffs Ensure compliance with Nepal's Generic Standard /Tolerance Limits for Effluents Discharged into Inland Surface Water	PMO, RPMOs, DSMC, and WUSC	Monitoring reports and checking operations against O&M manuals and permits/clearances	After commissioning of systems and semi-annually
Decentralized wastewater treatment system	Leakage in the small bored sewer pipe line and DEWAT facility	Prepare operations and maintenance manual Proper maintenance of the sewer pipe line Ensure qualified persons to operate the wastewater transport mechanism.	PMO, RPMOs, DSMC, and WUSC	Water Quality reports WTP records in the log book	During O&M of the system Quarterly monitoring

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		Ensure capacity of WUSC to implement quick response to any issue related to wastewater management. Implement SPS-complaint EMP and a wastewater safety plan Monitor the sewer system periodically			
	Odor and nuisance from the DEWAT facilities.	Plant Tulasi, Jasmin and Other plants around the DEWAT facilities Clean surroundings as per the O&M schedule. Clean inlet and outlet chambers periodically. Contract PMO and technical person if any unusual things happened.	WUSC	Functionality of the wastewater transport system Functionality of wastewater treatment system	During O&M of the system. Daily maintenance of chemicals used in the wastewater treatment system.
	Disposal of solid after the sand drying beds	Solid from the sand drying bed will be utilized in the gardening of the municipal area and remaining will be safely disposed according to the operation manual	WUSC / Municipality	State of solid from the sand drying beds	Monthly
Mishandling of chlorine and other chemicals	Excessive exposure to chlorine, hypochlorous acid, and hypochlorite ion results in irritation of the esophagus, a burning sensation in the mouth and throat, and spontaneous vomiting.	Ensure proper storage and handling practices for chemicals Ensure the knowledgeable and skilled person is in charge of chlorine handling Ensure use of PPE while using chemicals; Use of chlorine as per WHO guideline	WUSC	Effluent water quality test	Monthly
Effluent for irrigation	Contamination of agricultural soil and crops/plants	Ensure irrigated effluent comply with the Nepal Water Quality Guidelines for Irrigation Waters (see Appendix 4); Ensure WUA or municipality comply with the guidelines and precautions provided by the WHO Guidelines for	WUSC	Effluent water quality test	As needed prior to reuse of treated wastewater for irrigation.

Field	Impacts	Mitigations Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring
		the Safe Use of Wastewater, Excreta and Greywater, Volume 2: Wastewater use in agriculture (footnote 25); and Ensure to secure clearance from national or local authorities.			
Sanitation facilities	Contamination of land or waterways due to overflow of septic tanks and the uncontrolled dumping of septage	The town project incorporates a pilot for the controlling disposal of septage. This is to reduce the likelihood of uncontrolled septage disposal to land and local waterways (nallas). 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 to 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 reports from test pits near intake sites	During O&M of the system.

C. Environmental Monitoring Program

210. Environmental monitoring will be done during construction on three levels:
(i) Monitoring the development of project performance indicators by the PMO Environmental Safeguards Specialist;
(ii) Monitoring implementation of mitigation measures by the Contractor; and
(iii) Overall regulatory monitoring of environmental issues by the PMO.

211. In addition to regular monitoring on-site (at the town project level) by the ICG and DSMC-ESS on the EMP implementation of the mitigation measures, monitoring of key environmental parameters is proposed. Table 24 presents the indicative environmental monitoring plan for the town project, which includes environmental parameters, with a description of the sampling stations, the 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 town project.

Table 24: Environmental Monitoring Program

SN	Field	Stage	Parameters	Location	Frequency	Standards	Responsibility
1.	Air quality	Before construction to establish baseline Construction phase	PM_{10} SO_2 NO_x	Worksite locations Construction campsite locations	24-hour monitoring once in a season (except monsoons) during the construction	National Ambient Air Quality Standards, 2003	Contractor
2.	Noise and vibration levels	Before construction to establish baseline Construction phase	Equivalent day and night time noise levels	Worksite locations Construction campsite locations	Once in a season (except monsoons) during construction	National Noise Standard Guidelines, 2012	Contractor
3.	Water quality of receiving bodies of water	Before construction to establish baseline Construction phase O&M phase	TDS, TSS, pH, hardness, BOD, COD, fecal coliform, total nitrogen, total phosphorus, heavy metals, temperature, DO, hydrocarbons, mineral oils, phenols, cyanide, temperature [a]	Upstream and downstream relative to the location of DEWAT facilities	Twice a year (pre-monsoon and post-monsoon) during construction As needed or at least once a year during O&M phase	Result of upstream river water quality will be compared with result of downstream river water quality *	Contractor-during the construction and operation stage in 1-year WUSC – in the whole period of O&M phase
4.	Influent/ Effluent Water quality	O&M phase	TDS, TSS, pH, hardness, BOD, COD, fecal coliform, total nitrogen, total	Outlet of the DEWAT after finishing the treatment	Twice a year (pre-monsoon and post-monsoon)	Effluent water quality standard set by the Ministry of	Contractor-during the construction and O&M stage during defect liability period

SN	Field	Stage	Parameters	Location	Frequency	Standards	Responsibility
			phosphorus, heavy metals, temperature, DO, hydrocarbons, mineral oils, phenols, cyanide, temperature[b]		during construction As needed or at least once a year during O&M phase	Environment on 2003	WUSC – in the whole period of O&M phase
5.	Solid/ sludge from the DEWAT facilities	O&M phase	As required by WHO standards[c]	Residue / sludge from the sand drying beds	As needed	WHO standards	WUSC – in the whole period of O&M of the plants
6.	Survival rate of landscaping, tree plantation	O&M phase	Survival rate	In the areas where re-plantation/ landscaping is proposed	Twice a year	None	WUSC – in the whole period of O&M of the plants
7.	Community and occupational health and safety	Construction phase O&M phase	Incidence and types of health and safety issues	Subproject sites	Twice a year	Zero incidence	Contractor – construction phase WUA or municipality – in the whole period of O&M of the plants

BOD = Biochemical Oxygen Demand; DO = Dissolved Oxygen; NOx = nitrogen oxide; O&M = operation and maintenance; PM_{10} = particles equal to or smaller than 10 microns; pH=potential of hydrogen; SO_2 = Sulphur Dioxide; TDS= total dissolved solids; TSS = total suspended solids; WUA = water users association; WUSC = water users' and sanitation committee.

[a, b, c] Depending on what parameters laboratories in Nepal can test or analyze.

D. Institutional Capacity Development Program

212. Considering the limited capability of UWSSP 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 or seminars.

213. WUSC does not have the capacity to monitor the quality of effluent wastewater as prescribed in "Tolerance limits to discharge in inland surface water from combined wastewater treatment plant published by Government of Nepal in Gazette of 23 June 2003" as National Standard. Although monitoring kits and laboratory rooms will be provided, it does not guarantee that WUSC would be able to handle them for effective monitoring. DWSS has five regional laboratories; however, some are not functioning well due to lack of human resources. For effective monitoring, it is recommended that a licensed and accredited laboratory be engaged in water and wastewater quality monitoring during the first 2-3 years of operation during when WUSC will enhance its capacity by actively participating. After the engagement period and initial phase of "learning by doing", there should be continuing periodic training to sustain WUSC's capacity. The cost of monitoring during operation takes account of a licensed laboratory for water quality monitoring and training WUSC.

214. The PMQAC Environmental Safeguards Specialist, together with DSMC Environmental Safeguards Specialist will be responsible for environmental awareness training and management by 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 UWSSP. Typical modules would be as follows: (i) sensitization; (ii) introduction to the 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 before deployment to work sites. The proposed training project along with the frequency of sessions is presented in Table 25.

Table 25: Training Program for Environmental Management

Items	Pre-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 Government of Nepal 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 Government of Nepal.	To share the experiences and best practices aimed at learning lessons and improving implementation of environmental management plan (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 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 project management office (PMO), implementation core groups (ICGs), and design, supervision and management consultant (DSMC)
Participants	Executing and implementing agencies (WUSCs, WUAs, Municipalities), PMO, and PMO staff (technical and environmental) involved in the project implementation	PMO ICGs Contractors	PMO ICGs Contractors

E. Staffing Requirement and Budget

215. 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.

216. Environmental monitoring during construction will also be straight forward 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.

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

218. The operation phase for mitigation measures are good operating practices to mitigate the environmental impacts of this phase and the responsibility remains to WUSC. WUSC will conduct all monitoring during O&M phase. If a licensed laboratory is engaged for the first 2-3 years of operation for training purposes, the cost can be accommodated under the operations plan.

219. The cost of awareness program and WSP during contract is NRs500,000.00 under provisional sum.

220. The indicative cost of EMP implementation is shown in Table 26.

Table 26: Indicative Cost of Environmental Management Plan Implementation

SN	Particulars	Stages	Unit	Total Number	Rate (NRe)	Cost (NRe)	Cost covered by
A.	**Monitoring Measures**						
1.	Air quality monitoring	- Pre-construction - Construction	Per location	4	100,000.00	400,000.00	Civil works contract
2.	Noise levels monitoring	- Pre-construction - Construction	Per location	4	30,000.00	120,000.00	Civil works contract
3.	Water quality monitoring	- Pre-construction - Construction - O&M	Per location	6 (pre-construction and construction)	100,000.00	600,000.00	Civil works contract (pre-construction and construction) WUSC – in the whole period of O&M of the plants
B	**Capacity Building**						
1.	(i) Orientation workshop for officials involved in the project implementation on ADB Safeguards Policy Statement, Govenrment of Nepal environmental laws and regulations, and environmental assessment process; (ii) induction course contractors, preparing them for EMP implementation and environmental monitoring requirements related to mitigation measures; and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during implementation; and (iii) lessons learned information sharing	Module 1 – immediately upon engagement of DSMC environmental specialists Module 2 – before award of civil works contracts (twice a year for 4 years) Module 3 – before start of Phase 2 and upon completion of the project	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	DSMC
C.	**Human Resources Costs**						
1	PMO Environment Safeguards Officer	Construction phase	1	20	10,000.00	200,000.00	Budget covered

SN	Particulars	Stages	Unit	Total Number	Rate (NRe)	Cost (NRe)	Cost covered by
							through DRTAC
2	ICG Environment Safeguard Assistants	Construction phase	2	20	10,000.00	400,000.00	Budget covered through DSMC
4	DSMC Environmental Safeguard Specialist	Responsible for environmental safeguards of the project at ICG level	person months (spread over entire project implementation period)	20	30,000.00	600,000.00	Remuneration and budget for travel covered by the DSMC contract
D.	**Administrative Costs**						
1.	Legislation, permits, and agreements	Permit for excavation, tree-cutting permits, etc.	Lump sum		50,000.00	50,000.00	These consents are to be obtained by the contractor at his expense
		Environmental assessment and environmental clearances as per EPA 1996 and EPR, IEE presentation at review committee related expenses	Lump sum	1	50,000.00	50,000.00	50,000
E.	**Other Costs**						
1.	Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase, including public awareness campaign through media	As per requirement	Lump sum		300,000.00	Covered under DSM Contract

SN	Particulars	Stages	Unit	Total Number	Rate (NRe)	Cost (NRe)	Cost covered by
2.	GRM implementation	Costs involved in resolving complaints (meetings, consultations, communication, and reporting/information dissemination)		Lump sum		200,000.00	PMO cost
3.	Any unanticipated impact due to project implementation	Mitigation of any unanticipated impact arising during construction		Lump sum	Contractor's liability	As per insurance requirement	Civil works contract – contractor's insurance defect liability period
TOTAL (Indicative and partial. To be finalized in the updated IEE)						**4,220,000**	

DSMC = design, supervision and management consultant, EMP = environmental management plan, EPA = Environmental Protection Act, EPR = Environmental Protection Rules, ICG = implementation core group, IEE = initial environmental examination, NRe = Nepalese rupee, O&M = operation and maintenance, WUSC = water users' and sanitation committee.

221. The provisional amount of NRs4,200,000 has been provided to execute all necessary environmental mitigation measures.

Table 27: Proposed Topics for Capacity Building/Training

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

X. MONITORING AND REPORTING

222. RPMO will monitor and measure the progress of EMP implementation with assistance from DMSC. The monitoring activities will correspond with the subproject's risks and impacts and will be identified in this IEE. In addition to recording information on the work and deviation of work components from original scope PMO, RPMO, and DSMC will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome.

223. 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 semi-annual monitoring report format is in Appendix 9. Subproject budgets will reflect the costs of monitoring and reporting requirements.

224. For subprojects likely to have significant adverse environmental impacts, PMO will retain qualified and experienced external experts to verify its monitoring information. PMO environmental safeguard specialist (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 Environmental Safeguards Officer (PMO-ESO), with support from PMO-ESS.

225. ADB will review project performance against the MOWS 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 PMO to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
(iv) work with PMO 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.

XI. CONCLUSION AND RECOMMENDATION

226. The proposed subproject is not an environmentally critical undertaking. IEE indicates that the proposed subproject, and its components, is not located within or adjacent to environmentally sensitive areas.

227. The extent of adverse impacts is expected to be local, confined within the projects' main areas of influence, waste disposal sites, and the routes to and from these sites. With mitigation measures in place and ensuring that the bulk of earthworks are completed before the onset of the rainy season, the potential adverse impacts during construction would be site-specific.

228. The few adverse impacts of moderate magnitude during construction will be temporary and short-term (i.e., most likely to occur only during peak construction activities). These will not be sufficient to threaten or weaken the surrounding resources. Mitigation measures, integral to socially and environmentally responsible construction practices, are commonly used at construction sites and are well known to contractors. Hence, mitigation measures would not be difficult to implement.

229. This IEE shall be updated based on the final detailed design and shall consider the following recommendations:

(i) Include results of wastewater/sewage characterization used in the final detailed design of the DEWAT facilities, including constructed wetlands;
(ii) Site-specific information on the final location of the DEWAT facilities which should be at least 300m from the nearest receptor; and
(iii) Assessment of the amount of waste generated during the construction activities, including the volume of spoils and detailed information of disposal site.

230. The updated IEE shall be submitted to ADB for final review and disclosure on ADB website. Ultimately, the updated IEE shall be attached to the bid and contract documents. No works shall commence until ADB clears the updated IEE, including the SEMP.

231. During operation, the impacts of the DEWAT facilities can be mitigated with good O&M, prompt action on leaks, and appropriate lining protections to avoid groundwater contamination. The surrounding areas of the DEWAT facilities will be kept clean, provided with buffer zones and planted with trees to avoid or minimize dispersal of odor beyond the facility boundaries. Effluent water quality will be monitored regularly and ensure to comply with the tolerance limits set by the government.

232. The proposed DEWAT subproject will bring about the following benefits: (i) access to wastewater treatment facility for the population of Charikot; (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.

233. Based on the above findings, the classification of the DEWAT subproject in Charikot Town as Category B per ADB SPS is confirmed, and no further special study or detailed EIA needs to be undertaken. However, this IEE reiterates the following recommendations that should be adopted in the finalization of the detailed design of components of DEWAT plants, including the reed bed technology or constructed wetland as the final treatment stage:

(i) As discussed in Subsection C of Section II, use internationally recognized best practice in the design, implementation and operation of DEWAT facilities worldwide, such as the “Decentralized Wastewater Treatment Systems (DEWATS) and Sanitation in Developing Countries: A Practical Guide”, designed and produced by Bremen Overseas Research and Development Association (BORDA) (footnote 8). Additional useful references include the following: (a) conference paper on the “Standardization of Design and Maintenance of DEWATS Plants in India” (footnote 9); (b) academic paper on “Operation of Decentralized Wastewater Systems (DEWATS) under tropical field conditions” (footnote 10), and (c) UNESCAP presentation on wastewater management and sanitation promoting DEWATS in South-East Asia (footnote 11).
(ii) As discussed in Subsection C of Section II, use internationally recognized guidelines on the construction and operation of constructed wetlands as part of the DEWAT treatment plant, such as the “Manual on Constructed Wetlands Treatment of Municipal Wastewaters” of the United States Environmental Protection Agency (footnote 12); and
(iii) As discussed in Subsection B of Section VI, draft a comprehensive O&M manual for the DEWAT plants by integrating the documented solutions to problems encountered in the operation of existing DEWAT facilities worldwide.

RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST FOR CHARIKOT TOWN SUBPROJECTS

Country/Project NEP: Urban Water Supply and Sanitation Project

Title/ Project: Charikot Decentralized Wastewater Treatment (DEWAT) Subproject

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
▪ Densely populated?		√	The subproject town has only around 4 persons per hectare density.
▪ Heavy with development activities?		√	There are no heavy development activities in the town.
▪ Adjacent to or within any environmentally sensitive areas?		√	The subproject components are not within locations in or near sensitive and valuable ecosystems, including protected areas, forests, and other sensitive areas defined in ADB SPS.
- Cultural heritage site		√	
- Protected Area		√	
- Wetland		√	
- Mangrove		√	
- Estuarine		√	
- Buffer zone of protected area		√	
- Special area for protecting biodiversity		√	
- Bay		√	
▪ Any incidence of flooding or inundation in the last 5 years		√	
B. Subproject Requirements			
▪ Environmental clearance required?	√		The subproject falls under Schedule 1 of the EPR which requires IEE.
▪ Tree-cutting permit required?		√	No trees will be cut in the subproject locations.
▪ Access road/s during construction		√	Conveyance or sewer network will be on the road alignments with ROWs, and the DEWAT facility locations are already accessible. No need for access road construction.
▪ Access road/s during operations and maintenance		√	Conveyance or sewer network will be on the road alignments with ROWs, and the DEWAT facility locations are already accessible. No need for access road construction.
▪ Workers camp during construction	√		Workers camp required during construction and will be on government land if available. Otherwise the contractor will hire a rental house for the workers.
▪ Staging area/s during construction	√		Staging area needed during construction.
▪ Storage areas for construction materials	√		Contractor will need to look for storage area for construction material. This will be presented in the SEMP.
▪ Disposal sites for construction debris and unusable construction wastes	√		Contractor in coordination with the local government or municipality will

Screening Questions	Yes	No	Remarks
			identify disposal sites for construction debris and unusable construction wastes. This will be presented in the SEMP.
▪ If sewage treatment plant (STP) is included in this package, discharge point of effluent identified?	√		The two DEWAT facilities will discharge to two separate receiving bodies of water; namely: Jilu Stream and Kali Chhahara
▪ If STP is included in this package, sludge management included in design?	√		The DEWAT facility will develop an O&M manual which will include sludge management plan. The sludge management plan will be developed following internationally accepted best practices.
▪ Environmental laboratory available to analyze required parameters (if none, specify laboratory where environmental samples will be analyzed)		√	The town does not have any existing laboratory. This is part of the capacity building under the subproject.
▪ Bid and contract documents include item rate and/or provisional sum relevant to environmental measures and mitigation measures	√		Relevant to environmental measures and mitigation measures cost will included in bid and contract document either itemized rate and/or provisional sum.
▪ Bid and contract documents specify requirement on designation of contractor/s EHS supervisor	√		Bid and contract documents will specify requirement on designation of contractor/s EHS supervisor
C. Potential Environmental Impacts Will the Subproject cause…			
▪ Impairment of historical/cultural monuments/areas and loss/damage to these sites?		√	The subproject locations are not nearby the historical/cultural monuments/areas.
▪ Loss/damage to trees		√	There will be no cutting of trees in subproject locations.
▪ interference with other utilities and blocking of access to buildings, houses, businesses, schools, etc.	√		During construction period blocking access to buildings, houses, businesses, schools etc. will need alternate access. Mitigation measures are included in the EMP and will be more specific in the SEMP.
▪ nuisance to neighboring areas due to noise, smell, and influx of insects, rodents, etc.?	√		Nuisance to neighboring areas due to noise during construction phase may be relevant to the construction of conveyance or sewer network. All mitigation measures are included in the EMP. Noise during the construction of the DEWAT facilities will not be significant because the nearest human receptor is about 200 meters away from the sites. The smell, and influx of insects, rodents, etc. potential during operation of the

Screening Questions	Yes	No	Remarks
			DEWAT facilities will be mitigated per measures included in the EMP.
▪ dislocation or involuntary resettlement of people?		√	The subproject sites or locations are on either ROWs or government-owned land with no human settlements.
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		√	The subproject will positively impact all sectors of the population.
▪ impairment of downstream water quality due to inadequate sewage treatment or release of untreated sewage?	√		The DEWAT facilities are the potential sources of untreated wastewater that may be released to the receiving bodies of water. However, this potential negative impact will be mitigated with the proper design of the facility and implementation of the EMP and O&M manual during operation phase of the DEWAT facilities.
▪ overflows and flooding of neighboring properties with raw sewage?	√		The DEWAT facilities are the potential sources of untreated wastewater that may be released to the neighboring properties. However, this potential negative impact will be mitigated with the proper design of the facility and implementation of the EMP and O&M manual during operation phase of the DEWAT facilities.
▪ environmental pollution due to inadequate sludge disposal or industrial waste discharges illegally disposed in sewers?	√		This is possible if the DEWAT facilities are not operated properly. The subproject will develop O&M manual which includes sludge management plan following internationally accepted best practices on sludge management and handling.
▪ noise and vibration due to blasting and other civil works?	√		Nuisance to neighboring areas due to noise during construction phase may be relevant to the construction of conveyance or sewer network. All mitigation measures are included in the EMP. Noise during the construction of the DEWAT facilities will not be significant because the nearest human receptor is about 200 meters away from the sites.
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction?	√		This risk is inherent in construction works. However, occupational health and safety measures are included in the EMP following internationally accepted guidelines, such as the WB EHS guidelines on construction and decommissioning activities.

Screening Questions	Yes	No	Remarks
▪ risks and vulnerabilities related to occupational health and safety during project operation?	√		This risk is also inherent in DEWAT facility operations. However, occupational health and safety measures are included in the EMP following internationally accepted guidelines, such as the WB EHS guidelines on water and sanitation, and implementation of an O&M manual that follows internationally accepted guidelines.
▪ discharge of hazardous materials into sewers, resulting in damage to sewer system and danger to workers?		√	Not anticipated.
▪ inadequate buffer zone around pumping and treatment plants to alleviate noise and other possible nuisances, and protect facilities?		√	The DEWAT facility sites are away at around 200 meters from human receptors. This distance provides enough buffer zone to avoid nuisance to receptors.
▪ road blocking during construction?	√		This is possible during the construction of conveyance or sewer network. However, this impact will be mitigated with an efficient traffic management. This measure is included in the EMP.
▪ temporary flooding due to land excavation during the rainy season?		√	The construction activities will be avoided during monsoon season
▪ noise and dust from construction activities?	√		Anticipated during construction activities. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. The work areas and extent of excavation works are not heavy. Good construction practices will mitigate noise and dust, and has been specified in the EMP.
▪ traffic disturbances due to construction material transport and wastes?	√		This is possible during the construction of conveyance or sewer network. However, this impact will be mitigated with an efficient traffic management. This measure is included in the EMP.
▪ temporary silt runoff due to construction?	√		This is due to excavation and run-off from stockpiled materials. The impacts are negative but short-term and site-specific within a relatively small area and reversible through mitigation measures. Good construction practices will mitigate soil erosion and silt runoff, and are specified in the EMP.
▪ hazards to public health due to overflow flooding, and groundwater pollution due to failure of sewerage system?	√		This is possible with leaks from sewer pipes and malfunction of the DEWAT facilities. However, the

Screening Questions	Yes	No	Remarks
			design of the conveyance network and DEWAT facilities will ensure this hazard is addressed. The O&M manual will be implemented to ensure the DEWAT facilities will operate efficiently.
▪ deterioration of water quality due to inadequate sludge disposal or direct discharge of untreated sewage water?	√		The DEWAT facilities are the potential sources of untreated wastewater that may be released to the receiving bodies of water. However, this potential negative impact will be mitigated with the proper design of the facility and implementation of the EMP and O&M manual during operation phase of the DEWAT facilities.
▪ contamination of surface and ground waters due to sludge disposal on land?	√		Reuse of sludge may contamination surface or ground waters. However, this kind of disposal will not be allowed unless the disposal scheme follows international best practice on sludge reuse and permission is secured from the national or local authorities. This issue is included in the EMP.
▪ health and safety hazards to workers during execution of civil works (construction stage)	√		This risk is inherent in construction works. However, occupational health and safety measures are included in the EMP following internationally accepted guidelines, such as the WB EHS guidelines on construction and decommissioning activities.
▪ health and safety hazards to workers during operations (O&M of sewer network and DEWAT facilities)	√		This risk is also inherent in DEWAT facility operations. However, occupational health and safety measures are included in the EMP following internationally accepted guidelines, such as the WB EHS guidelines on water and sanitation, and implementation of an O&M manual that follows internationally accepted guidelines.
▪ large population increase during project construction and operation that causes increased burden on social infrastructure (such as sanitation system)?		√	Not anticipated. The contractor/s will be encouraged to hire local workers from the local labor force
▪ social conflicts between construction workers from other areas and community workers?		√	Not anticipated. The contractor/s will be encouraged to hire local workers from the local labor force.
▪ risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction?		√	Construction will not involve use of explosives. Excavation and trenching will be done manually. Petroleum products that will be used by heavy equipment during construction will be

Screening Questions	Yes	No	Remarks
			handled properly to avoid spills. The measures are included in the EMP.
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community during construction?	√		Construction area will be clearly demarcated, and access will be controlled. Only workers and project-concerned members will be allowed to visit the sites
▪ community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community during O&M?	√		The DEWAT facilities will be secured and access will be controlled. Only workers and project-concerned members will be allowed to visit the sites. Protection barriers and signages will be provided to excavation areas to avoid accidents. These are all included in the EMP.

NO MITIGATION MEASURES SCENARIO CHECKLIST

DETAILED GUIDANCE SAUW ENVIRONMENT SAFEGUARDS TEAM
Checklist When Reviewing an IEE or EIA
NO MITIGATION MEASURES SCENARIO

CHARIKOT TOWN-DEWATS
Checklist 1: Scoping Checklist Part 1 - Questions on Project Characteristics

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)?				
1.1	Permanent or temporary change in land use, land cover or topography including increases in intensity of land use?	Yes	Temporary change in land use at the designated stockyards by disposing excess of excavated materials	No, it is short term and is limited to construction period only
1.2	Clearance of existing land, vegetation and buildings?	No		
1.3	Creation of new land uses?	No		
1.4	Pre-construction investigations e.g. boreholes, soil testing?	No		
1.5	Construction works?	Yes	Same as 1.1	
1.6	Demolition works?	Yes	Will require demolition of ROW for excavation works for sewer lines and for manhole construction	No. The demolished ROW will also be readily rehabilitated.
1.7	Temporary sites used for construction works or housing of construction workers?	Yes	Possibility of disposal of the daily wastes to the nearby land or water bodies by the construction workers	No, there will be provision to prohibit such actions.
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?	Yes	Earthworks for sewer lines may bring change in land use disrupting the access to roadside shops and houses.	No, the spoils will be readily disposed, and the immediate backfilling works will be done.
1.9	Underground works including mining or tunnelling?	No		
1.10	Reclamation works?	No		
1.11	Dredging?	No		
1.12	Coastal structures *eg* seawalls, piers?	No		
1.13	Offshore structures?	No		
1.14	Production and manufacturing processes?	No		
1.15	Facilities for storage of goods or materials?	No		
1.16	Facilities for treatment or disposal of solid wastes or liquid effluents?	No		

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1.17	Facilities for long term housing of operational workers?	No		
1.18	New road, rail or sea traffic during construction or operation?	No		
1.19	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No		
1.20	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No		
1.21	New or diverted transmission lines or pipelines?			
1.22	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No		
1.23	Stream crossings?	No		
1.24	Abstraction or transfers of water from ground or surface waters?	No		
1.25	Changes in water bodies or the land surface affecting drainage or run-off?	No		
1.26	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Will generate dust and noise by vehicles for transportation of construction materials	No, because transportation of materials will be intermittent.
1.27	Long term dismantling or decommissioning or restoration works?	No		
1.28	Ongoing activity during decommissioning which could have an impact on the environment?	No		
1.29	Influx of people to an area in either temporarily or permanently?	No		
1.30	Introduction of alien species?	No		
1.31	Loss of native species or genetic diversity?	No		
1.32	Any other actions?	No		
2. Will construction or operation of the Project use natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply?				
2.1	Land especially undeveloped	No		

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	or agricultural land?			
2.2	Water?	No		
2.3	Minerals?	No		
2.4	Aggregates?	No		
2.5	Forests and timber?	No		
2.6	Energy including electricity and fuels?	No		
2.7	Any other resources?	No		
3. Will the Project involve use, storage, transport, handling or production of substances or materials which could be harmful to human health or the environment or raise concerns about actual or perceived risks to human health?				
3.1	Will the project involve use of substances or materials which are hazardous or toxic to human health or the environment (flora, fauna, water supplies)?	No		
3.2	Will the project result in changes in occurrence of disease or affect disease vectors (eg insect or water borne diseases)?	Yes	• The surroundings of the worker's camp may be affected as they may not have access to safe supply of water and good sanitation practice. • The effluent discharged from the treatment plant if not properly disposed may cause bad smell and result in the occurrence of disease	• No because it is limited to construction period only and it can also be avoided by provision of safe access to water, sanitation and health care. • The effluent is proposed to discharge to the cultivated land of the local people at their request as the community are willing to use the effluent as the manure for their agricultural productivity.
3.3	Will the project affect the welfare of people eg by changing living conditions?	No		
3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?	No		
3.5	Any other causes?	No		
4. Will the Project produce solid wastes during construction or operation or decommissioning?				

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
4.1	Spoil, overburden or mine wastes?	Yes	The spoil if not readily disposed at safe site, it will occupy the land and may create discomfort to the passer-by.	No, because it is short term and can also be avoided by provision of immediate disposal of the spoils at safe site
4.2	Municipal waste (household and or commercial wastes)?	Yes	The living environment of worker's camp may be polluted by the waste generated by the workers.	No, it is short term
4.3	Hazardous or toxic wastes (including radioactive wastes)?	No		
4.4	Other industrial process wastes?	No		
4.5	Surplus product?	No		
4.6	Sewage sludge or other sludge from effluent treatment?	Yes	The sewage sludge if not properly dried may not kill the pathogenic organisms properly which may pollute the environment and will affect the public health.	No, there will be provision of treatment of sludge and this will be regularly monitored.
4.7	Construction or demolition wastes?	Yes	• Air Pollution by the dust generated from the wastes • Discomfort to the passer-by if the wastes are not safely disposed	No, because it is limited to the construction phase only and there will be provision of immediate waste disposal
4.8	Redundant machinery or equipment?	No		
4.9	Contaminated soils or other material?	No		
4.10	Agricultural wastes?	No		
4.11	Any other solid wastes?	No		
5. Will the Project release pollutants or any hazardous, toxic or noxious substances to air?				
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources?	No		
5.2	Emissions from production processes?	No		
5.3	Emissions from materials handling including storage or transport?	Yes	Dust generation by the unloading of materials like cement, aggregates etc.	No -there will be regular monitoring
5.4	Emissions from construction activities including plant and equipment?	Yes	Dust generation by construction works like earthworks	No -there will be regular monitoring
5.5	Dust or odours from handling of materials including construction materials,	Yes	• Air pollution by the dust generation during unloading of materials	• No -there will be regular monitoring

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	sewage and waste?		like aggregates. • Odours from the sewage effluent creating nuisance to the surroundings.	• To avoid the odour from the sewage, the sewage will be properly and efficiently treated.
5.6	Emissions from incineration of waste?			
5.7	Emissions from burning of waste in open air (*eg* slash material, construction debris)?	Yes	The locality of the worker's camp may be affected by the open burning of waste generated from the worker's camp.	No, because it is limited to the local area only and is limited to the duration up to which the labours will be residing.
5.8	Emissions from any other sources?	No		
6. Will the Project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6.1	From operation of equipment eg engines, ventilation plant, crushers?	No		
6.2	From industrial or similar processes?	No		
6.3	From construction or demolition?	Yes	• The noise generated from the demolition of ROW for sewer lines and manholes may disturb the people residing at core bazaar area.	No because it is short term (limited to construction phase)
6.4	From blasting or piling?	No		
6.5	From construction or operational traffic?	Yes	Moving of vehicles carrying construction materials may affect core area like Charikot Bazaar	No- because it is short term
6.6	From lighting or cooling systems?	No		
6.7	From sources of electromagnetic radiation (consider effects on nearby sensitive equipment as well as people)?	No		
6.8	From any other sources?	No		
7. Will the Project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal waters or the sea?				
7.1	From handling, storage, use or spillage of hazardous or toxic materials?	No		
7.2	From discharge of sewage or	Yes	• The proposed project may	• No, there will be

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	other effluents (whether treated or untreated) to water or the land?		attract people from rural areas that will increase the population of the project area which in turn increase the generation of municipal sewage • The effluent discharge from the treatment plant may pollute the environment.	provision of treatment facilities and there will be also regular monitoring of this issue. • The effluent is proposed to be discharged to the nearby cultivated land which as per request of the community, will be used by the owners of that land for agricultural purposes.
7.3	By deposition of pollutants emitted to air, onto the land or into water?	Yes	The land nearby the workers camp may be polluted by the daily activities of the workers residing there temporarily.	No because there will be provision of strict monitoring of this area.
7.4	From any other sources?	No		
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No		
8. Will there be any risk of accidents during construction or operation of the Project which could affect human health or the environment?				
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous or toxic substances?	No		
8.2	From events beyond the limits of normal environmental protection eg failure of pollution control systems?	No		
8.3	From any other causes?	No		
8.4	Could the project be affected by natural disasters causing environmental damage (*eg* floods, earthquakes, landslip, *etc*)?	No		
9. Will the Project result in social changes, for example, in demography, traditional lifestyles, employment?				
9.1	Changes in population size, age, structure, social groups	Yes	There is chance of in migration due to this project	No, the ethnicity of project area is of

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	etc?		that will affect the existing community, cultural identity, economic conditions etc.	heterogeneous type. So, in migration of new community may not affect the existing community groups' identity.
9.2	By resettlement of people or demolition of homes or communities or community facilities eg schools, hospitals, social facilities?	No		
9.3	Through in-migration of new residents or creation of new communities?	Yes	People from the neighbouring remote areas may migrate to this project town to achieve improved living standards and this may bring change in demography as the population of the project area may be increased.	No, despite of change in demography, the proposed project has been designed on the basis of prediction of population growth in the future i.e., for 20 years.
9.4	By placing increased demands on local facilities or services eg housing, education, health?			
9.5	By creating jobs during construction or operation or causing the loss of jobs with effects on unemployment and the economy?	Yes	Requirement of labour for the construction works prioritize the local people hence, providing employment opportunities to the local people.	Yes, because the skills they learnt during their employment period can be utilized in the future in other similar kind of works.
9.6	Any other causes?	No		
10. Are there any other factors which should be considered such as consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality?				
10.1	Will the project lead to pressure for consequential development which could have significant impact on the environment eg more housing, new roads, new supporting industries or utilities, etc?	No		
10.2	Will the project lead to development of supporting facilities, ancillary development or development stimulated by the project	No		

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
	which could have impact on the environment eg: • supporting infrastructure (roads, power supply, waste or waste water treatment, etc) • housing development • extractive industries • supply industries other?			
10.3	Will the project lead to after-use of the site which could have an impact on the environment?	No		
10.4	Will the project set a precedent for later developments?	Yes	The safe access to sanitation by this project may create opportunities for other development infrastructures.	Yes, because it will be the important factor for the sustainable development of the town.
10.5	Will the project have cumulative effects due to proximity to other existing or planned projects with similar effects?	No		

Checklist 2: Scoping Checklist Part 2 - Characteristics of the Project Environment (Environmental Sensitivity)

Question - Are there features of the local environment on or around the Project location which could be affected by the Project? • Areas which are protected under international or national or local legislation for their ecological, landscape, cultural or other value, which could be affected by the project? • Other areas which are important or sensitive for reasons of their ecology e.g. • Wetlands, • Watercourses or other waterbodies, • the coastal zone, • mountains, • forests or woodlands • Areas used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the project? • Inland, coastal, marine or underground waters? • Areas or features of high landscape or scenic value?	Yes, the core Dolakha bazaar area may be susceptible to traffic congestion during sewer pipeline laying works that may provide discomfort to the passer-by and also may disrupt the access to the roadside shops & houses. Similarly, as the topography of the service area of this project is slightly sloped terrain, during sewer line laying works, there is possibility of erosion. Hence, it should be ensured that the trench for pipeline should not be abandoned and the contractor should be recommended to backfill the trench immediately.

• Routes or facilities used by the public for access to recreation or other facilities? • Transport routes which are susceptible to congestion or which cause environmental problems? • Areas or features of historic or cultural importance?	
Question - Is the Project in a location where it is likely to be highly visible to many people?	Yes. The project area is proposed to serve the Bhimeshwore municipality which includes the main market area due to which it will be highly visible to many people.
Question - Is the Project located in a previously undeveloped area where there will be loss of greenfield land?	No
Question - Are there existing land uses on or around the Project location which could be affected by the Project? For example: • Homes, gardens, other private property, • Industry, • Commerce, • Recreation, • public open space, • community facilities, • agriculture, • forestry, • tourism, • mining or quarrying	No
Question - Are there any plans for future land uses on or around the location which could be affected by the Project?	No
Question - Are there any areas on or around the location which are densely populated or built-up, which could be affected by the Project?	No
Question - Are there any areas on or around the location which are occupied by sensitive land uses which could be affected by the Project? • hospitals, • schools, • places of worship, • community facilities	No
Question - Are there any areas on or around the location which contain important, high quality or scarce resources which could be affected by the Project? For example: • groundwater resources, • surface waters, • forestry, • agriculture, • fisheries, • tourism, • minerals.	No
Question - Are there any areas on or around the location of the Project which are already	No

subject to pollution or environmental damage e.g. where existing legal environmental standards are exceeded, which could be affected by the project?	
Question - Is the Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions e.g. temperature inversions, fogs, severe winds, which could cause the project to present environmental problems?	No
Question - Is the Project likely to affect the physical condition of any environmental media? • The atmospheric environment including microclimate and local and larger scale climatic conditions? • Water - eg quantities, flows or levels of rivers, lakes, groundwater. Estuaries, coastal waters or the sea? • Soils - eg quantities, depths, humidity, stability or erodibility of soils? • Geological and ground conditions?	Yes, the sloped terrain of the project areas indicates the susceptibility to the soil erosion however if precautions are made, the effects can be made insignificant.
Question - Are releases from the Project likely to have effects on the quality of any environmental media? • Local air quality? • Global air quality including climate change and ozone depletion • Water quality – rivers, lakes, groundwater. Estuaries, coastal waters or the sea? • Nutrient status and eutrophication of waters? • Acidification of soils or waters? • Soils • Noise? • Temperature, light or electromagnetic radiation including electrical interference? • Productivity of natural or agricultural systems?	Yes, the construction activities may affect local air quality through dust emissions especially during dry season. It also generates noise pollution by the movement of vehicles for transporting materials, and demolition works of ROW for sewer line works. The proposed DEWATS system has the chance of possibility of contamination of effluent discharge if not properly managed. However, the recent field survey recommends that the effluent will be discharged to the nearby cultivated land which can be used as manure for agricultural purposes under the consent of the land owners.
Question - Is the Project likely to affect the availability or scarcity of any resources either locally or globally? • Fossil fuels? • Water? • Minerals and aggregates? • Timber? • Other non-renewable resources? • Infrastructure capacity in the locality - water, sewerage, power generation and transmission, telecommunications, waste disposal roads, rail?	No
Question - Is the Project likely to affect human or community health or welfare? • The quality or toxicity of air, water, foodstuffs and other products consumed by humans? • Morbidity or mortality of individuals, communities or populations by exposure to pollution?	Yes, • This project may offer employment to the local people to involve as a construction worker. This can be viewed as positive impact of the project. • This project also may result in the occurrence or

• Occurrence or distribution of disease vectors including insects? • Vulnerability of individuals, communities or populations to disease? • Individuals' sense of personal security? • Community cohesion and identity? • Cultural identity and associations? • Minority rights? • Housing conditions? • Employment and quality of employment? • Economic conditions? • Social institutions?	distribution of disease vector due to the temporary settlement of workers as they may not have access to safe water supply and sanitation. • The sewage effluent if not properly treated may pollute the environment and may result in the occurrence of disease vector. However, this effect will be insignificant if the sludge treatment process is done as per proposed in the design and if regular monitoring is done. • Similarly, this project if properly implemented will have positive effect on the welfare of the local people as they will have safe and easy access to good sanitation practice which will enhance their health. • Well planned sanitation system of this town will also boost the economic condition of the project town.

Checklist 3: Significance of Impacts

Questions to be Considered	
1. Will there be a large change in environmental conditions?	No
2. Will new features be out-of-scale with the existing environment?	No
3. Will the effect be unusual in the area or particularly complex?	No
4. Will the effect extend over a large area?	No
5. Will there be any potential for trans boundary impact?	No
6. Will many people be affected?	No
7. Will many receptors of other types (fauna and flora, businesses, facilities) be affected?	No
8. Will valuable or scarce features or resources be affected?	No
9. Is there a risk that environmental standards will be breached?	No
10. Is there a risk that protected sites, areas, features will be affected?	No
11. Is there a high probability of the effect occurring?	No
12. Will the effect continue for a long time?	No
13. Will the effect be permanent rather than temporary?	No
14. Will the impact be continuous rather than intermittent?	No
15. If it is intermittent will it be frequent rather than rare?	No
16. Will the impact be irreversible?	No
17. Will it be difficult to avoid, or reduce or repair or compensate for the effect?	No

RIVER WATER QUALITY MONITORING RESULTS
SURFACE WATER QUALITY TEST RESULTS OF CHARIKOT TOWN

S. N.	Parameters	Unit	Observed Value of Sample*			NDWQS, Nepal	WHO Guideline Values
			Jhapre	Hattichahara	Odare		
1	pH at 26^0C	-	7.0	7.4	7.7	6.5-8.5	
2	Electrical Conductivity	µmhos/cm	31	162	272	1500	
3	Turbidity	NTU	**2.0**	2.1	2.1	5(10)	
4	Taste and Odor		N.O.	N.O.	N.O.	N.O.	
5	Color	TCU	0.09	0.15	0.14	500	
6	Total hardness as $CacO_3$	mg/l	20	80	124	5(15)	
7	Total Dissolved Solid	mg/l	19	98	165	1000	
8	Total Residual Chlorine	mg/l	<0.10	<0.10	<0.10	0.1-0.2	5
9	Chloride	mg/l	<0.50	<0.50	<0.50	250	
10	Ammonia	mg/l	0.45	0.46	0.47	1.5	
11	Nitrate	mg/l	0.80	0.89	0.84	50	50
12	Aluminum	mg/l	<0.01	<0.01	0.02	0.2	
13	Fluoride	mg/l	0.15	0.51	0.13	0.5-1.5	1.5
14	Sulfate	mg/l	4.2	9.7	12.4	250	
15	Mercury	mg/l	<0.001	<0.001	<0.001	0.001	0.006
16	Calcium	mg/l	4.8	12.8	24	200	
17	Iron	mg/l	0.21	<0.05	<0.05	0.30(3)	
18	Manganese	mg/l	<0.05	<0.01	<0.01	0.2	
19	Lead	mg/l	<0.01	<0.003	<0.003	0.01	0.01
20	Cadmium	mg/l	<0.003	<0.05	<0.05	0.003	0.003
21	Chromium	mg/l	<0.05	<0.05	<0.05	0.05	0.05
22	Copper	mg/l	<0.05	<0.02	<0.02	1	2
23	Zinc	mg/l	<0.02	<0.01	<0.01	3	
24	Arsenic	mg/l	<0.01	<0.01	<0.01	0.05	0.01

* Surface water quality from samples taken on 22 April 2016.

NS Lab Accreditation No.: 09-2068/69 Regd. No. 53875/064/065

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(C e n t e r f o r c o m p l e t e s c i e n t i f i c s o l u t i o n)

Nepal Laboratory Accreditation Scheme
Accredited Laboratory
No - 09 - 068/69

Test Report/Certificate

Report No. : 22/2073
Entry No. : AASTHA – 14– 2073
Sample : Surface Water
Client : ICON - TAEC JV
Location : Jhapre, Dolakha

Date received : 10 – 01 – 2073
Date completed : 18 – 01 – 2073
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 26°C	4500-H⁺ APHA-AWWA-WEF 2012, 22nd Edition	7.0	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	31	1500
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	2.0	5 (10)
4.	Taste and Odor	-	N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.09	500
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	20	5(15)
7.	Total Dissolved Solid, (mg/l)	2540 C , APHA - AWWA - WEF 2012, 22nd Edition	19	1000
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	<0.50	250
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.45	1.5
11.	Nitrate, (mg/l)	4500-NO_3-B, APHA-AWWA-WEF 2012, 22nd Edition	0.80	50.0
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	<0.01	0.20
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22nd Edition	0.15	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	4.2	250
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF , WPCF, 17th Edition	<0.001	0.001
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22nd Edition	4.8	200
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	0.21	0.30(3)
18.	Manganese*, (mg/l)		<0.05	0.20
19.	Lead*, (mg/l)		<0.01	0.01
20.	Cadmium*, (mg/l)		<0.003	0.003
21.	Chromium*, (mg.l)		<0.05	0.05
22.	Copper*, (mg/l)		<0.05	1.0
23.	Zinc*, (mg/l)		<0.02	3.0
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05

Remarks: *Water quality meets NDWQS required limit.*

Analyzed By Checked By Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
3. Liability of our institute is limited to the invoiced detrimands and amount only.
4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.
5. Parameters in * are not accreditated by NBSM.

NS Lab Accreditation No.: 09-2068/69 Regd. No. 53875/064/065

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(Center for complete scientific solution)

Nepal Laboratory Accreditation Scheme — Accredited Laboratory — No - 09 - 068/69

Test Report/Certificate

Report No. : 24/2073
Entry No. : AASTHA – 14– 2073
Sample : Surface Water
Client : ICON - TAEC JV
Location : Hattichhare, Dolakha

Date received : 10 – 01 – 2073
Date completed : 18 – 01 – 2073
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 26°C	4500-H^+ APHA-AWWA-WEF 2012, 22nd Edition	7.4	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	162	1500
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	2.1	5 (10)
4.	Taste and Odor	-	N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.15	500
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	80	5(15)
7.	Total Dissolved Solid, (mg/l)	2540 C , APHA - AWWA - WEF 2012, 22nd Edition	98	1000
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	<0.50	250
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.46	1.5
11.	Nitrate, (mg/l)	4500-NO_3-B, APHA-AWWA-WEF 2012, 22nd Edition	0.89	50.0
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	<0.01	0.20
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22nd Edition	0.51	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	9.7	250
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF , WPCF, 17th Edition	<0.001	0.001
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22nd Edition	12.8	200
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	<0.05	0.30(3)
18.	Manganese*, (mg/l)		<0.01	0.20
19.	Lead*, (mg/l)		<0.003	0.01
20.	Cadmium*, (mg/l)		<0.05	0.003
21.	Chromium*, (mg.l)		<0.05	0.05
22.	Copper*, (mg/l)		<0.02	1.0
23.	Zinc*, (mg/l)		<0.01	3.0
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05

Remarks: *Water quality meets NDWQS required limit.*

Analyzed By Checked By Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
2. This report is neither to be reproduced wholly or partially nor can be used as an evidence in the court of law.
3. Liability of our institute is limited to the invoiced detrimands and amount only.
4. Even in the case of stable samples such as limestone, minerals, soil etc. they will not be stored more than six months.
5. Parameters in * are not accreditated by NBSM.

NS Lab Accreditation No.: 09-2068/69 Regd. No. 53875/064/065

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Tel: +977-1-4433748, E-mail: aasthalab2065@gmail.com

(C e n t e r f o r c o m p l e t e s c i e n t i f i c s o l u t i o n)

Nepal Laboratory Accreditation Scheme — Accredited Laboratory — No - 09 - 068/69

Test Report/Certificate

Report No. : 23/2073
Entry No. : AASTHA – 14– 2073
Sample : Surface Water
Client : ICON - TAEC JV
Location : Odare, Dolakha

Date received : 10 – 01 – 2073
Date completed : 18 – 01 – 2073
Sampled By : Client

S. N.	Parameters	Method	Observed Values	National Drinking Water Quality Standard
1.	pH at 26°C	4500-H^+ APHA-AWWA-WEF 2012, 22nd Edition	7.7	6.5 - 8.5
2.	Electrical Conductivity, (µmhos/cm)	2510 B, APHA-AWWA-WEF 2012, 22nd Edition	272	1500
3.	Turbidity, (NTU)	2130 B, APHA-AWWA-WEF 2012, 22nd Edition	2.1	5 (10)
4.	Taste and Odor	-	N. O.	Not Objectionable
5.	Color, (TCU)	2120 C, APHA - AWWA - WEF 2012, 22nd Edition	0.14	500
6.	Total Hardness as $CaCO_3$, (mg/l)	2340 C, APHA-AWWA-WEF 2012, 22nd Edition	124	5(15)
7.	Total Dissolved Solid, (mg/l)	2540 C , APHA - AWWA - WEF 2012, 22nd Edition	165	1000
8.	Total Residual Chlorine, (mg/l)	4500 - Cl B, APHA - AWWA - WEF 2012, 22nd Edition	<0.10	0.1-0.2
9.	Chloride, (mg/l)	4500-Cl- B, APHA-AWWA-WEF 2012, 22nd Edition	<0.50	250
10.	Ammonia, (mg/l)	4500-NH3 D, APHA, AWWA, WPCF, 17th Edition	0.47	1.5
11.	Nitrate, (mg/l)	4500-NO_3-B, APHA-AWWA-WEF 2012, 22nd Edition	0.84	50.0
12.	Aluminum, (mg/l)	3500-Al B, APHA, AWWA, WEF, 22nd Edition	0.02	0.20
13.	Fluoride, (mg/l)	4500-F- D, APHA - AWWA - WEF 2012, 22nd Edition	0.13	0.5-1.5
14.	Sulfate, (mg/l)	4500-SO_4^{2-} C, APHA - AWWA - WEF 2012, 22nd Edition	12.4	250
15.	Mercury*, (mg/l)	3500-Hg-C, APHA-AWWA-WEF , WPCF, 17th Edition	<0.001	0.001
16.	Calcium, (mg/l)	3500-Ca B, APHA-AWWA-WEF 2012, 22nd Edition	24	200
17.	Iron*, (mg/l)	3111 B, APHA - AWWA - WEF 2012, 22nd Edition	<0.05	0.30(3)
18.	Manganese*, (mg/l)		<0.01	0.20
19.	Lead*, (mg/l)		<0.003	0.01
20.	Cadmium*, (mg/l)		<0.05	0.003
21.	Chromium*, (mg.l)		<0.05	0.05
22.	Copper*, (mg/l)		<0.02	1.0
23.	Zinc*, (mg/l)		<0.01	3.0
24.	Arsenic, (mg/l)	3500-As B, APHA - AWWA - WEF 2012, 22nd Edition	<0.01	0.05

Remarks: *Water quality meets NDWQS required limit.*

Analyzed By | Checked By | Authorized By

Note : 1. The issued report refers only to the tested sample and applicable parameters. Endorsement of products is neither inferred nor implied.
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5. Parameters in * are not accreditated by NBSM.

NEPAL WATER QUALITY GUIDELINES FOR IRRIGATION WATER

Table 6.22 : Nepal Water Quality Guidelines for Irrigation Water

Microbiological constituents:

S.N.	Parameter name	Target Water Quality Range	Remarks
1.	Coliforms(faecal)	< 1 count /100 ml	1 – 1000 count / 100 ml could be used for plants for which edible parts are not wetted.

Physical Constituents:

S.N.	Parameter name	Target Water Quality Range	Remarks
1	pH	6.5 – 8.5	Adverse effect on plants outside this range
2.	Suspended Solids	< 50 mg/l	Above the limit problem with sedimentation and irrigation system
3.	Electrical Conductivity	< 40 mS/m	Upto 540 mS/m depending upon sensitivity of crops.

Chemical Constituents:

S.N.	Parameter name	Target Water Quality Range	Remarks
1.	Aluminium	< 5 mg/l	Upto 20 mg/l max. acceptable conc.
2.	Arsenic	< 0.1 mg/l	> 2 mg/l creates severe problem
3.	Beryllium	< 0.1 mg/l	0.1 – 0.5 mg/l max. acceptable conc.
4.	Boron	< 0.5 mg/l	Upto 15 mg/l depending upon species.
5.	Cadmium	< 0.01 mg/l	0.01 – 0.05 mg/l max. acceptable conc.
6.	Chloride	< 100 mg/l	Upto 700 mg/l depending upon species
7.	Chromium	< 0.1 mg/l	Upto 1.0 mg/l max. acceptable conc.
8.	Cobalt	< 0.05 mg/l	Upto 5.0 mg/l max. acceptable conc.
9.	Copper	< 0.2 mg/l	Upto 5.0 mg/l max. acceptable conc.
10.	Fluoride	< 2.0 mg/l	Upto 15 mg/l max. acceptable conc.
11.	Iron	< 5.0 mg/l (non-toxic)	> 1.5 mg/l creates problem in drip irrigation system
12.	Lead	< 0.2 mg/l	Upto 2.0 mg/l max. acceptable conc.
13.	Lithium	< 2.5 mg/l	For citrus < 0.75 mg/l
14.	Manganese	< 0.02 mg/l	Upto 10 mg/l max. acceptable conc.
15.	Molybdenum	< 0.01 mg/l	Upto 0.05 mg/l max. acceptable conc.
16.	Nickel	< 0.2 mg/l	Upto 2.0 mg/l max. acceptable conc.
17.	Nitrogen (inorganic)	< 5 mg/l	Higher concentration may affect sensitive plants and may contaminate ground water
18.	Selenium	< 0.02 mg/l	Upto 0.05 mg/l max. acceptable conc.
19.	Sodium Adsorption Ratio (SAR)	< 2.0	Upto 10 depending upon sensitivity of crops.
20.	Sodium	< 70 mg/l	Upto 460 depending upon sensitivity of crops
21.	Total Dissolved Solids (as EC)	< 40 mS/m	Upto 540 mS/m depending upon sensitivity of crops
22	Uranium	< 0.01 mg/l	Upto 0.1 mg/l max. acceptable conc.
23.	Vanadium	< 0.1 mg/l	Upto 1.0 mg/l max. acceptable conc.
24.	Zinc	< 1.0 mg/l	Upto 5 mg/l max. acceptable conc.

Source : Department of Irrigation, Ground Water Project (Nepal Gazette (Number 10, B.S., 2065-03-02)).

SPOIL MANAGEMENT PLAN

Purpose and Application: SMP is to describe how STWSSP will manage the spoil generated and reuse related to design and construction works. This is an integral part of EMP. The objective of SMP is to reuse of spoil from works in accordance with the spoil management hierarchy outlined in this document.

Objectives of SMP: The objectives of SMP are:

(i) To minimize spoil generation where possible;
(ii) Maximize beneficial reuse of spoil from construction works in accordance with spoil management hierarchy;
(iii) Mange onsite spoil handling to minimize environmental impacts on resident and other receivers;
(iv) Minimize any further site contamination of land, water, soil; and
(v) Manage the transportation of spoil with consideration of traffic impacts and transport related emissions.

Structure of SMP:

Section 1: Introduction of SMP
Section 2: Legal and other requirements
Section 3: Roles and responsibilities
Section 4: Identification and assessment of spoil aspects and impacts
Section 5: Spoil volumes, characteristics and minimization
Section 6: Spoil reuses opportunities, identification and assessment
Section 7: On site spoil management approach
Section 8: Spoil transportation methodology
Section 9: Monitoring, Reporting, Review, and Improvements

Aspects and potential impacts

The key aspects of potential impacts in relation to SMP are listed in table below

Aspects	Potential Impacts
Air Quality	Potential for high winds generating airborne dust from the stock piles
Sedimentation	Potential for sediment laden site runoff from spoil stockpiles and potential for spillage of spoil from truck on roads
Surface and groundwater	Contamination of surface and ground water
Noise	Associated with spoil handling and haulage and storage
Traffic	Impacts associated with spoil haulage
Land Use	Potential for spoil to be transported to a that does not have permission for storage/disposal
Design specifications	Limitations on opportunities to minimize spoil generation
Sustainability	Limited sites for storage, reuse opportunities

Spoil volumes, Characteristics and Minimization

Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.
Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials
Adopt Spoil Reduce, Reuse Opportunities: An overview of the assessment methodology to be used is mentioned below.

- Consideration of likely spoil characteristics
- Identification of possible reuse sites
- Screening of possible reuse opportunities

Identification of possible safe disposal sites for spoil: Those spoils which can't be reuse shall be properly disposed in designated areas, such disposal areas should be identified in project locations. Such disposal areas should be safe from environmental aspects and there should be any legal and resettlement related issues. Such areas need to be identified and prior cliental approval should be obtained to use it as spoil disposal area. The local administration must be consulted and if required permission should be obtained from them.

Storage and stock piling Transportation and haulage route

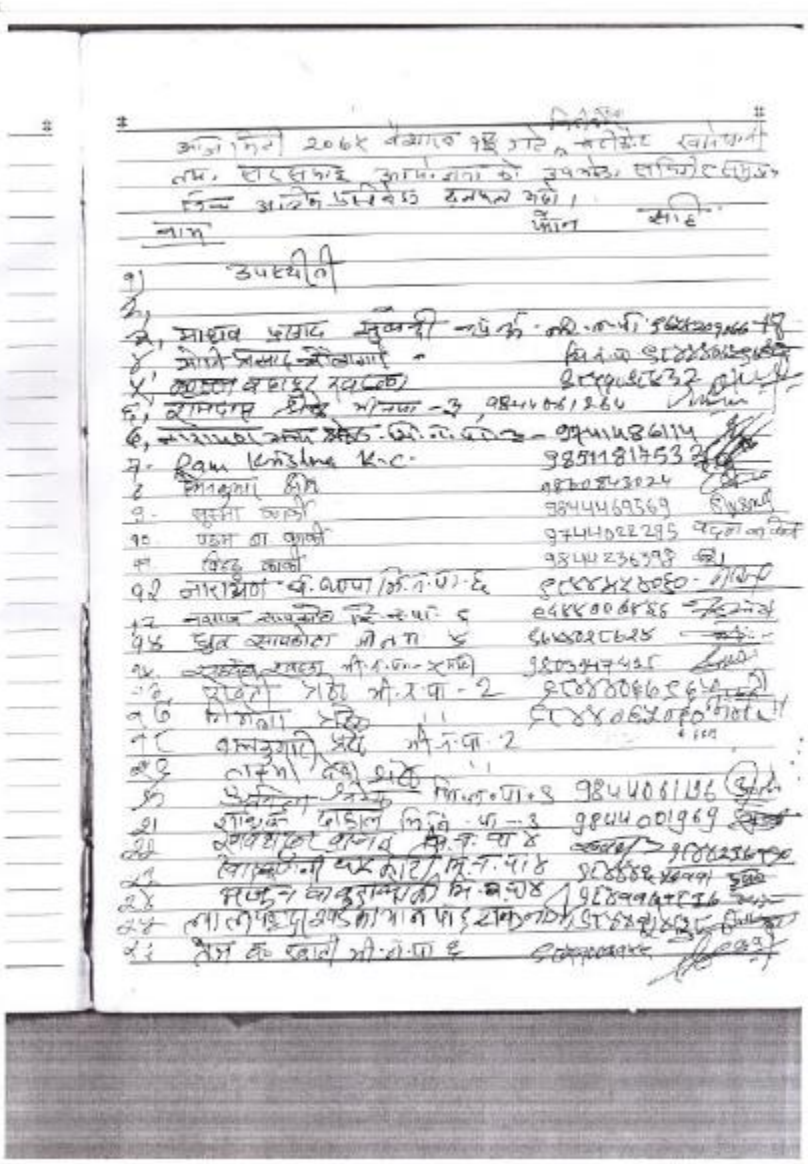
Based on the above, the contractor will prepare a SMP as an integral part of EMP and submit it to the DSC for their review and approval.

Summary of Key Issues and Remedial Actions

Summary of follow up time-bound actions to be taken within a set timeframe

MINUTES OF PUBLIC CONSULTATION MEETING

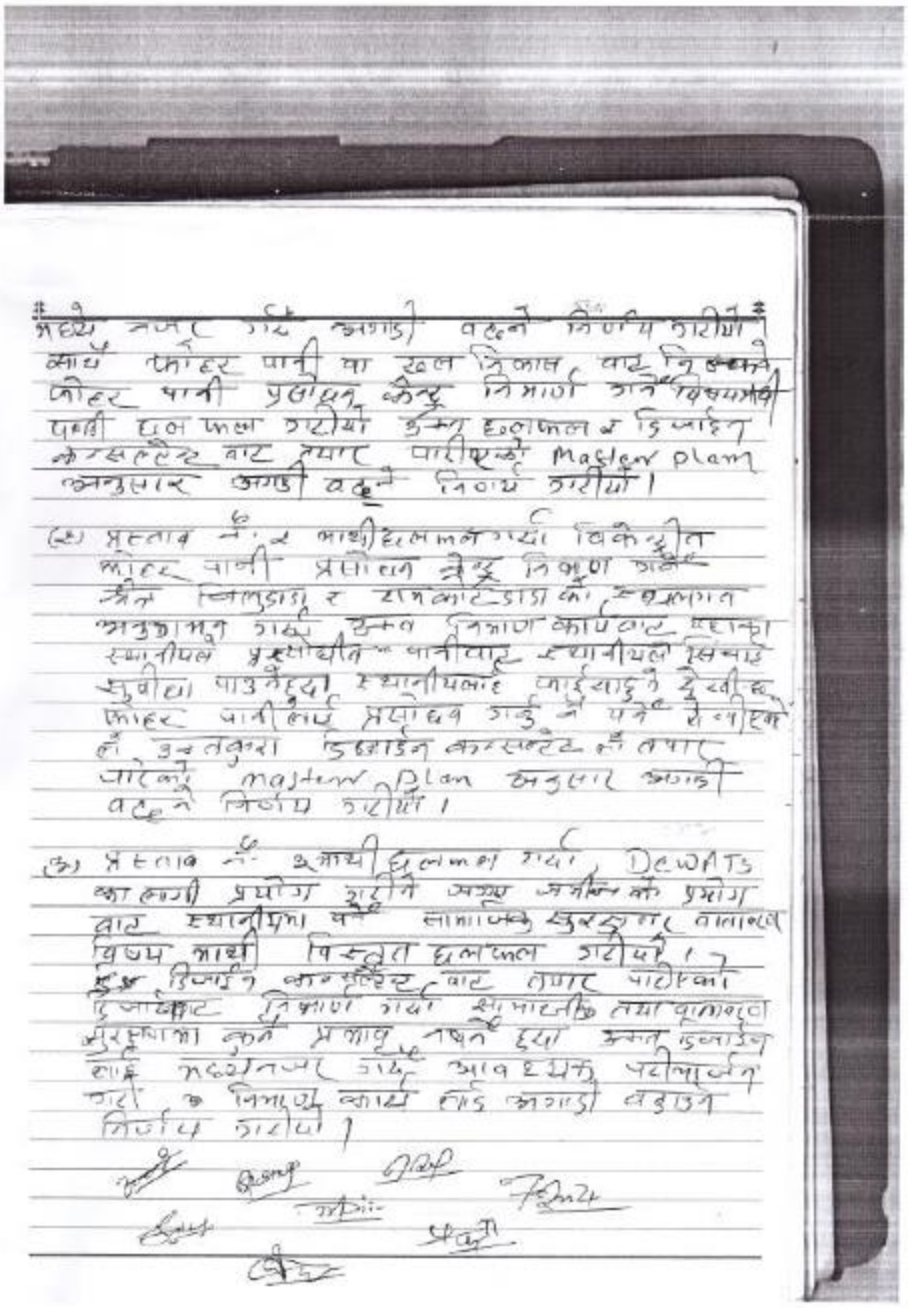
Minutes of Meeting



२७ दिपक प्रसाद ज्यौपाने [illegible] [signature]
२८ गोकुल प्रसाद ज्यौपाने [illegible] [signature]
२९. नीतिकृष्ण जोशी [illegible] [signature]
30. Binod Chandra Dahkal TAEP [signature]
31. Shiva Adhikari [signature]
32 Rajendra Sapkota
33 Subash Ray Panta
34 Manbahadur Gurung
35 Bal Ram Mayalu
~~36~~

छलफलका विषयहरु :-
प्रस्तावहरु
(१) आयोजना को अन्तीम प्रतिवेदन माथी छलफल ।
(२) विकेन्द्रीत फोहर पानी प्रशोधन तथा व्यवस्थापनका लागी आवश्यक पर्ने जग्गा [illegible] स्थलगत अनुगमन (निर्माणपछि) [illegible] र प्रशोधित पानी [illegible] पर्ने स्थलगत भ्रमण र उपयोगितामाथी छलफल ।
(३) DEWATS लागी प्रयोग गरीने जग्गा र उक्त निर्माण कार्यले वातावरण तथा सामाजिक [illegible] विषयमा पर्ने प्रभाव का विश्लेषण [illegible] छलफल ।

निर्णय हरु :
(१) प्रस्ताव नं. १ माथी छलफल गर्दा यस जिम्मेवार नगर पालिका [illegible] डिजाईन कन्सल्टेन्ट बाट विस्तृत नमुना प्रस्तुती [illegible] डिजाईन कन्सल्टेन्ट बाट प्रस्तुत गरीयो । उक्त प्रस्तुतीकरण माथी छलफल गरीयो र उक्त डिजाईन हाम्रो उपभोक्ताहरु लाई उपयोगी रहेकोले उक्त डिजाईन लाई



Minutes of Meeting

English Translation of Minute of Meeting

Charikot Small Town Water Supply, Sanitation and User's Committee has organized a public meeting dated 04-5-2016 in the premises of Bhimeshwor Municipality compound under Chairperson of municipality's executive officer Mr. Sanjaya Bahadur Rajlawat. Participation was made from all concerned stakeholders. After discussion in the meeting, it was concluded that about program shall be launched in their town by UWSSSP.

S. No.	Name of the Participants	Designation/Address
1	Mr.Sanjaya Bahadur Rajlawat	Chairman
2	Mr. RamKrishna KC	Charikot Drinking Water
3	Mr. Krishna Bahadur Karki	Hattichahara Drinking Water
4	Mr. Krishna Bahadur Khadka	Charikot Drinking Water
5	Mr. Kailash Shrestha	Hattichahara Drinking Water
6	Mr. Dhruba Basnet	Hattichahara Drinking Water
7	Mr. Anil Shrestha	Dolakha Drinking Water
8	Mr. Ram Prasad Sapkota	Jilu Drinking Water
9	Mr. Dawa Sherpa	Charikot Drinking Water
10	Ms. Roma Karki	S.T.
11	Ms. Krishna Kumari Thapa	
12	Ms. Rupa Bhujel (Shahi)	
13	Ms. Geeta KC	Bhimeshwor Municipality-10, Taganagi
14	Mr. Suku Shrestha	Treasurer, Drinking water committee
15	Mr. Ram Das Shrestha	Bhimeshwor Municipality
16	Mr. Lalbahadur Khadka	Chairman,Taganagi
17	Mr. Kabindra Das Shrestha	Bhimeshwor Municipality-07, Jilu
18	Mr. Jhamak Bahadur Basnet	
19	Mr. Yadav Prasad Dahal	Bhimeshwor Municipality-10, Taganagi
20	Mr. Dhan Bahadur Chaulagain	
21	Mr. Shree Krishna Neupane	Ramkot Drinking Water
22	Mr. Gokul Prasad Neupane	Ramkot Drinking Water
23	Mr. Manbir Dhanuke	Bhimeshwor Municipality-01
24	Mr. Taranath Chaulagai	Bhimeshwor Municipality-01
25	Mr. Bal Bahadur Shrestha	Bhimeshwor Municipality-07, Jilu
26	Mr. Gyan Bahadur Shrestha	Bhimeshwor Municipality-07, Jilu
27	Mr. Upendra Bahadur Khadka	Bhimeshwor Municipality-07, Jilu
28	Mr. Kumar Chaulagain	
29	Mr. Ram Bahadur KC	
30	Mr. Ganesh Bahadur KC	
31	Mr. Birsha Bahadur Budhathoki	
32	Mr. Mandhwoj Lama	Chothang
33	Mr. Tej Bahadur Shrestha	
34	Mr. Badri Kumar Shrestha	
35	Mr. Rajan Karki	Bhimeshwor Municipality-06
36	Mr. Ram Bahadur Karki	Bhimeshwor Municipality-06
37	Mr. Kamal Bahadur Thawa	Kamal Bahadur Thawa

S. No.	Name of the Participants	Designation/Address
38	Mr. Lalit Bhujel	Lalit Bhujel… Bhimeshwor Municipality-07
39	Mr. Sangdhwoj Lama	Bhimeshwor Municipality-01
40	Mr. Harihar Prasad Neupane	Ramkot
41	Mr. Durga Prasad Kafle	Charikot Drinking Water
42	Mr. Ranga Dhwoj Budhathoki	Bhimeshwor Municipality-06
43	Mr. Ganga Bahadur Budhathoki	Bhimeshwor Municipality-06
44	Mr. Ram Sharan Thapa	Charikot Drinking Water
45	Mr. Badri Kumar Shrestha	Hattichahara

SAMPLE GRIEVANCE REDRESS FORM

(To be available in Nepalese and English)

The___Project welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enables us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information remain confidential, please inform us by writing/typing* (CONFIDENTIAL)* above your name. Thank you.

Date	Place of registration			
Contact Information/personal details				
Name	Gender	*Male *Female	Age	
Home Address				
Place				
Phone No.				
E-mail				
Complaint/Suggestion/Comment/Question Please provide the details (who, what, where and how) of your grievance below: If includes as attachment/note/letter, please tick here:				
How do you want us to reach you for feedback or update on your comment/grievance?				

FOR OFFICIAL USE ONLY

Registered by: (Names of official registering grievance)	
Mode of communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/positions of official(s) reviewing grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

SAMPLE OUTLINE OF TRAFFIC MANAGEMENT PLAN

A. Principles

1. One of the prime objectives of this Traffic Management Plan (TMP) is to ensure the safety of all the road users along the work zone, and to address the following issues:

   (i) the safety of pedestrians, bicyclists, and motorists travelling through the Construction zone;
   (ii) protection of work crews from hazards associated with moving traffic;
   (ii) mitigation of the adverse impact on road capacity and delays to the road users;
   (iv) maintenance of access to adjoining properties; and
   (v) addressing issues that may delay the project.

B. Operating Policies for TMP

2. The following principles will help promote safe and efficient movement for all road users (motorists, bicyclists, and pedestrians, including persons with disabilities) through and around work zones while reasonably protecting workers and equipment.

   (i) Make traffic safety and temporary traffic control an integral and high-priority element of every project from planning through design, construction, and maintenance.
   (ii) Inhibit traffic movement as little as possible.
   (ii) Provide clear and positive guidance to drivers, bicyclists, and pedestrians as they approach and travel through the temporary traffic control zone.
   (iii) Inspect traffic control elements routinely, both day and night, and make modifications when necessary.
   (iv) Pay increased attention to roadside safety in the vicinity of temporary traffic control zones.
   (v) Train all persons that select, place, and maintain temporary traffic control devices.
   (vii) Keep the public well informed.
   (viii) Make appropriate accommodation for abutting property owners, residents, businesses, emergency services, railroads, commercial vehicles, and transit operations.

3. Figures below illustrate the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

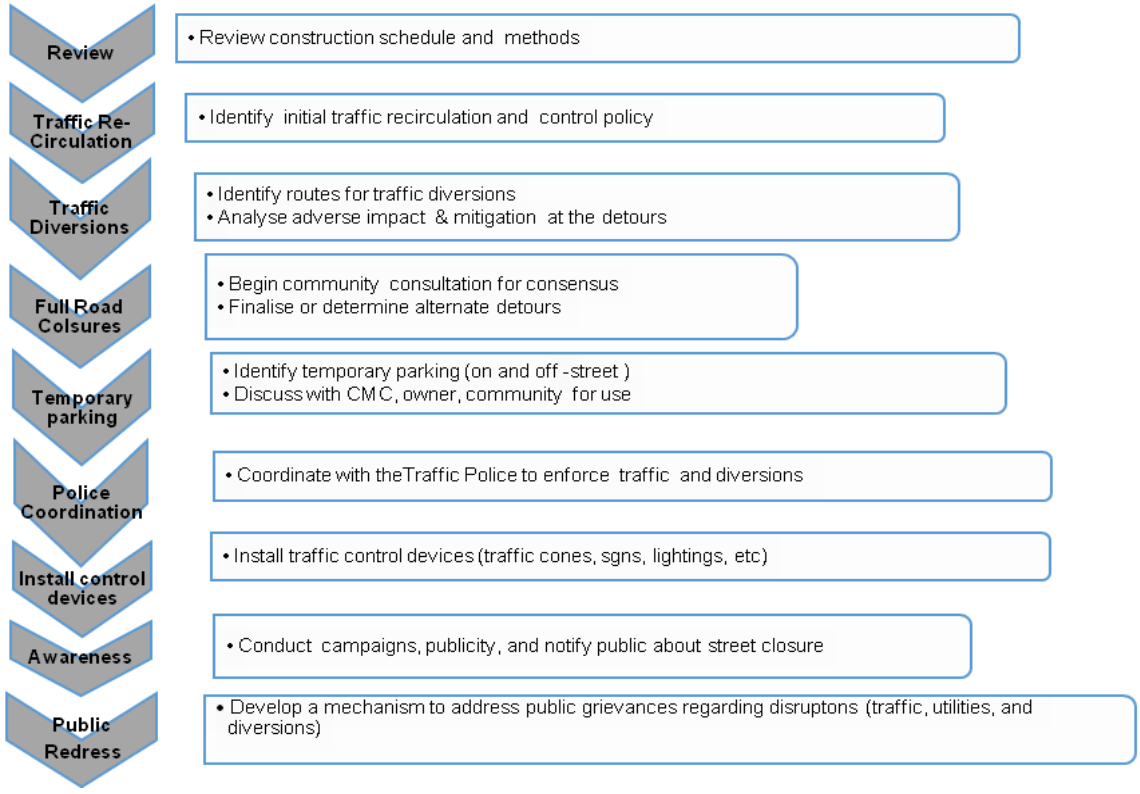
C. Analyse the impact due to street closure

4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:
   (i) approval from the local government to use the local streets as detours;
   (ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
   (iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;
   (iv) determining if additional traffic control or temporary improvements are needed along the detour route;
   (v) considering how access will be provided to the worksite;

(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
(vi) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

5. If full road-closure of certain streets within the area is not feasible due to inadequate capacity of the detour street or public opposition, the full closure can be restricted to weekends with the construction commencing on Saturday night and ending on Monday morning prior to the morning peak period.

Policy Steps for the TMP



D. Public awareness and notifications

6. As per discussions in the previous sections, there will be travel delays during the constructions, as is the case with most construction projects, albeit on a reduced scale if utilities and traffic management are properly coordinated. There are additional grounds for travel delays in the area, as most of the streets lack sufficient capacity to accommodate additional traffic from diverted traffic as a result of street closures to accommodate the works.

7. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public claims as result of these problems. These activities will take place sufficiently in advance of the time

when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices ward level meetings and city level meeting with the elected representatives.

8. The PIU will also conduct an awareness campaign to educate the public about the following issues:

   (i) traffic control devices in place at the work zones (signs, traffic cones, barriers, etc.);
   (ii) defensive driving behaviour along the work zones; and
   (iii) reduced speeds enforced at the work zones and traffic diversions.

9. It may be necessary to conduct the awareness programs/campaigns on road safety during construction.

10. The campaign will cater to all types of target groups i.e. children, adults, and drivers. Therefore, these campaigns will be conducted in schools and community centres. In addition, the project will publish a brochure for public information. These brochures will be widely circulated around the area and will also be available at the PIU, and the contractor's site office. The text of the brochure should be concise to be effective, with a lot of graphics. It will serve the following purpose:

    (i) explain why the brochure was prepared, along with a brief description of the project;
    (ii) advise the public to expect the unexpected;
    (iii) educate the public about the various traffic control devices and safety measures adopted at the work zones;
    (iv) educate the public about the safe road user behaviour to emulate at the work zones;
    (v) tell the public how to stay informed or where to inquire about road safety issues at the work zones (name, telephone, mobile number of the contact person; and
    (vi) indicate the office hours of relevant offices.

E. Install traffic control devices at the work zones and traffic diversion routes

11. The purpose of installing traffic control devices at the work zones is to delineate these areas to warn, inform, and direct the road users about a hazard ahead, and to protect them as well as the workers. As proper delineation is a key to achieve the above objective, it is important to install good traffic signs at the work zones. The following traffic control devices are used in work zones:

    - Signs
    - Pavement Markings
    - Channelizing Devices
    - Arrow Panels
    - Warning Lights

12. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry

considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

13. Below descriptions illustrate a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

    - Work on shoulder or parking lane
    - Shoulder or parking lane closed on divided road
    - Work in Travel lane
    - Lane closure on road with low volume
    - Lane closure on a two-lane road with low volume (with yield sign)
    - Lane closure on a two-lane road with low volume (one flagger operation)
    - Lane closure on a two-lane road (two flagger operation)
    - Lane closure on a four-lane undivided Road
    - Lane closure on divided roadway
    - Half road closure on multi-lane roadway
    - Street closure with detour

14. The work zone should take into consideration the space required for a buffer zone between the workers and the traffic (lateral and longitudinal) and the transition space required for delineation, as applicable. For the works, a 30 cm clearance between the traffic and the temporary STOP and GO signs should be provided. In addition, at least 60 cm is necessary to install the temporary traffic signs and cones.

15. Traffic police should regulate traffic away from the work zone and enforce the traffic diversion result from full street closure in certain areas during construction. Flaggers/ personnel should be equipped with reflective jackets at all times and have traffic control batons for regulating the traffic during night time.

16. In addition to the delineation devices, all the construction workers should wear fluorescent safety vests and helmets in order to be visible to the motorists at all times. There should be provision for lighting beacons and illumination for night constructions.

TEMPLATE FOR SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

This template must be included as an appendix in the EIA/IEE that will be prepared for the project. It can be adapted to the specific project as necessary.

I. INTRODUCTION

- Overall project description and objectives
- Description of sub-projects
- Environmental category of the sub-projects
- Details of site personnel and/or consultants responsible for environmental monitoring
- Overall project and sub-project progress and status

No.	Subproject Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational		
		□	□	□	□		
		□	□	□	□		
		□	□	□	□		

II. COMPLIANCE STATUS WITH NATIONAL/STATE/LOCAL STATUTORY ENVIRONMENTAL REQUIREMENTS

No.	Subproject Name	Statutory Environmental Requirements	Status of Compliance	Action Required

III. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

No. (List schedule and paragraph number of Loan Agreement)	Covenant	Status of Compliance	Action Required

IV. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There shall be Reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual Report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:
  - What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;
  - If water was escaping site boundaries or tracks were seen on adjacent roads;

- Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Are their designated areas for concrete works, and refuelling;
- Are their spill kits on site and if there are site procedure for handling emergencies;
- Is there any chemical stored on site and what is the storage condition?
- Is there any dewatering activities if yes, where is the water being discharged;
- How are the stockpiles being managed;
- How is solid and liquid waste being handled on site;
- Review of the complaint management system;
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE shall be monitored)	Method of Monitoring	Location of Monitoring	Date of Monitoring Conducted	Name of Person Who Conducted the Monitoring
Design Phase						
Pre-Construction Phase						
Construction Phase						
Operational Phase						

Overall Compliance with CEMP/EMP

No.	Sub-Project Name	EMP/CEMP Part of Contract Documents (Y/N)	CEMP/EMP Being Implemented (Y/N)	Status of Implementation (Excellent/ Satisfactory/ Partially Satisfactory/ Below Satisfactory)	Action Proposed and Additional Measures Required

V. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT
- Brief description on the approach and methodology used for environmental monitoring of each sub-project

VI. MONITORING OF ENVIRONMENTAL IMPACTS ON THE PROJECT SURROUNDINGS (AMBIENT AIR, WATER QUALITY AND NOISE LEVELS)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

As a minimum the results shall be presented as per the tables below.

Air Quality Results

Site No.	**Date of Testing**	**Site Location**	**Parameters (Government Standards)**		
			PM10 (µg/m^3)	**SO2** (µg/m^3)	**NO2** (µg/m^3)

Site No.	**Date of Testing**	**Site Location**	**Parameters (Monitoring Results)**		
			PM10 (µg/m^3)	**SO2** (µg/m^3)	**NO2** (µg/m^3)

Water Quality Results

Site No.	**Date of Sampling**	**Site Location**	**Parameters (Government Standards)**					
			pH	**Conductivity** (µS/cm)	**BOD** (mg/L)	**TSS** (mg/L	**TN** (mg/L)	**TP** (mg/L**)**

Site No.	**Date of Sampling**	**Site Location**	**Parameters (Government Standards)**					
			pH	**Conductivity** (µS/cm)	**BOD** (mg/L)	**TSS** (mg/L	**TN** (mg/L)	**TP** (**(**mg/L)

Noise Quality Results

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LA_{eq} (dBA) (Government Standard)	
			Day Time	Night Time

VII. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

- Summary of follow up time-bound actions to be taken within a set timeframe.

Appendixes

- Photos
- Summary of consultations
- Copies of environmental clearances and permits
- Sample of environmental site inspection Report
- Other

SAMPLE ENVIRONMENTAL SITE INSPECTION REPORT

Project Name
Contract Number
NAME: _____DATE: _____
TITLE: _____
LOCATION: _____
GROUP: _____
WEATHER CONDITION: _____
INITIAL SITE CONDITION: _____
CONCLUDING SITE CONDITION:
Satisfactory:____ Unsatisfactory:____ Incident:____ Resolved:____ Unresolved:___
INCIDENT:
Nature of incident:

Project Activity Stage	Survey	
	Design	
	Implementation	
	Pre-Commissioning	
	Guarantee Period	

_____
Intervention Steps: _____
Incident Issues
Resolution

Inspection

Emissions	Waste Minimization			
Air Quality	Reuse and Recycling			
Noise pollution	Dust and Litter Control			
Hazardous Substances	Trees and Vegetation			
Site Restored to Original Condition	Yes		No	

Signature

Sign off

_____ _____

Name, Position **Name, Position**

PHOTOS OF SUBPROJECT SITES

	
Charikot Bazaar	**Site selection was accompanied by public participation**
	
Topography of Charikot	**Access Road to the project location**
	
Location of the Wastewater Treatment Plant	**Bhimeshwor Temple of Dolakha, Charikot**