Initial Environmental Examination

PUBLIC

Project No. 47254-003
December 2023

Bangladesh: Dhaka Water Supply Network Improvement Project

NCB Package 2.12E (DMA- 705)

Prepared by Dhaka Water Supply and Sewerage Authority (DWASA), Government of Bangladesh for the Asian Development Bank (ADB).

Government of the People's Republic of Bangladesh

Ministry of Local Government, Rural Development and Co-Operatives

Dhaka Water Supply and Sewerage Authority (DWASA)

Dhaka Water Supply Network Improvement Project (DWSNIP)

Funded by:

Asian Development Bank and Government of Bangladesh

Project Management:

Design, Management and Supervision (DMS) Consultants

STC Shah Technical Consultants (P) Ltd, SEURECA VEOLIA,
Sodev consultant international Ltd & DevCon Consultants Ltd.

Contract No: NCB-02.12E MODS Zone-7 (1 DMA)

Rehabilitation of Distribution Networks for NRW reduction with O&M Support

UPDATED INITIAL ENVIRONMENTAL EXAMINATION NCB PACKAGE 02.12E

(DMA: 705)

December, 2023.

CURRENCY EQUIVALENTS

(As of 31 October, 2023)

Currency unit	-	Taka (Tk)
Tk.1.00	=	$0.0090
$1.00	=	Tk. 110.36

ABBREVIATIONS

ADB	–	Asian Development Bank
ARIPA	-	Acquisition and Requisition of Immovable Properties Act
AP	-	Affected person
AC	-	Asbestos Cement
BRTA	-	Bangladesh Road Transport Authority
BRM	-	Bangladesh Resident Mission
BC	-	Bituminous Carpeting
BFS	-	Brick Flat Soling
BGB	-	Boarder Guard Bangladesh
CC	-	Cement Concrete
TCEL	-	The Civil Engineers Limited
COVID	-	Corona Virus Disease of 2019
DWASA	-	Dhaka Water Supply and Sewerage Authority
DWSNIP	-	Dhaka Water Supply Network Improvement Project
DMA	-	District Metering Area
DMSC	-	Design Management and Supervision Consultants
DSCC	-	Dhaka South City Corporation
DoE	-	Department of Environment
DC	-	Deputy Commissioner
EA	-	Executing Agency
EMP	-	Environmental Management Plan
EIA	-	Environmental Impact Assessment
EHS	-	Environment Health and Safety
FGD	-	Focus Group Discussion
G o B	-	Government of Bangladesh
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GPR	-	Ground Penetrating Radar
HBB	-	Herringbone bond
HDD	-	Horizontal Directional Drilling
HDPE	-	High Density Polyethylene
NCB	-	International Competitive Bidding
I A	-	Implementing Agency
IFC	-	International Finance Corporation
IEE	-	Initial Environmental Examination
I R	-	Involuntary Resettlement
ML	-	Ministry of Land
NRW	–	Nonrevenue water
OT	-	Open Trench

O&M	–	Operation and Maintenance
PMU	–	Project Management Unit
PCU	-	Project Coordination Unit
PB	-	Pipe Bursting
PCR	-	Physical Cultural Resource
REA	–	Rapid Environmental Assessment
RoW	-	Right of Way
SPS	–	Safeguard Policy Statement
SEMP	-	Site Specific Environmental Management Plan
SWIP	-	Surface Water Inject Point
SIU	-	Safeguard Implementing Unit
SCADA	-	Supervisory control and data acquisition
TOR	-	Terms of Reference
TMP	-	Traffic Management Plan
USEPA	-	United States Environmental Protection Agency
ZLCC	-	Zonal Level Coordination Committee

WEIGHTS AND MEASURES

Km	-	kilometer
km^2	-	square kilometer
m^2	-	square meter
m^3/day	-	cubic meter per day
mm	-	millimeter

CONTENTS

EXECUTIVE SUMMARY

1. Dhaka Water Supply Network Improvement Project (DWSNIP) aims to improve provision of sustainable, reliable, and climate-resilient water supply in Dhaka city. It will enhance the distribution network efficiency gains achieved under two previous Asian Development Bank (ADB) financed projects to Dhaka Water Supply and Sewerage Authority (DWASA) for improving service delivery and capacity building.[1] DWSNIP impact will be safe drinking water made available for all urban population, which is aligned with the Seventh Five- Year Plan, 2016-2020. The outcome will be sustainable provision of more reliable, improved, and climate-resilient water supply in Dhaka city ensured. The outputs will be DWASA's (i) distribution network strengthened; (ii) sustainable DMA management capacity enhanced; and (iii) capacity for quality service delivery enhanced.

2. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

3. ADB classified DWSNIP as environment Category B and accordingly initial environmental examination (IEE) is required for all packages. During Feasibility study, the draft IEE report was prepared in January 2016 based on concept/preliminary design and best available information. Now this IEE has been updated based on detailed design and site specific EMP according to contractual obligations (Section 6 & 8) for 1 DMA (DMA 705) under Package 002.12E.

4. This updated version of the IEE describes the environmental condition of the Dhaka water supply network improvement project of 1 DMA under NCB 002.12E, including potential impact, formulation of mitigation measures, and preparation of institutional requirements and environmental monitoring for the project. Each DMA includes (i) survey and documentation including detailed design, specifications, preparation of quality assurance and design report, and design control services; (ii) supply, laying and commissioning of distribution, transmission, and reticulation pipes around (33.9 km); (iii) rehabilitation of service connections; and (iv) rehabilitation of production tube wells (PTWs) head works.

5. This IEE aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the national legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the DMA's area of influence; (iv) assess the DMA's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the DMA's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during

[1] ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loans and Technical Assistance Grant to the People's Republic of Bangladesh for the Dhaka Water Supply Sector Development Program* (Loan 2382 and 2383-BAN). Manila; ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Loan to the People's Republic of Bangladesh for the Dhaka Environmentally Sustainable Water Supply Project* (Loan 3051-BAN). Manila. These two loans finance some of feasibility studies of this project.

project implementation; (vii) describe the DMA's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

6. Potential negative impacts were identified in relation to pre- construction, construction operation of the improved distribution network, but no environmental impacts were identified as being due to either the DMA design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the network. This means that the number of impacts and their significance has already been reduced by amending the design.

7. No significant impacts are anticipated whether due to the location or design of the subproject as the sites are selected and fixed with the consideration that components are not located in environmentally-sensitive areas. All pipelines will be laid along the public roads within the right-of-way (ROW). The subproject utilizes the existing water source, and the abstraction will remain within its existing design capacity, therefore, no source related impacts is envisaged.

8. Due to the project sites being in urban areas and nature of open cut method (35%) for pipe laying works, unavoidable impacts include (i) health and safety hazards to workers during construction and operation; (ii) noise and dust from construction activities; (iii) increased road traffic due to interference of construction activities; (iv) soil erosion/silt runoff from construction waste soils; and (v) increased sewage flow due to increased water supply. These impacts during construction and operation can be mitigated through good and high-quality construction and operations and maintenance (O&M) practices. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be affecting small areas only.

9. Census survey has been conducted in all 1 DMA in order to identify IR impact. During the construction work, the involuntary resettlement impact will be temporary income loss from business to 9 mobile vendors (from DMA 705) in the streets and roadside footpaths. 10 affected person's families out of which 2 females and 7 males. All the affected persons are small-scale vendors who will move their belongings (i.e. wares and carts) easily. The movable characteristic of the businesses helps determine that there is no possibility of structure loss. No structure irrespective of types (permanent or semi-permanent) will be affected during the construction, hence no relocation costs are needed. All the affected business owners can return to the original sites once the construction is completed. The resettlement cost is based on entitlement matrix agreed for the Project. The affected persons will lose average net daily income of around BDT 645.00 derived from census for the period of disruption. The budgetary provisions for compensation have been made for 7 days for each affected person as per estimated income loss and number of days of disruption. If the actual number of days of disruption is higher, additional compensation will be paid.

10. The public participation processes have been undertaken during updating IEE ensuring that the stakeholders are engaged during implementation of the project. The

planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

11. The subproject's Grievance Redress Mechanism will provide the citizens with a platform for redress of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

12. The EMP will guide the environmentally-sound construction of each DMA and ensure efficient lines of communication between DWASA, PMU, DMSC and the 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 each DMA; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the each DMA; and (iv) ensure that safety recommendations are complied with.

13. The contractor under NCB 002.12E covering 1 DMA will be required to submit to PMU/DMSC, site environmental management plan (SEMP) including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes, for review and approval, (ii) specific mitigation measures of the EMP to ensure no significant environmental impacts; (iii) monitoring program as per SEMP; and (iv) budget for SEMP implementation. No works are allowed to commence prior to approval of SEMP.

14. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP has been made binding on all contractors included in bid and contract document. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

15. The PMU and DMSC will be responsible for monitoring. The DMSC will submit quarterly/semi-annual monitoring reports to PMU, and the PMU will review and send the semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

16. The citizens within 1 DMA (Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana) will be the major beneficiaries of this subproject. In addition to improved environmental conditions, the project will improve the over-all health condition of the town. With the improved water supply, they will be provided with a constant supply of better-quality water, piped into their homes. The replacement of old distribution lines shall avoid cross contamination and have positive benefit on health by avoiding diseases such as diarrhea and dysentery, resulting in less expenses on healthcare, improve working days and their economic status should also improve, as well as their overall health.

17. The proposed project is therefore unlikely to cause significant adverse impacts. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures.

18. Therefore, as per ADB SPS, the subproject is classified as environmental Category B and does not require further environmental impact assessment.

19. A Disposal plan for excavated spoil must be prepared. Waste generated on site must be removed on a regular basis, as determined by the Environmental Officer of Contractor. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.

20. Environmental Management Plan (EMP) is necessary to implement construction work without damaging the environment around the work site. Therefore, Environmental Management Plan (EMP) implementation cost should be finalize before commencement of construction work.

21. Proposed water distribution pipes will be buried along the public roads. Various utilities (telephone lines, electric poles and wires, sewers and gas pipelines) are already located along these roads. These may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with PMU/DMSC, shall:

(i) Identify the locations and operators of these utilities to prevent unnecessary disruption of services during construction phase

(ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies before site clearance and start of excavation work; and

(iii) Instruct contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

1. INTRODUCTION

A. The Project

1. Dhaka Water Supply Network Improvement Project (DWSNIP) aims to improve provision of sustainable, reliable, and climate-resilient water supply in Dhaka city. It will enhance the distribution network efficiency gains achieved under two previous Asian Development Bank (ADB) financed projects to Dhaka Water Supply and Sewerage Authority (DWASA) for improving service delivery and capacity building.[2]

2. **Enhancing distribution network efficiency gains.** Development of urban infrastructure in Bangladesh has not kept pace with rapid urbanization. The provision of drinking water in Bangladesh's capital city Dhaka has been particularly challenging. Dhaka's population has been growing at 3.6% per annum since 2005 which is in diminishing trend at the recent years, much higher than the national average of 1.1%, leading to increasing demand for drinking water supply.[3] DWASA, the water utility for Dhaka, serves 13.5 million people,[4] and has made continuous efforts to improve its distribution network, among others, with support of two ADB-financed projects: (i) Dhaka Water Supply Sector Development Program (DWSSDP[5]), which aims to rehabilitate and reinforce water supply systems and build DWASA's capacity; and (ii) Dhaka Environmentally Sustainable Water Supply Project (DESWSP[6]), which aims to augment surface water source and improve parts of the distribution network (footnote 1).

3. Under these two projects, distribution network improvement works have been implemented in seven out of ten zones of Dhaka city by establishing district metered areas (DMA) and focusing on nonrevenue water (NRW) reduction in each DMA. Commissioned DMA show good progress, which record uninterrupted 24-hour piped water supply, reduced physical water losses from 40% to less than 15%, with the current average of 4.95%, assured good quality potable water directly from taps without any other treatment, and reduced authorized or legalized 10,000 connections.

4. The remaining challenge for DWASA is to enhance the efficiency gains throughout its service area and reduce overall physical losses and NRW which is still estimated to be about 26%. In areas not covered by the ongoing projects, water losses remain the major cause of insufficient service delivery. Reduction of water losses will increase water availability for households, thereby reducing households' use of suction pumps and underground storage reservoirs. These will lead to improve water quality and reliability, reduce public health risks, and help increase coverage including to low-income communities. Reduction in NRW coupled with appropriate tariff level will also generate additional revenues for DWASA to further improve their services.

[2] ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loans and Technical Assistance Grant to the People's Republic of Bangladesh for the Dhaka Water Supply Sector Development Program* (Loan 2382 and 2383-BAN). Manila; ADB. 2013. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Loan to the People's Republic of Bangladesh for the Dhaka Environmentally Sustainable Water Supply Project* (Loan 3051-BAN). Manila. These two loans finance some of feasibility studies of this project.

[3] United Nations Department of Economic and Social Affairs. 2015. *World Urbanization Prospects: The 2014 Revision*. New York.

[4] DWASA is a service oriented autonomous commercial organization, entrusted with the responsibility of providing water supply, sewerage disposal, and storm water drainage services to the urban dwellers of Dhaka city.

[5] Completed

[6] Ongoing

5. **Impacts, Outcome, and Outputs**. The project impact will be safe drinking water made available for all urban population, which is aligned with the Eighth Five-Year Plan, 2021-2025.[7] The outcome will be sustainable provision of more reliable, improved, and climate-resilient water supply in Dhaka city ensured.

6. The outputs will be DWASA's (i) distribution network strengthened; (ii) sustainable DMA management capacity enhanced; and (iii) capacity for quality service delivery enhanced.

(i) **Output 1: Distribution network strengthened.** Further to the ongoing work of two ADB-financed projects, [8]the proposed project will contribute to improving the distribution network in Dhaka city, including: (i) new DMA not financed by the on-going loans in seven zones;[9] and (ii) additional financing to complete civil work contracts of DMA under DWSSDP.[10] The project will extend new or regularized connections to low-income communities.

(ii) **Output 2: Sustainable DMA management capacity of DWASA enhanced.** Managerial and technical capacity of DWASA will be strengthened to sustain NRW at a low level. The project will assist DWASA in (i) preparing and implementing a sustainable NRW reduction plan;[11] (ii) strengthening monitoring capacity at the zone level with renewed standard operating procedures, [12] upgraded training modules, and supervisory control and data acquisition system (SCADA) and piloting automated meter reading; and (iii) enhancing in-house design capacity for sustainable DMA management.

(iii) **Output 3: DWASA's capacity for quality service delivery enhanced.** The project will support DWASA to: (i) prepare and implement operational and financial improvement plan through upgrading the 5-year corporate business plan; (ii) enhance its capacity for design, construction supervision and project management; (iii) prepare and implement public awareness program for demand control, water conservation, and health and hygiene; (iv) enhance quality of service delivery to low-income communities including slums and informal settlements; (v) prepare and implement water quality monitoring system; (vi) implement gender action plan; and (vii) enhance project readiness of future investment.[13]

7. DWSNIP civil works is divided into five contracts (packages): NCB 2.8 covering 13 DMA, NCB 2.9 covering 11 DMA, NCB 2.10 covering 19 DMA (21 after splitting), NCB 2.11 covering 21 DMA, and NCB 2.12 covering 7 DMA.

[7] Government of Bangladesh, Planning Commission, Ministry of Planning. 2015. *Seventh Five-Year Plan: FY2016- FY2020.* Dhaka.

[8] In two on-going projects, DWASA has been rehabilitating existing water supply network in its five zones (Zone-3, 4, 5, 8, 10) and part of Zone-9 under DWSSDP; and Zone-6 under DESWSP out of ten administrative zones.

[9] The proposed project will cover DMAs of seven zones (Zone 1, 2, 3, 4, 7, 9, 10).

[10] The estimated cost of ADB's additional financing portion is $36.9 million due to increased requirements of work and goods and price escalation.

[11] Sustainable NRW reduction plan will include the long-term and annual targets of NRW; optimal DMA based organizational restructure; incentive mechanism; asset management plan, budget requirement, and training plan.

[12] Standard Operating Procedure will include water loss assessment; water balance calculation; leakage management including pressure management, repairs, and active leakage control; asset management; and smart water management of IT devices.

[13] DWASA will recruit consultants to conduct the preparatory works for future projects including sewerage management.

8. NCB 002.12E classified 1 nos. DMA. which is as follows: (DMA 705)

9. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS), 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, and loans involving financial intermediaries, and private sector loans.

10. ADB classified DWSNIP as environment Category B and accordingly Initial Environmental Examination (IEE) is required for all packages. During Feasibility study, the draft IEE report was prepared in January 2016 based on concept/preliminary design and best available information.
Now this IEE has been updated based on detailed design and site specific EMP according to contractual obligations (Section 6 & 8) for 1 DMA (DMA 705) under 02.12E.

11. This updated IEE aims to, based on model design, (i) provide critical facts, significant finding, and recommended actions; (ii) present the national and local legal and institutional framework within which the environmental assessment has been carried out; (iii) provide information on existing geographic, ecological, social and temporal context including associated facilities within the subproject's area of influence; (iv) assess the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic, and physical cultural resources in the subproject's area of influence; (v) identify mitigation measures and any residual negative impacts that cannot be mitigated; (vi) describe the process undertaken during project design to engage stakeholders and the planned information disclosure measures and the process for carrying out consultation with affected people and facilitating their participation during project implementation; (vii) describe the subproject's grievance redress mechanism for resolving complaints about environmental performance; (viii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (ix) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures; and (x) identify who is responsible for carrying out the mitigation and monitoring measures.

12. This updated IEE report is prepared for DMA (705) under Package no. 02.12E only which includes (i) survey and documentation including detailed design, specifications, preparation of quality assurance and design report, and design control services of 1 DMA (705); (ii) supply, laying and commissioning of distribution, transmission, and reticulation pipes; (iii) rehabilitation of service connections; and (iv) rehabilitation of production tube wells (PTWs) head works. Under Package No. and 02.12E, the proposed project is expected to have the following benefits: (i) rehabilitation of distribution network which will result in substantial reduction in water losses in the project area; and (ii) proper accounting for use of water and system losses by installation of metered connections.

13. The updated/revised IEE will be submitted to ADB for review and disclosure. The works will be conducted on getting clearance from the ADB.

B. Methodology used in preparing Updating IEE

14. The methodology that was followed while conducting the IEE study is as follows:

(i) Literature Review

- Project details, reports, maps, and other documents prepared by technical experts of the Contractor and the DMS consultant.

- Discussion with Technical experts of the DMS Consultants Team, PMU and relevant government agencies
- Secondary data from previous project reports and published articles, and
- Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from other similar projects, Government agencies and websites.

(ii) **Field Survey and Investigation:** Field survey was conducted to generate information on the physical, biological and socio-economic environment of the subproject area. Maximum focus was provided on consultation with local communities to have information and areas of potential environmental impacts. All the local bodies within the project area were consulted for their suggestions.

(iii) **Primary data (ambient air, Noise, water)** collected from ongoing DMA sites during pre-construction stage considered as baseline data

(iv) **Data Analysis**: In an integrated manner impacts on physical, biological, socio-economic and cultural resources by the 1 DMA (subprojects) were assessed using the ADB and other agencies good practice guidelines as well as compliance to the national requirements. They were grouped for pre-construction, construction and operation and maintenance phases of the project.

(v) **Stakeholder consultations**. In course of updating the IEE for 1 DMA under NCB 02.12E, intensive field visit, census survey, and some formal and informal meetings with stakeholders were conducted. Public consultations done through (a) Walk-through informal group consultations were held in the project area;

(vi) **Impact Evaluation:** Significance of impacts were evaluated on the basis of the reversible or irreversible, nature, magnitude, extent and duration of the impact. While evaluating the impacts, prescribing mitigation and doing alternative analysis, maximum efforts were made to get expert opinions and inputs of the design team, and safeguard team.

C. Structure of the Report

15. In compliance with ADB's SPS 2009 requirements, this IEE has been structured and consists of following chapters.

- Chapter 1: Introduction: The introduction chapter presents a brief overview of the assignment along with its background, objectives, scope of work, methodology etc.
- Chapter 2: Policy, Legal and Administrative Framework: Outlines the Policy and Legislation with respect to environmental issues.
- Chapter 3: Project Description: Describes the proposed project interventions including any alternative options suggested for the Project, background, project category, need for the Project, location, size and magnitude of operation.
- Chapter 4: Description of the Environment: Presents a description of the environmental baseline condition (socio-economic, physical and biological) of the project area.
- Chapter-5: Anticipated Environmental Impacts and Mitigation Measures: Deals with the environmental impacts of the proposed project and possible mitigation measures.
- Chapter 6: Consultations, Participation, and Information Disclosure: Mainly describes public opinion of the Project as well as major problems, impacts and any solutions recommended as well as information disclosure for the Project.
- Chapter 7: Grievance Redress Mechanism: Describes the mechanism for addressing complaints from public.
- Chapter 8: Environmental Management Plan: Defines the EMP and formulates the monitoring program of the Project and institutional arrangements.
- Chapter 9: Conclusion and Recommendations: This chapter presents the findings, conclusion, and recommendations of the report.

2. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

16. ADB requires the consideration of environmental issues in all aspects of ADB's operations, and the requirements for environmental assessment are described in ADB SPS, 2009. This states that ADB requires environmental assessment of all project loans, program loans, sector loans, sector development program loans, loans involving financial intermediaries, and private sector loans.

17. **Environmental Categorization.** ADB uses a classification system to reflect the significance of a project's potential environmental impacts. 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.
(iv) Category FI. A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI

18. Environmental management plan (EMP). An EMP, which addresses the potential impacts and risks identified by the environmental assessment, shall be prepared. The level of detail and complexity of the EMP and the priority of the identified measures and actions will be commensurate with the project's impact and risks.

19. Public disclosure. ADB will post the following safeguard documents on its website so affected people, other stakeholders, and the general public can provide meaningful inputs into the project design and implementation:

(i) for environmental category A projects, draft EIA report at least 120 days before Board consideration;
(ii) final or updated EIA and/or IEE upon receipt; and
(iii) Environmental monitoring reports submitted by the Project Management Unit (PMU) during project implementation upon receipt.

20. DWSNIP, as explained above has been classified by ADB as Category B, because it is not expected to have major negative environmental impacts. Under ADB procedures such projects require an IEE to identify and mitigate the impacts, and to determine whether further study or a more detailed EIA may be required.

21. **Pollution Prevention and Abatement.** During the design, construction, and operation of the project the PMU and PCUs 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 Environment, Health and Safety Guidelines[14]. These standards contain performance levels and measures that are normally acceptable and applicable to projects. When Government of Bangladesh regulations differ from these levels and measures, the PMU and PCUs will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, the PMU and PCUs will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

IFC's General EHS Guidelines

Table 1: Applicable WHO Ambient Air Quality Guidelines

Table 1.1.1: WHO Ambient Air Quality Guidelines[7,8]		
	Averaging Period	Guideline value in µg/m³
Sulfur dioxide (SO_2)	24-hour 10 minute	125 (Interim target-1) 50 (Interim target-2) 20 (guideline) 500 (guideline)
Nitrogen dioxide (NO_2)	1-year 1-hour	40 (guideline) 200 (guideline)
Particulate Matter PM_{10}	1-year 24-hour	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline) 150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter $PM_{2.5}$	1-year 24-hour	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline) 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: General EHS Guidelines; IFC-WB Group, April 2007

Table 2: World Bank Group's Noise Level Guidelines

Table 1.7.1- Noise Level Guidelines[54]		
	One Hour L_{Aeq} (dBA)	
Receptor	Daytime 07:00 - 22:00	Nighttime 22:00 - 07:00
Residential; institutional; educational[55]	55	45
Industrial; commercial	70	70

[14] World Bank Group, 2007.Environment, Health and Safety General Guidelines. Washington, DC

Source: General EHS Guidelines; IFC-WB Group, April 2007

B. National Laws

22. The Government of Bangladesh has framed various policies, laws and regulation for protection and conservation of natural environment. These legislations with applicability to this project are summarized below in Table 3

Table 3: Relevance of national policies, laws and framework in the context of the proposed DWSNIP Project

No.	National Policies, Laws and Frameworks	Relevance to the Project	Implication of National Policies, and regulations on DWSNIP
1	National Environmental Policy 1992 National Environment Management Action Plan (NEMAP) 1995	The overarching policy that stresses environmental considerations in all development activities in Bangladesh including the health and sanitation sector. The action plan recommends safe drinking water supply as key actions in the health and sanitation sector.	This policy is triggered for the project.
2	National Environment Policy 2018	The national environmental policy has been updated in 2018. The environmental policy is a comprehensive framework environmental action, together with a set of broad sectorial action guidelines. The policy has identified twenty-four sectors of different attributes to ensure environmental conservation and management. 'Safe food and water' and 'Public Health and Health Services' are the two important sectors among them that the policy focuses on. These two sectors are closely linked with this project. 'Safe food and water' sector put emphasis on ensuring healthy and environment friendly production, processing, storage, transportation, marketing etc. of food, water and other dinks. It also prohibits establishment of industries and waste discharge point and waste dumping centers, sanitary land fill etc. which are closed to water sources. The National Environment Policy	The updated environmental policy includes total twenty-four sectors and areas. The Policy includes outline of organizational set-up and national environmental policy compliance for different sectors. This policy is triggered for the project.

No.	National Policies, Laws and Frameworks	Relevance to the Project	Implication of National Policies, and regulations on DWSNIP
		recognizes that clean environment is the pre-requisite of good health. Hence, it includes environmental conservation issues related to plans, policies and other programs for the sake of public health in the country.	
3	Environment Conservation Act 1995 and subsequent amendments in 2000, 2002 and 2010[15]	This umbrella Act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution of the proposed project. The details of environmental clearance formalities are prescribed in ECR 1997 which is a specific Rule under this Act.	The provisions of the act apply to all of the components of DWSNIP interventions in the construction and operation stages

[15] *ECA Amendment 2000* focuses on ascertaining responsibility for compensation in cases of damage to ecosystems, increased provision of punitive measures both for fines and imprisonment and the authority to take cognizance of offences. *ECA Amendment 2002* elaborates restrictions on polluting automobiles; restrictions on the sale, production of environmentally harmful items like polythene bags; assistance from law enforcement agencies for environmental actions; break up of punitive measures; and authority to try environmental cases. In *ECA Amendment 2010,* no individual or institution (government or semi-government/non-government/self-governing can cut any hill or hillock; fill-up or changed any remarked water body however in case of national interest; the mentioned activities can be done after getting clearance from respective the departments.

4	Environment Conservation Rules 2023.	As per Environmental Conservation Rules 2023, the components (subprojects) of the project will fall into any one of the four categories (i.e. Red, Yellow Orange, and Green) and based on that environmental clearance need to be obtained from DoE for the corresponding category. According to ECR 2023, sewage treatment plant, water treatment plant and water distribution line laying/relaying/extension falls into "Red" category. The ECR 2023 also consists of drinking water quality standards and sewage discharge standards, the compliance of which is mandatory for water supply and wastewater treatment systems respectively.	DWSNIP components will be classified as red. All requisite clearances from the DoE shall be obtained prior to commencement of civil works on ground.
5	Environment Court Act 2010	If project adversely affects the locality or an individual, the affected party can seek remedy in an environment court, the procedures of which are delineated in the Environment Court Act 2010.	Not triggered because such type of adverse impacts is not anticipated due to the pipelines will be laid along the public roads within the right-of-way (ROW).
6	National Land-use Policy, 2001	The policy states to take measures to prevent land pollution and to ensure the minimal use of land for construction of both government and nongovernment buildings which may be applicable for the proposed project.	The DWSNIP will take necessary measurement to prevent land pollution and ensure minimal use of land for construction.
7	National water policy	This policy requires a project to facilitate availability of safe and affordable drinking water and to prevent fecal pollution of the aquifer. These two aspects are very much applicable for the proposed project.	The proposed project aims to enhance and strengthen the water supply network systems in different DMA to improve health and living standards. Given the present situation, it is reasonable to assume that the proposed project activities are not likely to cause any long-term or irreversible environmental impacts.
8	The Ground Water Management Ordinance 1985	Discusses institution all arrangements for installing tube wells in a locality for water supply.	Under this law it is clearly mentioned that DWASA is sole authority for rehabilitation or installation of DTWs in Dhaka city. No permission is required for local government office.
9	National Policy for Arsenic Mitigation 2004	The project aims at providing safe (and arsenic-free) drinking water by installing water supply infrastructures and tube wells. The national policy for arsenic mitigation	This policy is triggered for the project

		highlights the national priorities in choosing arsenic-safe water supply options	
10	Bangladesh Wild Life (Preservation) Act, 1974 and revision 2008 (Draft)	Restricts people from damaging or destroying vegetation in wild life sanctuaries and hunting and capturing of wild animals.	This Act is triggered.
11	Water Supply and Sanitation Act, 1996	Management and Control of water supply and sanitation in urban areas.	This Act is triggered
12	National Safe Drinking Water Supply and Sanitation Policy 1998	The National Safe Drinking Water Supply and Sanitation Policy was adopted in 1998 and sets out the basic framework for the improvement of public health quality and to ensure an improved environment, together with a set of broad sectorial action guidelines. The policy has the following objectives: To manage water supply and sanitation related basic needs for all; To bring about a positive change of peoples' attitude towards water and sanitation; To improve sustainable water supply and sanitation system;	This policy covers the project as far as the protection of surface waters and groundwater are concerned. The project will have to ensure that its operations from all phases of implementation will not cause negative impacts to these water supply resources.
13	Water Supply and Sewerage Authority Act, 1996	Water Supply and Sewerage Authority Act, 1996 was enacted to develop water supply and sanitation system and to deliver water supply, sewerage and storm water drainage services. It provides for autonomous corporate management structures of Water Supply and Sewerage Authority (WASAs) which are answerable to their respective Boards of Directors representing a range of stakeholders. No person can abstract, treat, pump, preserve or supply of water or construct sewerage, pumping and treatment plant within its jurisdiction. But the authority is not at all concerned about the industrial effluents.	The Act is triggered.
14	The Protection and Conservation of Fish Act 1950 and subsequent amendments in 1982 and 1985	Water source selection will be in line for the conservation and Protection of fishes in surface water bodies;	No source selection is required under DWSNIP
15	Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural water-bodies such as lakes, ponds, beels, canals, tanks, etc. affected by man-made interventions	DWSNIP do not pass any wetland area, so, wetland protection act will not be triggered.

		or other causes; Prevents the filling of publicly-owned water bodies and depressions in urban areas for preservation of the natural aquifers and environment. Prevents unplanned construction on riverbanks and indiscriminate clearance of vegetation on newly accreted land.	
16	Noise Control Act, 2006	Provides allowable noise limits based on land use categories.	Allowable noise level standards are to be maintained during construction of the project
17	National 3R (Reduce, reuse, recycle) Strategy for Waste Management, 2010	Construction related waste management for all civil works	Construction wastes and spoil are to be managed according to waste management norms.
18	Constitution of Bangladesh Antiquities Act, 1968	Preservation of physical cultural resources accidentally discovered during excavation works.	.
19	Bangladesh Climate Change Strategy and Action Plan 2009	This is a comprehensive strategy to address climate change challenges in Bangladesh. Bangladesh Climate Change Strategy and Action Plan (BCCSAP) built on and expanded the National Adaptation Program of Action (NAPA). It is built around the following six themes: (I) food security, social protection and health, (2) disaster management, (3) protective infrastructure, (4) research and knowledge management, (5) Decreased carbon development, and (6) capacity building and institutional strengthening. There are 44 specific programs proposed in the BCCSAP under the above six themes.	This strategy and action plan is relevant to the project. The project is required to consider in its design mitigation measures that will ensure the infrastructures can withstand the impact of climate change in the future. This, in turn, will contribute to the realization of the objectives of the strategy and action plan.
20	Air Pollution Control Rule, 2022	"The Air Pollution Rules 2022", dated 25 July 2022. Aiming to protect environmental health, the government has published a new rule based on section 20 of The Bangladesh Environment Conservation Act, 1995. The main objectives of this rule are to prevent, control, and reduce air pollution.	Air quality standards are to be maintained during construction of the project and

C. Legal Framework for Land Acquisitions in Bangladesh

23. The principal legal instrument governing land acquisition in Bangladesh was the Acquisition and Requisition of Immovable Property Ordinance 1982. This ordinance was repealed by the newly passed act in September 2017 under the name of Acquisition and Requisition of Immovable Property Act of 2017. The ARIPA 2017 requires that compensation be paid for (i) land and assets permanently acquired (including standing crops, trees, houses); and (ii) any other damages caused by such acquisition. The Act also provides for the acquisition of properties belonging to religious organizations like mosques, temples, pagodas and graveyards if they are acquired for public interest. The ARIPO, however, excluded the acquisition of properties used by the public for the purpose of religious worship, graveyards and cremation grounds. The Act stipulates certain safeguards for the landowners and provides for payment of "fair value" for the properties acquired.

24. The Ministry of Land (MOL) has the overall responsibility to enforce land acquisition. The MOL delegates some of its authority to the Commissioner at the Divisional level and to the Deputy Commissioner at the District level. The Deputy Commissioners are empowered by the MOL to process land acquisition and pay compensation to the legal owners of the acquired property. The burden to establish his/her legal rights to the acquired property in order to be eligible for compensation under the law is on the landowner. The Deputy Commissioner is empowered to acquire a maximum of 50 standard bigha (16.50 acres) of land without any litigation for which he would obtain the approval of the Divisional Commissioner. Acquisition of land exceeding 16.50 acres has to be approved from the central land allocation committee (CLAC) headed by the prime minister of the Government of Bangladesh. In the case of acquiring Khas land (government owned land), the land will be transferred through an inter-ministerial meeting following an acquisition proposal submitted to DC or MOL.

25. Under the ARIPA 2017, The Deputy Commissioner determines the value of the acquired assets as at the date of issuing the notice of acquisition under section 4(1) of the Act. The DCs thereafter enhance the assessed value by 200% and another 100% premium for loss of standing crops, structures and income due to compulsory nature of the acquisition. The compensation such determined is called the Cash Compensation under Law (CCL). If the land acquired has standing crops cultivated by a tenant under a legally constituted written agreement, the law requires that compensation money be paid in cash to the tenants as per the agreement. The new Act of 2017 under section 4 (13) permits the acquisition of those properties if it is for a public purpose provided the project for which the land is acquired provides for similar types of assets in some other appropriate place. Households and assets moved from land already acquired in the past for project purposes and/or government khas land are not included in the acquisition proposal and therefore excluded for considerations for compensation under the law. Lands acquired for a particular public purpose cannot be used for any other purpose. The new Act under section 4 (2) also facilitates the private organizations to request from the government to acquire the land for their development activities. Furthermore, the new Act under its section 15 provides for the acquisition of entire houses/buildings if their owners request to acquire the entire house or building against partial acquisition.

26. The government is obliged to pay compensation for the assets acquired. The previous Ordinance of 1982 did not address social and economic impacts resulting from land acquisition such as compensation and other assistance for non-titleholder project-displaced persons such as informal settlers (squatters), occupiers, and informal tenants and lease-holders without registration document. Furthermore, the Ordinance did not provide for compensation for loss of livelihoods and incomes. The new Act of 2017 has incorporated certain provisions to address the above gaps and therefore it would reduce the gaps between the national legislative framework of the government and Donor policies.

D. Environmental Requirements for the Project

27. Bangladesh is a signatory to a number of International Treaties and Conventions, which require safe protection of her environment from degradation and environmental concerns of global scale, protect workers against hazards arising from occupational exposure to harmful substances and agents in the working environment. Section 12 of the ECR stipulates that "No industrial unit or project shall be established or undertaken without obtaining environmental clearance from The Director General of the Department of Environment (DG, DOE) in the manner prescribed by the rules". The act also bestowed rule-making power to the government which requires that rules be made to "evaluate, review the environmental impact assessment (EIA) of various projects and activities and procedures be established for approval." The Department of Environment (DOE) which is a statutory body under the Environment Conservation Act, is responsible for the environmental review of all development projects in Bangladesh.

28. Under the Environmental Conservation Rules (1997) a classification system was established for development projects and industries on basis of the location, the size and the severity of potential pollution. There are four categories of projects: green, orange A, orange B and red with respectively no, minor, medium and severe environmental impacts.

29. As per Schedule 1 of ECR, 1997 all packages under DWSNIP is likely to be classified as red category (serial number 64 under ECR) which require both IEE and EIA for getting SCC and ECC from the DoE prior to commencement of the subproject. During discussion with Director, Environmental Clearance on October 28, 2018 at DoE, the Department of Environment provided exemption from Site Clearance considering high priority of the project and approved TOR for conducting EIA in favor of DWSNIP (see Appendix 1). DWASA with the assistance of the consultant teams, has prepared EIA Report and submitted to DoE and presentation on EIA report has done at DoE office on April 1. PMU submitted revised EIA report to DoE incorporating all comments and got Environmental Clearance Certificate on June 12, 2019. The copy of ECC is enclosed as **Appendix 1.**

30. Procedural steps are to be followed for obtaining Environmental Clearance Certificate (ECC) in connection with red categorization on DWSNIP interventions from DOE is outlined in Figure 1

31. To follow the rules, Contractors will have to collect no objection certificate (NOC) from concerned local authorities (mentioned in the following Table) before commencement of civil works:

Table 4: Relevant Statutory Clearance required for Package NCB 02.12E

No.	Statutory Clearance	Remarks
1	Forest Clearance	No forest clearance is required as The DMA under NCB 02.12E do not pass any forest or biodiversity protecting area within the project area
2	No Objection Certificate/Letter	No objection Certificate/Letter are not required.
3	Site Location Clearance	Exemption from DoE
4	Environmental Clearance Certificate	PMU got ECC from DoE on June 12, 2019. PMU has already applied application to DoE for renewal ECC for next one year. DoE issued first ECC renewal on July 18, 2020 which is valid until June 12, 2021 and second ECC renewal on 30.06.2021 which is valid until June 12, 2022 and third ECC renewal on 12 June 2022 which was valid till 12 June 2023 and fourth renewal on 14.11.2023 which is valid until June 12, 2024 Copy is attached in **Appendix 1A**.
5	Permit/Consent to Construct (or equivalent)	No permit/Consent to construct are required
6	Permit/Consent to Operate (or equivalent)	No permit/Consent to operate are required
7	Road cutting permit	Contractor will obtain road cutting permission for road trial pits and pipe laying from DSCC before commencement of civil works

E. International Treaties

32. Bangladesh has signed most international treaties, conventions and protocols on environment, pollution control, bio-diversity conservation and climate change, including the Ramsar Convention, the Bonn Convention on migratory birds, the Rio de Janeiro Convention on biodiversity conservation and the Kyoto protocol on climate change. An overview of the relevant international treaties and conventions signed by GOB is shown in **Table 5.**

Table 5: Relevant International Treaties, conventions, and protocols signed by Bangladesh

Treaty or Convention	In	Brief Description	Responsible Agency	Govern by the Project
Ramsar Convention	1971	Protection of wetlands	Department of Environment/ Department of Fisheries	No
CITES Convention (Washington)	1973	Ban and restrictions on international trade in endangered species of wild fauna and flora	Department of Environment/ Department of Fisheries	No
Prevention and Control of Occupational hazards (Geneva)	1974	Protect workers against occupational exposure to carcinogenic substances and agents	Ministry of Health and Family Welfare	Yes
Occupational hazards due to air pollution, noise & vibration (Geneva)	1977	Protect workers against occupational hazards in the working environment	Ministry of Health and Family Welfare	Yes
Occupational safety and health in working environment (Geneva)	1981	Prevent accidents and injury to health by minimizing hazards in the working environment	Ministry of Health and Family Welfare	Yes
Occupational Health Services (Geneva)	1985	To promote a safe and healthy working environment	Ministry of Health and Family Welfare	Yes
UN framework convention on climate change (Rio de Janeiro)	1992	Regulation of greenhouse gases emissions	Department of Environment/ Ministry of Environment and Forest	Yes
Convention on Biological Diversity (Rio de Janeiro)	1992	Conservation of bio-diversity, sustainable use of its components and access to genetic Resources	Department of Environment/ Ministry of Environment and Forest	No
International Convention on Climate Changes (Kyoto Protocol)	1997	International treaty on climate change and emission of greenhouse gases	Department of Environment/ Ministry of Environment and Forest	Yes
Convention on Persistent Organic Pollutants, Stockholm Convention	23.5.2001	Convention is to protect human health and the environment from persistent organic pollutants.	Department of Environment/ Ministry of Environment and Forest	No

Figure 1: Steps to be followed for Environmental Clearance Certificate for Red Category Projects

F. Relevant Occupational Health and Safety Laws and Rules

33. The implementation of all subprojects (construction contract packages) shall comply with the relevant occupational health and safety laws and rules as outlined in Table 6.

Table 6: Relevant Occupational Health and Safety Laws and Rules

Title	Overview
Bangladesh Labor Act 2006(amendment 2013), Bangladesh Labor Rules 2015	These regulations are under the Ministry of Labor which provides for the occupational rights and safety of factory workers and the provision of comfortable work environment and reasonable working conditions including the prohibition of child labor and adolescent
Water Supply and Sewerage Authority Act 1996	The act calls for ensuring water supply and sewerage system to the public, preservation of system, and other related health and environmental facilities for the community.
Labor Relations under Labor Laws, 1996 (Revisions to scattered Acts and Ordinances to formulate a unified code)	General concerns during the project implementation state that the project manager must recognize labor unions.
Public Health Emergency Provisions Ordinance, 1994	Calls for special provisions with regard to public health. In case of emergency, it is necessary to make special provisions for preventing the spread of disease, safeguarding the public health, and providing adequate medical service, and other services essential to the health of respective communities and workers during construction-related work.
Bangladesh Factory Act, 1979	Workplaces provisions: these Act and Labor Laws require medical facilities, first aid, accident and emergency arrangements, and childcare services to be provided to the workers at workplace.
The Employees State Insurance Act, 1948	Health, injury, and sickness benefit should be paid.
The Employer's Liability Act, 1938	Covers accidents, risks and damages with respect to employment injuries
Maternity Benefit Act, 1950	Framed rules for female employees, who are entitled to various benefits for maternity.

Source: Bangladesh Government Rules and Regulation book

G. Environmental Standards

National standards

34. At present there are so-called “Environment Quality Standards” in effect in Bangladesh, as promulgated under the Environment Conservation Rules-1997. The standards prescribe discharges and emission limits for various water sources, ambient air, noise, odor industrial effluent and emission discharges, vehicular emission etc. The ambient Standards of Air Quality and Noise level was updated in 2005 and 2006 respectively.

IFC Environmental, Health and Safety Guidelines

35. The Environmental, Health and Safety (EHS) Guidelines of the World Bank Group (WBG)/International Finance Corporation (IFC), 2008 is the safeguard guidelines for environment, health and safety for the development of the industrial and other projects. They contain performance levels and measures that are considered to be achievable in new facilities at reasonable costs using existing technologies. When host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. If less stringent levels or measures than those provided in these EHS Guidelines are appropriate, in view of specific project circumstances, a full and detailed justification for any proposed alternatives is needed as part of the site- specific environmental assessment. This justification should demonstrate that the choice for any alternate performance levels is protective of human health and the environment.

36. The section 4 of EHS Guidelines for “Construction and Decommissioning” provides additional, specific guidance on prevention and control of community health and safety impacts that may occur during new project development, at the end of the project life-cycle, or due to expansion or modification of existing project facilities.

Applicable Environmental Standards

37. ECR, 1997 also provides the environmental standards applicable to the project. Schedule 2 of the ECR presents the national standards as presented in Appendix 5. Following requirements of ADB SPS, the project shall apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in EHS Guidelines. When the government regulations differ from these levels and measures, the project shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, DWASA through PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS. **Appendix 5** presents the applicable environmental standards which provides a comparison between Government of Bangladesh and standards per ADB SPS, and which should be applicable to the project based on ADB SPS requirements on pollution control and abatement.

3. DESCRIPTION OF THE PROJECT

A. Need for the Project

38. (DMA 705) area under NCB 02.12E of MODS Zone 7 is characterized by high population density, narrow roads and high traffic congestion at most times of the day. The water supply situation is characterized by the significant number of deep tube wells. Padma Jashaldia water treatment plant, Saidabad surface water treatment plant and Chadnighat water works are supplementing as water in this area. This area is also regarded as low quality and somewhere inadequately sized water pipes, low workmanship, low operating pressures, inaccurate and inadequate data about location of pipes and service connections, and inaccurate and inadequate data about location of other utility lines.

39. The existing distribution system has a total pipe length of about 14.47 km out of 33.9 km road length, the distribution system is PVC, MS and DI Pipe, ranging in size from 100 mm to 600 mm diameter. Table 7 provides details of the existing distribution pipe network.

40. The storage and distribution network is insufficient and old to meet even present requirements. Improvement and rehabilitation in the water supply system has been identified as a major priority for Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana which is covered under DMA 705.

Table 7: Existing Distribution Pipe Size and Lengths

Pipe Materials	Pipe Length (m)						Total (Meter)	Total (Km)
	Ø600	Ø450	Ø300	Ø200	Ø150	Ø100		
DI	495.61	480.62	1695.20	0	0	0	2671.43	2.67
PVC	0	0	10.85	3819.21	3466.64	4487.90	11784.60	11.78
MS	0	0	0	12.38	0	0	12.38	0.01238
Total	**495.61**	**480.62**	**1706.05**	**3831.59**	**3466.64**	**4487.90**	**14468.41**	**14.47**

41. DWSNIP is needed in areas not covered by the DWSSDP and DESWSP projects to reduce water losses which is the major cause of insufficient service delivery. Reduction of water losses would reduce household use of suction pumps and underground storage reservoirs, increase water availability and generate additional financial sources for DWASA's capital investments and O&M. This would in turn improve water quality and reliability, reduce public health risks, and help increase coverage including to low-income communities.

42. The objective of this sub-project is to provide continuous (24x7) pressurized, safe water of 150 lpcd to the entire population, through household connections where feasible, at the required minimum pressure head (10 m).

B. Subproject Components

43. The Civil Engineers Ltd (TCEL) has been awarded the contract package NCB-02.12E for Rehabilitation of distribution networks under DWSNIP in DWASA.

44. Package No. 02.12E covers 1 DMA (705) which includes (i) rehabilitation of a b o u t 33 km distribution network under zone 7 ;(ii) Construction, regeneration of all DTWs; (iii) service connections including installations of meter chamber, domestic meters and floating valve; and (iv) installations of valves, bulk meters and loggers, etc. For efficient and effective execution, the package will be implemented through a design-built contract, i.e. the civil works contractors will also prepare the detail designs. The main activities (the works) of the contract is expected, as a minimum, to comprise the following steps:

(i) Survey;[16]

(ii) Resettlement plan implementation;[17]

(iii) Design comprising of (a) detailed survey of area (location of water pipes, service connections, valves, tube wells, bulk meters, and other utility lines); (b) detailed network modelling of areas and updating of basic model (outline design) with additional information obtained from survey; and (c) submission of detailed design package of area including design drawings (1:2000) and expected work methodologies for each DMA;

(iv) Pipe works comprising of (a) Improvement of Distribution Network, establishment of DMA; (b) installation of bulk meters, valves etc. and construction of DMA chambers. (c) Rehabilitation or replacement of existing pipes network design;[18] (d) extension of network to areas not adequately served; [19] and (e) p re-commissioning and commissioning of DMA.

(v) Service connections [20] comprising of (a) installing a meter chamber for each existing connection; (b) connecting the meter chamber with the water pipes, using new materials; (c) installing water meter in meter chamber; (d) pressure testing of each service connection; and (e) installing float valves at the first reservoir of the household.

(vi) Design and installation of SCADA (compatible with the WSD SCADA); Installation of electro- magnetic flow meters and connection to SCADA

(vii) Other works such as (a) according to given requirements wherever needed; (b) repair of other utilities in case they are damaged during the work; and (c) provision of alternative sources of water for people while being disconnected from water supply system during the implementation.

(viii) Operation and Maintenance of the District Metered Areas (DMA) including flow recording, monitoring and assessment of Water Loss on a regular basis.

[16] To establish (i) location of existing water and other utility infrastructure; (ii) location of service connections; and (iii) location of existing valves, meters, and production tube wells

[17] The Contractor will be responsible in implementing the Resettlement Plan (RP) prepared by DWASA and/or resettlement NGO. No civil works will be allowed to begin until all compensation to affected persons is paid.

[18] The term “pipe replacement” means that the existing pipe will be replaced, either by the traditional open trench method, where the existing pipe will be abandoned and a new pipe will be installed or by pipe bursting, where the existing pipe will be used as a host pipe which will be cut open, expanded and a new pipe will be installed inside the old pipe.

[19] The term “pipe extension” means the laying of a new pipe where no distribution pipes previously existed. Laying pipes in un-served and underserved area and replacing spaghetti lines (bunch of small diameter coil pipes) with

new reticulation pipe lines will be considered as extension work. Areas which have recently been developed on an ad-hoc basis are considered partly served, as the secondary or tertiary water lines do not reach all houses. In these areas water supply is often supplied through long coil pipes laid by the owner of the house on the side of the road.

[20] The term “service connection” means the pipe between the water distribution network, the distribution or reticulation pipe, and the water meter installed in the meter chamber inside the boundary of the consumer/ customer. It is assumed that all existing service connections need to be replaced. This is due to the long tradition of the use of substandard quality materials and low quality workmanship when connecting customers to the water network.

45. The entire distribution network in target areas of Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana under NCB 02.12E would thus be rehabilitated and water losses could be reduced in public network with active public participation and extensive communication program. This initiative would also result in increasing the average pressure in distribution. The savings of water could then be used for better water supply to adjacent Zone 7 areas. In nutshell it can be stated that the overall objective of this package (NCB 02.12E) is to rehabilitate and demonstrate water loss reduction in this project within 2 years and operate and maintain the technical efficiency within the project area for another 1 years. For the pandemic situation the survey work delayed for quite a long time and the design as well, the reason why time extension for a reasonable period will be required to complete the physical activities of the project.

46. Table 8 provides detailed information on the components of 1 DMA under NCB 02.12E.

Table 8: Details of 1 DMA under NCB 02.12E

Item	Description	Remark	Unit	Quantity
1	Network Rehabilitation under NCB-02.12E	1 DMA (705)	km	33.9
2	Area	Total area for 1 DMA	Km^2	0.63
3	Installation of Pipes and Fittings	HDPE (75-450 mm)	km	33.9
4	Household meter	Domestic water meter with AMR provision	Nos.	5093
5	Replacement/Up-gradation of Deep Tube wells (DTWs)	In order to maintain normal water supply	Nos.	03
6	Chlorinator	Liquid Chlorine with chlorination equipment	Nos.	03
7	SCADA	SCADA will be implemented in 1 DMA	Nos.	1

Source: TCEL, September 2023

47. The 1 DMA (Figure 2) are characterized by high population density, narrow roads and high traffic congestion at most times of the day. Due to the significant pressure on the transport network in Dhaka, it is foreseen that any open trenching in or near roads, particularly in the larger roads, will only be permitted during the night. For this reason and to minimize public disturbance, it is expected that trenchless techniques[21] will be used for replacement and rehabilitation as well as network extension and service connections. In situations where the contractors prefer the traditional trenching technology, [22] the case must be justified and approved by DWASA.

[21] This involves the use of horizontal direction drilling (HDD) which involves a hydraulic machinery to drill a horizontal tunnel for a new pipe or to insert a flexible plastic lining inside an existing pipe, so no trenches are dug, and excavation is limited to the entry and exit points.

[22] The size of trenches will depend on the diameter of the pipe, but most will be 0.3 to 0.7 m in width and 1.4 to 1.8 m deep.

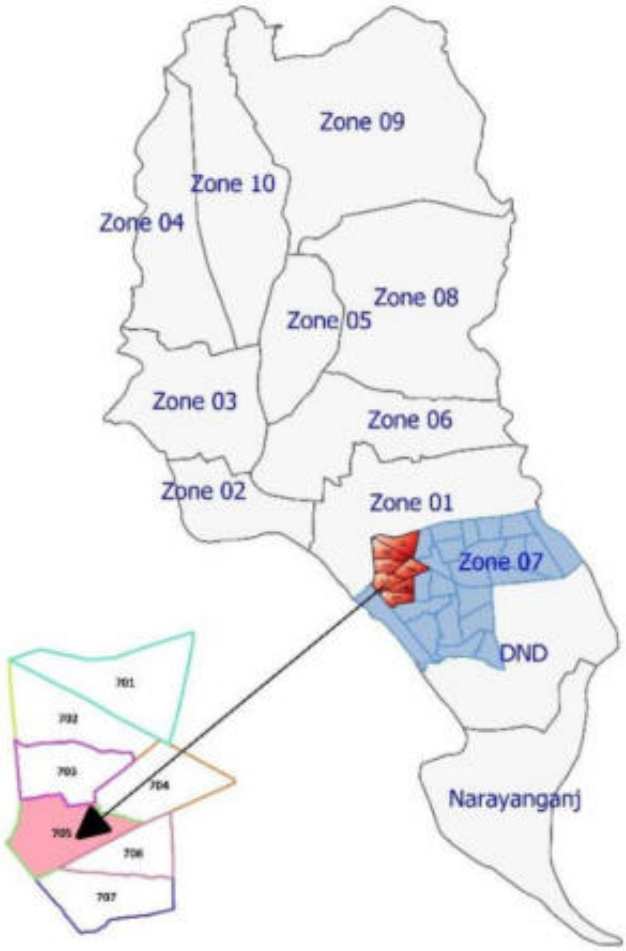


Figure 2: DMA Map Showing Locations of 1 DMA covered in Package No. NCB 02.12E

48. Table 9 summarizes various components of DMA 705.

Table 9: Summary of Components on DMA 705

Item	Description	Unit	DMA 705	Total
1	Installation of Distribution Pipes through open trench, etc. Including installation of buried gate valves etc. - Diameter of pipes between 110 mm and 200 mm	m.	**14773**	14773
2	Installation of Reticulation Pipes Pipe diameter 75 mm	m.	14408	14408
3	Transmission pipes - Diameter of pipes between 250 mm and 450 mm	m.	4717	4717
4	Rehabilitation of service connections of length as required etc. -Pipe diameter 20 mm to 50 mm	Nos.	5093	5093
5	Upgrading of Tube Wells delivery system i/c pipes, supports, fittings and accessories complete as per standard drawing	Nos.	03	03
6	Construction of Chambers of approved design, drawing with all fittings and fixtures.			
6a	Construction of RCC Gate Valve Chamber including installation of valves for pipeline of 315 mm dia and above.	Nos.	6	6
6b	Construction of RCC Interconnection chamber for isolation of DMA where required and approved including installation of Pressure Sustaining Valves, Air Release Valves, Non-Return Valves, Bulk Water Meters, Data Loggers etc.	Nos.	1	1
6c	Construction of RCC Interconnection chamber to connect the network with the nearby water transmission main including installation of Pressure Sustaining Valves, Pressure Reducing Valves, Air Release Valves, Non-Return Valves, Bulk Water Meters, Data Loggers etc.	Nos.	3	3
6d	Construction of RCC Air Release Valve Chamber for pipeline including installation of ARV and data loggers.	Nos.	3	3
7	Testing, repair, replacement, cleaning & disinfection of pipelines all complete	m.	0	0

49. Table 10 provides the comparison of components in the Draft IEE (preliminary design) and components in the detailed engineering design.

Table 10: Comparison of Components in the Preliminary and Detailed Engineering Design

DMA No.	Components	Unit	During Preliminary design (BOQ)	During Detailed Design	Any Change recommended by DBO Contractor (if yes, reason/justification)
705	Network Pipelines	m	33898	27555.378	Overall length of network decreased after detail survey.
	Bulk Water Meter (BWM)	Nos.			
	Rehabilitation of HH-connections with meters	Nos.	5093	2908	Assessment as per approved survey Report

C. Laying of Distribution Network

50. The distribution pipelines will be laid within the RoW of Government roads. Total length of about 33.9 km distribution pipelines and reticulation will be laid in Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana under DSCC (Zone 5 & 10). No potential temporary impact is anticipated during the laying of distribution pipleline. The diameter of pipeline ranges from 75 to 450 mm, and the road widths vary between 0.6 to 41.1 meters and pipe diameters are planned in accordance with road widths. Table 11 provides details of the distribution network.

Table 11: Details of Distribution Network

Category of the Pipe	Pipe Dia (mm)	DMA 705	Total (m)
Reticulation	75	14408	**14408**
	110		
Distribution	110	7759	**7759**
	160	5229	**5229**
	200	1785	**1785**
Transmission	250	2317	**2317**
	315	1572	**1572**
	355	55	**55**
	400	99	**99**
	450	674	**674**
Total		**33898**	**33898**

51. Pipes will be laid appropriately based on the availability of suitable land strip, considering existing utilities (drains, telephone lines) and effect on traffic. In narrow roads, where there is no place, the pipeline will be laid within the road; where the roads are very wide pipes will be laid in the road shoulder, and if the roads have service roads, the pipes will be mostly laid in the service roads.

52. There AC pipes in the existing network; they will be left as it is in the ground untouched.

Width required for excavation and Available Right of Way (ROW)

53. Standard **Trench Width for Open Trench**:

Pipe OD (mm)	Minimum Trench Width (mm)
75	OD +200
110 ~ 315	OD +300

54. Trench **Width for HDD:**

Intermediate Mud Collecting Pit - 1.00 m

Pipe Receiving Pit - 1.30 m (max.)

Pipe Levelling Pit - 1.30 m (max.)

55. **Width of available ROW:**

For planned area: 9.00 m or 30 ft (minimum)

For un-planned area: 1.50 m ~ 3.66 m or 5 ~12 ft (minimum)

56. The design team confirmed that no trees are to be cut and no vegetation are to be cleared. At this moment, overhead utilities may not be required to shift.

57. The sequence of work process (step-by-step) are as follows:

- Survey, GIS base Network Modelling and Design, Pressure Tests, Pre-commissioning, Commissioning / Guarantee Test(-s).
- Supplying and laying of 75-450 mm dia HDPE pipes (approx. 33.9) water distribution lines by using Open Trench (35%) and HDD (65%).
- Installation of Service connections to 5039 households including supplying of HDPE pipes, fittings & accessories etc.
- Supplies of key plant of Regular and Special valves, Domestic and Bulk-Water meters and Well screen are also part of the facility.

Pipe works:

- Network replacement /rehabilitation.
- Disconnect cross connections between DMA's.
- Inter connection works to existing surface water transmission pipeline.
- Install bulk meters and valves at all needed cross connections between adjacent
- DMA's (DMA chamber-export/import).
- Repair / rehabilitation or replacement of existing pipes according to design.
- Extension of network to areas not adequately served.
- Pipes will be laid along the public roads within the road right of way

Post Construction:

- Overall testing of pipeline section.
- Pre-Commissioning, Commissioning/Grantee Test following "Full System Test".
- Post Construction Modelling and Training Manual.
- Handing over DMA to the Project.

Other works:

- Road Cutting Permission from road owning Authority as per road cutting plan to be made.
- Repair roads according to given requirements wherever needed (e.g. where permit from public Road Authorities has been issued).
- Repair other utility lines in case they are damaged during the work.
- Provide alternative sources of water (through water bowser) for people while being disconnected from water supply system during the implementation.

58. **Construction works.** Civil works in the subproject mainly include laying of water supply pipelines from the diameters ranging from 75 mm to 450 mm. These works will include linear excavation for laying pipes along the roads, placing pipes in the trench, jointing, hydro-testing and refilling with the specified soil.

Maowa Road, Muradpur High School Road 18, Muradpur High School Road, Muradpur High School Road 27, Muradpur Madrasa Road 1, Muradpur Madrasa Road 2, Muradpur Rajab Ali Sardar Road, Pokar Bazar Road, Islamabad Mosjid Road-6, Haji Ke Ali Road-9, Pukurpar Road, Haji Khorsed Ali Sorder Road etc. are the main roads (width > 4m) in the subproject area.

The other important internal roads (width 2-4 m) include Hazi Lalmia Sarker Road, Paterbag Road, Al-Modina Mosque Road, Jummon Mia (Chairman) Road, Jahid Hossain Road, Adorsho School Road, Muradpur Road 6 etc. All these roads, carry heavy traffic most of the day. The next level of roads - tertiary roads (width

< 2 m) like Muradpur Madrasa Road 1, Patebag Subway, Beenabag Sub Len-5, Adorsha Sorok Len-1, are very narrow and bust with commercial establishment all along the roads, and carry heavy traffic of two-wheelers, and cycle rickshaws.

Subsequent to completion of works, road reinstatement will be undertaken by the contractor as part of the civil works.

(i) Excavation: About 35% of the pipes will be laid by open cut trench type method while the rest 65% will be laid by adopting trenchless construction method. The open excavation will be carried out with excavators and where there are space constraints it will be done manually. Proper barricading will be done all around the excavated area for the safety and if required traffic diversion will be considered. Suitable trenchless technology will be adopted by the contractor such as horizontal directional drilling or pipe bursting method by machine trenchless technology. Trenchless technology will be adopted at all locations, which are convenient/suitable to use such technology, with a purpose to avoid public inconvenience and safety, traffic disruptions, dust control, and avoid blocking access to properties.

(ii) Barricading: To protect persons from injury and to avoid damage to property, adequate barricades, construction signs, torches, flickering lights, red lanterns and guards, as required, will be placed and maintained during the progress of the work. The hard barricading will be done at all construction locations, where there are space constraints, soft barricading such as tape will be used.

(iii) Temporary construction material storage: Due to space constraints and heavy traffic, the temporary construction of material storage at site will be limited. Material will be brought to the site as required. Material required for a day's work is only kept at the work site.

(iv) Temporary storage of excavated soil, refilling & disposal of surplus soil: All excavated material will be stacked in such a distance from the trench edge that it will not endanger the work or workmen and it will avoid obstructing footpaths, roads and drive ways. The excavated soil will be refilled on the same day. The surplus soil will be transported to approve disposal sites.

(v) Traffic diversions: Traffic diversions may be required at some locations. Public will be informed in advance and approval of the competent authorities will be obtained. Traffic plan will however be prepared by the contractor

(vi) Testing and refilling: Pipe laying and testing activities will be planned meticulously. Excavation will be planned in such a way that; back filling will be done by the end of the day's activity. All smaller diameter pipes will be hydraulically tested before backfilling. Pipes clean up prior to supply: Prior to supply of water through newly laid pipelines, ensure that pipes are properly cleaned and disinfected.

(vii) Road relaying. Backfill material in the open trenches (including excavations made for entry and exit of HDD, where trenchless is adopted) will be consolidated mechanically, and road restoration will be taken up taken up immediately. If it is not possible to take up the road restoration immediately for technical reasons of road construction, a plain concrete layer will be laid over the trench to make the surface smooth for driving and also to arrest the dust generation and erosion.

59. Contractor will prepare a method statement for each work, particularly in detail for laying of pipelines. Approval of method statement by the Engineer is prerequisite for the start of work. Method statement will be specific to each site/road section as appropriate. The overall work shall be split into individual tasks (per say, site clearance, excavation, pipe laying and up to final road restoration), and each task shall be detailed out in the method statement. The method statement shall provide an activity-space-time graph along the alignment for each section, which should clearly show section-wise, for example, how many days the trench will be open kept open. All the works shall be taken as per the documented procedures only.

60. Once the new pipeline laid along a street (mostly parallel to the existing pipeline or as suitable considering the existing situation), all the consumer connections on the old pipeline shall be transferred to the new pipeline. This new pipeline shall be connected to the existing water system and commissioned to ensure water supply to the consumers. The work of connection transfers from old to new pipes will be done on section-wise basis, to minimize the supply disruptions to a day. Advance notice will be given to the consumers about the likely disruptions, and if the disruption extends to more than a day, then alternative arrangements (like water supply via tankers) will be provided.

D. Materials, Labor and Equipment

61. Details of materials are as follows:

62. Pipe and pipe fittings (such as Tee, Elbow, end cap, reducer, slip etc.); HC pipe and fittings (such as ferrule, elbow, saddle, compression coupler); Gate Valve, Data Logger. The concrete materials such as Stone, sand (Sylhet and local), Cement etc.

63. The quantity will estimate during start of construction. Equipment lists are appended in **Appendix 2.**

64. Materials storage area is about 5500 ft^2 which is situated the central store compound at Diyabari Uttara, Dhaka. It is to be mentioned that TCEL using this area for storage material of NCB 02.12E under Dhaka Water Supply Sector Development Project funded by ADB.

65. For implementation of each DMA works, NCB 02.12E contractor will deploy personnel/workers according to different types of activities which are shown in the followings:

Table 12-I: List of Field / Site Personnel

Sl. No.	Designation	Total nos.
Skilled Manpower		
1	Asst. Project Manager	8
2	Project engineer	5
3	Asst. Project Engineer	8
4	Site Engineer	8
5	Asst. Site Engineer	10
6	Survey Engineer	3
7	Supervisor	12
8	BF jointer	10
9	EF jointer	5
10	Welder	6
11	Mechanic	6
12	HDD Operator	7
13	HDD Helper	10
14	HDD Tracker	7
15	Pipe Bursting Operator	4
16	PB Helper	8
17	Plumber	5
18	Store Keeper	1
19	Store Assistant	1
20	Computer Operator	2
21	Driver	10
22	Equipment operator	8
	Total	144

Source: Contractor, NCB 02.12E; June 2023

Table 12-II: List of Site Personnel covering Environment, Health and Safety and Traffic Management

Sl	Name	Designation	Contact No.
Environmental and Resettlement			
1	Md. Jakirul Islam	Environmental Officer	01839697069
2	Md. Anower Hossain	Resettlement Officer	01678224507
Planning & Design			
1	Md. Saifur Rahman	Design Engineer	01678224561
Health & Safety			
Sl	**Name**	**Designation**	**Contact No.**
1	Md. Emon Afroj	Health & Safety Officer	01925155247
2	Md. Suruj Mia	Health & Safety Inspector	01710738031
Traffic Management			
1	Md. Habibur	Traffic control officer	01865810636
Traffic Control Supervisor			
1	Md. Shakil Kawser	Traffic control supervisor	01844602790
2	Md. Zillur Rahman	Traffic control supervisor	01847468154
3	Md. Muniruzzaman	Traffic control supervisor	01725370833
4	Biddut Kumar	Traffic control supervisor	01844664699
5	Mobarak Islam	Traffic control supervisor	01844601621

E. Implementation Schedule

66. The Civil Engineers Limited will implement 1 DMA which started on October, 2023 including handing over on August, 2024. Schedule of each DMA implementation is planned in Table 13.

Table 13: Planned Implementation Schedule (Tentative Start October 25, 2023)

DMA No	Start	End	Duration
DMA 705	08.10.2023	02.08.2024	300 Days

4. DESCRIPTION OF THE ENVIRONMENT

A. Objectives and Methods

67. The primary objective of the study of existing environmental and social parameters is to provide an environmental and social baseline against which potential impacts from the construction and operation phases of the major components of the proposed network improvement project can be compared.

68. Baseline data includes inventory of physical, ecological and socio-economic parameters. Covering these aspects, data has been compiled for:

- Physical Environment (topography, physiographic, meteorology, geology, seismology, soils, hydrology);
- Ecological Environment
- Environmental quality (air, water, noise, soil etc.)
- Socio-economic Environment

69. **Data collection and stakeholder consultations.** Data for this study has been primarily collected through comprehensive literature survey, discussion with stakeholder agencies, and field visits to the proposed subproject sites.

70. The literature survey broadly covered the following:

- Project details, reports, maps, and other documents prepared by technical experts of the DMS Consultants and Contractor
- Discussion with Technical experts of the DMS Consultants Team, PMU and relevant government agencies
- Secondary data from previous project reports and published articles, and
- Literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and other planning documents collected from other similar projects, Government agencies and websites.

71. **Visual inspection**. Several visits to the project sites were made during IEE updating to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed project. A census survey was conducted to identify IR impact and to determine existing service levels, stakeholder needs and priorities. preparation

72. **Data analysis and interpretation.** The data collected has been analyzed and interpretations made to assess the physical, biological, and socioeconomic features of the project area. The relevant information is presented in the succeeding paragraphs.

B. Physical Characteristics

73. **Location.** The service area of above 1 DMA includes Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana under DSCC lying in DWASA operation Zone 7. The details of DMA within each Thana and Wards are tabled below:

Table 14: Administrative Divisions of 1 DMA under 3rd Batch Package No. NCB 02.12E

Package	DMA No	Area (Sq km)	Thana	Ward
NCB 02.12E	705	0.63	Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana	DSCC-52 DSCC-53 DSCC-60
Total		**0.63**		

Source: DMS Consultants, DWSNIP, July 2023

74. The detail physical features for each DMA are as follows:

DMA-705

The location of the area is confined within DMA 705 locally known as Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur within the ward no. 52, 53 and 60 under Kadamtali (Police Station) in Dhaka South City Corporation. This area is bounded by DMA 703 at the north, DMA 706 and 707 is located at the south, DMA 704 at the north-east side, and DMA 118 of Zone 1 & DMA 708 at the west side. The total area covered by DMA 705 is 0.63 km^2.

75. **Appendix 3** (MAP) shows the physical features and satellite image of the proposed network improvement under 1 DMA. Salient features of project influence area in the social and environmental views are summarized in Table 15

Table 15: Summary of Important Features of the Project Area

Sl.	Parameter	Description	
1	Climate	The climate in the DMA area is humid and sub-tropical, with a typical three season pattern. During the winter season (November-February), cool winds blow from the north-east. The average temperature is 26.1°C (79 °F). The project area receives on average 1875 mm (73.8 inch) of precipitation annually or 156 mm (6.2 inch) each month. The prevailing winds vary month to month in the project area, though predominantly in the north-west, south and north-east directions.	
2	Ecologically Critical Area	No Ecologically critical areas were found in the study area	
	Reserve/Protected Forests	No reserve or protected forests area were found in the study area	
3	Predominant Geological Formations	Dhaka is situated at the southern tip of a Pleistocene terrace of the Madhupur Tract. Two characteristic geological units cover the city and surroundings, the Madhupur clay of the Pleistocence age and alluvial deposits of recent age.	
	Topography	The area has an elevation of 3 to 10 meter. Average elevation of the area is 6.78 meter from the mean sea level.	
	Major Physiographic Units	The area falls into Physiographic unit of Madhupur Tract. It comprises central part of Dhaka the course of Brahmaputra – Jamuna Flood Plain.	
	Major Soil Type	The area general soil belongs to a Pleistocene terrace consisting mainly of red colored and mottled clays. Soils in the valleys are dark grey heavy clays. They are strongly acidic in reaction with low status of organic matter, low moisture holding capacity and low fertility level.	
4	Principal crops	Like other cities of Bangladesh, agriculture is important in parts of urban fringe of the Dhaka city. Rice is the most important crop. Farmers plant variety with different flood tolerance in different seasons. Wheat and potatoes are also important. In addition to fruit, in particular mango, banana and pineapple.	
5	Major Water Bodies	DMA 705	There is no specific lake and pond inside this DMA..
6	Flooding	Area is generally flooded by the ingress of flood water from north, west and south side by the Bangsi, Dhaleswari, Tongi khal, Turag and Buriganga rivers. Storm water logging take place at the several low laying areas during heavy downpour.	
7	Seismicity	The project area falls in the earthquake Zone-2 of the seismic map of Bangladesh. This zone refers medium intensity of seismic effects.	

Sl.	Parameter	Description	
8	Environmental Quality	**Air Quality:** The main source of air pollution are vehicles and non-point sources such as open burning of garbage **Noise Level:** Subproject components are in the built-up part of Dhaka, with residential, commercial and institutional establishments. Vehicular movement are the major cause of noise pollution **Surface Water Quality:** The quality of the surface water surrounding Dhaka is not enough good quality other than Dhupkhola and other pukur (Pond). Untreated discharge of industrial and municipal effluents into the rivers, swamps, and natural channels causes water pollution. Ground Water Quality: The groundwater quality varies significantly more in the upper aquifers of Dhaka City	
8	Environmental Hotspots	DMA 705	There are some Govt. primaries and high schools are situated inside this DMA. Some departmental stores like Mina Bazar, Shopna etc., commercial banks and restaurant are situated under this DMA. A lot of moshjid, are situated under this DMA.
9	Major Settlement	DMA 705	Residential area, Commercial area, Institutional etc. No slum area.

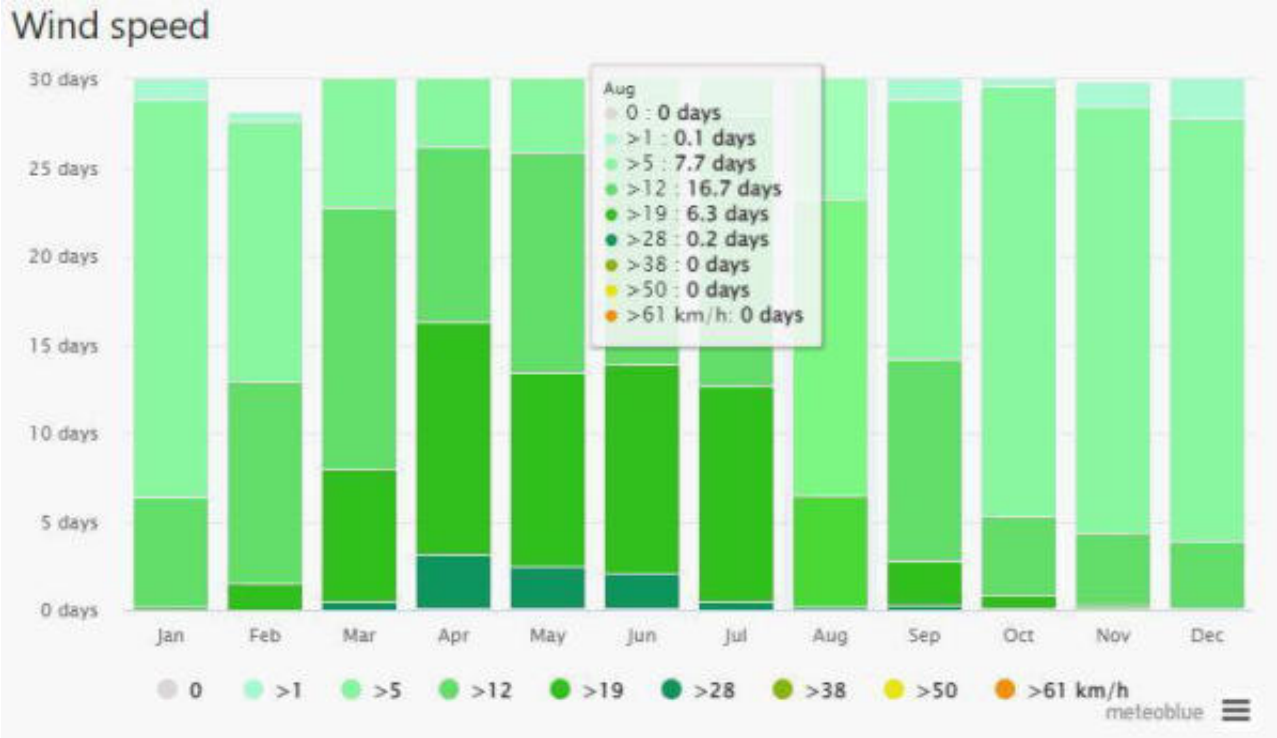
76. **Topography and Physiography.** The project area is at the northern edge of the delta in the center of the country, between the confluences of the rivers. and the project area is flat and low lying particularly around the delta, which floods extensively in the rainy season. The area has an elevation of 6 to 10 meter. The area falls into Physiographic unit Madhupur Tract. It comprises central part of Dhaka the course of Brahmaputra-Jamuna Flood Plain.

77. **Geology and Soils.** Geologically Dhaka is situated at the southern tip of the Pleistocene terrace, the Madhupur tract. Madhupur Clay of the Pleistocene age and alluvial deposits of recent age cover the two characteristic geological units of the city Dhaka. The Madhupur Clay is the oldest sediment exposed in and around the city area having characteristic topography and drainage.

78. The major geomorphic units of the city are: the high land or the Dhaka terrace, the low lands or floodplains, depressions and abandoned channels. Low lying swamps and marshes located in and around the city are other major topographic features. Madhupur Clay of the Pleistocene age, characterized by reddish plastic clay with silt and very fine sand particles. The soil is non-calcareous dark grey in color in and around the project area. Moreover, dark grey floodplain soil can be found adjacent to the area of Turag and Buriganga.

79. **Climate.** Climate of Dhaka generally experiences a hot, wet and humid tropical influenced by Indian Ocean Monsoon climate. Under the Koppen climate classification, Dhaka has a tropical wet and dry climate. In line with regional climatic characteristics Dhaka city experiences four meteorological seasons like pre-monsoon (May to June), Monsoon (July to September), Post-monsoon (October to November) and Dry (December to April). Average annual rainfall of Dhaka is in the range of 1700 mm to 2200 mm while most of the time average temperature varies between 25^0C to 31^0C. About 70% rainfall occurs from June to September. Mean monthly rainfall during the same period is between 300 mm to 450 mm. Average humidity remains in the range of 80% to 90% during monsoon.

80. Wind speed data recorded at Dhaka Weather Station represents that the wind speed fluctuates round the year. The highest wind speed remains in March-April and then in October-November in the year. Wind data from the Bangladesh Meteorological Department Climate Division suggests that wind directions vary month-to-month in Dhaka, though predominantly in the NW, S, and NE directions.



81. Maximum temperature may rise up to 37°C and minimum temperature may go down to 12°C. Average humidity remains in the range of 80% to 90% during monsoon. Figures below describe the climatic variations of Dhaka.

82. Further during preparation of IEE report, latest meteorological data for subproject area from 2019 are collected from website which is shown in Table 16.

Table 16: Monthly Averages of Climatic Variables of the Subproject Site for the year 2023

Month	Mean Daily Minimum Temperatures (˚C)	Mean Daily Maximum Temperatures (˚C)	Mean Precipitation (mm)	Wind Speed (km/h)	Sunny (Days)	Partly Cloudy (Days)	Overcast (Days)	Precipitation (Days)
January	12	27	3	6	25.9	4.2	0.9	0.9
February	15	30	16	7	19.7	7.5	1.1	3.5
March	19	34	43	10	15.7	14	1.2	7.9
April	23	37	97	14	5.3	23	1.6	17.5
May	25	35	121	13	5	21.9	4.1	22.2
June	26	32	166	14	2.8	19.3	8	23.7
July	26	31	143	14	1	19.7	10.3	21.2
August	25	31	119	12	0.6	22.1	8.3	20.9
September	25	30	167	9	1.9	19.3	8.9	24.8
October	22	31	97	6	14.7	10.2	6.1	14.1
November	18	29	34	6	23.8	3.9	2.3	2.5
December	14	27	6	6	26.9	3.2	0.9	0.9

Station: DSCC; Source :(www.meteoblue.com)

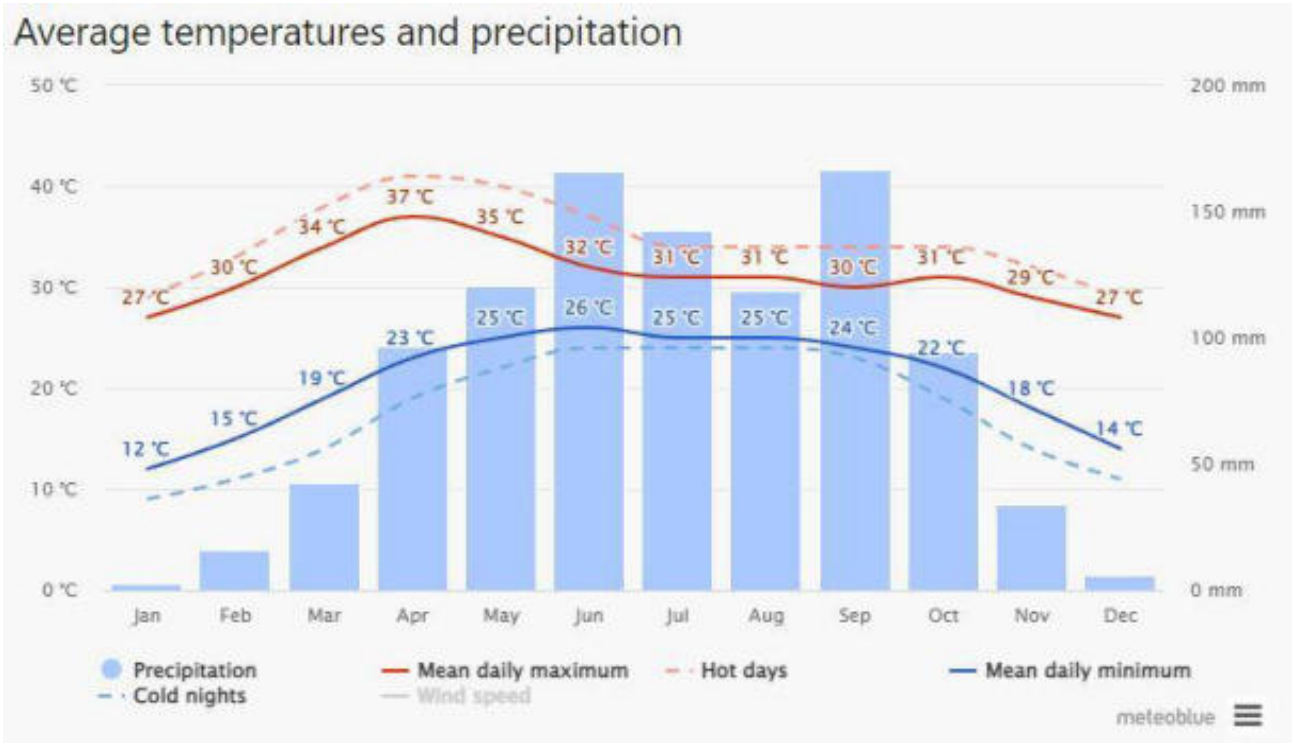
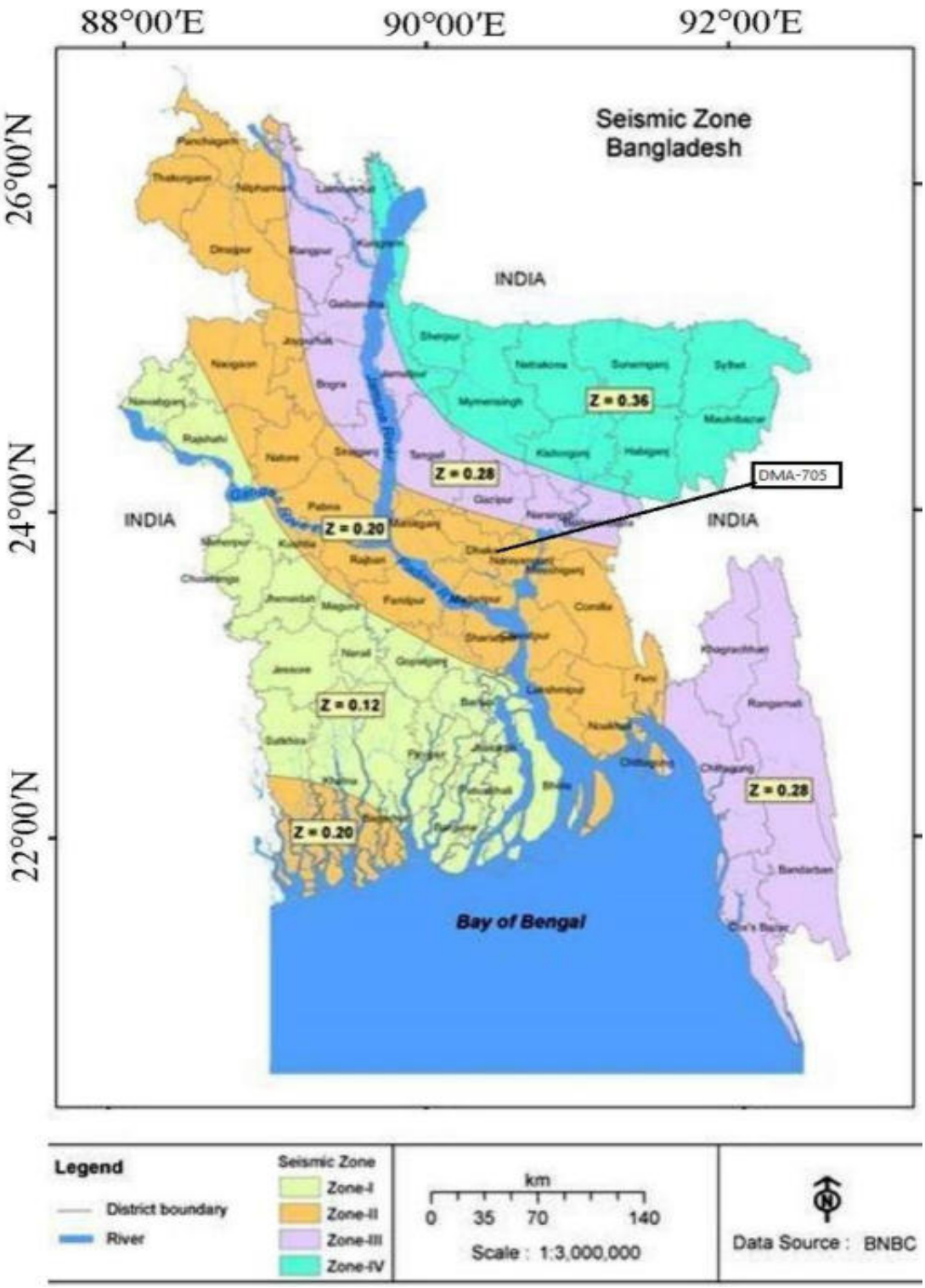


Figure 3: Average Annual Rainfall and temperature records of Dhaka (www.meteoblue.com)

83. **Seismology.** According to the National Seismic Zoning Map produced by the Geological Survey of Bangladesh (GSB), Dhaka lies at the end of the Dauki fault in an area of medium seismic risk. This means that shocks of moderate intensity are possible, with a probable maximum magnitude of 6.5-7 on the Richter scale. Seismic events in Bangladesh are relatively infrequent but historically have been severe, such as the earthquakes of 1930 and 1950 that caused widespread damage throughout the country, and the earthquake in 2004 that damaged large parts of Dhaka City. The project area falls in the earthquake Zone-2 of the seismic map of Bangladesh (Figure 3-National Seismic Zoning map produced by GSB).


88°00'E
90°00'E
92°00'E
26°00'N
24°00'N
22°00'N
Seismic Zone
Bangladesh
INDIA
INDIA
INDIA
Z = 0.36
Z = 0.28
Z = 0.20
Z = 0.12
Z = 0.28
Z = 0.20
DMA-705
Bay of Bengal
Legend
District boundary
River
Seismic Zone
Zone-I
Zone-II
Zone-III
Zone-IV
km
0 35 70 140
Scale : 1:3,000,000
Data Source : BNBC

C. Ecological Resources

84. The ecological component generally refers to flora and fauna, their present status, description and habitats. The status of the flora and fauna of the study area (both terrestrial and aquatic environments) was determined by:

- Reconnaissance survey[23] of DSCC and surrounding area
- Interviews and discussion with local informants
- Review of IUCN-Bangladesh Red Data Book relevant to the area, and
- Through different secondary sources.

85. **Terrestrial Flora.** No natural terrestrial flora of significance for protection remains at the Project site(s). The composition of the plant community is low growing and herbaceous vegetation as well as other flora typical for urban sites.

86. Some of the major types of trees found in the project area include mahogany, rain tree, Kul, and Sishu. As per discussion with local people project area does not host any endangered floral species. The primary fruit-bearing trees include mango, jackfruit, bananas and coconut.

87. **Terrestrial Fauna**. No wild mammal species were observed during the visit to the site and site survey.

88. **Aquatic Flora.** The open waters (rivers, khals, wetlands ponds etc.) surrounding the Project site(s) host species common to open water in and around Dhaka, including common species such as Kalmilata (Ipomoea reprans), Shapla (Nymphaea lotus), Helencha (Altemathera philoxeroides) and Kuchuripana (Eihhcormia crassipes).

89. **Habitats.** In Dhaka as in other parts of the country there are a wide array of aquatic habitats, natural and man-made, permanent and ephemeral, of varying sizes and characteristics. In general, the rivers and floodplains are the most important, as they are the areas that support the aquatic species that are exploited by man, are the most productive of the habitats, and are the areas that attract other important species, such as birds. However, as in other environmental sectors, the rapid urbanization and industrialization of the city and its expanding population (particularly the urban poor who use natural resources to supplement both their food and income) have brought large scale damage and degradation to these areas.

90. **Rivers.** Most rivers in Bangladesh suffer under the influence of man, from the disposal of solid and liquid waste in urban and industrial areas around Dhaka and the other cities and towns, and from the diversion of water upstream for irrigation and/ or power generation.

91. Dhaka is enclosed between the Turag-Buriganga River in the west and the Balu-Sitalakhya River in the east, both of which drain into the Meghna in the south, along with the Dhaleswari, old Brahmaputra and other rivers outside the city limits. Like other inland waterways these rivers support a fish fauna that includes carp, catfish, loach, *hilsa* and shrimp, plus a variety of invertebrates and insects that have been little studied. The Ministry of Environment and Forests estimates that 80% of the sewage produced by the 15 million people in Dhaka and surrounding areas enters the rivers untreated, and most of the 7,000 industries dispose of their waste to drainage ditches and rivers without treatment (Dhaka Environment Program 2005). It is not surprising that the ecology of the rivers has deteriorated under such pressure, and declining fish catches (from pollution, habitat degradation and over-exploitation) are just one indicator of the malaise. Catches in the North Central region for example were 26,476 ton in 1983-4 to 6,095 ton in 1996-7.

[23] Reconnaissance survey was conducted in January 2019 during preparation of EIA for DWSNP

92. **Flood Plain and Fisheries.** Floodplains are the natural lowlands alongside rivers, which are inundated each year in the monsoon as the increased volumes of water overflow river banks. These zones are important ecologically as they are the areas into which the adults of many species of fish migrate to breed. Floodplains are rich in nutrients from the inundated soil and decaying vegetation, and are also rich in food in the form of dead insects, soil invertebrates, and aquatic plankton that frequently bloom under such conditions. They are also protected from the strong currents in the main river, so are ideal areas for young fish to feed and grow, before entering the main river when water levels decrease. These areas also frequently attract large numbers of water birds, to feed on the juvenile fish in the shallow waters.

93. Most of Dhaka is in the natural floodplain of the various rivers in the area, and would have functioned as an important breeding and nursery ground for many aquatic species in the past. This function is still evident in the seasonal flooding that affects large parts of the city, although now the floodwaters invariably become polluted by sewage and chemicals washed out from the inundated areas. The floodplain function has been further degraded by the construction of embankments to protect the city from flooding, and particularly from infilling to reclaim land, which dramatically reduces the water retention capacity of these areas and increasing flooding both upstream and downstream. These factors have greatly reduced the importance and capacity of this area as a breeding ground, which has contributed to the declining ecology in the rivers.

Other Aquatic Habitats. Like elsewhere throughout the country, there are a variety of other aquatic habitats in Dhaka which include man-made lakes in residential neighborhoods, permanent and ephemeral pools in natural lowlands (known as *beels*), and flooded borrow pits excavated for building material **(Figure 4)**. These are generally of little ecological value as the water is frequently polluted, and these areas are often characterized by dense growths of the water hyacinth *Echicornica crassipes*, which out-competes other plants through its rapid growth, although species such as water chestnut and lotus can be seen in places.

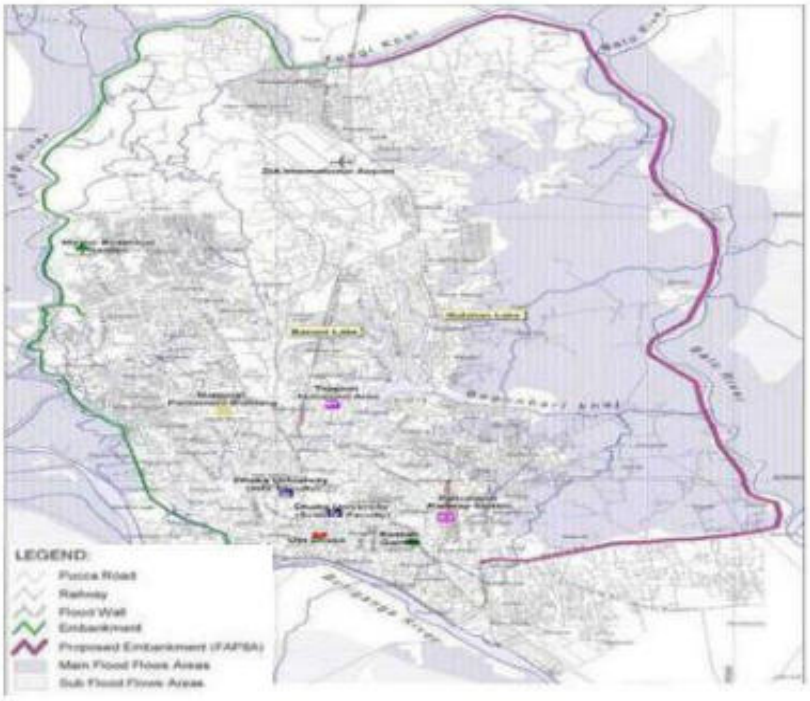


Figure 4: Surface water and aquatic habitats of Dhaka

Source: Initial Environmental Examination, March 2013; BAN: Urban Public and Environment Health Sector Development Program: Dhaka Secondary Transfer Stations.

94. **Protected Areas and Endangered Species.** There are no areas in or around the 1 DMA that are designated and protected for nature conservation, and no rare or endangered species. This is because as explained above terrestrial habitats have been destroyed to provide land for urbanization, and aquatic habitats are damaged and degraded by water pollution, infilling, and other anthropogenic activities.

D. Environmental Quality

95. **Air Quality.** Motor vehicles and traditional brick kilns are two of the main causes of air pollution in the Dhaka area. More recently, several industrial undertakings have also contributed to increasing air pollution. The main air pollutants in Dhaka City are nitrogen oxides (NOx), sulfur dioxide (SO2), particulate matter (PM10, i.e. PM with diameter of 10 microns or smaller, and PM2.5, i.e. PM 2.5 microns or smaller), carbon monoxide (CO) ozone, volatile organic compounds (VOCs), and lead (Pb). Motor vehicles are the major source of PM pollution. Most of the PM pollution (greater than 80%) comes from diesel-run vehicles. In the low-lying agricultural land surrounding Dhaka city, hundreds of brick kilns operate during the dry months of November–April. These generate smoke and dust, including SO2, NOx, and hydrocarbons that contribute to worsening ambient air and damage to public health that can contribute to cardiovascular and respiratory diseases or lung cancer.

96. Motorized transport has grown rapidly in Dhaka in recent years. The total number of registered vehicles in Bangladesh rose from 70,000 in 1970 to 460,000 in 2006. Dhaka has more than 3,000 old minibuses, which run on diesel fuel. About 80% of these buses are unfit to run on the city roads because of their high emissions. Even though aging trucks are not allowed to run in the city during daytime, the trucks cause significant air pollution, particularly during the dry winter months. Despite the phasing out of two-stroke three-wheeler baby taxis in 2003, air quality cannot be sustained because of the great number of smoky diesel vehicles. Dhaka city has witnessed a tremendous increase in vehicles fueled by compressed natural gas (CNG) in recent years. Many gasoline-fueled vehicles have been converted to run on CNG.

97. There was a notable amount of dust surrounding some of the DMA location visited, this is due to the nature of the sand-based play grounds of the local area and existing construction sites. Some of the unpaved roads also cause dust pollution when used by large vehicles.

98. The DoE maintains three continuous air quality monitoring stations within the Dhaka city. This monitoring is under the Clean Air and Sustainable Environment (CASE) project funded by the World Bank[24]. Table 17 shows the summary of monitoring results from January to June 2019 collected through the CASE project and Figure 5 shows the location of the monitoring stations and respective DMA boundary.

99. Results from the CASE air quality monitoring suggest that NO2, PM10 and PM2.5 exceeded the limits set by the National Ambient Air Quality Standards (2005). Existing sources of air pollution are mainly vehicular emissions, ongoing construction of large infrastructure projects, and dust-generating activities of densely populated settlements.

[24] Department of Environment. Clean Air and Sustainable Development

http://case.doe.gov.bd/index.php?option=com_contact&view=contact&id=1

100. Moreover, DBO Contractor (NCB 02.12E) has measured baseline air quality for in priority-based areas at DMA 705 which is adjacent to the study area. The result is used as the baseline data for NCB 02.12E. Table 18 shows the baseline results and Figure 6 shows sampling points where the study area is adjacent. The baseline air quality level for 1 DMA will be measured by the design build contractor (NCB 02.12E) according to monitoring plan prior to commencement of work. The results will be provided in the environmental monitoring report.

Table 17: Summary of Monitoring Results, July 22

	National Ambient Air Quality Standards	**unit**	**Station**		
			CAMS -1 Sangshad Bhavan, Sher-e-Bangla Nagar	**CAMS -2 Farmgate**	**CAMS -3 Darus- Salam**
Average Monthly air quality data- January 2019-					
SO_2- 24 hr	140	PPb	6.32	2.64	16.8
NO_2- 24 hr	53 (Annual)	PPb	63.3	141	93.2
$PM_{2.5}$-24 hr	65	µg/m^3	131	149	205
PM_{10}-24 hr	150	µg/m^3	DNA	212	302
Average Monthly air quality data- February 2019-					
SO_2- 24 hr	140	PPb	7.79	2.77	12.4
NO_2- 24 hr	53 (Annual)	PPb	66.1	111	71.0
$PM_{2.5}$-24 hr	65	µg/m^3	124	134	144
PM_{10}-24 hr	150	µg/m^3	DNA	235	244
Average Monthly air quality data- March 2019-					
SO_2- 24 hr	140	PPb	DNA	2.41	5.99
NO_2- 24 hr	53 (Annual)	PPb	84.0	DNA	45.1
$PM_{2.5}$-24 hr	65	µg/m^3	86.3	114	123
PM_{10}-24 hr	150	µg/m^3	164	206	225
Average Monthly air quality data- April 2019					
SO_2- 24 hr	140	PPb	3.16	2.60	DNA
NO_2- 24 hr	53 (Annual)	PPb	54.3	DNA	21.8
$PM_{2.5}$-24 hr	65	µg/m^3	57.2	67.3	71.5
PM_{10}-24 hr	150	µg/m^3	115	149	132
Average Monthly air quality data- May 2019					
SO_2- 24 hr	140	PPb	DNA	15.8	DNA
NO_2- 24 hr	53 (Annual)	PPb	DNA	DNA	20.1
$PM_{2.5}$-24 hr	65	µg/m^3	38.2	69.6	49.7
PM_{10}-24 hr	150	µg/m^3	98.7	129	99.8
Average Monthly air quality data- June 2019					
SO_2- 24 hr	140	PPb	5.75	DNA	DNA
NO_2- 24 hr	53 (Annual)	PPb	DNA	DNA	15.9
$PM_{2.5}$-24 hr	65	µg/m^3	18.9	58.0	33.2
PM_{10}-24 hr	150	µg/m^3	43.0	105	58.4

Source: Monthly Air Quality Monitoring Report under Clean Air and Sustainable Environment project, prepared by Department of Environment, July 2023

Table 18: Air Quality Monitoring Data

Location ID	Name of DMA	GPS Coordinates	SPM (µg/m³)	PM 2.5 (µg/m³)	PM 10 (µg/m³)	SO_2 (µg/m³)	NO_2 (µg/m³)	CO (mg/m³)	O_3 (µg/m³)
AQ 01	705	23°41'43.2"N 90°26'09.5"E	159	94	141	7.73	29	0.065	1.009
AQ 02		23°41'43.7"N 90°26'51.3"E	181	98	149	8.47	24	0.042	0.993
Duration (Hours)			**8**	**24**	**24**	**24**	**24**	**8**	**8**
Bangladesh Standard*			**200**	**65**	**150**	**80**	**80**	**5**	**100**
Air Pollution Control Rules-2022			**NYS**	**65**	**150**	**80**	**80**	**5**	**100**

101. Total seven parameters (SPM, PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and O_3) of ambient air quality have been analyzed for each location. Overall, the results show that the level of air pollutants in all of the monitoring locations were found within the permissible limit. The concentration of fine particulate matter ($PM_{2.5}$) varies from 94 µg/m_3 in AQ 01 to 98 µg/m_3 in AQ 02 area. Similarly, the concentration of PM_{10} also varies from 141 µg/m_3 in AQ 01 to 149 µg/m_3 in AQ 02 areas. The details analysis is given in Annex of the report. According to the test result the working environment of this area is good. But it is recommended to providing mask to the relevant peoples of those areas where the concentration of the pollutant was found closed to the standard level to avoid health hazard.

Figure 5: Location Map of Baseline Air Quality near the DMA under NCB 02.12E

METHODOLOGY

General Approaches

The Environmental team conducted environmental observation around the sub-project site through a structured checklist to determine the potential area of concern/impact. Similarly, discussions with stakeholders and project team, review of project documents, available online resources and other sources was also carried out.

EMP is to demonstrate how the proposed construction works can be delivered in a logical, sensible and safe sequence with the incorporation of specific environmental control measures relevant to construction works of this nature. The following steps were followed to prepare the EMP:

- Reviewing IEE, EIA report and all the relevant documents in connection with Dhaka Water Supply Network Improvement Project (DWSNIP);
- Ensuring the EMP is consistent with applicable environmental laws, regulations and standards as outlined in the Chapter 2.
- Regular consultation was done by the Environmental Expert to monitor the environmental condition of the project area.
- Baseline data collection from the sub-project construction sites.

The general approach to establish the environmental baseline was to survey the project corridor for identification of the environmental features those are mentioned in the environmental management plan document.

Quantitative Environmental Aspects

During the construction stage of the project, it may raise several concerns about certain environmental adverse impacts on the surrounding environment. By implementing the monitoring and mitigation programme, the adverse impacts can be effectively managed. The environmental quality tests (air quality, noise, surface water and groundwater) for several environmental parameters were conducted from the Tarabo Pourashava sites to comply with the EMP. This baseline environmental monitoring identified the environmental performance and management of the proposed project construction.

Air Quality

Ambient air quality has been monitored at Dry period (19th October, 2023) when the air quality generally remains in poor condition than that of wet period. The portable OCEANUS AQM-09 Air Quality Monitoring Station shown below was used to collect, measure and document critical pollutants including Carbon monoxide, Ozone, Nitrogen dioxide, Sulfur dioxide and Particulates Matter.

Ambient Air Quality Monitoring Equipment (OCENAUS: AQM-09)

Photographs

Sampling and analysis of ambient air quality was conducted by referring to the recommendation of the United States Environmental Protection Agency (USEPA). Air quality data was measured automatically every one minute and directly recorded onsite for measured parameters (SPM, PM_{10}, $PM_{2.5,}$ SO_2, NO_2 and CO and O_3) as shown below Different analysis methods, such as Particulates 90° Infrared Light Scattering for particulate matters (SPM, PM_{10}, $PM_{2.5}$), and electrochemical sensors for toxic gases (NO_2, SO_2, O_3 and CO) are integrated in the device.

Methods of Air Quality Sampling and Analysis

Parameter	Instrument Name	Methods of Testing	Analysis Method
SPM	OCENAUS AQM-09	On Site Recording	Light Scattering Nephotometer
$PM_{2.5}$	OCENAUS AQM-09	On Site Recording	Light Scattering Nephotometer
PM_{10}	OCENAUS AQM-09	On Site Recording	Light Scattering Nephotometer
Sulfur Dioxide (SO_2)	OCENAUS AQM-09	On Site Recording	High Sensitivity Electrochemical
Oxides of Nitrogen (NOx)	OCENAUS AQM-09	On Site Recording	High Sensitivity Electrochemical
Carbon monoxide (CO)	OCENAUS AQM-09	On Site Recording	High Sensitivity Electrochemical
Ozone	OCENAUS AQM-09	On Site Recording	High Sensitivity Electrochemical

As per the national standard, SPM, CO and O_3 was monitored for 8 hours to compare with the national standard. For Particulate Matter ($PM_{2.5}$ and PM_{10}) and gaseous pollutants (NO_2 & SO_2) the standard duration is 24 hours. A conversion equation was used to convert the data from specific time period to expected time period in order to be able to compare results to the GoB standards.

102. **Salient findings from air quality monitoring are as follows:**

- In all cases concentration of NO_2 and CO are within the prescribed standards applicable for the subprojects.
- In all cases concentration of PM_{10} and SO_2 are within the prescribed standards applicable for the subprojects.
- In all cases concentration of $PM_{2.5}$ were exceeded the standard level. This could be due to more traffic movement.

103. **Surface Water Quality.** The quality of the surface water surrounding Dhaka is poor. Untreated discharge of industrial and municipal effluents into the rivers, swamps, and natural channels causes water pollution.

104. The DoE has identified 450 polluting industrial units in Dhaka (196 tanneries, 129 textile producers, 38 engineering factories, and plants manufacturing pesticides, chemicals, fertilizers, pulp and paper), many of which discharge untreated wastewater to the rivers. The sewerage system covers only 20% of the city population, and 50% of people use septic tanks, 20% pit latrines and 10% use open latrines and other unsanitary methods.

105. The surface water quality in Dhaka City's peripheral rivers varies seasonally due to the flow pattern (SWECO et al 2010). The low flows in the dry season results in very poor water quality conditions as there is limited dilution of wastewater entering the rivers. Water quality parameters such as Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and ammonia exceed acceptable limits in various water bodies around Dhaka City during the dry season.

106. DoE has been collecting water quality data in the river system around Dhaka city from 1980 (DoE 1993). Analysis of available data from DoE shows that the water quality in the river is deteriorating.

107. The water quality of Buriganga River has deteriorated tremendously over the years due to the discharge of untreated wastewater, sewage and industrial effluents from different sources. In a recent survey conducted during February-March 2017[25], high level of pollution became very evident. The dissolved oxygen level in Buriganga was observed to be near zero in almost the entire length of the river. This indicates that during the driest part of the year the river is absolutely unsuitable for any aquatic life. It was further noticed that the pollution level of the river is highly risky for public health in the near vicinity of the river.

108. There are no Water body present in this DMA (705). So there is no surface water for sample and testing.

[25] Environmental, Resettlement and Social Management Framework for subcomponent 2.4 and component 3 under Dhaka Sanitation Improvement Project under World Bank funded prepared by Dhaka WASA, December 2018

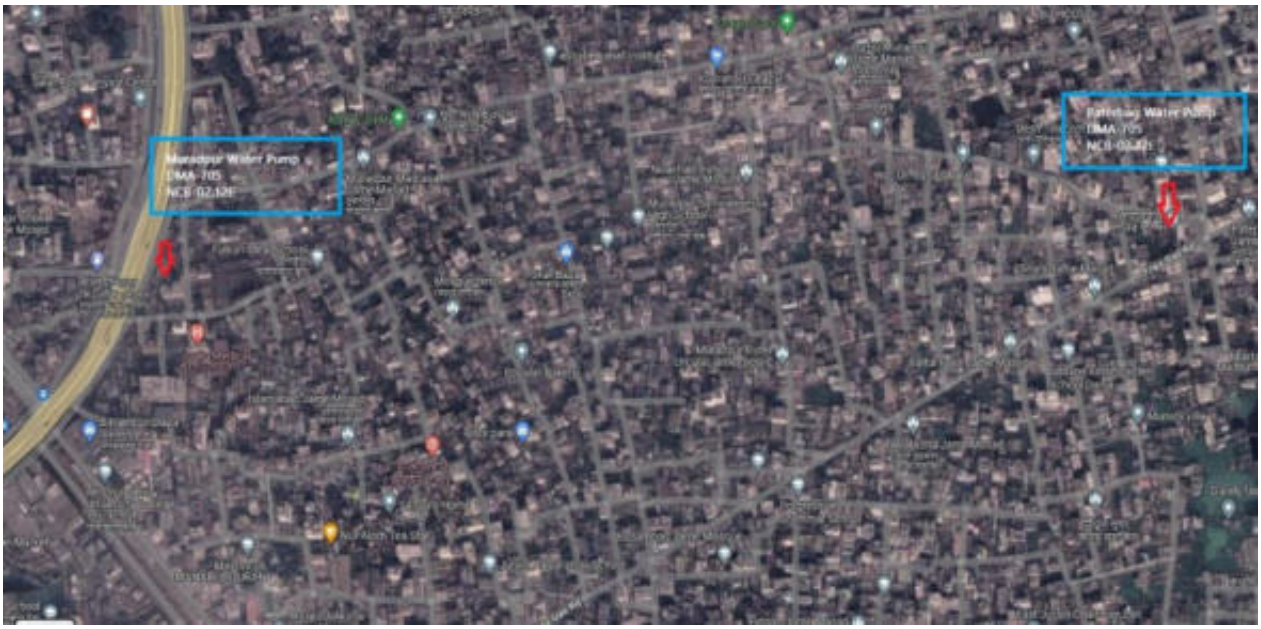


Figure 6: Location Map of Water Quality near the DMA under NCB 02.12E

109. The baseline water quality level will be measured by the design build contract (NCB 02.12E) according to monitoring plan prior to commencement of work. The results will be provided in the environmental monitoring report.

110. **Ground Water Quality.** It has been recorded that Dhaka city's ground water has been depleting in the past decade. The groundwater from the Dupa Tila Aquifer, located in the Madhupur Tract has a chemistry of calcium-bicarbonate to sodium-bicarbonate. It has less than 350 mg/l of total dissolved solids and is oxygenated, making its pH slightly acidic. These baseline conditions of groundwater in the Dupi Tila aquifer have since then been altered by the influence of recharge modification that increased the concentration of chloride, nitrate and sulphate, which are the principal inorganic indicators of urban contamination[26].

111. As per the site specific EMP, the TCEL is required to test the ground water used by labors. ground water quality monitoring was carried out at pump locations of each DMA during project implementation period and before starting the implementation of work. The parameters were pH, DO, Chloride, Iron, Mn, As, Total Coliform, Turbidity, Total Suspended Solid. During water collection period, the laboratory personal used proper Personal Protective Equipment (PPE) including vests, face musk, hand gloves and helmets. They collected the water sample by water collection sample bottle and sealed the bottle to carry to the laboratory. Laboratory analyzes the water by using different methods such as Electrometric, Nephelometric Method, Gravimetric, Electrometric, Argentometric, AAS, As-test kit, Membrane Filtration. The results are shown in Table 19(b) for ground water.

[26] Burgess WG, Hasan MH, Rihani E, Ahmed KM, Hoque MA,

Darling WG (2011) Groundwater quality trends in the Dupi Tila aquifer of Dhaka: Bangladeshâ€" sources of contamination evaluated using modelling and environmental isotopes. Int J Urban Sustain Dev 3(1):56- 76

Table-19: Water Quality of DMA

Table-19(a): Ground Water Sampling Location

Sl.	Name of DMA	Location ID	GPS Coordinates
i.	DMA-705	GW 01	23°41'43.2"N 90°26'09.5"E
		GW 02	23°41'43.7"N 90°26'51.3"E

Table-19(b): Result of Ground Water Quality Analysis

Parameter	Unit	Concentration Present		Bangladesh (ECR-2023)	WHO-2011	Analysis Method
		GW 01	GW 02			
pH	--	7.17	7.35	6.5-8.5	6.5-8.5	Electrometric
Turbidity	NTU	21.7	24.1	5	5	Nephelometric method
Total Suspended Solids (TSS)	mg/l	04	06	10	NYS	Gravimetric
Dissolved Oxygen (DO)	mg/l	7.61	7.94		NYS	Electrometric
Chloride	mg/l	46	39	150-600	250	Argentometric
Iron (Fe)	mg/l	1.37	1.14	0.3-1.0	0.03	AAS
Manganese (Mn)	mg/l	0.450	0.529	0.4	0.4	AAS
Arsenic (As)	mg/l	<0.01	<0.01	0.05	0.01	AS-test kit
Total Coliform (TC)	CFU/100 ml	0	0	0	0	Membrane Filtration

112. The analysis results of the ground water quality are shown in **Table 19(b).** The results show that, all of the parameters except Turbidity of ground water quality in the monitoring locations are within the permissible limit according to ECR,23 and WHO guideline. The concentration of Coliform (Total and Fecal) is found Nill in all of the locations. The groundwater samples were collected near from selected locations where several numbers of worker were deployed due to heavy construction activities. The reason of the selection was to compare the existing water quality with national standard and to ensure good potable water for the workers during full construction period.

113. In Dhaka city the ground water extraction started from a depth of 100m and in some extreme conditions the well goes up to 300 meters to reach the main aquifer. The rate of depletion varies from area to area. The city's groundwater level has dropped about 20m over the last seven years at a rate of 2.81m per year. From the year 2000 the rate has been increasingly high. Long term hydrographs from different parts of the Dhaka city indicate the drop-in water level is increasing rapidly throughout the city.

114. This trend of continuous decline of the water table with little or no fluctuation is usually a sign that the aquifers have been over exploited (Bangladesh Water Development Board, 2007).

115. The groundwater level is comparatively high in the city's periphery and low in the central part of the city. Among the periphery, the northern part of the city has a comparatively higher water level than the southern part. This is because the south of the city has comparatively fewer open spaces and small surface water bodies that are dispersed and therefore the rate of withdrawal of groundwater is higher.

116. **Noise Level.** Subproject components are in the built-up part of Dhaka, with residential, commercial, and institutional establishments. The volume of traffic that passes through these sections is significant and traffic jams are frequent. Vehicular movement can be considered as major cause of noise pollution.

117. In order to collect baseline noise level data, NCB 02.12E Contractor conducted baseline monitoring (preconstruction stage) on noise level for different priority-based locations in which DMA 705 is adjacent to the study area. Baseline noise level monitoring results are shown in Table 20 and sampling points are shown in Figure 7**.**

118. Some areas are within allowable limits and some are exceeded both for commercial and residential land use pattern. The exceeding values are due to different types of commercial activities and sudden horn from motorbike and auto rickshaw.

119. The baseline noise level (proposed 1 DMA) will be measured by the subproject contractors prior to commencement of work. The results will be provided in the environmental monitoring report and all other measurements during implementation will be reported as part of EMP implementation

Table- 20: Base Line Noise Level Monitoring Data within Different DMA sites

Location ID	Name of DMA	GPS Coordinates		Noise level [dB(A)]			Standard* (dBA)	Land Use Category
				Leq	L_{max}	L_{min}		
NL 01	705	23°41'43.2"N 90°26'09.5"E	Day	58.94	66.2	46.5	60	Mixed
			Night	46.63	57.6	41.7	50	
NL 02		23°41'43.7"N 90°26'51.3"E	Day	63.39	70.2	52.2	60	Mixed
			Night	42.26	54.3	38.9	50	

Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006

Exceeding Standard Level

Methodology

Noise level were measured at Six (06) locations for 15 minute duration both day and night time on 19 October 2023. The Lutron SL-4033DS noise level meter shown below was used for noise level monitoring. The device was recorded data throughout the monitoring period. After getting the raw data from the device, appropriate formula was applied to calculate Leq for monitored locations.

Noise Level Monitoring Equipment (Lutron SL-4033DS)

Photograph

120. Dhaka, the capital of Bangladesh, must address the issue of noise pollution. The monitoring locations are belonged to mixed zone. The analysis result indicates that the noise pollution level is exceed the national standard both day and night time during the monitoring period where traffic is

one of the major sources of noise which also multiplies due to drivers' behavior; for example: frequent braking and/or honking. Other important factors that affecting noise values are continuity of the commercial activities, dimension of the roads, position of the roads, people's mobility etc. Day time noise level (Leq day) was recorded in the range of 66.18 (NL 05) to 72.32 dB (A) (NL 02) while the night time noise level (Leq night) in the project area were 52.50 (NL 05) to 59.62 dB (A) (NL 02). The details analysis is given in Annex of the report.

Figure 7: Location Map of Baseline Noise level near the DMA under NCB 02.12E

Groundwater Quality

The groundwater samples were collected by maintaining standard procedures from Two (02) locations of the project corridor on 19 October 2023. The parameters are pH, Turbidity, Total Suspended Solids (TSS), Dissolved Oxygen (DO), Chloride, Iron (Fe), Manganese (Mn), Arsenic (As) and Total Coliform. After collected, the samples were placed into appropriate and labeled black bottle and kept in an ice cooler. Then the samples were submitted to DWASA laboratory for analysis of parameters. Groundwater results has been compared with national standard. [ECR-2023]

E. Economic Development

121. **Land Use.** Present land use is mainly urban in the center however other land uses as well, including residential units between and above shops in the increasing numbers of high-rise buildings, and some industry.

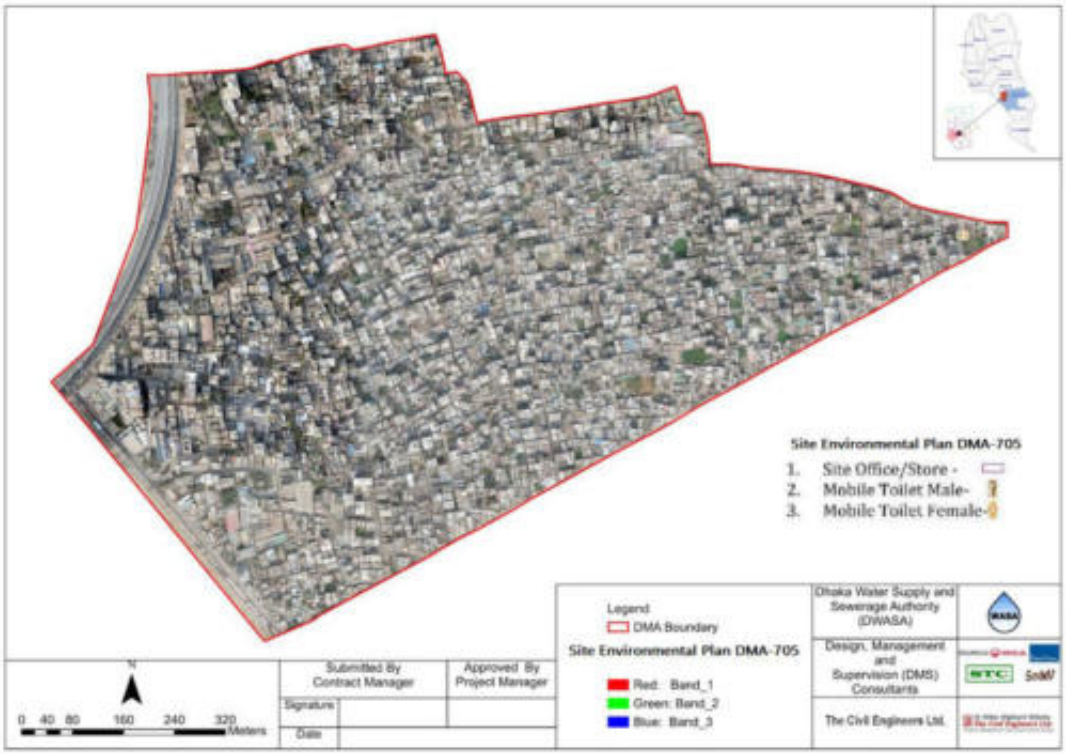


Figure 8: GIS Based Land Use Map of DMA (705) of NCB-02.12E

122. **Industry.** Almost half of all Bangladesh's industry is based in Dhaka, where manufacturing is the most important activity, with many factories supplying low cost garments to major companies in Europe. The main industries are leather tanneries and textile production, but there are factories manufacturing a wide range of other products including fertilizers, pesticides, chemicals, pharmaceuticals, rubber, plastics, cement, and foodstuffs including salt, sugar and rice.

123. There are several industrial areas in DMA area. It is found that lots of small-scale workshops are located in the DMA boundaries.

124. Although workers are still primarily male, there has been an increase in the employment of women during the past 30-40 years, particularly in the manufacture of ready-made garments.

125. **Transportation.** The project area heavily congested throughout much of the day, because roads are insufficient for the volume of traffic, and problems are exacerbated by driver indiscipline and ineffective policing of traffic laws.

126. **Roads.** There are a multitude of smaller cross-linking roads, many of which are narrow and suitable for only one or two vehicle widths, which also become congested as drivers seek alternative routes. The problem is compounded by the very large population of Dhaka, which

creates a large volume of pedestrian traffic, and the vast array of public and private transport vehicles seeking customers. These include large numbers of buses, taxis, auto rickshaws, private cars, and bicycle rickshaws. These operate throughout the city at both regulated and unregulated stops, and the buses and taxis provide links to surrounding districts.

127. **Classification of roads by size and by surface type.** [27] There is no standard classification of roads based on traffic volume, tonnage, location and function they have to perform. However, depending on use the roads are classified as VIP roads, main roads and other roads. For road restoration purposes the roads are also classified as asphalt road, bituminous road, and reinforced concrete cement (RCC)/concrete cement (CC) road, brick pavement, macadam and earthen road depending on construction and surface type.

128. As there is no control on movement of heavy traffic, DWASA considers all types of roads as heavy-duty road for design purpose. Dhaka city roads are with footpaths, underground/surface drainage, sewer line, gas, electricity, telephone and other utility services.

129. In order to be systematic and for convenience of work the roads are classified based on width and are defined as Table 21 below.

[27] Categories of roads as per surface types are important for road restoration purposes. The pavement restoration, where required, will be carried out by Dhaka City Cooperation (DCC) when all backfill has been settled for 6 weeks. For this purpose, DCC will have to be paid as per surface types of the roads. DWASA will apply for the road cutting permission and the contractor must pay therefore. The road cutting plans necessary for the application must be prepared by the contractor.

Table 21: Road Classification in Dhaka

	Road Classification	Description
A.	By Width	
1.	< 2-meter width	The tertiary roads in unplanned areas are usually narrow and mostly less than 2 meters where no vehicles or only one car can pass at a time. These categories of roads will be treated as tertiary roads / lane / access road. The tertiary roads may be of earth, brick pavement, macadam or RCC / CC type. These types of roads have no footpath, have no proper drains and normally a limited number of other utility services beneath.
2.	4-meter width	The internal roads of a planned area and the branch of main roads are within 2-4 m width and are classified as secondary roads. The secondary roads are usually of bituminous surfacing, although RCC / CC and brick pavement and macadam type may constitute a secondary road. These roads may be with or without foot path and in most have all types of utility services beneath.
3.	> 4-meter width	The main roads and VIP roads of Dhaka city are larger than 4 m and are of asphalt / bituminous surfacing. These are heavy tonnage roads; traffic volume is large and traffic congestion is a common feature with these categories of roads. These roads are always with foot path and all other utility services beneath.
4.	Major roads	Main roads are the major roads of Dhaka city allowing all types of traffic including three-wheeler rickshaws and heavy truck/lorries.
5.	VIP roads	These are also the main roads of Dhaka city allowing all types of traffic including heavy truck/lorries except the three-wheeler rickshaws and pushcart.
B.	By Surface Type	
1.	Asphalt and Bituminous Road	Major roads of Dhaka city are of asphalt/bituminous flexible pavement consisting of wearing course, base course, sub-base and sub-grade. The pavement structure of roads >4 m (main and VIP) have all these elements, however, narrower roads depending on site and traffic conditions may not have the same design.
2.	RCC / CC	Special and access roads are of rigid pavement type and are made of RCC / CC. Usually a rich mixture of cement, sand and course aggregate is laid in a single layer for this type of roads.
3.	Macadam/ Brick Pavement	Areas less important and under developed have macadam and brick pavement (200 mm) without base and sub-base course and usually designed for light traffic.
4.	Earth / Kutcha Road	There are also earth/kutcha roads in areas newly developed and sometimes concrete rubbish is used for surfacing.

130. The major roads in the study area include: Maowa Road, Haji Khorsed Ali Sorder Road, New Wasa Road, New Wasa Road-1, Muradpur High School Road 1-16, Rajab Ali Sarder Road, Haji Lal Mia Road, Muradpur Rajab Ali Sardar Road, Master Bari Road 1, Jummon Mia (Chairman) Road, Paterbag Road, Adorsha Sorok etc. (DMA 705). are some major roads within 01 DMA.

Table 22: Type of Road[28] within DMA

DMA No.	Type of Road	Length (km)
705	BC	0.49
	CC	12.04
	RCC	11.14
	Katcha	1.70
	Total	**25.37**

Source: Survey Report for 1 DMA prepared by TCEL; October 2023

131. **Infrastructure.** Infrastructure is a major problem in all towns and cities in Bangladesh, where many facilities are inadequate to serve the needs of such a large population, after decades of under-funding and neglect. Some of the infrastructure is provided and maintained by DWASA, and other elements are the responsibility of other government agencies.

132. Water supply, sewerage and drainage are mostly provided and maintained by DWASA. Water supply is provided by ground water and surface water in Dhaka city. An estimated 83.70% of water is supplied from ground water through Deep Tube Wells (DTWs) and 16.30% supplied from surface water through water treatment plant. The sewerage system is also provided (only 20% of the population) by DWASA through underground sewer pipelines, sewer lift stations and sewerage treatment plants. The sewers are blocked and leaking in many places. Many buildings, including high-rise developments, have no sanitation system at all, and discharge their effluent into lakes, rivers, drainage ditches or onto open ground, causing unsightly areas, health risks and water pollution.

133. The city drainage system consists of surface and underground elements, which are maintained by Dhaka City Corporation (DCC) and DWASA respectively. Surface drains are mainly brick and concrete-sided channels (covered and uncovered) and these are built by the Roads and Highways Department alongside roads, and the Rajuk in residential areas.

134. Dhaka's natural drainage system is made up of a number of retention and detention areas including khals (canal), which are also linked to the surrounding rivers. The rain water is usually collected in these retention and detention areas and then discharged to the surrounding rivers through the khals.

135. Solid waste in urban areas is the responsibility of the city corporations (DCC), and in most locations NGOs or CBOs operate the primary collection service, removing waste from houses and businesses each day, mainly on cycle-rickshaws. These carry waste to Secondary Transfer Station (STS) at various locations around the town, from where it is carried for final disposal by vehicles operated by the respective city corporation.

136. Each of the city corporations was divided into 5 Zones for zone wise collection and transportation of solid waste in Dhaka City. Figure 9 shows different waste collection zones of Dhaka city with existing landfill sites.

137. DCC is now going to establish 12 STS at different locations of Dhaka city to improve management of solid waste and hospital waste through municipality-managed public-private partnerships and other mechanisms under **"Public Urban Environment Health Sector Development Program"** funded by ADB.

[28] Survey Report for 1 DMAs prepared by TCEL; October 2023

138. There are two semi-engineered landfills- one in (one in Matuail for DSCC and the other in Aminbazar for DSCC), in Dhaka, where poor practices (including leaving waste uncovered until a cell is filled and allowing people to sort through the waste for recyclables in a disorganized and unsafe manner) create an unsighty and insanitary facility. Elsewhere disposal is by open dumping with little or no management or pest control, and as a result these areas are highly insanitary and hazardous to public and environmental health.

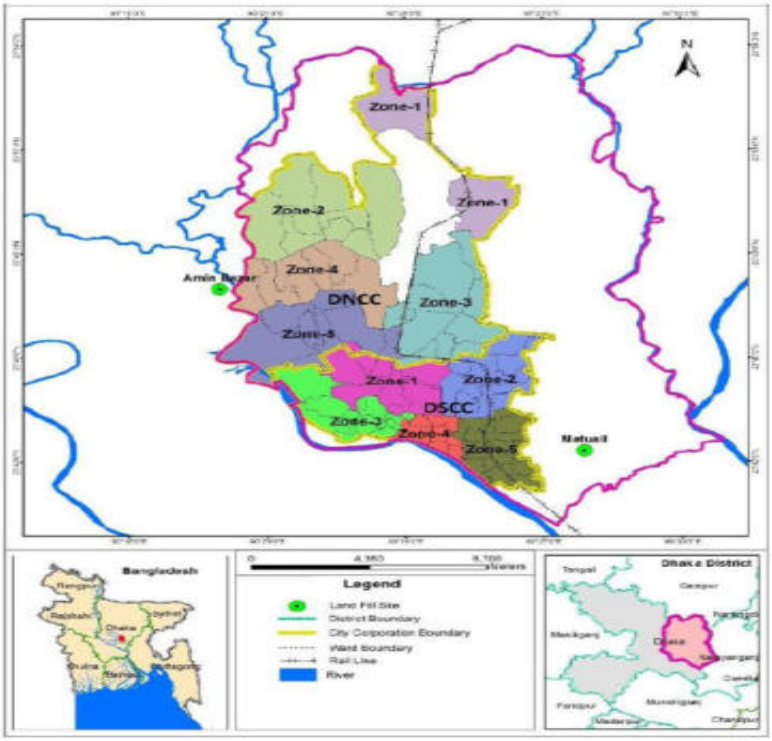


Figure 9: Waste Collection Zones of DSCC and DSCC with Existing Landfill Sites

Source: Journal of Bangladesh Institute of Planners; Vol. 8, 2015 (Printed in December 2016), pp. 35-48, © Bangladesh Institute of Planners- Municipal Solid Waste Management System: A Study on Dhaka North and South City Corporations

139. In Dhaka, there is an effective medical waste treatment facility operated by the NGO PRISM (Projects in Agriculture, Rural Industry, Science and Medicine), located alongside the municipal landfill at Matuail. Here infected waste is treated by autoclaving, plastics are recovered for recycling after disinfection, body parts are buried and any remaining waste is incinerated. At present, there are some simple types of transfer stations in DCC area but the collection and transportation of solid waste will be improved substantially after implementation of the 12 STSs.

140. The gas supply is provided by Titas Gas Transmission and Distribution Company Ltd. In Dhaka city gas comes from Demra, Gazipur, Dhonia and Shiddirganj City Gate Stations (CGSs), then to District Regulation Stations (DRSs) and then through feeder stations, gas is distributed to different consumers.

141. Electricity is supplied in Dhaka city mainly by Dhaka Electric Supply Authority (DESA) and Dhaka Electric Supply Company (DESCO) through 33/11 kV substations and 132/33 kV grid substations by underground and overhead distribution lines.

142. **Other Economic Development.** Like most of the towns and cities of Bangladesh, agriculture is important in parts of the urban fringe of the Dhaka city. Rice is the most important crop and farmers plant varieties with different flood tolerances (developed by the Bangladesh Rice Research Institute) in different seasons to obtain two or even three harvests. *Aus* rice is grown in March to June, followed by the flood-tolerant *Aman* in July to October, and in the dry season farmers plant a combination of *Boro* rice and vegetables. Wheat and potatoes are also important, along with fruit, in particular mango, banana and pineapple. Most of the produce is sold in markets in the city, although rice is also exported, after processing in one of the local mills.

143. Dhaka is the commercial heart of Bangladesh. The city has a growing middle-class population, driving the market for modern consumer and luxury goods. The city has historically attracted a large number of migrant workers. Hawkers, peddlers, small shops, rickshaw transport, roadside vendors and stalls employ a large segment of the population — rickshaw-drivers alone number as many as 400,000. Half the workforce is employed in household and unorganized labor, while about 800,000 works in the textile industry. Even so, unemployment remains high at 19%. As of 2009, Dhaka's Gross Municipal Product (GMP) is registered at $85 billion. With an annual growth rate of 6.2%, the GMP is projected to rise to $215 billion by 2025. The annual per capita income of Dhaka is estimated at $1,350(USD), with 34% of households living below the poverty line, including a large segment of the population coming from rural areas in search of employment, with most surviving on less than $5 a day.

144. Urban developments have sparked a widespread construction boom; new high-rise buildings and skyscrapers have changed the city landscape. Growth has been especially strong in the finance, banking, manufacturing, telecommunications and services sectors, while tourism, hotels and restaurants continue as important elements in the economy of Dhaka.

F. Social and Cultural Resources

145. **Demography.** Dhaka City is the capital of the People's Republic of Bangladesh. In 2011, the Dhaka Metropolitan Area (DMA) had a population of 9.3 million. As per census 2011, the following 3 shows the distribution of Thana-wise population in the project area. The table also presents the distribution of household size of the study area.

Table 23: Thana wise Population size

Thana	Area (Sq. Km)	Population	Density (Sq. Km)	Household Size
		2011	2011	
Kadamtali	11.80	370895	31432	4.20

Source: BANGLAPEDIA (National Encyclopedia of Bangladesh), Bangladesh Population Census 2011, Bangladesh Bureau of Statistics.

146. **Age and Sex Structure**. The following Table 24 shows that about 52% is male population out of total population rather than female is 48%. The highest percentage of the population is found under the age 25-39 and the lowest population group is found under the age 60+.

Table 24: Age-Sex Structure

Age group	Male		Female		Total Population	
	Number	%	Number	%	Number	%
Below 5	213824	4.70	194393	4.27	408218	8.96
5-14	477287	10.48	433914	9.52	911201	20.00
15-24	473707	10.40	430659	9.45	904366	19.85
25-39	691589	15.19	628741	13.8	1320330	28.98
40-59	435524	9.55	395946	8.68	831470	18.25
60 and above	94503	2.08	85915	1.88	180418	3.96
Total	2386434	**52.4**	2169568	**47.6**	**4556003**	**100**

Source: Detailed Area Plan of DMDP Area, RAJUK, 2010

147. **Religious Groups**. In the project area, Muslims represent the highest percentage (96.53%) of the total population. It also has a sizeable percentage of population of other religious groups like Hindu (3.28%), Buddhist (0.03 %) and Christian (0.15 %).

148. **Educational Status.** The project area about 8.36 percent population are illiterate, 28.84 percent have elementary level of education, about 10.23 percent respondents have S.S.C. level education, about 21 percent have H.S.C and higher level of educational qualifications and about 9 percent population are under aged and the rest one percent have other type of education, for instance, religious education, etc. The most significant and observable fact is that about 61 percent of the project area's population have elementary to S.S.C. level of education.

149. **Occupation.** The occupation pattern of the project area's population is a very diversified and dynamic as well. It is found that the number of people engaged in traditional professional activities like agriculture is not so significant. Business is one of the main occupations of the people of the area and 9.57 percent people are engaged in it. Service in government /non-government organization is the occupation of about 12 percent people. Household work indicating housewives is the single most common field of employment in the area with the figure 25.33%. Employments in industries as skilled Mechanic/Artisan or unskilled workers comprise 02.12E percent. About 25.40 percent are students while unemployed constitute 4.02 percent. A substantial number comprising 10.66 percent are infants.

150. **Income and Expenditure.** Income and expenditure pattern of population reflect their socio-economic status and the status of the area as well. The income-expenditure pattern also refers to the savings status of the selected population. The income and expenditure here present the monthly income from different sources and expenditure for different items of household and their other common needs. Monthly income level is presented in the

151. Table 25 below. The table given below shows that about 21 percent of the household's monthly income is Tk. 25,001 and above, about 20.42 percent of the household earn monthly Tk. 18,001 to 25000, about 18 percent of the households' monthly income is Tk. 12,001 to 18000. About 33 percent of the households' monthly income is Tk. 8,001 to 12,000 and about 8 percent household income is within Tk. 4501 to 8000 per month.

Table 25: Level of Income

Level of Income	Percentage
Below 4500	0.85
4501-8000	8.66
8001-12000	30.21
12001-18000	18.17
18001-25000	20.42
25000+	21.69
Total	**100.00**

Source: Detailed Area Plan of DMDP Area, RAJUK, 2010

152. The expenditure pattern of the project area reflects that most of the people (26%) are in the BDT 12001-18000 expenditure groups, while a significant percentage (12%) of household are in the over BDT 25000 expenditure group. The detailed expenditure pattern of the people within study area are given in Table 26.

Table 26: Family Expenditure (in BDT)

Family Expenditure	Percentage
Below 4500	1.00
4501-8000	19
8001-12000	18
12001-18000	26
18001-25000	24
25000+	12
Total	**100.00**

Source: Detailed Area Plan of DMDP Area, RAJUK, 2010

153. **Physical and Cultural Heritage**. There are several sites of cultural interest in Dhaka, dating from various periods of the city's history. Major cultural heritage sites within the project area are as follows:
Ahsan Manjil, Choto Katra, Boro Katra, Lalbagh Fort, Sat-Gambus Mosque, Dhamnodi Old Eidgah, Unknown Tomb near Sat-Gambus Mosque, Paribibir Mazar are also some heritage sites.

154. It is to be mentioned that all of above sites are far away from the proposed 1 DMA area and none of those will be affected due to the project interventions.

155. **Indigenous Peoples.** There are no indigenous people identified in the 1 DMA

G. Site Specific Existing Condition of the 1 DMA in the Project Area

156. The subproject sites and water pipe alignments are located in the built-up area of Dhaka City and are not within or adjacent to environmentally sensitive areas such as protected areas, wetlands, buffer zones of protected area, and special areas for protecting biodiversity. Table 27 provides description of the 1 DMA covered under NCB 02.12E.

Table 27: Description of 1 DMA under NCB 02.12E

DMA No.	Existing Conditions	Site Photographs
705	This DMA 705 is placed within zone 7 with residential and commercial areas as well as these places are the mostly planned areas. The location of the area is confined within DMA 705 locally known as Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur within the ward no. 52, 53 and 60 under Kadamtali (Police Station) in Dhaka South City Corporation. This area is bounded by DMA 703 at the north, DMA 706 and 707 is located at the south, DMA 704 at the north-east side, and DMA 118 of Zone 1 & DMA 708 at the west side. The total area covered by DMA 705 is 0.63 km2. This DMA is a residential area where many schools and markets exist, along with commercial grocery markets. Medium to high traffic congestions take place on these roads throughout the day. Most of the roads are RCC and CC maintained poorly which are deep within the project area. Roads which are broader and near to the express and highway are maintained properly. Narrow roads within the project area does not provide adequate space for medium sized vehicles as well. There are a few numbers of open sewages and canals which are poorly maintained and causes a health concern for the residents within the project area.	

5 ANTICIPATED IMPACTS AND MITIGATION MEASURES

157. Potential environmental impacts of the proposed network improvement components are presented in this section. Mitigation measures to minimize/mitigate negative impacts, if any, are recommended along with the agency responsible for implementation. Monitoring actions to be conducted during the implementation phase is also recommended to reduce the impact.

158. Screening of potential environmental impacts are categorized into four categories considering subproject phases: location impacts and design impacts (pre-construction phase), construction phase impacts and operations and maintenance phase impacts and mitigation is devised for any negative impacts

(i) **Location Impacts** include impacts associated with site selection and include loss of on-site biophysical array and encroachment either directly or indirectly on adjacent environments. It also includes impacts on people who will lose their livelihood or any other structures by the development of that site.
(ii) **Design Impacts** include impacts arising from Investment Program design, including technology used, scale of operation/throughput, waste production, discharge specifications, pollution sources and ancillary services.
(iii) **Construction Impacts include** impacts caused by site clearing, earthworks, machinery, vehicles and workers. Construction site impacts include erosion, dust, noise, traffic congestion and waste production.
(iv) **O&M Impacts** include impacts arising from the operation and maintenance activities of the infrastructure facility. These include routine management of operational waste streams, and occupational health and safety issues.

159. In the case of this project (i) most of the individual elements involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being mostly located in urban area and not falling in any environmentally sensitive zones will not cause direct impact on biodiversity values. The project will be in properties held by the local government and access to the project location is through public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

A. Magnitude and Significance of Impacts

1. Methodology

160. The implementation of the 1 DMA will affect most of the city as branches of the distribution network are located in most roads and streets, and the construction process will continue for about 1 year. However, the construction work is in fact not expected to cause major negative impacts. This is because:

(v) most network construction will be conducted by small teams working on short lengths at a time so most impacts will be localized and short in duration; and
(vi) Because Dhaka city contains no sensitive features.

161. Issues for consideration have been raised by the following means: (i) input from interested and affected parties; (ii) desktop research of information relevant to the proposed subproject; (iii) site visit and professional assessment by environment specialist of DMS consultants; and (iv) evaluation of proposed design scope and potential impacts based on the environment specialist's past experience.

162. The methodology used to rate the impacts was qualitative. Each category was divided into a number of different levels. These levels were then assigned various criteria as indicated in **Table 28-I.**

Table 28-I: Summary of Quantifiers and Qualifiers Used for Assessment Purposes

Duration (time-scale)	Short-term	Impact restricted to construction (0-12 months).
	Medium-term	Impact will continue throughout operation (after construction-30 years).
	Long-term	Impacts will exist beyond the life of the project components (>30 years)
	Permanent	Impacts will have permanent potential
Geographic spatial scale	Site	The impact will be limited to within the site boundaries.
	Local	The impact will affect surrounding areas.
	Regional	The impact will affect areas far beyond the site boundary but limited to the Dhaka city.
Significance rating before mitigation (positive / negative)	Minor	The impact will have a minimal effect on the environment
	Medium	The impact will result in a measurable deterioration in the environment.
	Major	The impact will cause a significant deterioration in the environment.
Mitigation	n/a	No mitigation necessary.
	Full	Full mitigation/reversal of the impact is possible.
	Partial	Only partial mitigation/reversal of the impact is possible
	None	No mitigation or reversal of the impact is possible
Degree of Certainty	Certain	(>90%)
	Possible	(50%)
	Unsure	(<40%)

163. The potential impacts of the project have been categorized as major, medium; minor based on consideration of the parameters such as: (i) duration of the impact; (ii) Geographical spatial scale; (iii) mitigation; (iv) degree of certainty. These magnitude categories are defined in the above Table.

164. In the case of this subproject (i) most of the individual elements are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in the built-up area of Dhonia, Polashpur, Shanir Akhra, Janatabug and Nurpur under Kadamtali Thana under Zone 7, will not cause direct impact on biodiversity values. The subproject will be in properties held by the local government and access to the subproject locations is thru public rights-of-way and existing roads hence, land acquisition and encroachment on private property will not occur.

165. **Sensitivity of Receptor.** The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic. Criteria for determining receptor sensitivity of the project's potential impacts are outlined in the following Table.

Table 28-II Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very Severe	Vulnerable receptor with little or no capacity to absorb proposed changes
Severe	Vulnerable receptor with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Mild	Vulnerable receptor with some capacity to absorb proposed changes or moderate opportunities for mitigation
Low	Vulnerable receptor with good capacity to absorb proposed changes or/and good opportunities for mitigation

166. **Assigning Significance**. Following the determination of impact magnitude and sensitivity of the receiving environment or potential receptors, the significance of each potential impact has been established using the impact significance matrix shown below in the table.

Table 28-III Significance of Impact Criteria

Magnitude of Potential Impact	Sensitivity of Receptors			
	Very Severe	Severe	Mild	Low
Major	Critical	High	Moderate	Negligible
Medium	High	High	Moderate	Negligible
Minor	Moderate	Moderate	Low	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

2. Summary of Impacts

167. The project's potential impacts on the key environmental parameters have been assessed and their significance determined using the methodology described above. A summary of the potential impacts of the project on the key environmental parameters and significance of these impacts are presented in the following Table.

B. Planning and Design Phase Impacts

168. Outline design of NCB 02.12E was done by Design and Management Consultants in 2016. Based on the ongoing packages and DWASA experience in implementing similar projects, planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible (design and construction features are presented in **Table 29).** For the rehabilitation and distribution of network of DMA 705 models were prepared to check the performance of the system for existing and future (2040) scenario. Considering the rapidly depleting groundwater level and keeping consistency with future water supply plan of DWASA, surface water from transmission main was considered for future water source. To overcome the possible risks and uncertainties, one inter-DMA connection with chamber with valves is considered as contingency plans to satisfy consumer needs in the event of key facility fails. To ensure the robustness of the models; risk analysis, sensitivity analysis, surge analysis, etc. were carried out and optimized the models until they were satisfactory. As a result, some measures and design criteria have already been included in the package. This means that the impacts and their significance have already been reduced. To minimize traffic disturbance and public life hazards, trenchless technologies is being used wherever possible for laying pipes during implementation of the package. The introduction of trenchless technologies requires the use of High-Density Polyethylene (HDPE) pipe which satisfies project requirement as pipe material, design life, tensile strength, joint strength etc.

169. The package is being implemented through a design-built contract, i.e., the civil works contractors also prepare the detail designs. Thus, the contractors conduct detailed survey of the project area, update the initial designs with additional information obtained from survey; and submit the detailed design package and expected work methodologies for each DMA.

Table 28-IV: Summary of Anticipated Potential Impacts

Potential Impact	Duration of Impact	Spatial Extent	Likelihood	Magnitude	Sensitivity	Significance prior Mitigation	Significance after Mitigation
Preconstruction/Design Stage							
Resettlement	Short Term	Site	Certain	Minor	Mild	Low	Negligible
Disruption of Utilities/Services	Short Term	Site	Possible	Medium	Mild	Moderate	Negligible
Consents, Permits, NOCs, Clearances etc.	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Road Excavation	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Traffic Management Plan	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Community Awareness Program	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
EMP Implementation Training	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Construction Stage, Commissioning, Post Construction							
Air Quality	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Noise and Vibration	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Drainage	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Biodiversity (Flora and Fauna)	Short Term	Local	Likely	Minor	Mild	Low	Negligible
Landscape and Visual	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Road Excavation Works	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible

Potential Impact	Duration of Impact	Spatial Extent	Likelihood	Magnitude	Sensitivity	Significance prior Mitigation	Significance after Mitigation
Trenchless Pipe Installation	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Surface Water Quality	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Runoff Sediment	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Infrastructure and facilities	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Handling Excavated Materials	Long Term	Local	Certain	Medium	Mild	Moderate	Negligible
Socio-economic status- loss of livelihoods	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Socio-economic status- employment	Short Term	Local	Certain	Medium	Mild	Beneficial	Beneficial
Physical Cultural Resources (PCR)	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Traffic Control and safety	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Community health and safety	Short Term	Local	Certain	Major	Severe	High	Negligible
Worker health and safety	Short Term	Local	Certain	Major	Severe	High	Negligible
Handling AC Pipes	Long Term	Local	Certain	Major	Severe	High	
Site Reinstatement	Short Term	Local	Certain	Medium	Mild	Moderate	Negligible
Disinfection of Pipes	Short Term	Local	Possible	Medium	Mild	Moderate	Negligible

Potential Impact	Duration of Impact	Spatial Extent	Likelihood	Magnitude	Sensitivity	Significance prior Mitigation	Significance after Mitigation
Water Supply Interruption	Short Term	Local	Certain	Major	Severe	High	Negligible
Operation Stage							
Detection and repair of leaks and pipe bursts	Long	Local	Certain	Medium	Mild	Moderate	Negligible
Socioeconomic Resources	Short	Site	Possible	Minor	Mild	Low	Negligible
Social and Cultural Resources	Short	Site	Possible	Medium	Mild	Moderate	Negligible
Improvement Water Supply in terms of supply and quality	Long	Local	Certain	Major	Mild	Beneficial	Beneficial

Table 29: Design and Construction Features of the Package NCB 02.12E

Parameter/Activity	Consideration
Design Period	The DMA is designed to meet the requirements over a 50-year period after completion.
Design Population	The forecasted population for 2040 is estimated 410803 for the DMA
Per capita supply	150 lpcd for network population and 140 lpcd for non-network population considering design year 2040
Pressure requirements	The subproject is designed on continuous 24 hours basis to distribute water to consumers at adequate pressure at all points. The minimum residual pressure is 10 m in general.
DTW and surface water provision	As per approved design, 3 PTWs are to be upgraded in order to maintain normal water supply in 1 DMA area. No Replacement or installation of new DTW has proposed for the 1 DMA of NCB-02.12E. As no new PTW is designed for any of the DMA full scale EMP may not be required, however EMP for the headwork Up gradation of the tube wells are included in the report. As per model design the production of 3 DTW of phase-3 are 103.33 liters/ Sec which is 51% of the total demand whereas, the present demand is 200 liters / Sec. The deficit quantity of remaining 97 liters/sec (49%) contributing from Saidabad Water Treatment plant from different surface water Injection points of the DMA. In future the water demand will be 220.11 at the design period of 2040. As per model design The Surface water treatment plant will be contributing 154.13 liters / sec., around 70% of the demand and remaining quantities 66 Liters/sec, 30% will be adding from the PTW production. the use of potable water from the surface water will reduce the dependency of the ground and protect the environmental degradation.
Alignment of distribution network	Alignment of the distribution pipeline is guided by Government ROWs and existing road alignment.
Pipe materials	The pipe materials considered in the design will ensure durability, life and overall cost which include pipe cost, installation and maintenance costs necessary to ensure the required function and performance of the pipeline throughout its designed life time.
Pipe laying	The distribution network will be laid using HDD and Open Trenching. Every day's work will be done in short length
Resettlement plan	The contractor shall assist NGO and DMS consultants for implementing Resettlement Plan; No civil works will begin until all compensation to affected persons is paid.
Ecological diversity	The subproject is situated within an existing built- u p area and no areas of ecological diversity occur within the subproject. Due to the nature and locality of the subproject there is unlikely to any impacts on biodiversity within the area. Any landscaping to be undertaken will be done with locally indigenous species and low maintenance requirements.
Land use and livelihoods	The key efforts undertaken to minimize impacts: before the preparation of engineering design, a detailed survey of the properties nearby the project components was conducted with regard to their ownership with the objective that minimum proprietary land is utilized for the subproject.
Traffic flow and access	A traffic Management Plan will be developed to provide vehicle and pedestrian access and maintain community linkages. Local communities along the alignment will be continuously consulted regarding location of construction

Parameter/Activity	Consideration
	camps, access and hauling routes and other likely disturbances during construction. The road closure together with the proposed detours will be communicated via advertising, pamphlets, road signage, etc. The implementation of the road detours will also be dependent on advance road signage indicating the road detour and alternative routes. The Contractor along with DMS will coordinate with the traffic police for the implementation of the Traffic Management Plan.
Infrastructure and services	- There are a number of existing infrastructure (roads, telecommunication lines, power lines and various pipelines along the alignment of the transmission mains. To mitigate the adverse impacts due to relocation of the utilities, Contractor will (i) identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and (ii) require construction contractors to prepare a contingency plan
Trenchless pipe installation	- Pipes shall be installed by the horizontal directional drilling (HDD) methods where required. Should survey information indicate that the method is not feasible the contractor shall inform the Project Manager and gain prior approval for an alternative method or for open trench method. - Excavation material shall be removed from the conduit as the work progresses. No accumulation of excavated material within the conduit will be permitted. - The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation. - The contractor shall supply portable mud tanks or construct temporary mud pits to contain excess drill fluids during construction. Spent drilling fluids and cuttings shall be confined to the entrance and exit pits. - The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. Any drilling fluid that enters the pipe shall be removed by flushing or other suitable methods. - The contractor shall be responsible for cleanup and restoration due to hydro-fractions from excessive pressure in the drilling fluid Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better. Sections of sidewalks, curbs, and gutters or other permanent improvements damaged during HDD operations shall be repaired or replaced at the contractor's expense.
Working hours and times	- All work in major roads and on minor roads that are heavily used by traffic will only be permitted at night between 7:00 pm and 7:00 am. - All the minor roads and alley with less traffic may be considered for both day and night working provided alternative passageway can be maintained.
Road cutting[29]	- Unnecessary road cutting should be avoided. - The contractor has to take all necessary safeguards to avoid accidents at site, prevent loss/damage to all existing utilities like pipelines, telephone/gas/electric cables, poles etc and any government or private property during the contract period. - The contractor will apply for the road cutting permission to the road owning agency and shall give full effort and cost of road restoration and collect the road cutting permission for required days. Therefore, the road cutting plans must be prepared by the contractor. - No temporary or permanent works must proceed before the design and drawings are approved by the Project Manager and road cutting permission obtained from DSCC - The contractor shall prepare a traffic management scheme (road closure program or diversions) and incorporate detail of traffic diversions and pedestrian routes, all traffic signs (for the regulation and for information) and road markings shall be ensured prior to start of road cutting.

[29] Most of the roads are owned and maintained by DSCC. Some narrow roads having width even less than 2 m are privately-owned.

Parameter/Activity	Consideration
Road excavation	- All excavations shall be done to the minimum dimension as required for safety and working facility - The excavation must be carried out in the most expeditious and efficient manner. - The excavation shall be executed in such manner, that the contractor does not damage or interfere with existing services or structures. If damage or interference is so caused the contractor shall make arrangements with the supply and/or building owner to execute the repairs at the contractor's own cost. - All trench and pit excavations and other work shall be carried out keeping minimum sufferings for the traffic and within the limits of any existing road area shall be completed as rapidly as possible and, in the case of roads capable of carrying two or more lanes of traffic, not more than one half of the width of the carriage way shall be obstructed at any one time. In single lane roads, the contractor shall program his work in such a manner that the minimum inconvenience is caused to those persons who have reasonable grounds for using the road. - Road drains and channels shall be kept free from obstruction at all time. - In case of excavation in VIP and other large roads, the trenches and pits may need to be covered by steel plates to allow traffic to pass during non-working periods. The contractor must liaise with the DSCC and the responsible police to familiarize themselves and adheres to such rules. All costs involved to adhere to such rules shall be borne by the contractor. - Pits and trenches not backfilled at end of a night shift, the excavation must be covered with steel plates and in alleys with wooden plates. - It is preferable that trench excavation along roads be located in footpaths or verges adjacent to the road rather than in the carriage way itself. Trench excavation shall wherever practicable be carried out in such a way that every part of the excavation is at least 0.5m clear of existing edges of the carriage way. - Where trench excavation or any other part of the works obstructs any footpath or right- of-way, the contractor shall provide, at his own cost, a temporary footpath around the obstruction to the satisfaction of the Project Manager. - The contractor shall have particular regard to the safety of pedestrian, livestock, and shall ensure that all open excavation, access routes and steep or loose slopes arising from the contractor's operations are adequately fenced and protected.
DTW upgrade/ rehabilitation	- As almost all the plants of the Delivery line and fittings are to be replaced to introduce SCADA system. Which will improve the environmental monitoring system and quicker system of leakage repairing and other incidents. - There will be no leakage kept untouched as soon as they are detected and all are nonrevenue water will be counted for. People will have safe supply drinking water throughout the day 7 days a week.

170. The design considerations were discussed with the specialists responsible for the engineering aspects, and as a result measure have already been included in the network design for the distribution system. This means that the number of impacts and their significance has already been reduced by amending the design. Alternatives of project components in respect to location, technology and design are discussed in **Tables 30 to 31.**

Table 30: Design Considerations for the Transmission and Distribution Pipeline Construction Methodology

	Parameters	Trenchless Technology	Open Trenching
1	Construction methodology	Horizontal directional drilling or pipe bursting method by Machine Trenchless Technology	Primitive; manual
2	Accidental damage to utilities	Below utility lines	Invasive through or avoiding the utility lines; often utility lines are required to be shifted
3	Waste (solid and liquid) handling and disposal during construction	Solid waste handling volume is less; disposal of waste is somewhat complicated	Handling volume is more; some part of the excavated material needs to be put back again to fill up the trench after pipe is placed; construction method is hazardous
4	Pollution potential (air, noise, vibration, surface water, etc.) during construction	Less severe as operation is below the ground without disturbing the surface	Open trenching gives rise air, water and noise pollution
5	Relative hazards during construction	Less	More
6	Relative loss of business due to construction	Loss of business is minimal	Loss of business is likely to be more if the roads are narrow and traffic is heavy
7	Inconvenience to people using ROW	Less likely	More likely
8	Cost	More compared to trenching	Much less
9	Construction time	Less	More
10	Maintenance	Same effort is required	Same effort is required
	Recommendation	Trenchless Technology	

Source: DMS Consultants, January 2023

Table 31: Summary of Design Considerations for Pipe Materials

SL	Factors for selection of pipes	Ductile Iron (DI)	High Density Polyethylene (HDPE)
1	Hydraulic smoothness (C value)	140	150
2	Structural strength for external loads	Very good	Good in resisting external loads
3	Ease in handling, transportation and storage	Pipes are heavy and hence difficult to handle	Light and easy to handle; lighter equipment are used in jointing and installation
4	Resistance to internal corrosion	Internally protected by cement mortar lining	Does not rust, rot or corrode
5	Economy	Very costly	Much cheaper than DI pipes at lower dia.
6	Availability of spares and replacements	To be imported	To be imported but cost will be less as it is light and can be brought in large consignment
7	Availability of skilled personnel for installation and maintenance	Skilled personnel are required for laying DI pipes	This can be used with little training even by novice workers
8	Capacity to withstand damage in handling and maintenance	Damage to internal cement mortar lining is possible during handling	Very good in withstanding damage due to handling
9	Reliability and effective joints	Reliable	Fusion joints or butt joints are very reliable
10	Capability to absorb surge pressure	Capable	These can withstand surge pressure
11	Ease in maintenance and repair	Handling of heavy materials is required	Materials are light and very easy to handle
12	Durability (sustainable trouble-free maintenance)	Durable if external corrosion protection is made	Durable. Very resistant to breaking
	Recommendations	High Density Polyethylene (HDPE)	

171. **Existing Utilities**: Proposed water distribution pipes will be buried along the public roads. Various utilities (telephone lines, electric poles and wires, sewers and gas pipelines) are already located along these roads. These may require to be shifted in few cases. To mitigate the adverse impacts due to relocation of the utilities, the contractor, in collaboration with PMU/DMSC, shall:

(i) Identify the locations and operators of these utilities (DPDC, BTCL, Titas Gas, Optical Fiber etc) to prevent unnecessary disruption of services during construction phase
(ii) Conduct detailed site surveys with the construction drawings and discuss with the respective agencies before site clearance and start of excavation work; and
(iii) Instruct contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services.

172. **Tree Cutting at Subproject Sites.** All sites are carefully selected, and layouts designed to minimize the tree cutting. The design team confirmed that no trees are to be cut and no vegetation are to be cleared

173. **Site selection of construction work camps, stockpile areas, storage areas, and disposal areas.** Priority is to locate these near the DMA locations. However, if it is deemed necessary to locate elsewhere, sites to be considered will not promote instability and result in destruction of property, vegetation and drinking water supply systems. Thickly populated residential areas will not be considered for setting up camps to protect the human environment (i.e., to curb accident risks, health risks due to air and water pollution and dust, and noise, and to prevent social conflicts, shortages of amenities, and crime). Extreme care will be taken to avoid disposals near the forest, water bodies or in areas which will inconvenience the community. All locations would be included in the design specifications and on plan drawings. Locations are selected without impacting the local habitation.

174. During updating IEE Report, Site environmental plan (SEP) for the DMA was provided D swing mobile toilet, temporary material storage, and disposal point.

175. **Site selection for equipment lay-down and storage area.** Improper selection will affect local environment and inconvenience to public. Possible mitigation measures are,

- Choice of location for equipment lay-down and storage areas must take into account distances to adjacent land uses, general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.
- Storage areas shall be secure so as to minimize the risk of crime. They shall also be safe from access by children / animals etc.
- Equipment lay-down and storage areas must be designated, demarcated and fenced if necessary.
- Fire prevention facilities must be present at all storage facilities.
- Recover used oil and lubricants and reuse or remove from the site
- Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.

176. NCB 02.12E Contractor established a central stackyard (about 5500 ft^2) which is located at Diyabari, Uttara, Dhaka. The contractor will however be encouraged to engage local workers as much as possible so that they will reside at their house; so, no separate living areas are required.

177. Temporary labor camp is established within the DMA boundary with sufficient drinking water facility and separate mobile toilets for male and female workers.

178. **Maintaining Core Labour Standard.** The Contractor and PMU are responsible for ensuring that international CLS[30] as reflected in national labour laws and regulations (Bangladesh Labour Rules 2015) are adhered to. PMU is ultimately responsible for monitoring compliance with national labour laws and regulations, provided that these national laws are consistent with CLS. ADB will carry out due diligence- during loan review missions - to ensure that DWASA and contractors comply with applicable (national) core labour standards and labour laws. PMU/PCU will ensure that bidding and contract documents include specific provisions requiring contractors to comply with all: (i) applicable labour laws and core labour standards on: (a) prohibition of child labour 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 labour; and (ii) the requirement to disseminate information on sexually transmitted diseases including HIV/AIDS to employees and local communities surrounding the project sites. These will be monitored as part of the project's safeguards reporting.

C. Construction Impact

179. **Construction method.** Existing pipes are buried within roads in Dhaka City, and this practice will be continued by this project. Larger pipes (200 mm and above) are normally located in main roads, and smaller pipes (<200 mm) are in minor roads, and in most cases the pipeline is situated near the center of the road.

180. Distribution mains will be buried in trenches adjacent to roads using available rights-of-way (ROW). In some areas occupied by drains or edges of shops and houses, trenches may be dug into the edge of the road to avoid damage to utilities and properties.

181. All work in major roads and on minor roads that are heavily used by traffic will only be permitted at night between 7:00 pm and 7:00 am. All the minor roads and alley with less traffic may be considered for both day and night working provided alternative passageway can be maintained. In all cases the contractor shall take prior permission from DSCC. Contractors are required to obtain permission from the police for construction work in roads. The work has to be conducted in amounts that can be completed in a single night, and the surface is reinstated for use in the morning.

182. There are no Historical sites in the DMA-705 area. So, it is ensured that the noise level should not disrupt the activities in the area. Prior to civil works and during construction, noise level will be monitored to keep the allowable standards. Open cut method will be preferable for the area to avoid vibration

183. Most of the pipe replacement/rehabilitation will be carried out by trenchless technology, where a flexible plastic tube is inserted into an existing pipe and inflated to seal the inner surface. Small chambers are due to open two ends of a pipe and a wire is inserted to pull through the plastic tube, which is expanded by air pressure and adheres to the inside of the pipe. The only excavation is hand digging to build two small chambers (roughly 1.9 m^3) per length, and the machinery is also small, involving a rotating drum for the wire and plastic liner, and an air compressor and water pump. This approach can also be used to install new pipes by drilling a horizontal tunnel and inserting the pipe, or by installing a tube inside a faulty pipe and inflating until the pipe bursts below ground, leaving a new pipe with a larger diameter and

[30] Core Labor Standards (CLSs) are a set of four internationally recognized basic rights and principles at work: (i) freedom of association and the right to collective bargaining; (ii) elimination of all forms of forced or compulsory labor; (iii) effective abolition of child labor; and (iv) elimination of discrimination in respect of employment and occupation.

capacity. At some location's trenches will be built to remove leaking pipes and install replacements, and this will be done using backhoe diggers, supplemented by manual labor where necessary. Excavated soil will be loaded onto trucks and taken offsite for dumping, and sand for infilling will be brought in on trucks and stored on site. Pipes are normally covered by 1.0 m of soil, and a clearance of at least 150 mm is left between the pipe and each side of the trench to allow backfilling, so trenches will be relatively small, between 0.4 and 0.65 m wide and 1.4 and 1.8 m deep. DSCC is responsible for re-applying the final asphalt surface to metaled roads, and this will be done after approximately 6 weeks, to allow settling of the compacted material.

184. Pipes will be of HDPE (75mm to 450 mm) and will be brought to site on trucks, offloaded manually or by crane, and positioned in the trench by crane or via a pipe-rig. After pipes have been joined, the trench will be backfilled with sand, and soil will be applied to the surface layer and compacted by hand-operated vibrating compactor.

185. Pipelines work will be taken up in section wise. Excavation, pipe laying and refilling work will be conducted in small sections in sequence, and at any point of time not more than 30-40 m section will be open for work at any work site. There will be no open trenches at the end of each day of work. Sufficient care will be taken while laying, so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Once they are laid, pipes will be joined as per specification and tested for any cracks of leakages.

186. Chambers for network valves for diameter 250mm and above and all bulk meters will be built in the trenches that are dug to install new pipes or at the entry and exit points for the trenchless work, so no separate excavation will be needed. Most chambers will be around 1.5 m^3 with concrete floors and brick sides, which will be built by hand by masons. Valves will be put in place by hand or via small cranes and will be attached to the pipe flanges, and each chamber will be closed by a removable steel manhole cover.

187. House connections will be provided when work is conducted on the distribution pipe in the vicinity, and short trenches will be dug between the pipe and each residence, and a short length of small-diameter high density polyethylene (HDPE) pipe will be attached. This will terminate at the boundary of the property with a meter and a small valve.

188. In Low Income Communities (LIC) or slum areas efforts will be made by involving the community through Community based Organization (CBOs) to encourage individual private water connections, and in situations where laying a distribution network main is not permissible, shared taps would be provided duly identifying the respective owners for such shared taps.

189. **Pipeline laying works**. Civil works in the project mainly include linear pipe laying works for around 33.9 km. As explained previously, around 65% of pipes were proposed to be laid using trenchless technology (HDD), and the rest 35% will be laid by open cut method. Trenchless technology will be adopted at all locations, which are convenient/suitable to use such technology, with a purpose to avoid public inconvenience, ensure safety, traffic disruptions, dust control, and avoid blocking access to properties, business and houses. Open cut trenching method of pipe laying involves excavation for laying pipes along the roads, placing pipes in the trench, jointing and testing, and refilling with the excavated soil. The trenches will be of 0.5 m – 1.5 m wide and 1 to 2.2 m depth. Subsequent to completion of works, road reinstatement will be undertaken by the contractor as part of the civil works. There is different type of roads in the subproject area.

190. Maowa Road, Muradpur High School Road 18, Muradpur High School Road, Muradpur High School Road 27, Muradpur Madrasa Road 1, Muradpur Madrasa Road 2, Muradpur Rajab Ali Sardar Road, Pokar Bazar Road, Islamabad Mosjid Road-6, Haji Ke Ali Road-9, Pukurpar Road,

Haji Khorsed Ali Sorder Road etc. are the main roads (width > 4m) in the subproject area; carries very heavy traffic throughout most of the day. This will be done by using trenchless technology (HDD).

191. Hazi Lalmia Sarker Road, Paterbag Road, Al-Modina Mosque Road, Jummon Mia (Chairman) Road, Jahid Hossain Road, Adorsho School Road, Muradpur Road 6.; called internal roads carry very heavy traffic and are congested with activities (commercial establishments are located all along), pedestrians and traffic. In most of the commercial areas, on-road vehicle parking is provided, which occupied a line, and footpaths are provided along the roads. In these roads, pipelines will be laid in the parking lane.

192. Muradpur Madrasa Road 1, Patebag Subway, Beenabag Sub Len-5, Adorsha Sorok Len-1 etc. are very narrow and are very congested with traffic, pedestrians and commercial activities. Tertiary road in this area is too narrow (less than 2 m). Within 1 DMA, about 36% tertiary road and 23% internal roads where pipeline is to be laid.

193. Earth work excavation will be undertaken by machine (backhoe excavator) and include danger lighting and using sight rails and barricades. At a time about 200 m stretch of work will be undertaken. Where backhoes excavator is used and the pipelines width is more than 600 mm, adequate width of strip will be barricaded and all the works and equipment, excavated material will be stocked within that area.

194. Pipe laying works will include laying pipes at required gradient, fixing collars, elbows, tees, bends and other fittings including conveying the material to work spot and testing for water tightness. Sufficient care will be taken while laying so that existing utilities and cables are not damaged and pipes are not thrown into the trenches or dragged, but carefully laid in the trenches. Trenches depth are a maximum of 1.5 m, the risk of collapse of trenches or risk to surrounding buildings is assessed by the contractor during the work and necessary precautions, like shoring, will be undertaken based on the necessity. Shoring will also be provided where the trench excavation is to be restricted due to site conditions (soil condition, narrow road etc.), shoring will be provided and vertical cut will be provided.

195. Once they are laid, pipes will be joined as per specification and then tested for any cracks of leakages. The minimum working hours will be 8 hours daily, the total duration of each stage depends on the soil condition and other local features. About 25% of the excavated soil will be used for refilling the trench after placing the pipe and therefore residual soil after pipe laying and refilling is not significant. This soil shall be used for construction for beneficial purposes such as construction or leveling ground.

196. Although pipe laying work involves quite simple techniques of civil work, the invasive nature of excavation and pipeline alignment in the built-up areas of the select project blocks where there are a variety of human activities, will result in impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration, however, needs to be mitigated.

197. Anticipated impacts during the construction phase are discussed below along with appropriate mitigation measures to avoid, minimize or mitigate those impacts to acceptable levels.

198. **Preparation of Method Statement**. Contractor will prepare a method statement for each work, particularly in detail for laying of pipelines. Approval of method statement by the Engineer is prerequisite for the start of work. Method statement will be specific to each site/road section as

appropriate. The overall work shall be split into individual tasks (per say, site clearance, excavation, pipe laying and up to final road restoration), and each task shall be detailed out in the method statement. The details shall include about the material, machinery, workforce, work process, waste disposal, clearances/approvals, etc. The method statement shall provide a activity-space-time graph, which should clearly show section-wise. All the works shall be conducted as per the documented procedures of Method Statement only.

199. **Procurement of Materials.** Significant amount of sand and coarse aggregate will be required for this project. The quantity will estimate during start of construction. It will be the Contractor's responsibility to procure all materials from recognize vendors and to obtain approval of PMU/DMSC. The Contractor will be required to

(i) Procurement of material is approved by PMU/DMSC according to the technical specification
(ii) Submit to PMU/DMSC on a monthly basis documentation of procurement of materials

200. **Impacts on Air Quality.** Construction work, coupled with dry and windy working conditions, traffic movement, has high potential to generate dust, especially from earthwork activities. Emissions from construction vehicles, equipment, and machinery used for excavation and construction will induce impacts on the air quality in the construction sites. Anticipated impacts include dusts and increase in concentration of vehicle-related pollutants such as carbon monoxide, sulfur oxides, particulate matter, and nitrous oxides. Given that in the baseline situation, the particulate matter in the ambient air exceeded the limit. Therefore, dust generation from construction activity will further deteriorate the air quality, and may have adverse impacts on people and environment. To mitigate the impacts, contractors will be required to:

(i) Initiate site clearance and excavation work only after barricading of the site is done
(ii) Confine all the material, excavated soil, debris, equipment, machinery (excavators, cranes etc.,), to the barricaded area
(iii) Limit the stocking of excavated material at the site; remove the excess soil from the site immediately to the designated disposal area
(iv) Conduct work sequentially - excavation, pipe laying, backfilling; conduct pipe testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done.
(v) Remove the excavated soil of first section to the disposal site; as the work progresses, sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust.
(vi) Backfilled trench at any completed section after removal of barricading will be the main source of dust pollution. The traffic, pedestrian movement and wind will generate dust from backfilled section. Road restoration shall be undertaken immediately.
(vii) Cover the soil stocked at the sites with tarpaulins
(viii) Control access to work area, prevent unnecessary movement of vehicle, public trespassing into work areas; limiting soil disturbance will minimize dust generation
(ix) Undertake the work section wise: 100 – 200 m section should be demarcated and barricaded
(x) Remove the excavated soil of first section to the disposal site; as the work progresses sequentially, by the time second section is excavated, the first section will be ready for back filling, use the freshly excavated soil for back filling, this will avoid stocking of material, and minimize the dust.
(xi) Use tarpaulins to cover the loose material (soil, sand, aggregate etc.,) when transported by trucks
(xii) Control dust generation while unloading the loose material (particularly aggregate,

soil) at the site by sprinkling water and unloading inside the barricaded area

201. **Immediate road restoration after refilling the trench.** Excavation and refilling activities disturb the top soil, and under the influence of wind, traffic, and other activities etc. produces dust. There is large potential to generate significant quantities of dust after refilling the trench, and prior to road relaying. It is a common practice not to restore the road immediately after refilling the trench so as to allow sufficient time for the refilled material to stabilize naturally. Given the dry and windy conditions, and heavy traffic and other activities along the roads, the refilled trenches with loose top soil along the roads will generate maximum dust, and create very unhealthy conditions. Moreover, as the barricades/dust screens removed after the refilling of trench, there will be nothing to control the dust generation. Dust control activities like wetting of top soil will not be effective given for the site conditions. It is therefore necessary to restore/relay the road surface immediately or take suitable steps to arrest the dust. Soil consolidation technique shall be used so that road can be restored immediately. Necessary costs towards this shall be included in the project costs.

(i) Immediately consolidate the backfilled soil and restore the road surface; if immediate road restoration is not possible, provide a layer of plain cement concrete (PCC) of suitable mix on the backfilled trench so that dust generation, erosion is arrested and it will also provide a smooth plying surface for the traffic until the road is properly restored. Backfilled trench without any road restoration is a major source of dust.

202. **Runoff of Sediments.** Pipe laying works will be conducted throughout the old town of Dhaka even near the roadside drains flowing to nallahs. The excavation works are expected to generate sediments and cause soil runoff during rain events. Runoff may still cause impacts to roads (internal and tertiary) and nearby drainage in the immediate vicinity. These potential impacts are temporary and of short-term duration only. Appropriate mitigation measures to prevent soil runoff will be implemented that includes:

(i) Excavation activities will be scheduled during the dry season as much as possible;
(ii) Avoid material/surplus soil stocking in congested areas (internal or tertiary roads) – immediately remove (on the same working day) from site/ or brought to the site as and when required
(iii) Stockpiles of excavated soil from the trench excavation will be located in areas that will avoid blocking of drainage lines.
(iv) Stockpile of excavated soil will be covered by tarpaulins or plastic sheets and stabilized to prevent runoff.
(v) Sediment trenches or barriers around stockpiles of materials will be provided to block runoff water and catch sediments and other debris entering the drain.

203. **Generation of Spoil and disposal.** Out of 33.9 km water pipeline network, about 65% will be done by using trenchless technology (HDD) and rest 35% will be implemented by open cut method. The construction using trenchless methods will not have major physical impacts as the only ground disturbance will be the excavation of chambers every 10 to 100 m for the entry and exit of the H D D machinery and pipes. The use of this technology will generate waste material but since the contractor will be required to remove it quickly and dispose appropriately, this work will also not have major physical effects.

204. There will however be much greater physical disturbance from the installation of the remainder of the pipes, as this will require the construction of over 33.9 km of trenches (35 % open cut: 11.865 km). If average trench dimensions are 1.2 x 0.4 m, then this work will excavate almost 6055 m^3 of soil and stone. After construction, approximately 25% of the trench will be occupied by the pipe, 50% by backfilled sand, and 25% by excavated soil on top of the pipe. This means that over the project area as a whole, a total of 3028 m^3 of sand will be brought to site, 1513.8 m^3 of soil will be replaced in the trenches and 4992.15 m^3 of waste soil and stone will be left over.

205. Estimated amount is as follows:

Quantification of Spoil Materials among 1 DMA under 02.12E

	Open Cut Method (m^3)	**Horizontal Directional Drilling HDD(m^3)**	**Total (m^3)**
Total Excavation	5695.2	360.75	6055.95
Refilling of Trenches (25% of excavated soil)	1423.8	90	1513.8
Balance Materials for Disposal	4721.4	270.75	4992.15

206. The contractor will remove surplus soil (about 4992.15 m^3) from the working site by drum truck after covering with tarpaulin. The proposed disposal site is about 27.15 km away from DMA 705 at temporary stackyard area at Diyabari, Uttara, Dhaka. The proposed disposal site is enough volume (about 25000 m^3) to accommodate accumulated balance of 4993 m^3 excavated soil without causing any problems to the site. Detail enclosed in **Appendix 4.**

207. The following photographs showing that the workers (engaged by **TCEL**) have removed excavated materials from the construction site at night for other packages covering all types of roads. The same arrangements will be applied for all proposed DMA for removing excavated materials from the site.

Removing of Excavated Materials from site

208. **Existing Infrastructure and Facilities.** Excavation works can damage existing infrastructure located alongside roads, in particular water supply pipes. It will be particularly important to avoid damaging existing water pipes. It is therefore important that civil works contractors will be required to:

(i) Utility shifting (if required) will be undertaken prior to commencing construction works
(ii) Keep construction related disturbances to a minimum.
(iii) Consult with affected service providers regarding impacts on access to infrastructure and services and alternatives.
(iv) Consult with affected communities or businesses prior to foreseeable disruptions, for example notifying residents of a temporary interruption of water supply.
(v) Provide backup or alternative services during construction-related disruptions,
(vi) Provide access points to infrastructure and services
(vii) Monitor complaints by the public

209. **Generation of Construction wastes**. Solid wastes generated from the construction activities are excess excavated earth (spoils), discarded construction materials, cement bags, wood, non-useable pipe pieces, oils, fuels and other similar items. Domestic solid wastes may also be generated from the workers' camp. Improper waste management could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape. The following mitigation measures to minimize impacts from waste generation shall be implemented by the contractor:

(i) Implement a Construction Waste Management Plan. The waste management plan is in the **Appendix 13;**
(ii) As far as possible utilize the debris and excess soil in construction purpose, for example for raising the ground level or construction of access roads etc.;
(iii) Avoid stockpiling any excess spoils at the site for long time. Excess excavated soils should be disposed of two approved designated areas immediately;
(iv) If disposal is required, the site shall be selected preferably from barren, infertile lands; site should be located away from residential areas, forests, water bodies and any other sensitive land uses;
(v) Domestic solid wastes should be properly segregated in biodegradable and non-biodegradable for collection and disposal to designated solid waste disposal site;

(vi) Residual and hazardous wastes such as oils, fuels, and lubricants shall be disposed of in disposal sites approved by PMU/DMS;
(vii) Prohibit burning of construction and/or domestic waste;
(viii) Ensure that wastes are not haphazardly thrown in and around the project site, provide proper collection bins, and create awareness to use the dust bins;
(ix) Conduct site clearance and restoration to original condition after the completion of construction work; PMU/DMS to ensure that site is properly restored prior to issuing of construction completion certificate.

210. **Noise and Vibration Level.** Al the construction works will be conducted in built up areas and the roads in Old Dhaka, where there are houses, schools and hospitals, religious places, and areas with small-scale businesses. The sensitive receptors are the general population in these areas. Increase in noise level may be caused by earth-moving and excavation equipment, and the transportation of equipment, materials, and people. Vibration generated from construction activity, for instance HDD and the use of pneumatic drills, will have impact on nearby buildings. This impact is negative but short-term, and reversible by mitigation measures. The construction contractor will be required to:

(i) Plan activities in consultation with PCU so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance
(ii) Proper noise control apparatus (silencers, mufflers etc.,) will be ensured for construction equipment
(iii) Before undertaking work with heavy noise/vibration, surrounding area/buildings will be surveyed to identify any old / sensitive buildings at risk, and necessary precautions will be taken to avoid any risk
(iv) Noisy works will not be conducted near sensitive places (hospitals, schools, etc.,) and at sensitive times (prayer time etc.,); works will be scheduled accordingly
(v) The noise level of the machineries and equipment mobilized by the Contractor for the work must not exceed 70 decibels (dBA). Protective measures shall be introduced by the Contractor to keep the produced sound at the site due to any means within acceptable value.
(vi) Monitor noise levels in potential problem areas.

211. **Impacts on Ecological Resources.** As most trenches and chambers for the trenchless works will be dug within roads, then there will not be any direct ecological impacts from construction of the network improvements. Contractors will however be required to ensure that no roadside trees are damaged or removed in the course of the work; and to mitigate any accidental losses, contractors will be required to plant and maintain five trees of the same species for every one that is removed and necessary budget is allocated for replantation and care up to the maturity.

212. **Impacts on Socio-Economic Development**

213. **Land use.** Network improvement activities will not affect the land use. All activities are being conducted in the vacant space along the road ways.

214. **Traffic Management/Access during Pipeline Works**. Excavation along the roads, hauling of construction materials and operation of equipment on-site can cause traffic problems. Roads in the proposed 1 DMA /old town area of Dhaka (Kadamtali thana) are very narrow and are very congested with traffic, pedestrians and commercial activities. Transportation is the principal activity that will be impeded by this work, and the impact will be considerable if proper precautions and traffic management is not implemented. The

following measures therefore shall be implemented to minimize the disturbance:

215. **Type of roads and measures for fine tuning the alignment of pipelines:**

(i) As far as possible, adopt trenchless technology (HDD) at locations where are likely disruptions to traffic
(ii) In internal narrow roads (width 2-4 m), pipeline works will completely disturb the traffic (mainly 2-wheelers, 3-wheelers, pedestrians, limited cars) except pedestrians. In such cases, works shall be undertaken from junction to junction (about 100 m), so that traffic can be stopped and diverted to other parallel roads.
(iii) In tertiary narrow roads (width < 2m), small diameter pipelines will be laid, mostly in the middle of the road. Existing traffic is only of 2-wheelers and rickshaws, which will be disturbed during the work. In such cases, work shall be conducted section wise (one road from junction to junction at a time) and completing the work in minimum possible time (2 days).

216. **Measures to minimize traffic and accessibility disruptions:**

(i) Barricade and confine the work area
(ii) Minimize the work area / barricaded area along the roads to the minimum possible width;
(iii) Confine all the activities within in the barricaded area, including material & waste/surplus soil stocking;
(iv) Avoid material/surplus soil stocking in congested areas – immediately remove (on the same working day) from site/ or brought to the site as and when required;
(v) Transport material, waste etc., during low traffic periods (e.g., before 8 AM)
(vi) Minimize access disruptions to adjacent properties; vehicle access may be controlled however, pedestrian access should always be available; if necessary, provide temporary pedestrian access (e.g., over the trench) using wooden planks/metal sheets;
(vii) Plan transportation (for material and waste) routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites;
(viii) At work site, public information/caution boards shall be provided including contact for public complaints
(ix) Employ trained flaggers to direct traffic movements in areas with lane closures
(x) Coordinate with Traffic Police for temporary road diversions, where necessary, and or provision of traffic aids if transportation activities cannot be avoided during peak hours

217. **Impacts on Social Sensitive Areas**. Since the work is being conducted in an urban area, sensitive areas like schools, hospitals and religious centre, the excavation of trenches and pipe laying activity will create nuisance and health hazard to children and people with ailments. **There are several mosques/madrasas (08 nos.), educational institutions (12 nos.), hospital (2 nos.), Mondir (01 nos.) in the proposed 1 DMA.** These are abutting the roads, pipeline alignment will disturb the access, and may also inconvenience due to noise, dust and from safety risks during the works. Proposed mitigation measures will aim to minimize the impact in all areas in general; however, special attention is necessary for these locations. The measures suggested under various heads in this section will minimize the impact in general in all areas; however, special attention is necessary at these locations. The following measures shall be implemented within a 50 m radius around the sensitive locations (schools, hospitals, and religious centers):

(i) No material should be stocked in this area; material shall be brought to the site as and when required;
(ii) Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles;

(iii) No work should be conducted near the religious places during prayer time;
(iv) Material transport to the site should be arranged considering school timings; material should be in place before school starts;
(v) Notify concerned schools, hospitals etc., 1 weeks prior to the work; conduct a 30-minute awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts; and
(vi) Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites.

218. **Socioeconomic- Income**. The project components will be located in existing roads and rights-of-way (ROWs) there will be no need to acquire land from private owners for the project, so there will be no resulting impacts on the income and assets of landowners or their tenants. Some shops and other premises along the roads may lose business income if the access will be impeded by excavation of trenches, the presence of heavy vehicles and machinery etc. Access disruption to hospitals, socio cultural places etc., will inconvenience public. Implementation of the following best construction measures will avoid the disturbance reduce the inconvenience and disturbance to the public:

(i) Inform all businesses and residents about the nature and duration of any work well in advance so that they can make necessary preparations;
(ii) Provide walkways and metal sheets where required to maintain access across for people and vehicles;
(iii) Barricade the construction area and regulate movement of people and vehicles in the vicinity, and maintain the surroundings safely with proper direction boards, lighting and security personnel – people should feel safe to move around
(iv) Control dust generation
(v) Noisy activities must be restricted to the times given in the Project Specification or General Conditions of Contract
(vi) Increase workforce in the areas with predominantly institutions, place of worship, business establishment, hospitals, and schools;
(vii) Consult businesses and institutions regarding operating hours and factoring this in work schedules; and
(viii) Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints.
(ix) Notify community/ water users in advance about likely interruptions in water supply
(x) Provide alternate sources of clean water until water supply is restored.
(xi) Complaints register (refer to the Grievance Redress Mechanism) shall be housed at the site office.

219. **Socioeconomic- Employment**. Manpower will be required during the 12 months construction stage. This can result in generation of temporary employment and increase in local revenue. Thus, potential impact is positive and long term. The contractor will be required to:
(i) Employ local labor force as far as possible
(ii) Secure construction materials from local market

220. **Involuntary Resettlement Impact.** Census survey has been conducted in 1 DMA in order to identify IR impact. During the construction work, the involuntary resettlement impact will be temporary income loss from business to around 9 mobile vendors in the streets and roadside footpaths of whom 90% are male and 10% are female. The total population is 47 (Male around 52% and Female 48%) belonging to the 9 affected persons' families. All the affected persons are small-scale vendors who will move their belongings (i.e., wares and carts) easily. The movable characteristic of the businesses helps determine that there is no possibility of structure loss. No structure irrespective of types (permanent or semi-permanent) will be affected during the

construction, hence no relocation costs are needed. All the affected business owners can return to the original sites once the construction is completed. The resettlement cost is based on entitlement matrix agreed for the Project. The affected persons will lose average net daily income of BDT 645.00. derived from census for the period of disruption. The budgetary provisions for compensation have been made for 7 days for each affected person as per estimated income loss and number of days of disruption. If the actual number of days of disruption is higher, additional compensation will be paid.

221. **Table 32**, below, describes the involuntary resettlement impacts identified during the assessment of the package. As the survey of DMA 705 has just completed the reason why the relevant information may be collected from the Team Leader NGO SAMAHAR (Resettlement).

Table 32: Detail Involuntary Resettlement Impacts in NCB 02.12E

Sl	Area	Affected Persons (AP) Total 9	Temporary Economic Impacts & Average Daily Income Average daily income	Remarks
1	**DMA:**705	9	Income loss for 7 days of each AP	Tiny movable shop; pots, wooden plates, rickshaw van - those will not be damaged or any other losses incurred in this regard, thus compensation is not required
Total HH members in 1 DMA		Total affected HHs: 9 -		Average daily income of DMA is BDT 645.00

222. **Impacts on Social and Cultural Resources.** When construction is conducted in residential areas, people may be disturbed by the noise of the construction activities and by dust during dry and windy weather, and trenches may impede access to houses for residents and their vehicles. In this case the fact that work will be conducted at night creates another potential problem as people may be disturbed by on-site lighting, and their sleep may be disrupted by noise. However, these impacts will not be greatly significant because:

(i) Disturbance at most locations will last for a few days only;
(ii) Background noise in much of Dhaka is high, even at night, so residents are adapted to a relatively high noise environment;
(iii) People will be more willing to tolerate short-term temporary disturbance if they are aware of the benefits, they will gain from an improved water supply.

223. DWASA will inform residents fully about the work, its duration and impacts, the mitigation measures, and the benefits of the completed scheme. In addition, officials in charge of facilities of social and cultural importance (e.g., schools, hospitals, mosques, museums, etc.) will be involved in stakeholder meetings so that they can be informed about the work in advance, and can bring specific concerns and issues to the attention of DWASA, if necessary.

224. **Impacts on Occupational Health and Safety**. Workers need to be mindful of the occupational hazards which can arise from working in pipe laying and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures. The contractor will be required to:

(i) Comply with requirements of Government of Bangladesh Labor Law of 2006 and all applicable laws and standards on workers' health and safety (H&S).

(ii) Develop and implement site-specific Health and Safety (H & S) Plan which should include measures such as: (a) excluding public from the site; (b) ensuring all workers are provided with and use Personal Protective Equipment; ((c) documented procedures to be followed for all site activities; and (d) documentation of work-related accidents;
(iii) Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site;
(iv) Provide workmen's compensation insurance coverage for workers**;**
(v) Secure all installations from unauthorized intrusion and accident risks;
(vi) Provide health and safety orientation training to all new workers to ensure that they are appraised of the basic site rules of work at the site, personnel protective protection, and preventing injuring to fellow workers;
(vii) Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted;
(viii) Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas;
(ix) Ensure moving equipment is outfitted with audible back-up alarms;
(x) Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate;
(xi) The use of hearing protection shall be enforced actively;
(xii) Provide supplies of potable drinking water; and
(xiii) Overall, the contractor should comply with IFC EHS Guidelines on Occupational Health and Safety (this can be downloaded from the below link)

225. Health and safety plan in response to COVID-19 (attached as **Appendix 12**) is an integral part of the environmental management plan (EMP).

i. The H&S plan may be updated as and when new guidelines are issued by the governments, and international organizations such as WHO and ADB.
ii. All the contractors be advised to prepare site-specific plan compliant with government circulars, guidelines and public health advisories, elaborating the arrangements and measures for implementation of the H&S plan.
iii. These site-specific plans should be shared with ADB after PMU's approval. In accordance with the government guidelines, the respective agreed measures are in place before resumption of the specific activity at project sites and congregation of workers at the project site and camps. The implementation of the contractor's approved site-specific plans is properly monitored by the DMS consultants and the PMU/PCUs.

226. Meanwhile, BRM have prepared a COVID-19 Health and Safety Advisory Guidance for Construction Workforce. The guidance includes the protocols on the following:

(i) Prerequisite measures before reopening the worksites;
(ii) Worksite entrance;
(iii) Worksite management;
(iv) Camp management;
(v) Work site awareness raising;
(vi) Risk exposure assessment guidance;
(vii) Engage an employee/staff to oversee health and safety issues; and
(viii) Monitoring and reporting mechanism.

227. It is ensured that PMU with the assistance from DMS Consultants will review, approve, ensure implementation and monitor the On-site Health and Safety Plans on COVID-19 and report to ADB on quarterly progress reports and semi-annual environmental monitoring reports

228. **Impacts on Night Works.** Most of the construction works shall be undertaken only during day hours. Night works (permitted at night between 7:00 pm and 7:00 am) are required only in the extreme conditions such as road having heavy traffic in day time and/or no alternate access can be provided for that road users. Contractors are required to take prior approval from DSCC and PMU for night works. Contractors are required to adhere following conditions for night works-

(i) Contractors should have hand held noise level meter for measurement of noise during night hours
(ii) Preferably electrical connections are available for running equipment's otherwise sound proof Generator or Generator in noise reducer box should be available
(iii) Sound level should not increase as per following-

Type of area of work	Maximum Noise Level (dBA)
Industrial	70
Commercial	60
Mixed Area	45
Residential Area	45
Silent Zone	40

(iv) All the noise activity like hammering, cutting, running of heavy equipment should be done in day time and avoided in night time
(v) Workers engaged in night works should have adequate rest/sleep in day time before start of night works
(vi) Worker engaged for night works should have previous experience of night works and should be physically fit for such works including clear vision in night
(vii) All the necessary provisions of traffic aids such as traffic signals, road signage, barricades, cautions boards, traffic diversion boards etc. should be available with fluorescent arrangements
(viii) Horns should not be permitted by equipment and vehicles
(ix) Workers should not shout and create noise
(x) First aid and emergency vehicles should be available at site

229. **Impacts on Communities.** A potentially more significant impact is the effect on people and communities if water supplies are closed down for extended periods when work is conducted on the network. This would be inconvenient in the short term, and there could be health risks if the water supply was unavailable for several successive days or longer. The package design and specifications require the contractors to plan the construction program to keep the cessation of water supplies to the minimum possible (in both area and duration), provide alternative potable water to affected households and businesses for the duration of the shut-down, liaise with affected persons to inform them of any cessation well in advance, and to ensure that they are provided with an alternative supply.

230. There are no Asbestos Cement Pipe inside DMA-705 of NCB-02.12E.

231. **Impacts on Community Health and Safety.** Pipeline works along the road, and hauling of equipment and vehicles have potential to create safety risks to the community. Hazards posed to the public, specifically in high-pedestrian areas may include traffic accidents and vehicle collision with pedestrians. Potential impact is negative but short-term and reversible by mitigation

measures. The construction contractor will be required to:

(i) Restrict construction vehicle movements to defined access roads and demarcated working areas (unless in the event of an emergency)
(ii) Enforce strict speed limit (20-30 kmph) for playing on unpaved roads, construction tracks
(iii) Temporary traffic control (e.g., flagmen) and signs will be provided where necessary to improve safety and provide directions
(iv) Public access to all areas where construction works are on-going will be restricted through the use of barricading and security personnel
(v) Warning signs, blinkers will be attached to the barricading to caution the public about the hazards associated with the works, and presence of deep excavation
(vi) The period of time when the pipeline trench is left open will be minimized through careful planning
(vii) Control dust pollution – implement dust control measures as suggested under air quality section
(viii) Provide road signs and flag persons to warn of on-going trenching activities.
(ix) Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety (this can be downloaded from the below link) http://www1.ifc.org/wps/wcm/connect/dd673400488559ae83c4d36a6515bb18/3%2Bcommunity%2Bhealth%2Band%2Bsafety.pdf?MOD=AJPERES)

D. Impacts During Commissioning

232. **Occupational Health and Safety.** Hydro testing of pipes for leaks and pressure prior to commissioning, poses safety risk to workers, to access the pipelines in the confined spaces (trenches). Risks include collapse of trench due to loosen soil or under uncontrolled water pressure. Workers should be trained in confined space working. Often, improper planning, adopting ad-hoc methods of testing, and use of non-standardized equipment are the main reasons for accidents. Cleaning of pipes, sewers, manholes, etc., if required as per the contract prior to commission, shall be carried out mechanically, and manual cleaning must be avoided.

233. **Disinfection of Pipes**. When the pipes are already laid out, the pipe work will be hosed down with chlorine solution on the interior to prevent any contaminated material into the water pipe and to protect and disinfection the water line's sanitary condition. This is typically done after the completion of the leak and pressure tests. During this process, extra caution will be necessary to avoid disposing water with excessive chlorine residuals.

234. **Mitigation Measures.** After pressure testing, all mains executed under HDD, bursting or open trenching will be washed out and disinfected.

235. The Contractor will carry out the disinfection of pipes in accordance with European Norms (EN 805) under the supervision of the Testing Foreman and Site Manager. The disinfectant will be selected jointly by PMU and DMS and submitted to the Project Manager for approval together with the method of application. It is considered to use a bleaching powder solution (30% concentration); process for the hypochlorite solution is given hereinafter: after a section of the mains has been hydraulically tested successfully and before being commissioned, the contractor will proceed with the disinfection.

236. Firstly, the pipes section will be flushed with clean water to remove foreign matter.

237. Then the section will be disinfected with a bleaching powder solution at a rate as to obtain 100 mg/l of active chlorine at the point of introduction. The line will be blown-off until a residual of 3mg/l chlorine is obtained at the point of blow-off. If a residual of 3 mg/l chlorine is obtained, the blow-off will be closed and the water allowed remaining in the pipe for a minimum of 24 hours (static method). After this period the water will be tested for residual chlorine at the point of blow-off. If no residual chlorine remains, the process will be repeated until satisfactory results are obtained.

238. After completion of the disinfection process the pipes will be flushed with 0.5 mg/l chlorinated water until effluent concentration at the point of blow-off is less than 0.5 mg/l. The method of drainage each section after disinfection and flushing will be indicated by the Site Manager for each section prior to the testing.

E. Post Construction Impact

239. **Interruption of Water Supply:** Replacement of existing distribution network, and shifting the water connections from the existing to new lines will disturb the water supply services, though temporarily. Once the new pipeline laid, all the consumer connections on the old pipeline will be transferred to the new pipeline. This new pipeline shall be connected to the existing water system and commissioned to ensure water supply to the consumers. The work of connections transfers from the old to new pipes will be done on section-wise basis, to minimize the supply disruptions to a day. Advance notice will be given to the consumers about the likely disruptions, and if the disruption extends over a day, then alternative arrangements will be provided. Following measures are to be implemented to minimize the inconvenience:

(i) Organize a structured and sustained communications program through "NGO Awareness" to inform the residents about the disruption of services and the alternate arrangements made to minimize the inconvenience;
(ii) Plan the construction program to keep the interruption of water supplies to the minimum possible (in both area and duration);
(iii) In coordination with PCU, provide alternative potable water to affected households and businesses for the duration of the shut-down; and
(iv) Liaise with affected persons to inform them of any interruption in advance, and to ensure that they are provided with an alternative supply.
(v) Supplies to essential emergency services and, medical facilities such as hospitals and clinics (where patients are resident) shall be supplied with water at all times, either by pipeline or tanker.

240. **Mitigation Measures.** The Contractor will provide to the users of service disturbance or disruption through announcement made locally door to door visit by the NGO personnel and also distribution of leaflet to registered consumers and by miking/loud speaker to the locally before 2 days of implementation. The Contractor will make arrangement for temporary potable water which will be supplied by alternative ways like carrying water from nearest DWASA PTW and fill the underground reservoir through water browsers,

241. DWASA PTWs in each DMA is one of the main sources of water supply. Usually there are 2''-dia water hydrant line in each DTW premises. Water can be collected from these points by a hose pipe to a water bowser or plastic tank. Later water can be supplied to houses temporarily disconnected from main source of water supply or the water-bowsers can be taken from the System Operation & Control Division (SOC) of DWASA using our water bowsers for temporary distribution to the areas temporarily disconnected from water supply. 1 (one) plastic tank will be set for 4 to 5 houses filled up by water tankers/lorry like this way whole area temporary water supply will be done.

- **Water Bowser**

Water Bowsers will be used for temporary water supply to the offices, educational and religious institutes during temporarily disconnected periods. In those cases, water will be supplied to underground reservoirs of the hospitals / houses / offices.

This is suitable for supplying in planned area, (main road having sufficient width of the road for the movement of the water bowser.

- **Trolley with plastic tank.**

Trolley with plastic tank may be source of water supply. It can be put in narrow roads (internal and tertiary) and is suitable for supplying in low-income community (LIC) area and to the by lanes.

242. Prior to taking up the rehabilitation/replacement of the house connection works; the existing water lines will be disconnected which will be reconnected as soon as the replacement is made.

243. Arrangement will be made to make the water available by using our own transport. The water bowser, Trolley-mounted water tank, Water tank to a convenient place, water jar on wheel barrow is mentionable. The following measures will be taken for temporary water supply to the consumers of the working area.

244. Water tanks in Tractor trolleys 500/1000 / 2000/ 5000/10000 liters' water tanks are uses.

F. Operation and Maintenance Impact

245. The main O&M activities of the rehabilitated pipes will be detection and repair of leaks and pipe bursts. The generally flat topography and the usage of good quality pipes should mean that pipeline breaks are very rare, and that leaks are mainly limited to joints between pipes and areas where residents continue to attach their own illegal house connections. Leak repair work will be similar to the pipe-laying work as earlier explained. Trenches will be dug to reveal the leaking area and the faulty connection will be refitted, or the pipe will be removed and replaced if necessary.

246. The bulk meters will allow automatic computerized monitoring of amounts of water flowing through individual parts of the network, which will pinpoint areas where there are leaks and/or where water is being taken out of the system illegally. DWASA will visit such areas with audio devices to locate individual leaks, which will then be repaired in essentially the same way that the pipes were installed. Trenches will be dug to reveal the leaking area and the faulty connection will be re-fitted, or the pipe will be removed and replaced if necessary. If illegal connections are found these will be removed and the pipe will be re-sealed, or a new properly fitted connection with a meter will be provided.

247. **Impacts on Physical Resources.** Generally, the main risk to the physical environment of operating an improved water supply system is that increased abstraction of surface or groundwater will deplete the water resource. However, that will not be the case here, as there will be no additional abstraction. The increase in supply will be obtained from the refurbishment of the distribution network (which will significantly reduce system losses from leakage), and the installation of a new metering system (which will improve leak detection and cost recovery). This is expected to both improve the supply of water to the consumer and reduce the decline in groundwater from over-abstraction.

248. If trenches are dug to locate and repair leaks or remove and replace lengths of pipe or illegal house connections, the work will follow the same procedure that occurred when the infrastructure was improved. In this case soil and backfilled sand will be removed to expose the leaking junction or pipe, and if necessary, a new pipe will be brought to site and replaced. The trench will then be refilled and re-compacted. This work should be very infrequent, and will affect individual small locations for short periods only (an average of a few hours for most repairs). Physical impacts will therefore be negligible. Work will not be conducted during rainfall so there will be no effect on drainage, and the removed material will be replaced in the trench so there will be no waste. There should also be no need to cover excavated material to prevent dust as it will have been wetted by the leaking water.

249. **Impacts on Ecological Resources.** The distribution network is located within roads, so any repairs will have no ecological impacts.

250. **Impacts on Socio-Economic Resources.** If network repairs are conducted in areas where there are shops or other commercial activities, these could lose some business while the repairs are conducted if access is difficult for customers. However, these will not be significant and will not need to be compensated, because repairs will be much smaller in scale than the original trenching works and much shorter in duration, so any losses will be at the level of normal day-to-day fluctuations in business income.

251. **Impacts on Social and Cultural Resources.** If network repairs are conducted in residential areas people may be disturbed by construction noise, and there could be some interruption of access to houses and locations of social and cultural importance (such as mosques, schools and hospitals) by the trenches and excavated soil. However, these impacts should also not be significant because of the short-term and infrequent nature of the works.

252. **DWASA** (and the contractors during the defects liability period) will operate the same kinds of H&S procedures as used in the construction phase to protect workers and the public. This will include application of the asbestos protocol if any AC pipes are encountered, and prohibition of the use of AC pipes for any repair and maintenance work.

253. The citizens of the city will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better-quality water, piped into their homes. This should produce major improvements in the social capital of the city, and significant improvements in individual and community health and well-being. To augment these benefits, DWASA will conduct a public education and information campaign to raise awareness of the health risks of contaminated water and the continuing need to boil municipal water before consumption. Then diseases of poor sanitation, such as diarrhea and dysentery, will be greatly reduced.

254. People will then spend less on healthcare and lose fewer working days due to illness, so the economic conditions of individuals and the community as a whole should improve. There should be fewer deaths in infancy and at other stages of life, so the structure and well-being of families should also improve. The cultural resources of the city may also benefit, because if people are healthier and have more income, they should also have more time and money to spend on cultural pursuits.

G. Project Benefits

255. The citizens of the city will be the major beneficiaries of the improved water supply, as they will be provided with a constant supply of better-quality water, piped into their homes. This should produce major improvements in the social capital of the city, and significant improvements in individual and community health and well-being. To augment these benefits, DWASA will conduct a public education and information campaign to raise awareness of the health risks of contaminated water and the continuing need to boil municipal water before consumption. Then diseases of poor sanitation, such as diarrhea and dysentery, will be greatly reduced.

256. People will then spend less on healthcare and lose fewer working days due to illness, so the economic conditions of individuals and the community as a whole should improve. There should be fewer deaths in infancy and at other stages of life, so the structure and well-being of families should also improve. The cultural resources of the city may also benefit, because if people are healthier and have more income, they should also have more time and money to spend on cultural pursuits.

H. Mitigation Measures

257. There are no impacts that are significant or complex in nature, or that need an in-depth study to assess the impact. Thus, the subproject is will not cause significant adverse impacts. In addition to the mitigation measures and specifications already considered in the package design, the potential adverse impacts that are associated with construction and O&M can be mitigated to acceptable levels with the specific mitigation measures discussed in the EMP.

258. The final IEE report assessed all potential impacts of the package/subproject based on detailed design by DBO Contractor. The final IEE report concluded that the package/subproject will not cause any significant adverse impacts due to: (i) scheme is relatively small and their effect will be local and site-specific which is manageable and controllable and (ii) impacts are site-specific and likely to be associated with the construction process and are produced because the process is invasive, involving excavation and earth movements.

259. **Table 33** provides the assessment of the potential impacts of components based on detailed engineering design. Based on the results, the potential impacts identified in the Draft IEE report approved by ADB in January 2016 are similar in nature and remains as not significant. The findings have been verified by the DMSC and PMU.

260. Site specific mitigation measures by the Contractor for their contractual obligations (Section 6 & 8) are summarized as in table (**Table 34**). It will be revised if needed before commencement of construction works.

261. As preapproved design 23 PTWs are to be upgraded in order to maintain normal water supply in 1 DMA area. The no Replacement or installation of new DTW has proposed for these 1 DMA of this third construction Phase of NCB-02.12E. As no new PTW is designed for any of the DMA sites, PTW location and other information is provided for information. As per model design at the present stage of 2023, production of 35 DTW of phase-3 are 608.33 liters/Sec whereas, the present demand is 1368 liters /Sec. The deficit quantity of remaining 760.64 liters/sec contributing from Saidabad Water Treatment plant from different surface water Injection points of the DMA. The water demand will be 16102.12E as the design period of 2040. The quantity as per model design: The Surface water treatment plant will be contributing 1153.13 liters / sec and remaining quantities 458.97 Liters/sec will be adding from the PTW production.

Table 33: Comparison of Impacts in the Draft IEE and as Per Detailed Engineering Design

Particulars	Details of Proposed component as per BOQ (preliminary design)	Details of component as per DBO Contractor	Any Change recommended by DBO Contractor (if yes detail of that subcomponent with approval)	Whether any new impacts due to changes/impacts that were not assessed in the draft IEE	Mitigation Measures
Distribution Network	Distribution pipe line of total length 33898 m (HDPE Pipes) 75 -450 mm diameter Location: Pipes will be laid within Row of Government roads under Dhonia, Polashpur, Shanir Akhra, Janatabug	Distribution pipe line of total length 27555 m (HDPE Pipes), 75 – 450 mm diameter Location: The distribution pipelines will be laid within the RoW of Government roads under Dhonia, Polashpur, Shanir Akhra, Janatabug		No additional impacts. Assessment in the Draft IEE is still applicable	Mitigation measures in draft IEE is still applicable There are no forest areas within the prescribed limit of the town. Hence There are no involvement of forest land or required any permission

	and Nurpur under Kadamtali Thana of DSCC; in narrow roads, where there is no place, the pipeline will be laid in the center of the road; where the roads are very wide,the pipelines will be laid in the road shoulder.	and Nurpur under Kadamtali Thana of DSCC; the road widths vary between 0.6 to 42.00 meters and pipe diameters are planned in accordance with road widths. In narrow roads, where there is no place, the pipeline will be laid within the road; where the roads are very wide pipes will be laid in the road shoulder, and if the roads have service roads, the pipes will be mostly laid in the service roads.			for pipe laying. There is no tree cutting involved during construction period. Most pipeline construction will be conducted by small teams working on short lengths at a time so most impacts will be localized and short n duration; No additional impacts. Assessment in draft IEE approved by ADB is still applicable
Bulk Water Meter		n/a	Fixed with the pipe section at strategic locations like inside the network to isolate a specific community inlet etc.	n/a	n/a
Rehabilitation of service connections with flow meters	5093 Location: Water delivery pipe will be connected to distribution lines and meters will be attached to the delivery pipe at each house with a meter chamber	2908	Number of connections decreased as per the household survey conducted by DBO Contractor	n/a	n/a

n/a- not applicable

Table 34: Site Specific Mitigation Measures for 1 DMA of NCB 02.12E

Aspects	Mitigation Measures
Preconstruction Stage	
EMP implementation and reporting	Environmental Health and Safety (EHS) Officer will be mobilized to carryout environmental safeguard tasks Ensure that all pre-construction activities are complete prior to start of construction work • Updated IEE / site specific EMP will be submitted • Ensure timely submission of monitoring reports
Utilities on sites (electric, telephone lines, water pipes etc.)	• Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; and • Contingency plan will be prepared and implemented in case of service
Road Cutting	Procedure for Road Cutting and Excavation Plan: • The contractor first identified the trial pit location • Then this is submitted to the DMSC for approval • After approval of DMSC the contractor estimated the road cutting amount and submit to DSCC for demand note for road cutting • After getting the demand note from DSCC, then the contractor deposits the demand note to the bank • After deposit the amount of demand note then DSCC issue the road cutting permission • After getting the road cutting permission then the contractor applying to Traffic Office for traffic permission. • After getting the traffic permission then the contractor starts the excavation of road for trial pit or execution. An outline of TMP are provided for reference at **Appendix 6.**
Security of the sites	• The Contractor shall be responsible for guarding all utilities, plants equipment, material, etc. delivered on sites and for ensuring that all sign, lights, fences, etc. are in their proper place. • The Contractor shall be responsible to guard all works carried out under this contract, including any goods or materials provided by the Employer for use in the Facilities falling under this contract. • The Contractor's security responsibilities shall continue until each DMA has been taken over by the Employer
Traffic Management Plan	• Isolate the work area with temporary barriers. • Control traffic movement around work site • Travel paths for general traffic and site vehicle movements must be clearly marked. • Separate pedestrian travel paths should be marked in high traffic areas. • Traffic diversion and road closure as per requirement in the narrow roads present in the site • Provide sign boards for pedestrians to inform nature and duration of construction works and contact numbers for concerns/complaints. • A site-specific traffic management plan for each DMA as approved by the DMSC and PMU is to be in place before construction work commences;

Aspects	Mitigation Measures
Waste Management Plan	• Excess soil / debris will be utilized in construction / useful purposes to avoid disposal • Excess soils/debris will be removed from site immediately (on the same working day) to avoid stockpiling at site • The dumping places will be selected before start of construction work and approve from DMS/PMU. • The Contractor will collect segregated domestic wastes in a container and dispose to roadside dustbins regularly; The recyclable waste may use for jointing purpose or will be sold in market • Burning of waste will not be allowed • Surplus soil is to collected from the working site by the workers, put it to the dump truck which is waiting at the main road and will dump to the land filling area or selected disposal places.
Protection for Trench Excavation	Necessary protection will be provided the following: • Bamboo/ pipe/ sheet for land sliding • Steel sheet for trench crossing • Side safety post for person/ vehicles falling into trench • The trench for the pipe laying is hardly 1.5m below from existing GL so, no structural risk of building or other infrastructures.
Storage and Disposal Area	• Contractor has own stackyard which is about 27.15 km maximum distance from nearest DMA 705. • Total stackyard capacity is about 25000 m^3 and area of material storage is about 4000 m^2. • Temporary storage area and disposal area is selected near the respective DMA. • Train employees in the storage and handling of materials which can potentially cause soil contamination;
Site office/Labor camp	• The Contractor already rented main site office at House No186, Decent shamim tower, Haji lal miah sarker road, Muradpur, Dhaka-1204. • One store as well as site office has been established for the DMA, where there is also settled labour camp and morning assembly will also be held there. • The contractor will however be encouraged to engage local workers as much as possible so that they will reside at their house; so, no separate living areas are required. • Temporary labor camp will be established at vacant location within the DMA boundary without inconveniencing local residents and movement of vehicles. • Sufficient drinking water facility and separate mobile toilets for male and female workers will be provided.

Aspects	Mitigation Measures
Asbestos Cement Pipes	Due to potential health risks, AC pipes will be left in-situ and replaced next to existing AC pipe by new HDPE pipes. During construction stage, the contractor will leave asbestos cement pipes in-situ untouched. The alignment of newly installed HDPE pipe will be maintained at least 1 m from the existing AC pipes. The PCU (Zone 7) has also Liaison with other utilities and agencies such as DESCO, DESA, BTCL, TITAS GAS, DCC (North and South), and informed them regarding all identified AC pipes with GIS based maps, share with them proper marking of AC pipes during implementation and inform them due to potential health risks, these pipes will be left in-situ untouched during excavation of other utilities.
Fuel and Lubricants Depot	• The fuel & lubricant require for the operation of machine will be stored in the main store possible nearby the site office. The quantity required daily basis will be taken out day to day wise and kept at site under safe custody. • For any unusual fire incident, there will be fire extinguisher arrangement in the stackyard area as well as temporary stores of the worksite.
Sanitation Facility	• Temporary labor camp is established within the DMA boundary with separate mobile toilets for male and female workers.
Fire Prevention	TCEL has own firefighting team well equipped with modern firefighting devices. The team will be stand by for the local minor incidents. Besides there are good numbers of Govt. fire brigade station within the area of NCB – 02.12E, all necessary telephone numbers will always keep for using in worst or uncontrolled situation. TCEL will obtain and follow any instructions of the competent authorities with respect to fire hazard when working in the vicinity of gas installations. Should a fire occur in the natural vegetation or plantations adjacent to the road for any reason, firefighting people will immediately suppress it.
DTW Upgradation / Re-habitation	Almost all the plants of the Delivery line and fittings are to be replaced to introduce SCADA system. Which will improve the environmental monitoring system and quicker system of leakage repairing and other incidents. There will be no leakage kept untouched as soon as they are detected and all are nonrevenue water will be counted for. People will have safe supply drinking water throughout the day 7 days a week in case of water scarcity: temporary water supply will be provided using water bowser, any leakage will be repaired as soon as receiving the complaint and seen any overflow on the road or dirty water complain.
Construction Stage	
EMP Implementation Training	• Project manager, staff and all key workers will be required to undergo training on EMP implementation including spoils/waste management, Standard operating procedures (SOP) for construction works; occupational health and safety (OH&S), core labor laws, applicable environmental laws, etc. prior to start of work

Aspects	Mitigation Measures
Dust Control	• Site clearance and excavation work will be commenced only after barricading the site • Works and all associated activities (material, soil, debris, equipment, machinery) will be confined to barricaded area • Excavated soil storage will be removed from the site immediately & stored/disposed at identified site • Work will be conducted work sequentially -excavation, pipe laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done • Excavated soil will be removed section-wise, and used for filling the previous section, this is to avoid stocking of excavated soil • Road restoration will be taken up immediately after backfilling by proper consolidation • Water will be sprinkled adequately (in dry weather) to maintain surface in stabilized and damp condition
Noise Control	• Noisy works will be avoided in the night • Proper noise control apparatus (silencers, mufflers etc.,) will be ensured for construction equipment • Noisy works will not be conducted near sensitive places (hospitals, schools, mosque etc.,) and at sensitive times (prayer time, festivals etc.,); works will be scheduled accordingly • Monitor noise levels in potential problem areas

Aspects	Mitigation Measures
Accessibility	**Access to houses/business during pipeline works:** • Access to any house, business or property will not be blocked completely, at least safe pedestrian access will be maintained • Leave spaces for access between mounds of soil; • Provide walkways, wooden and metal sheets/planks on excavated trenches where required to maintain access across for people and vehicles; **Material transport using heavy trucks** • Material haulage vehicles will main/wide roads as far as possible • Transportation / hauling activities will be conducted during non-peak hours • Proper entry and exits to facilities will be provided facilities at low traffic **For works in very narrow roads- (internal and tertiary road)** • Minimize the work area / barricaded area along the roads to the minimum possible width; • Confine all the activities within in the barricaded area, including material & waste/surplus soil stocking; • Avoid material/surplus soil stocking in congested areas – immediately remove (on the same working day) from site/ or brought to the site as and when required; • Transport material, waste etc., during low traffic periods (e.g., before 8 AM) • Minimize access disruptions to adjacent properties; vehicle access may be controlled however, pedestrian access should always be available; if necessary, provide temporary pedestrian access (e.g., over the trench) using wooden planks/metal sheets; • Plan transportation (for material and waste) routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; • At work site, public information/caution boards shall be provided including contact for public complaints • Employ trained flaggers to direct traffic movements in areas with lane closures • Coordinate with Traffic Police for temporary road diversions, where necessary, and or provision of traffic aids if transportation activities cannot be avoided during peak hours
Occupational, Health and Safety	• Develop and implement site-specific occupational health and safety (OH&S) Plan which will include measures such as: (a) identification of potential hazards and safety issues; (b) ensuring all workers are provided with and use personal protective equipment; (c) OH&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • Ensure that qualified first-aid is provided at all times. Equipped first-aid box shall be easily accessible throughout the site Health and Safety Plan is attached in **Appendix 12.**

Aspects	Mitigation Measures
Asbestos Cement Pipes	• Leave asbestos cement pipes in-site untouched • Follow the procedures prepared by the DMS for installation of new pipes in an area with an existing AC pipe
Community Health and Safety	Caution tape and barricade will be provided for public safety especially near residential area, pit area, pipe laying location, near school and religious places Provide road signs and flag persons to warn of on-going trenching activities

Source: Information provided by **TCEL**; August 2020

I. Cumulative Impact Assessment

262. The cumulative impact assessment (CIA) examined the interaction between the project's residual effects (i.e., those effects that remain after mitigation measures have been applied) and those associated with other past, existing, and reasonably foreseeable future projects or activities. The interaction of residual effects associated with multiple projects and/or activities can result in cumulative impacts, both positive and negative. The project's potential cumulative effects were considered with respect to valued components (VCs) in environmental and socioeconomic categories, in four areas:

(i) of any potential residual project effects that may occur incrementally over time;
(ii) consideration of other known relevant projects or activities within the specified study area boundaries, even if not directly related to the project;
(iii) potential overlapping impacts that may occur due to other developments, even if not directly related to the proposed project; and
(iv) Future developments that are reasonably foreseeable and sufficiently certain to proceed.

263. The project has identified the VCs as water quality, noise, traffic management, socio- economic and socio-community components, and human health. There are no foreseeable projects that will overlap with the project. The spatial boundary of the project is the area along the pipe alignment, existing right of ways, and building sites. The temporal boundary can be considered as the whole Dhaka City.

264. Given the water supply requirement in Dhaka will be met and the sources considered adequate, there are no significant cumulative impacts expected on the future water supply.

265. Air quality effects will occur during construction. Consequently, although emissions of common air contaminants and fugitive dust may be elevated in proximity to active work sites, this impact will be short-term and localized to the immediate vicinity of the alignment. Greenhouse gas (GHG) emissions may increase as a result of project activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the project's relatively minor contribution to common air contaminants and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

266. Noise levels during construction in the immediate proximity of most work sites are expected to increase. The duration of this exposure will be relatively brief. This exposure represents a temporary, localized, adverse residual effect of low to moderate

significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction. Noise levels associated with the project O&M will be largely imperceptible, as the buildings are located in relatively small sites within the city proper.

267. Land use/traffic management concerns will occur spatially during construction. Site- specific mitigation measures will be implemented to address temporary disruptions to land use and access, traffic delays and detours, parking modifications, and increased volumes of construction-related traffic. Traffic movement along the alignment will be improved once construction is completed. Since the project will be the rehabilitation of existing pipelines and a building to be constructed adjacent to existing water supply facilities, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial, and business facilities and increased densities are expected to develop and enhance the project area. This can be considered a long-term cumulative benefit of the project.

268. Upon completion of the project, the socio community will benefit from improved water supply system. This is considered a long-term cumulative benefit.

269. No adverse residual effects to human health will occur as a result of project construction or operation. While exposure to elevated noise levels and fugitive dust and common air pollutants will occur in proximity to project work sites during construction, due to their short-term, localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

270. Therefore, the project will benefit the general public by contributing to the long-term improvement of water supply system and community livability in Dhaka City.

6. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

A. Public Consultation Conducted

271. The public participation process included (i) identifying interested and affected parties (stakeholders); (ii) informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; (iii) creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments, and concerns) with regard to the proposed development; (iv) giving the stakeholders feedback on process findings and recommendations; and (v) ensuring compliance to process requirements with regards to the environmental and related legislation.

272. The following methodologies have been used for carrying out public consultation:

(i) Local communities, individuals, and owners and employees of commercial establishments who are directly or indirectly affected were given priority while conducting public consultation.
(ii) Walk-through informal group consultations were held in the proposed project area.
(iii) the local communities were informed through public consultation, with briefing on project interventions, including its benefits; and
(iv) The environmental concerns and suggestions made by the participants were listed, and discussed, and suggestions accordingly incorporated in the EMP.

273. Different techniques of consultation with stakeholders were used during project preparation (interviews, public meetings, group discussions, etc.). A questionnaire was designed and environmental information was collected. Apart from this, a series of public consultation meetings were conducted during the project preparation. Various forms of public consultations (consultation through adhoc discussions on-site) have been used to discuss the project and involve the community in planning the project design and mitigation measures.

274. Field level community-based consultation meetings, Focused Group Discussion and Participatory Rapid Assessment (PRA) have been carried out in major distribution route. The stakeholders expressed their opinion on the proposed pipeline alignment and provided important information regarding available government land along the proposed right of way relevant maps, papers and documents of the Dhaka city and surrounding areas, socio-economic and environmental conditions to facilitate decision making of the project authority.

B. Consultation and Participation during Updating IEE Report

275. In course of updating the IEE for the DMA (705) under NCB 02.12E, intensive field visit, census survey, and some formal and informal meetings with stakeholders were conducted from February to September 2023. Public consultations done through (a) Walk-through informal group consultations were held in the project area; (b) The local communities were informed through public consultation on project interventions, including its benefits; (c) The environmental concerns and suggestions made by the participants were listed, discussed, and suggestions accordingly incorporated in the EMP; and (d) Various forms of informal public consultations (consultation through ad-hoc discussion-site) have been used to discuss the project activities.

276. Consultations were conducted with key stakeholders and community people in line with the ADB's requirements pertaining to environmental and social considerations.

277. SAMAHAR's Resettlement Team conducted meetings and discussion sessions like the tea stall meetings and FGDs with stakeholders in the Kadamtali Thana of Dhaka City in order to updating the IEE and RP along with the field level officials and Engineers from the DWASA, DMS and the contractor (TCEL) also participated in those public consultation meetings. Businessmen, service holders, teachers, laborers, shop keepers, students, housewives and few community leaders representing the area participated in the meetings.

SI.	VENUE	DMA NAME	DATE	TIME	PARTICIPANTS	MEETING TYPE
1	52 No. Ward Councillor office	705	26.9.23	11:00	Male:11 Female:06	FGD

278. Census survey including socio-economic survey has been conducted in all 1 DMA in order to identify IR impact in all 1 DMA. Project components and its benefits, impacts and resettlement issues were discussed and opinions exchanged with the community and affected persons. Majority of the participants in the discussions with the affected people demanded compensation for their loss. In most of the cases the route along main roads is free from impacts. Vendors in the smaller lanes in the interior will be the ones most affected. They have temporary structures and they have been occupying these spaces for running their livelihood for years.

279. Most of the vendors have been operating small business in the places for a long time. They depend primarily on the surrounding community for running their business. These people work in the surrounding market place and are from the low-income group. Local community gets their day-to-day needs, household shopping (vegetable, fish, etc.), snacks, food, tea and other services from these local vendors. These vendors have built their temporary structures on the RoW and over the existing water line route. The project would require them to be moved.

280. Issues related to the DWASA Project have been shared with the participants. In the consultation meeting, different problems related to water have been revealed. DWASA, consultants of DMS and NGO officials informed them the better water service will be ensured by the project and it will start as soon as possible considering the formalities of recruitments of contractor and NGO. Local participants have learned that this new project will bring better water service in the area. The participants opined that improvement of safe water supply system will help them getting safe drinking water, and improving health reducing water borne diseases like diarrhea, dysentery, cholera, and so on.

281. Participants during meetings emphasized non-stop water supply to extinguish fires that took place/blazed in Dhaka city including old Dhaka recently. They also said, water hydrants are considered the best solution in places which lack adequate water reserves. Rivers that are surrounded in Dhaka city are being extremely contaminated and dried up in dry season. Canal and lake that lie like a net in Dhaka are being filled up and grabbed by miscreants. People and fire brigade wouldn't cry for water if all of the water bodies were maintained properly. In this reason, participants demand water hydrants to be set up at different places to counteract emergency situations under the project.

282. It was observed that people are willing to extent their cooperation as the proposed activities are proposed to enhance the water supply service levels and the living standard

of the public. The public expressed their concern regarding the nuisance and disturbance (dust, road closure, and traffic management activities), and the project team explained the EMP provisions to minimize the disruptions. Poor quality of water supply in some parts of subproject area is a major concern expressed by the stakeholders, and project team explained that the pipe replacement works that are being taken up under this subproject will remove these problems and provide potable water in adequate quantity and at requisite pressure.

283. During the meeting local public and affected people shared their views to the project team.

284. The consultations primarily highlighted the proposed developmental interventions, perceived impacts and mitigation measures and public participation during implementation. Community members largely spoke about the insufficient or no availability of potable water for use of drinking and domestic purpose. The participants conveyed their support for the project that benefits the community with safe drinking water. They expressed concern over the present quality of drinking water they consume and appreciated government's effort of distributing clear and treated water.

285. It has been observed that people are very happy about the project as the project area currently faces severe water problem due to lack of potable water supply system due to depletion of groundwater level. People are very much willing to extend their cooperation as the project will be provide much needed potable water and enhance living standard of the public. There are no negative impacts perceived by the community, however, project team explained the likely issues during construction and proposed EMP to manage the negative impacts. Increasing traffic and disturbance to vehicle movement during the work is raised during the meeting, and it was informed that proper care will be taken for movement of construction vehicles including traffic management plan, prior information to people etc., It was also informed no road closures anticipated due to this work, and if needed during the construction phase, alternative access will be provided. These measures are included in the EMP.

286. The proceedings, and list of participants of the stakeholder consultation meetings are attached in **Appendix-14.** Project Co-ordination meeting with various utility authorities are very important and has been conducted for NCB 2.12 are discussed below:

Minutes of the Project Co-ordination Meeting under Dhaka Water Supply Network Improvement Project (DWSNIP), DWASA for contract NCB 2.12 (All packages)

Date and time: 06.02.2024 at 11:00 AM.

Venue: Project Manager DMS consultant's site office at 618, Hazi Salahuddin Tower, (2nd floor) Opposite of Bright school and college, Dania, Dhaka -1236.

Agenda: Interagency Coordination, Risk factor during implementation work, Emergency support, remedies and sharing experiences are the main features.

Md Fakrul Isam, the Deputy Project Director, DWSNIP, DWASA presided over the meeting. Among others, the Executive Engineer Jeni Chakma, Contract Management Expert (CME): ICB-2.12 Mr. Mahfuzul Mannan with his team the Contract Managers of the respective DMAs, concerned key persons of the packages and Officials from the Stakeholders organization attended the meeting.

List of the Attendees:

Sl No.	Name	Designation	E-mail	Contract No.
1	Md. Fokrul Islam	SE & DPD DWSNIP	fakrul@dwasa.org.bd	01715-059822
2	Jeni Chakma	EE, DWASA	tongla11@yahoo.com	0155-3266545
3	Saddam Hossain	SDE, PMU	saddamcuob3@gmail.com	01515-260895
4	Abul Hasnat	CM (DMA-704)		01844-200476
5	Abdul Momin Sarkar	SM (DMA-704)		01844-601885
6	Bhabatosh Roaja	SAE, PMU		01820-709779
7	Prosanta Bala	SI PS, Jatrabari	prasantabala@100gmail.com	01710-014334
8	Md. Sazzad Hossain	Lalbagh Traffic Division	ksazzad@100gmail.com	01716-525792
9	Saber Ahmed	Contractor representative	info.smity@yahoo.com	01708-128402
10	Mahfuzul Mannan	CME, DMS	mmahfuz55@gmail.com	01712-763358
11	Md. Faruque Sikder	SAE, BTCL	sikderfaruk613@gmail.com	01911-231119
12	Lubna Islam	Supervisor, SAMAHAR	lubnaislam54321@gmail.com	01760-822311
13	Kazi Habib Ullah	CPP RPL	rfl66@rflgroupbd.com	01844-601149
14	Md. Abul Hossain	APM (RPL)		01844-603169
15	Md. Mahbubur Rashid	Project Engr. TCEL	mahbubur.engr@gmail.com	01712-130670
16	Faruk Ahmed	Project Engr.	farukengineer91@gmail.com	01723-75913
17	Arman Pasha	F.O RW Samahar	samahar.rw.jo@gmail.com	01744-959670
18	Sarder Asaduzzaman	SE, TCEL		01712-653023
19	Shwlbot Ali	Site Engr.	soikotsorkar473@gmail.com	017955-32721
20	Md. Humayun Kabir	Site Manager	jumayunuccl@gmail.com	01841-356776
21	Nazmul Hossain	Field Officer		01721-949725
22	Mofakhkharul Hoque	SARE, DMS	mofakhkharul25@gmai.com	01621-820023
23	Md. Khorshed Alam	SARE, DMS	alam.khorshed1965@gmail.com	01716-443968
24	Qazi Md. Zillur Rahman	ARE, DMS	quzizillur@yahoo.com	01712-214113

Sl No.	Name	Designation	E-mail	Contract No.
25	Md. Ashadudzaman	Manager, Titas Gas	man-nas@titasgas.org.bd	01952-277311
26.	Abani bar	ARE DMS	abanibar91@gmail.com	01681407081

At the beginning the Chair welcomed the participants and gave a short briefing on DMA concept. The DPD informed the meeting that total 165 km of water pipe line will be rehabilitated with service connections under the contracts. He discussed about the reason for delaying in implementing the contract ICB-2.12 due to failure of the previous contractor, converted the contract in NCB and Splitting of the whole contract in five packages consisting of eight DMAs. As the work is mainly underground pipe line, the cooperation and assistance from the agencies concern specially DPDC, BTCL, DSCC, Police, Titas gas, Optical fiber etc. is very important issue in implementing and completing the project in time. The outcome of the project will be making the water supply system of the city more reliable, sustainable and climate resilient he added.

The Executive Engineer Jeni Chakma Stated that, the project is ADB financed, already late in implementing for quite a long time, In order to get the benefit from the project and get relief of the water supply problem of the area, we got to complete the project within stipulated time, She also requested the stakeholders assistance from every sector including exchanging and providing their layout maps to each-others and ensuring all cooperation.

The Contract Manager, Mr. Abul Hasanat of RPL earnestly requested for the cooperation from all concerned agencies (Stakeholders). He emphasized the need of “WhatsApp” Group, and requested all concerned to use this Coordination group for providing all necessary information, suggestions including posting photos etc.

Mr. Mahfuzul Mannan the CME ICB-2.12 stated that this was most suffered area having low pressure with water deficit problem. DWASA is implementing the project for an efficient reliable and sustainable water supply network of the area. The inhabitants will have each and every drop of fresh water on completion of the Packages under the project. The project will be implemented using most modern equipment keeping the disturbance at minimal level during construction. all procedure will be followed to have the desirable pressure in the newly completed water line.

Stakeholders	Discussion	Remarks
BTCL	Telephone and Internet (fiber optic cable) are extremely important. Faster restoration is necessary with utmost cooperation from the Agencies concerned. Need to have the drawing for the propose water line, timely response and communication are important	

Stakeholders	Discussion	Remarks
POLICE	Need weekly Traffic management plan. Night time work schedule to be sent to the respective PS and TI for information. To avoid the traffic jam and movement of the pedestrians During Ramadan, No work in the Evening hours. Night work preferable when traffic is less Safety barricade to be in place and complete the restoration or using Steel Sheet to cover the trench and fill the depression immediately. Removal of excavated earth and placing of equipment carefully in a planned way and construction materials not to obstruct the roads.	
TITAS GAS	Prior information is very important to send representatives to the work site House connection damages are common, these incidents should be reduced taking extra care. Emergency safety measures to be taken in case of any leakage incident encircling the spot till the Titas gas team comes. Gas Leakage information must not be suppressed. Close contact with System Operation Department (SOD) of Titas should be maintained.	
NGO	NGO will inform the inhabitants regarding starting time of the Pipe installation work, for keeping the local people informed about the inconvenience during the implementation period for the time being.	

On the light of the discussion in the meeting the following decision has been taken:

1. Before starting the work, survey should be conducted with the representatives of each organization, and appropriate marking should be made for the critical locations
2. The concerned agencies having utilities at the working spot will send their representatives at site to locate their Pits, lines and hot spots, the pipe line alignment drawing to be made available by the
3. Contractor should make the gas detector available at every working site.
4. Contractor will provide weekly or daily program.
5. During Ramadan No work in the evening work
6. Work site to be kept clean by the contractor in order to facilitate the Traffic movement and pedestrians
7. Md. Momin Sarker is the focal person from the RFL Plastics ltd to coordinate with the stakeholder.
8. The respective Contractors of the DMAs under the Package – ICB-2.12 will inform about the night work to respective DMP thana and the Traffic inspector.

9. In case of any incident takes place with the (Damage, Leakage or breaking of any utilities) the contractor should inform the respective stakeholder immediately through the mail / phone or in WhatsApp
10. The Contractor should take proper safety and security by encircling the probable critical spot and providing sign boards for the awareness of the traffic and pedestrians.
11. All the stakeholder's representative attended the meeting will be added in the Coordination WhatsApp group of ICB-2.12

The meeting ended with a vote of thanks by the chair.

C. Consultations during construction phase

287. Prior to start of construction, PCU with the assistance from NGO Awareness and DMS Consultants will conduct meaningful[31] consultation information dissemination sessions at various places and solicit the help of the local community, leaders/prominent for the project work. Focus group meetings will be conducted to discuss and plan construction work (mainly pipeline work) with local communities to reduce disturbance and other impacts and also regarding the project grievance redress mechanism. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction phase.

288. A constant communication will be established with the affected communities to redress the environmental issues likely to surface during construction and operational phases and also regarding the grievance redress mechanism. Local body (Ward Councilor))/PCU and Design, Management and Supervision Consultants (DMSC) NGO Awareness will organize public meetings and will appraise the communities about the progress on the implementation of EMP. Meeting will also be organized at the potential hotspots/sensitive locations before and during the construction.

289. Design Built Contractor will include records of consultations, issues/concerns, attendance sheets, and resolutions to the progress report to be submitted to DMSC. This will be included by PMU in the environmental monitoring report to be submitted to ADB on a semi-annual basis.

D. Project Disclosure

290. Public information campaigns including dissemination of construction schedules to explain the project to the wider city population and prepare them for disruptions they may experience once construction is underway. Public disclosure meetings at key project stages to inform the public of progress and future plans, and to provide copies of summary documents in local language. Formal disclosure of completed project reports by making copies available at convenient locations in the study areas, and informing the public of their availability and providing a mechanism through which comments can be made.

291. For the benefit of the community, the Executive Summary of the IEE will be translated in the local language and made available at (i) PMU office, (ii) zonal offices,

[31] Meaningful consultation will: (i) be carried out on an ongoing basis throughout the project cycle; (ii) involve timely disclosure of relevant information. Affected peoples and stakeholders will have access to relevant project information prior to any decision-making that will affect them; (iii) be conducted free of intimidation or coercion; and (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups.

and (iii) contractor's offices/campsites. It will be ensured that the hard copies of IEE are kept at places which are conveniently accessible to citizens, as a means to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE will be placed in the official website of DWASA and the ADB website after approval of the IEE by ADB.

E. Involvement of NGOs, CBOs and Women's Organizations

292. The active involvement of NGOs, CBOs, and organizations representing women and other vulnerable groups is seen by DWASA as essential in fostering positive community participation in the program and ensuring that the views and wishes of the disadvantaged are heard and acted upon. NGOs will perform a number of key roles in the project, in particular:

(i) An Awareness NGO (SAMAHAR) have been appointed by the PMU to organize and implement the consultation and disclosure activities described above, and the various awareness raising campaigns;
(ii) The PMU has also appointed "SAMAHAR" – as Resettlement NGO for implementation Resettlement Plans in each hydraulic zone and distribute the entitlements;
(iii) The resettlement expert of DMS Consultants engaged for monitoring activities, with the help of the NGO, may fulfill the role of Training Coordinator in the PMU. They will organize training for DWASA staff, safeguard implementation unit (SIU) and CBOs in community level;
(iv) NGOs will also be appointed to assist the PMU and PCUs with other technical tasks, for example in conducting some of the resident surveys for the resettlement activities, where an established relationship with the communities is essential.

293. The main role of CBOs and organizations representing women and other vulnerable groups will be to represent the interests of their members in dealings with the program proponents, in particular the PMU and PCUs and also the contractors. These organizations will be registered stakeholders and will thus be involved in the various consultation and disclosure activities. Together with NGOs they will be assured of representation in the various committees and other forums that are established to plan and implement the program and monitor its progress. As a further safeguard to ensure their representation and involvement key positions on all committees will be reserved for women and vulnerable persons.

7. GRIEVANCE REDRESS MECHANISM

294. A project-specific grievance redress mechanism (GRM) is established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM aims to provide a time-bound and transparent mechanism to record and resolve social and environmental concerns linked to the project. A common GRM is in place for social, environmental, or any other grievances related to the project; the resettlement plans (RPs) and IEEs will follow the GRM described below. The GRM provides an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The multi-tier GRM for the project is outlined below, below, each tier having time-bound schedules and with responsible persons identified to address dress grievances and seek appropriate persons' advice at each stage, as required.

295. **Grievance Redress Committee:** project-specific grievance redress mechanism (GRM) will be established in PMU to receive, evaluate, and facilitate the resolution of

affected person's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

296. PMU will maintain a Complaint Cell headed by a designated Grievance Officer at its office. The Grievance Registration/Suggestion Form (**Appendix 9 and Appendix 10**) will be available at the Complaints Cell and in Zonal Offices and will also be downloadable from the DWASA website (link to DWASA website: https://dwasa.org.bd/dwsnip/).

297. PMU/PCU with assistance from NGO (Resettlement and Public Awareness Campaign) are ensuring that awareness on grievance redress procedures is generated through the campaign. PCU Safeguard Focal Person through NGO- 'Public Awareness' (SAMAHAR) will conduct wide awareness campaigns at each DMA sites to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements.

298. APs have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complain complaints/suggestion boxes or by e-mail, by post, by telephone, or by writing in a complaint register in PMU/PCU offices. Careful documentation mentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area, and how the problem was resolved are being undertaken by NGO/DMSC. The PMU Project Officers (Environment & Social) will have the overall responsibility for timely grievance redress respectively on environmental and social safeguards issues and for registration of grievances, related disclosure and communication with the aggrieved party through PCU (Safeguard Nodal Person).

299. GRC was established on Dec 19, 2018 at both PMU and PCU level. The GRC committee are shown below:

GRC at PMU Level:

1.	Project Director- DWSNIP	-	Convener
2.	Deputy Project Director	-	Joint Convener
3.	Safeguard Focal Person (Concerned Executive Engineer)	-	Member
4.	Environmental Expert, DMS, DWSNIP	-	Member
5.	Resettlement Expert, DMS, DWSNIP	-	Member
6.	Team Leader, Resettlement (NGO SAMAHAR)	-	Member
7.	Affected Person (APs)/Representative (if applicable)	-	Invited Specially

GRC at PCU Level:

1.	Executive Engineer (Concerned MODS Zone)	-	Convener
2.	Safeguard Focal Person (AE/SDE, (Concerned MODS Zine)	-	Member
3.	Team Leader, Resettlement (NGO SAMAHAR)	-	Member
4.	Resettlement Officer of Concerned Civil Works Contractor	-	Member
5.	Ward Councilor/Female Ward Councilor (Concerned City Corporation)		-Member
6.	Affected Person (APs		-Invited Specially

300. The office notification is attached in **Appendix 10** (Bangla version)

301. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes that have

already been installed by project or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaint register in the project office.

Grievance Redress Process

302. Grievances received and responses provided will be documented and reported back to the affected persons. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the offices of the different Zonal office of DWASA and web. Project-affected people can also send their grievances directly to ADB through the Bangladesh Resident Mission and/or to ADB's Accountability Mechanism.

303. In case of grievances that are immediate and urgent in the perception of the complainant, the contractor, 'NGO SAMAHAR' and DMSC on-site personnel will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact phone numbers and names of the concerned PCU safeguard focal person and contractors; will be posted at all construction sites at visible locations.

a. 1st Level Grievance

304. The phone number of the PCU Zonal office should be made available at the construction site signboards. The contractors, NGO Representative and PCU safeguard focal person can immediately resolve on-site in consultation with each other, and will be required to do so within 7 days of receipt of a complaint/grievance.

b. 2nd Level Grievance

305. All grievances that cannot be redressed within 7 days at field/DMA level will be reviewed by the grievance redress committee (GRC) of PCU headed by Concerned Executive Engineer of MODS Zone- 1 with support from PCU designated safeguard focal person, Team Leader NGO, Resettlement Officer of **TCEL** and Ward Councilor (DSCC). GRC will attempt to resolve them within 15 days The PCU designated safeguard focal person will be responsible to see through the process of redress of each grievance.

c. 3rd Level Grievance

306. The PCU designated safeguard focal person will refer any unresolved or major issues to the PMU safeguard focal person and DMSC environmental and resettlement specialists. The PMU in consultation with these specialists will resolve them within 30 days.

307. 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.

308. Affected Person also can use the ADB Accountability Mechanism through directly contact (in writing) to the Complaint Receiving Officer (CRO) at ADB headquarters or to ADB Bangladesh Resident Mission (BRM). The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will include in the project information document (PID) to be distributed to the affected communities, as part of the project GRM

309. **Consultation Arrangements.** This will include group meetings and discussions with affected persons, to be announced in advance and conducted at the time of day agreed on with affected persons and conducted to address general/common grievances; and if required with the Environment/Resettlement Specialist of PMU/DMSC for one-to-

one consultations. Non-literate affected persons/ vulnerable affected persons will be assisted to understand the grievance redress process, to register complaints and with follow-up actions at different stages in the process.

310. Record-Keeping. Records will be kept by PMU/PCU Office/Contractors' site office of all grievances received including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were in effect, and final outcome.

311. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the offices of the different MODS zone of DWASA and web. The phone number where grievances are to be recorded will be prominently displayed at the construction sites.

312. **Periodic Review and Documentation of Lessons Learned.** PMU will periodically review the functioning of the GRM and effectiveness of the mechanism, especially on the Project's ability to prevent and address grievances.

313. All costs involved in resolving the complaints (meetings, consultations, communication and reporting / information dissemination) will be borne by PMU.

314. GRC activation meeting will be held at PCU level, MODS Zone 7. Complaints Box regarding grievances and suggestion on civil works will be available at MODS Zone 7 office.

315. **Recordkeeping.** Records will be kept by PMU/PCU office (Zone 7)/Contractor's site office of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were affected and final outcome.

316. **Periodic Review and Documentation of Lessons Learned**. PMU will periodically review the functioning of the GRM and effectiveness of the mechanism, especially on the Project's ability to prevent and address grievances.

317. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

318. **GRM for the labourers/workers.** PMU has been taking initiatives to ensure that the contractor will also have a GRM for the laborers/workers through the following ways during civil works:

- Monitoring by Contractor and Resettlement NGO
- Meeting/FGD with the worker/laborers by Contractor, NGO and DMSC
- In the GRC meetings, such issues will be discussed

319. It is also mentionable that in PCU level, Resettlement Officer of concerned Contractor and Team Leader of Resettlement NGO are nominated in the GRC. They are assigned to supervise and coordinate the overall activities of grievance redress.

8. ENVIRONMENTAL MANAGEMENT PLAN

A. General

320. This updated EMP based on model design aims to (i) provide critical facts, significant finding, and recommended actions; (ii) present the set of mitigation measures to be undertaken to avoid, reduce, mitigate, or compensate for adverse environmental impacts; (iii) to describe the monitoring measures and reporting procedures to ensure early detection of conditions that require particular mitigation measures; and (iv) identify responsibility for carrying out the mitigation and monitoring measures.

321. The EMP will guide the environmentally-sound construction of 1 DMA of NCB 02.12E and ensure efficient lines of communication between DWASA, PMU, DMSC and Design Build Contractors. The EMP identifies activities according to following three phases of development: (i) Pre-Construction Activities; (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

322. The purpose of the EMP is to ensure that the activities are undertaken in a responsible non-detrimental manner with the objectives of: (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with. The contractor of NCB 02.12E will be required to submit to PMU for review and approval site specific environmental management plan (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 at **Table 37** of the Environmental Mitigation Action Plan to ensure no significant environmental impacts; (iii) monitoring program as per SEMP; and (iv) budget for SEMP implementation. No works are allowed to commence prior to approval of SEMP.

323. For civil works, the contractor will be required to (i) establish an operational system for managing environmental impacts (ii) carry out all of the monitoring and mitigation measures set forth in the EMP; and (iii) implement any corrective or preventive actions set out in safeguards monitoring reports that the employer will prepare from time to time to monitor implementation of this IEE and EMP. The contractor shall allocate a budget for compliance with these EMP measures, requirements and actions.

324. A copy of the EMP/approved SEMP must be kept on site at all times during the construction period. The EMP has been made binding on all contractors and included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

325. The Contractor is deemed not to have complied with the EMP/approved SEMP if:

(i) Within the boundaries of the site, site extensions and haul/ access Roads there is evidence of contravention of clauses.

(ii) If environmental damage ensues due to negligence.

(iii) The contractor fails to comply with corrective or other instructions issued by the PMU/DMSC within a specified time.

(iv) The Contractor fails to respond adequately to complaints from the public

B. Design Rationale

326. Necessary re-adjustments in Detailed Design stage to create conformity between EMP and design - this means mitigation through avoidance. Built-in inherent negative impacts can be invited through an unsound design and most negative factors can be avoided (eliminated) through the use of improved and environmentally sound technical design. Usually the engineer, find a compromise somewhere in between to adjust with available finances. As the detailed design of the project is now available, necessary re-adjustments in the EMP have been made in the light of detailed design features and the processing of salient features of IEE/EMP have been brought to the notice of design-built contract i.e., the civil works contractor who will also prepare detailed design. They have the option to avoid as many adverse factors as possible through design adjustments. **Table 30** (Chapter V) shows the Salient Features of various design and construction parameters which will consider during detailed design. International best practices (**Appendix 5** –Applicable Environmental Standards) based on ADB SPS requirements on pollution control and abatement have also been incorporated in the design.

C. Implementation Arrangement

327. The project is being implemented through the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC). DWASA is both the EA responsible for the management, coordination and overall technical supervision of the program, and the IA responsible for supervising construction of the infrastructure and conducting the non-infrastructure elements.

328. DWASA has established a Project Management Unit (PMU), responsible for day-to-day management of the program, including tendering and selection of contractors, construction supervision, monitoring and evaluation, and compliance with safeguards policies. The PMU is headed by a full-time Project Director (PD) in the rank of Additional Chief Engineer (ACE). In addition, there are 2 (two) dedicated Deputy Project Directors (DPDs) in the rank of Superintending Engineer (SE) Level.

329. Project coordination unit (PCU) in Zone 7(for 1 DMA), headed by an executive engineer, will be responsible for liaising and coordinating with the contractors, DMS, N G O , and other stakeholders on all day-to-day implementation of distribution network improvement work under the project. To strengthen the PCU in conducting these activities and addressing their day-to- day O&M issues, DWASA will assign additional staff for the project period.

330. DWASA is being be assisted by an inter-ministerial Project Steering Committee (PSC), to provide policy guidance and coordination in the implementation of the program. The PSC meeting will be convened by LGD. Its membership will include the Managing Director, DWASA; Project Director of PMU; representative from Dhaka City Corporation; representative from the Economic Relations Division and the Finance Division of MoF; the Planning Commission; the Planning Monitoring and Evaluation Division; RAJUK (Capital Development Authority); LGED, Ministry of Environment and Forestry; and ADB representative as observer.

331. A Zonal Level Coordination Committee (ZLCC) will monitor implementation of the program at local level in each zone, and will report to the PSC.

332. The organizational structure is shown in Figure 11.

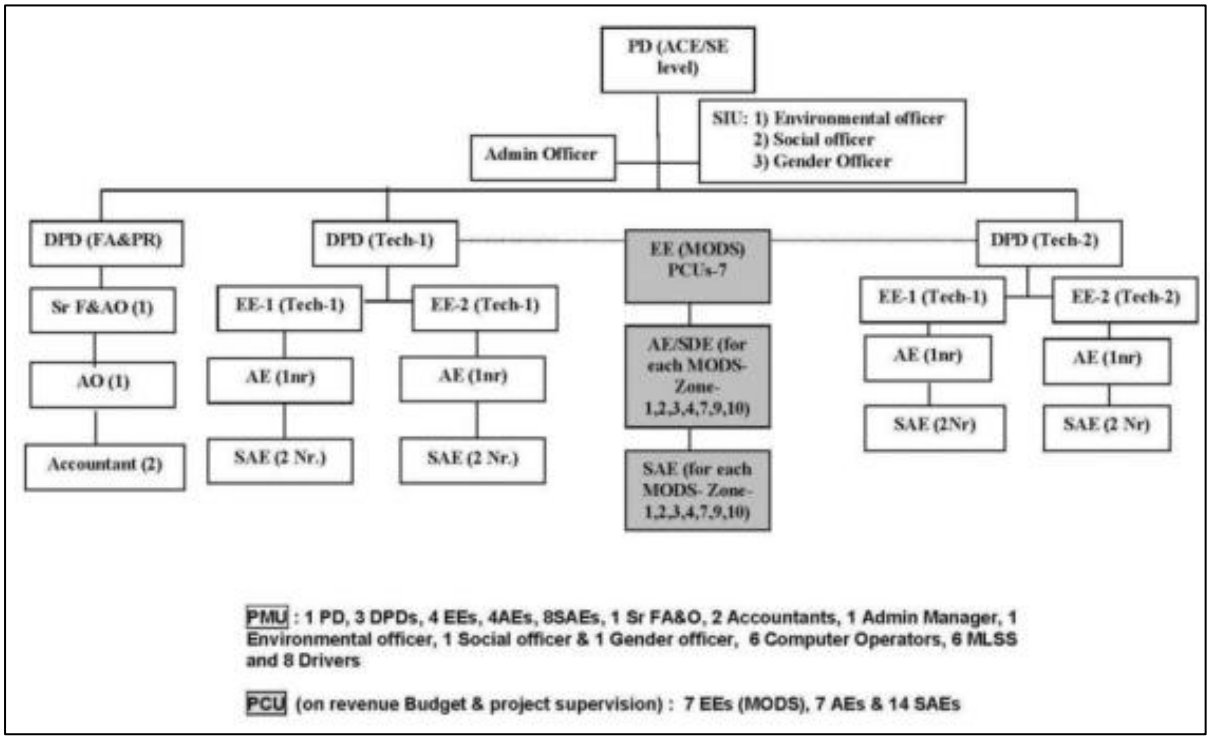


Figure 11: Organizational Structure of PMU and PCU

333. The Environmental Officer in the SIU, assisted by the environmental specialist on the DMS team, will oversee implementation of environmental safeguards work under the project, including the following activities: (i) update draft IEEs/EMPs prepared during detailed designs in accordance with ADB's Safeguards Policy Statement (SPS, 2009) and Environmental Conservation Rules (ECR 1997) and submit to ADB for review, final approval, and disclosure prior to commencement of works (note: a single document will be finalized to fulfill ADB and government environmental impact assessment [EIA] requirements); (ii) facilitate and confirm overall compliance with Government of Bangladesh rules (e.g., ECR)[32] oversee timely preparation and finalization of EIA by contractors, and obtaining all required clearances and environmental permits in timely manner prior to construction; (iii) monitor EMP implementation by the contractors during construction including all mitigation measures and environmental parameters (air and water quality, noise, etc.) and taking corrective actions where necessary; (iv) address and record grievances through the Grievance Redress Mechanism in a timely manner, and taking quick corrective actions where necessary; and (v) review monthly environmental monitoring reports submitted to DWASA by contractors and consultants, and submitting semi-annual environmental monitoring reports to ADB. All semi-annual monitoring reports submitted to ADB will be disclosed on ADB's website, as per ADB safeguards and communication policies.

334. PMU and DMS Environmental Specialist has already been mobilized. The respective zonal executive engineers are responsible for environmental issues in PCU level. The contact details for them are as follows:

[32] The contractor of civil works packages will update the draft IEE in the process of preparing the government EIA based on detailed designs, and the DMS will then review the documents. Note: a single document will be finalized to fulfill ADB and government EIA requirements under the project. For ADB purposes, the document is called an IEE, and for government purposes, it is called an EIA.

Safeguards Team

Name	Designation/Office	Email Address	Contact Number
PMU			
1. Ershadul Haque	Executive Engineer (Focal person: Gender)	Milon.buet96@yahoo.com	+8801712104097
2. Jenny Chakma	Executive Engineer (Focal person: Environment)	tongla11@yahoo.com	+8801553266545
3. Wahida Begum	Assistant Engineer (Resettlement focal point)	Rupa_0215@yahoo.com	+8801716257477
PCUs			
1. Mr. Lemon	Executive Engineer MODS Zone-7	engrlemondwasa@yahoo.com	+8801763051234
DMS			
1. Jannatul Ferdous Barsha	Environmental Inspector	engr.barsha12@gmail.com	+8801755388383

335. **Civil works contracts and contractors.** IEEs are to be included in bidding and contract documents. The PMU and DMS 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.

Contractor's responsibilities:

Preconstruction stage:

(i) Understand the EMP requirements and allocate necessary resources (budget, staff, etc.,)
(ii) Understand the regulatory compliance requirements related to labor welfare, safety, environment etc.
(iii) Conduct baseline environmental condition monitoring for air, water, and noise quality in the project area prior to civil works and include in SEMR the results of the baseline environment condition.

Construction stage:

(i) Ensure that all regulatory clearances (both project related and contractor related) are in place before start of the construction work.
(ii) Mobilize EHS officer prior to start of work
(iii) Confirm with PCU availability of rights of way at all project sites prior to start of work.
(iv) Update site specific EMP
(v) Prepare Method Statement and get it approved prior to start of work

- Construction waste management (CWM) plan
- Traffic management (TM) plan
- Occupational Health & Safety (OHS) Plan

(vi) Implement the mitigation measures as per the EMP including CWM & TM Plans
(vii) Finalize sections for use of trenchless technology considering technical, environmental and social safeguard aspects with the coordination of DMSC and PMU
(viii) Follow the EMP measures/guidelines for establishment of temporary construction camps, construction waste disposal sites, and material storage areas, etc.
(ix) Implement EMP and ensure compliance with all the mitigation and enhancement measures
(x) Conduct environmental monitoring (air, noise, water etc.,) as per the EMP
(xi) Undertake immediate action as suggested by PCU / PMU / DMSC to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation
(xii) Submit monthly Environmental Monitoring Reports on EMP implementation
(xiii) Act promptly on public complaints and grievances related to construction work and redress in a timely manner in coordination with NGO/DMSC
(xiv) Comply with applicable government rules and regulations
(xv) Site clean-up and restoration including clean up and disinfection of pipelines prior to supply

336. The contractor will appoint an Environment, Health and Safety (EHS) supervisor/nodal person to implement EMP. The EHS Supervisor will update the EMP and submit a SEMP for approval of PMU. Contractors will carry out all environmental mitigation and monitoring measures outlined in EMP, approved SEMP and their contracts.

337. NCB 02.12E Contractor has already appointed Environmental Officer, Resettlement Officer and Health and Safety Officer for implementation of EMP during civil works construction. The details are follows:

Name	Designation	Contact no.
Md. Jakirul Islam	Environmental Officer	+8801839697069
Md. Emon Afroj	Health, Safety Officer (HSO)	+8801925155247
Md. Anower Hossain	Resettlement Officer	+8801678224507

Source: NCB 02.12E Civil Contractor, September 2023

338. Organizational procedures/institutional roles and responsibilities for the safeguard's implementation are described in Table 35.

Table 35: Institutional Roles and Responsibilities for Safeguards Implementation

Activities	Agency Responsible
Disclosure of proposed project and anticipated social and environmental impacts on website	ADB, DWASA
Disclosure of proposed project, social/environmental impacts, proposed entitlements/mitigation measures in local languages	DWASA
Disclosure of grievance redress mechanism/process	PMU, DMSC, PCU, ZLCC Nongovernment organization (NGO)- Resettlement

Activities	Agency Responsible
Finalization of sites and alignments	PMU, DMSC, Contractors
Identification of roads for closure, existing utilities, road conditions	PMU, DMSC, Contractors
Updating of safeguard documents (IEE and RP) based on detailed design	DMSC with assistance from contractors and NGO
Review of updated RP/IEE and send to ADB for approval prior to contract award	PMU
Clearance and disclosure of updated safeguard documents	ADB, DWASA
Conducting transect walks through road stretches to identify extent of impacts	DMSC, Contractor, NGO
Conducting meetings at community/household level with affected persons (APs)	DMSC, Contractor, NGO
Design/implementation of detailed measurement survey (DMS)[33] on roads identified for full/partial closure; identification of poor and vulnerable Aps	DMSC, NGO
Computation of entitlements	PMU, DMSC
Categorization of APs for finalizing entitlements	DMSC, NGO
Conducting focus group discussions/meetings/consultations/workshops during DMS survey and updating safeguards documents	PMU, DMSC, NGO
Finalizing entitlements and rehabilitation packages for all Aps	PMU DMSC, NGO
Disclosure of final entitlements and rehabilitation packages	PMU, DMSC, NGO
Delivery of entitlements/award of checks	PMU
Implementation of mitigation and rehabilitation measures	PMU, DMSC, Contractor
Consultations with APs during rehabilitation activities	DMSC, Contractor, NGO
Grievance redress	PMU, DMSC, NGO, Contractor
Internal monitoring	PMU, DMSC

D. Capacity Building

339. In the Weekly assembly, a short ES&H lecture session is the continuous process implementing the EMP at the survey and design level (photo attached). Before the construction training and orientation session will be arranged.

340. Program would be organized by the Environmental Specialist of DMSC and PMU for the contractors, laborers, and technical and office staff of the contractors, site engineers (ARE) of DMSC and the relevant staff of the PCU for building their capacity with regards to principles and procedures of environmental management, pollution abatement measures, public consultation and participation, health and safety measures, grievance redresses mechanism and implementation of EMP.

[33] Detailed measurement survey to be carried out during detailed design, to record and quantify resettlement impacts and entitled persons.

Table 36: Indicative Capacity Building and Training Program

Description	Contents	Schedule	Participants	Remarks
Program 1 Seminar Training on the review of ADB SPS and basic principles of construction safety and health.	(i) review of the ADB's SPS SR1; (ii) guide and pointers for the site-specific environmental assessment and mitigation plan (SEMP); (iii) good practices and basic principles of construction health and safety; and (iv) challenges encountered in the site-specific environmental management plan (SEMP) and OHS measures implementation	½ day	The concerned	Will conducted at a convenient time as soon as the COVID situation improves.
Program 2 Orientation workshop	Orientation ADB Safeguards Policy Statement • ADB Safeguards Policy Statement (ADB SPS)-Safeguard-Requirement 1-Environment • ADB Safeguard Policy Statement (2009) Policy Principles and Requirements-Safeguard Requirement: Involuntary Resettlement and Indigenous People • Implementation of Social Safeguard Policies	1 day	The concerned	Will be conducted may be virtually if the COVID situation stands longer.
Program 3 Classroom Training on procedure of installing new pipes in an area with an existing AC Pipe	• Identification of AC Pipes along the existing pipeline • Mapping of AC Pipes • Guidance provisions for Asbestos Cement Pipes • Procedure for handling AC Pipes during installation of	1/2 day	The concerned	Classroom Training on procedure of installing new pipes along the alignment having AC pipe as soon as the pipe installation work is started

Description	Contents	Schedule	Participants	Remarks
	new pipes			
Program 4 Occupational Health and Safety Training	Able to knowledge about impacts on occupational, health and safety during construction works	1/2 day	PMU, PCU, DMS, Contractors	Discussing the issue in Weekly assembly. Combined program will be conducted soon.
Health and Safety training to mitigate threat related COVID-19	Able to knowledge all the necessary information about COVID-19 and its impact on human body.	1/2 day	The concerned	

341. Safeguards review meeting and orientation training program on safeguards issues and Safeguards Review Meeting will be conducted.

Environment and Safety – Review Meeting

- Submission of compliance report against site observation and as per direction of DMSC
- Timely submission of SEMR documents
- Carry out air, noise and water quality monitoring - quarterly monitoring. All baseline monitoring needs to be completed prior to start of civil works
- Caution- project display board – contact numbers – emergency, contact number of safety officer, contractor's contact number and DMSC office phone no for any grievances
- Use of caution tape, barricade, occupational (no use of proper shoes, hand gloves) and community safety.
- Implement good housekeeping practices at the storage area, stack yard area and work site.
- Labor and Office Camp site management- requirement of proper sanitation and solid waste management
- Disposal / utilization of overburden earth, rocks, spoil materials after work
- Traffic management during laying of pipes (as per requirement)
- Strictly implement health and safety measures and audit on a regular basis
- Firefighting facilities (Fire Extinguisher, sand bucket) at vulnerable work sites/ site office. Regular checking of expiry date of firefighting equipment. Refilling immediately as per requirement
- Arrangement of sufficient light at night work location
- Additional Health and Safety Plan for implementing COVID 19 pandemic

E. Mitigation Measures, Monitoring and Reporting

342. Environmental Mitigation Measures Action Plan (**Table 37**) describes in details the project activities and mitigation measures, responsible agencies for implementation and monitoring mechanism during preconstruction, construction and operation phases of DMA under NCB 02.12E, as updated by the DMS Consultants in close coordination of contractors, during the detailed design stage of DMA 705. Updating of IEE/EMP will be a continuous process which will be done as detailed design of DMA advances. Note that the final IEE/EMP should be reviewed and cleared by DWASA and ADB at time of detailed design of the DMA and prior to commencement of construction work.

343. The Mitigation Plan points out that most measures are the usual good engineering practices. The effectiveness of the measures will be evaluated based on the results of the environmental monitoring and inspection to determine whether they be continued or improvements should be made. Improvements need to be confirmed through stipulated environmental management procedures.

344. Environmental Mitigation Measures Action Plan indicate Site specific mitigation measures by the Contractor for their contractual obligations (Section 6 & 8) and following recommended steps suggested by ADB from previous cleared draft IEE in January 2016.

345. **Environmental monitoring program.** A program of monitoring will be conducted: (i) to ensure that all parties take the specified action to provide the required mitigation, (ii) to assess whether the action has adequately protected the environment, and (iii) to determine whether any additional measures may be necessary. Most measures will be checked by simple observation, by checking of records, or by interviews with residents or workers. This will be coordinated by the PMU and DMS Environmental Specialist (ES). The ES will be responsible for all monitoring activities and reporting the results and conclusions to the PMU, and will recommend remedial action if measures are not being provided or are not protecting the environment effectively. The ES is being assisted by full time Environmental Inspector who makes many of the routine observations at the various construction sites. Post-construction monitoring will be conducted by DWASA as part of their overall management of the operating distribution system

.

Table 37: Environmental Mitigation Measures Action Plan

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
Planning and Design Stage							
Safeguard Compliances during preparatory stage	• Be familiar with the present traffic congestion in the construction areas and taking road cutting permission from DSCC. • Arrange for temporary water supply for the HH water supply disruption due to works • Protect all underground and over ground utility services around (gas, telephone electricity etc.) • The following surveys are to be completed prior to detailed design: ○ Existing service connection survey ○ Road surveys ○ Initial status photography ○ Existing utilities survey (tracing and/or excavation of trial pits	Contractor	DMS/PCU/PMU	• Road cutting plan • Arrangement for temporary water supply • Disruption to utilities	As required in the program of performance	N/A	• Conducted survey to identify the type and exact location of the buried water lines and also other utility services by GPR Survey.
Pipe replacing, rehabilitate and network extension	• The network expansion in the subproject areas will be through trenchless or conventional trenching methods with cover depth of 1.0 meters.	Contractor	DMS/PCU/PMU	• Residual design life and proposed method of repair	As required in the program of performance	Each DMA sites	Maintaining minimum coverage 1.00 m for all the pipes installation other than utility Ground problems areas.
Working hours and times	• All work in major roads and on minor roads that are heavily used by traffic will only be permitted at night	Contractor	DMS/PCU/PMU	Work hours	As required in the program of performance	Each DMA sites	

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	between 7:00 pm and 7:00 am. • All the minor roads and alley with less traffic may be considered for both day and night working provided alternative passageway can be maintained.						
Road Crossing	• Trenchless Technology method or open trench method are recommended for road crossings. In case of narrow streets, by lane, open trench method is recommended for road crossing to minimize the traffic. • Use Horizontal Directional Drilling (HDD) method after making sure that no other utilities are in the way of drilling equipment.	Contractor	DMS/PCU/PMU	Construction method statement	Construction method of statement	Each DMA sites	About 35% pipeline are expected to be installed through open trench method
Road Cutting	• Unnecessary road cutting to be avoided. • The contractor will take all necessary safeguards to avoid accidents at site, • The contractor will take road cutting permission from DSCC with proper road cutting plans. • Every works shall be proceeded with final design and proper road cutting plan. • The contractor shall follow traffic management plan,	Contractors for preparation of road cutting plan, application for permission, and payment for pavement restoration	DMS/PMU DSCC for issuance and monitoring of pavement compaction	• Road category along pipe alignments • Budget allocation for pavement restoration • Road Cutting Plan • Road cutting permission from DSCC	Prior to start of works (trial pit and layout of pipes)	Each DMA sites	Obtaining segment wise road cutting permission of the DMA by depositing the money as per Demand note from the respective zone of DSCC. The one stop cell meeting gap is 30 to 45 days causing delay to the project

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	signal and protection works						progress.
Road Excavation	• Pipes shall be installed by the horizontal directional drilling (HDD) as required. • The contractor shall provide sediment and erosion control and shall clean the conduit. • The contractor shall be responsible for cleanup and restoration • Excavated pits shall be backfilled and disturbed areas shall be restored properly. And gutters or other permanent improvements damaged during HDD operations shall be repaired or replaced at the contractor's expense.	Contractors for preparation of road cutting plan, application for permission, and payment for pavement restoration	DMS/PMU DSCC for issuance and monitoring of pavement compaction	• Road category along pipe alignments • Budget allocation for pavement restoration • Road Cutting Plan • Road cutting permission from DSCC	Prior to start of works (trial pit and layout of pipes)	Each DMA sites	Waiting period for road cutting permission from DSCC is causing the delay in starting the implementation. The Flag man with a road supervisor work for traffic diversion will be stand by as when necessary. Maximum HDD method of installation are in use for the wide roads. Road restoration are done as soon as the pipe installation is completed.
Trenchless pipe installation	● Pipes shall be installed by the horizontal directional drilling (HDD) methods as and where required. Should survey information indicates that the method is not feasible the contractor shall inform the Project Manager and gain prior approval for an	Contractor	DMS/PMU	●Program of Performance ● Plan for locating, exposing and reconnecting service connections ● Proposed pit size and	As required in the program of performance	Each DMA sites	

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	alternative method or for open trench method. ● Excavation material shall be removed from the conduit as the work progresses. No accumulation of excavated material within the conduit will be permitted. ● The contractor shall provide sediment and erosion control measures in accordance with local environmental legislation. ● The contractor shall take all necessary precautions to minimize the damage to the adjacent properties. ● The contractor shall be responsible for cleanup and restoration • Pits excavated to permit connection of bored pipe shall be backfilled, and disturbed areas shall be restored to their original state or better. Sections of sidewalks, curbs, and gutters or other permanent improvements damaged during HDD operations shall be repaired or replaced at the			location ● Temporary water supply plan ● Plan for consumer notification ● Traffic Management Plan			

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	contractor's expense.						
O&M manuals catalogues	• The contractor shall supply catalogues and installation manuals for each type of pipes to DWASA at the time of submission the Operation and Maintenance manuals. • All catalogues and manuals shall be printed in the English language or accompanied by an English translation.	Contractor	PMU/DMS	Program of Performance	Completion of civil works and decommissioning	N/A	Mentioned in bidding documents (Article 2.10.9-Section 6.22-Employer's Requirements
DTW upgrade/ rehabilitation	• Almost all the plants of the head work, delivery line and fittings are to be replaced to introduce SCADA system. - Prior notice to be given to the inhabitants regarding the timing of plants fitting and construction of delivery line. - New plants and fittings of appropriate quality and measurement to be checked - In case of longer duration temporary water supply arrangement to be made available. • Existing tube well compound to be cleared of all unused materials and keep the area clean for starting the headwork and delivery lines - Delivery line and space for construction and connecting the network to be rightly selected.	Contractor	PMU/DMS	Program of Performance	As required in the program of performance	Each DMA sites	

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
Prior to construction phase							
Resettlement Plan	• Update Resettlement Plan according to detailed design and submit to PMU/ADB for approval • Implement updated RP approved by ADB • No civil works will begin until all compensation to affected persons is paid	Resettlement NGO with assistance from contractor and DMS	PMU/ADB	• Proper and satisfactory involuntary resettlement for all PAPs following GOB and SPS-ADB guidelines.	After updating RP for Third Batch, before commencement of civil works	1 DMA under 02.12E	Updated RP for the first phase submitted to PMU for approval
Prepare final IEE/EMP	• Update IEE/site specific environmental management plan (SEMP) based on detailed design • Submit to ADB for approval and disclosure	Contractor will update with the assistance from DMS & PMU submit to ADB	PMU	• Site specific EMP as of updated IEE/ EMP	After completion of detailed design and prior to commence of civil works	1 DMA under 02.12E	Updated IEE submitted
Safeguard Supervisors	• The Contractor shall appoint one EHS supervisor and one Resettlement Supervisor who will be responsible for assisting contractor in updating IEE/Site specific EMP; assisting NGO for updating RP, coordinating with DMS Environmental and Resettlement Specialist; community liaison, consultation with interested/affected parties, reporting and grievance redress on a day to day basis ; Timely submission monthly of monitoring reports including documentary evidence on EMP implementation such	Contractor	DMS-Environmental Specialist and Resettlement specialist	Hiring and actual work	As work progresses	N/A	Environmental Officer, Resettlement Officer and Health and Safety Officer has already appointed.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	as photographs.						
Consents, permits, clearances, No objection certificate (NOCs) etc.	Obtain all necessary clearance from concerned authorities like DSCC, DWASA, and other concerned stakeholders and authorities	Contractor	PMU (Environmental Expert) and DMS (Environmental Specialist)	All applicable permits and approvals	Prior to commencement of civil works and as necessary	Each DMA site, Contractor's office	PMU obtained ECC from DOE prior to construction work and Applied for road cutting permission on 16.05.22 for starting of the 02.12E
Environmental Monitoring report	• Submit to ADB semi-annual environmental monitoring report	Contractor with the assistance from DMS to prepare PMU submit to ADB	PMU	EMP Contract provisions	Semi Annual	N/A	
Education of site staff on general and environmental conduct	• Ensure that all site personnel have a basic awareness training and Staff operating equipment shall be trained up also • All employees must undergo safety training.	Contractor	PMU and DMS	Records of training	Prior to start of civil works and every new employee	N/A	Already training and lecture session is running on weekly basis. during the Survey and Design period. All equipment operating training will be ensured.
Identify the disposal sites	The contractor shall identify safe disposal site and will take permission from PMU	Contractor	DMS/PMU	Approved disposal sites	As work progress	As identified	Respective DMA have their DSCC Disposal Site. And at Diyabari, Uttara, Dhaka
Establish the lay down and storage area	The site shall be in isolation (as possible) with proper impervious layer at the top	Contractor	DMS/PMU	Approval of location and facilities	Prior to moving onto site and during site	As identified	Stockpiles and storage areas are selected at Diyabari, Uttara

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
					set-up		area
Sources of materials	As specified in the specification of bidding document	Contractor	DMS/PMU	Bid documents	As work progress	As Identified	As per technical specification
Asbestos Cement Pipes	Careful location of AC pies and with no disturbance to other settings around	Contractor	DMS/PMU	Maps showing inventory of AC Pipes	As work progress	As Identified	During survey, No AC pipes were identified.
Environmental Baseline Test (air quality, noise level, water quality)	• Air, water (surface & ground water), noise level should be tested every DMA prior to construction.	Contractor	DMS/PMU	Parameters are mentioned in the table 18, 19 & 20	Three locations per DMA	As Identified	During reporting period, the baseline monitoring yet to be done. It will be done before construction of work
Construction stage							
Safety, security and protection of the environment	• Take all necessary precautions against pollution or interference with the supply or obstruction of the flow of, surface or underground water. These precautions shall include but not be limited to physical measures such as earth bunds of adequate capacity around fuel, oil and solvent storage tanks and stores, oil and grease traps in drainage systems from workshops, vehicle and plant washing facilities and service and fueling areas and kitchens	Contractor	DMS/PCU/PMU/DoE	• ECC Provisions • Program of Performance • Waste Management Plan • Complaints from Community	• As required in the Program of Performance • As work progress	Project influence area of 1 DMA	All vehicle and equipment cleaning and maintenance will be done at the Central workshop compound

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	• Establish sanitary solid and liquid waste disposal system • Should any pollution arise, clean up the affected area immediately at his own cost and to the satisfaction of the Project Manager, and pay full compensation to any affected parties.						
Protection of waterways	• Protection of soil from chemical or harmful contamination • Safe disposal of vehicle or plant washing • Prohibition of vehicle washing at project sites. • All substances required for vehicle maintenance and repair must be stored in sealed containers until they can be disposed of removed from the site.	Contractor	DMA, PCU, PMU	ECC Provision or GRC issues	As work progress	Project influence area of 1 DMA	
Setting the Labor Camp	• Choice of site for the contractor's camp requires the Project Manager permission and must take into account location of local residents, businesses and existing land uses, including flood zones and slip / unstable zones. A site plan must be submitted to the Project Manager for approval. • If the Contractor chooses to locate the camp site on	Contractor	DMS, PCU, PMU	Approval of Site layout Plan and facilities	Prior to start of civil works As work progress	As Identified	Temporary labor camp are being established within the DMA boundary with a healthy environment. Having pure drinking water and sanitation facility.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	private land, he must get prior permission from both the DMSC Environment Specialist and the landowner. • The contractor shall make adequate provision for temporary toilets for the use of their employees during the construction phase. Such facilities, which shall comply with local authority regulations, shall be maintained in a clean and hygienic condition. Their use shall be strictly enforced. • Bins shall have liner bags for efficient control and safe disposal of waste						
Handling of surface water, flooding event, heavy downpour etc.	• Protect the working area including pits, trenches, materials, machineries and equipment from any damage due to inundation by downpour. • Ensure not to make any congestion in the open drains or natural or artificial channels by any of his activity. • Take necessary measure to bring the site to the condition prevailing before the downpour without delay. Necessary measure has to be taken so that storm water does not get	Contractor	DMS, PCU, PMU	• Program of Performance • Biweekly 6 weeks running plan • On site record book	As work progress	Project influence area of 1 DMA	Road side storm drainage/natural channel will be used as discharging points to the nearby catchment of the respective DMA. Flat lay pipes will be used for road crossing of the delivery system.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	into the newly installed pipelines. • Be particular in keeping updated weather forecast and maintain a record book at site in which weather condition is recorded.						
Handling of Excavated materials	• The Contractor can process the excavated materials at the disposal site and use these as selected backfill materials • Hauling vehicles must always be present at the excavation site	Contractor	DMS, PCU, PMU	• Program of Performance • Biweekly 6 weeks running plan • On site record book • Complaints from stakeholders	Prior to start of civil works As work progress	Each DMA site, disposal site	Calculated total volume of surplus soil for 1 DMA shall be carried safely to dispose near Diyabari, Uttara, Dhaka.
Minimum public disturbs	• Restrict works and keep accessible for the inspection by competent authority • Ensure, no disturbance to public during night works • Proper road signage with alternative routes for the vehicles to be ensured including adequate signs and lightings at night • Ensure all entrances to their properties without any hazardous and objectionable matter.	Contractor	DMS, PCU, PMU	• Program of Performance • Inventory of utilities, signs and barriers • Access to paths, steps, crossings or drives for all entrances to property • Complaints from stakeholders • Records of disclosure and public	• Prior to start of civil works (per pipe section) • During pipe laying/bursting • As work progress	Each DMA sites	
Awareness to the HHs with problems of having supply	• Submit detailed work plan for the particular portion of the work to the	Contractor Awareness	DMS, PCU, PMU	• Program of Performance • Inventory of	• Prior to start of civil	Each DMA sites	Detailed plan already submitted to PMU.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
water during works running	Project Manager for approval. • Before setting out for the work, inform the inhabitants, businesses and consumers through appropriate means (bill board display, leaflet distribution, using color papers and other means	NGO		utilities • Proper liaison with owners and operators • Complaints from stakeholders and affected people	works (per pipe section) • During pipe laying/bursting		
Provision for security of the sites	• Be responsible for guarding all utilities, plants equipment, material, etc. delivered on sites and for ensuring that all sign, lights, fences, etc. are in their proper place. • Provide, install and maintain suitable barriers and/or fences to protect the facilities, constructions camp, storage yard, existing facilities and construction and installation operations and to remove same when no longer required by DWASA, or at completion of the project.	Contractor	DMS, PCU, PMU	• Program of performance • Signs and barriers • Security measures in place	• Prior to start of civil works (per pipe section) • During pipe laying/ bursting • As work progress	Each DMA site	Proper arrangement shall be made for guarding all utilities, plants equipment, material, etc. delivered on sites and for ensuring that all sign, lights, fences, etc. will be in their proper place.
Protection of trees and vegetation	• Ensure that no trees or shrubs are felled or harmed except for those required to be cleared for execution of the works. • Ensure no tree shall be	Contractor	DMS, PCU, PMU, DoE	• Program of performance • Complaints from stakeholders • Number of	• As required in the program of perform	As identified	This can be ensured that no vegetation and trees will be fallen or harmed

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	removed without the prior approval of the Project Manager and any competent authorities. • Plant and maintain 5 trees of the same species for every one that is removed.			trees cut and planted	ance • As work progres ses		
Use of wood as fuel	• Not use wood as a fuel for the execution of any part of the works • To the extent practicable, ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodations.	Contractor	DMS, PCU, PMU	• Program of performance • Complaints from stakeholders •	• As required in the program of perform ance • As work progres ses	Each DMA sites, Labour camp	Ensured
Fire Prevention	• Take all precautions necessary ensure that no buildings and supply utilities, etc. or vegetation along the line of the road outside the area of the permanent works is affected by fires arising from the execution of the works. • Follow any instructions of the competent authorities with respect to fire hazard when working in the vicinity of gas installations • Immediately suppress if a fire occurs in the natural vegetation or plantations adjacent to	Contractor	DMS, PCU, PMU	• Program of performance • Number of fire occurrences	• As required in the program of perform ance • As work progres ses	Each DMA sites, Labour camp. stackyard	Well-equipped Firefighting team with modern firefighting device and emergency team will be always stand by at the central store. DMA working team will take care the local minor incidents. Besides there are good numbers of Govt fire brigade station within the area of DMA.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	the road for any reason.						
Handling of traffic and access	• Submit to the Project Manager for approval a traffic management plan and detailed work plan showing activities on hourly basis. • Minimize the work area / barricaded area along the roads to the minimum possible width; • Confine all the activities within in the barricaded area, including material & waste/surplus soil stocking; • Avoid material/surplus soil stocking in congested areas – immediately remove (on the same working day) from site/ or brought to the site as and when required; • Transport material, waste etc., during low traffic periods (e.g., before 8 AM) • Minimize access disruptions to adjacent properties; vehicle access may be controlled however, pedestrian access should always be available; if necessary, provide temporary pedestrian access (e.g.,	Contractors	DMS, PCU, PMU	• Program of Performance • Traffic management plan • Lists and samples of warning signs and barricades	• As required in the Program of Performance • As work progresses	All access and haul roads	Submit the specific Plan and Program of Traffic Planning including road closure program for each DMA before execution of works.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	over the trench) using wooden planks/metal sheets; • Plan transportation (for material and waste) routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites; • At work site, public information/caution boards shall be provided including contact for public complaints • Employ trained flaggers to direct traffic movements in areas with lane closures • Coordinate with Traffic Police for temporary road diversions, where necessary, and or provision of traffic aids if transportation activities cannot be avoided during peak hours						
Minimizing noise level	• Noisy works will be avoided in the night • Proper noise control apparatus (silencers, mufflers etc.,) will be ensured for construction equipment • Noisy works will not be conducted near sensitive places (hospitals, schools, mosque etc.,)	Contractors	DMS, PCU, PMU	• Complaints from community • Noise level monitoring record	• As work progresses	In potential problem area	Noise level monitoring data for baseline will be conducted prior to construction works according to Environmental Monitoring Plan and it will be included in

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	and at sensitive times (prayer time, festivals etc.,); works will be scheduled accordingly • Monitor noise levels in potential problem areas • Ensure noise level of the machineries and equipment must not exceed 70dB (A).						Environmental Monitoring Report. Regular monitoring will be done.
Minimizing dust generation and air pollution	• Site clearance and excavation work will be commenced only after barricading the site • Works and all associated activities (material, soil, debris, equipment, machinery) will be confined to barricaded area • Excavated soil storage will be removed from the site immediately & stored/disposed at identified site • Work will be conducted work sequentially - excavation, pipe laying, backfilling; testing section-wise (for a minimum length as possible) so that backfilling, stabilization of soil can be done • Excavated soil will be removed section-wise,	Contractors	DMS, PCU, PMU	• Program of Performance • Complaints from stakeholders • Vehicle emission testing records	• As required in the Program of Performance • As work progresses	In potential problem area	Air quality monitoring data for baseline will be done prior to start the work and during construction period.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	and used for filling the previous section, this is to avoid stocking of excavated soil • Road restoration will be taken up immediately after backfilling by proper consolidation • Water will be sprinkled adequately (in dry weather) to maintain surface in stabilized and damp condition						
Protecting the community and facilities and locations of social and cultural importance (e.g. schools, hospitals, mosques, etc.)	The following measures shall be implemented within a 50 m radius around the sensitive locations (schools, hospitals, and religious centers): • No material should be stocked in this area; material shall be brought to the site as and when required; • Conduct work manually with small group of workers and less noise; minimize use of equipment and vehicles; • No work should be conducted near the religious places during prayer time; • Material transport to the site should be arranged considering school timings; material should	Contractor	DMS, PCU, PMU	• Program of Performance • Bi-weekly 6 weeks running plan • On-site record book • Complaints from stakeholders • Grievance Redress Mechanism records	As required in the Program of Performance	As identified	• Caution tape and barricade will be provided for public safety especially in the main road, by lanes, near residential area, pit area, pipe laying location, near school and religious places • Provide road signs and flag persons to warn of on-going trenching activities

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	be in place before school starts; • Notify concerned schools, hospitals etc., 1 weeks prior to the work; conduct a 30-minute awareness program on nature of work, likely disturbances and risks and construction work, mitigation measures in place, entry restrictions and dos and don'ts; and • Implement all measures suggested elsewhere in this report – dust and noise control, public safety, traffic management, strictly at the sites. • Overall, the contractor should comply with IFC EHS Guidelines Community Health and Safety.						
Occupational Health and Safety	• Comply all national occupational health and safety laws and rules (See Table 2 of this IEE) • Develop and implement site- specific occupational health and safety (OH&S) Plan, and include in the Site-specific EMP. The OH & S plan will include measures such as: (a)	Contractor	DMS, PCU, PMU	• Occupational health and safety plan • Number of accidents and work-related injuries • Complaints from Community	As work progresses	Each DMA sites, labor camp	Company's health and safety guidelines followed (Appendix 8)

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	excluding public from the site; (b) ensuring all workers are provided with and use personal protective equipment like helmet, gumboot, safety belt, gloves, nose mask and ear plugs;(c) OH&S Training for all site personnel; (d) documented procedures to be followed for all site activities; and (e) documentation of work-related accidents; • Ensure that qualified first-aid can be provided at all times. Equipped first-aid stations shall be easily accessible throughout the site; • Provide medical insurance coverage for workers; • Secure all installations from unauthorized intrusion and accident risks; • Provide supplies of potable drinking water; • Provide H&S orientation • Overall, the contractor should comply with IFC EHS Guidelines on OHS.						
Response to COVID 19 Pandemic	• Design and implement measures in accordance with H&S Plan (addendum	Contractor	DMS/PMU	• Adequate PPE, disinfectant,	Daily	Worksite, Temporary Labor	Proper arrangement will be ensured for All

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
	of Health and safety plan in response to COVID 19 pandemic) to prevent worker exposure.			sanitizer, soap, covered trash bin • Temperature measurement • Social distance • Posters/Signboards		Camp	COVID safety and sanitization and other exclusive social program as per government and WHO guide lines for the working area
Asbestos cement (AC) pipes	• leave asbestos cement pipes in-situ untouched • Follow the procedures prepared by the DMS for installation of new pipes in an area with an existing AC pipe (Appendix 7)	Contractor	DMS, PCU, PMU	• Detailed construction drawings showing alignment of AC pipes • On site observations and records	As work progresses	DMA sites for identified existing AC pipes	Special care will be taken following the guideline to keep them as it is in the trench.
Submission of EMP implementation report	• Appointment of supervisor to ensure EMP implementation • Timely submission of monitoring reports including pictures	Contractor	DMS/PMU	• Availability and competency of appointed EHS officer • Monthly report	Monthly	N/A	EMP implementation report will be submitted on starting of the installation work.
During Commissioning							
Disinfection of Pipes Prior to commissioning, disinfection will be undertaken on the pipeline. Discharge of chlorine above the allowable limits is toxic to fish and	• Measure chlorine residual if within the allowable limit of 0.2 – 0.5 mg/l before flushing, otherwise, treat or dilute prior to disposal into the environment. • Disinfection of pipes in accordance with EN 805, under the supervision of the testing foreman and Site Manager. • Cleaning of pipes, sewers, manholes, etc., if	Contractor	DMS/PMU	• Residual chlorine should be 0.2 – 0.5 mg/l before flushing.	Prior to commissioning	Pipeline	Will be done in accordance with the EN 805 under the supervision of SM.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
other aquatic life.	required as per the contract prior to commission, shall be carried out mechanically, and manual cleaning must be avoided.						
Post-construction phase (prior to turnover to DWASA)							
• Interruption of Water Supply • During execution of the works, stoppage of water supply may occur, necessary measures to be taken to make the water available to the consumers of the working area. This arrangement will be required especially during the time of replacement of the existing connections.	• Plan and execute in such a way the water supply shall be kept in operation with maximum disruptions of one working day (12 hours) • Notify existing users about temporary disruption of water supply if unavoidable. • Provide with alternative water source to disconnected consumers to meet their daily requirement. • In providing water, ensure that the rights of and supply to existing users are not affected either in quality, quantity or timing. • Inform the Project manager in the event of a dispute over the effect of the contractor's arrangements on the water supply of others.	Contractor	DMS, PCU, PMU	• Program of Performance • Number of disconnected consumers • Quantity of supplied water to affected consumers		Each DMA sites	Interception of water supply during execution will be notify timely. And provide with alternative water source.

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
Access	• All excavated roads shall be reinstated to original or better condition.	Contractor	DMS, PMU	Road conditions	Prior to turn-over	Each DMA sites,	This would be reinstated for easy movement of the vehicles.
Utilities and other existing infrastructure	• All disrupted utilities restored • All affected structures rehabilitated/compensated	Contractor	DMS, PMU	All affected utilities	Immediately after civil works	Each DMA sites	Will be done as per requirement.
Construction camps and storage areas	• After construction work, all structures comprising the construction camp are to be removed from site or handed over to the property owner/community as per mutual agreement (if established on private/community land). • The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. • All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be top soiled and re-grassed using the guidelines set out in the revegetation specification that forms part of this document. • The contractor must arrange the cancellation of all temporary services	Contractor	DMS, PMU	General conditions of the area	Prior to end of construction period/demobilization	Labor camp, stack yard	Will be done accordingly

Activity	Mitigation Measures	Responsible for		Parameter to Monitor	Frequency of Monitoring	Location	Remarks
		Implementation	Monitoring				
Waste management	• All wastes shall be removed from the site and transported to a disposal site or as directed by the environment management specialist. Waybills proving disposal at each site shall be provided for the environment management specialist's inspection.	Contractor	DMS, PMU	General condition of the areas	Prior to end of construction period/demobilization	As determined	Will be removed and transported to safe distance / Disposal site.
Operation and maintenance phase (including Defects Liability Period							
Detection and repair of leaks and pipe bursts	Ensure leak detection and restoration time is minimized to the extent possible.		DWASA	Number of reported leaks	As part of operations and maintenance of the improved system	As determined	

F. Environmental Monitoring Plan

346. The monitoring plan is structured by the three phases (site establishment and preliminary activities, construction and post-construction activities) of 1 DMA under NCB 02.12E and consists of environmental indicators, sampling locations & frequency, standards, responsible parties etc. The purpose of the monitoring plan is to determine the effectiveness of the impact mitigations, and to document unexpected positive or negative environmental impacts of the subprojects. The contractor for NCB 02.12E shall update the environmental monitoring plan consistent with its SEMP

Table 38: Environmental Monitoring Plan

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
1. Site establishment and preliminary activities						
Legislation, Permits and Agreements	Cutting Permit for Scheduled Trees if any		-	prior to moving into site and during construction	Contractor	DMS/PMU
	Road cutting permit					
	Copy of EMP	ADB SPS	subproject site, offices, website, etc.	at all times	Contractor	DMS/PMU
Access to site	Existing conditions New development	EMP	all access and haul roads	prior to moving into site	Contractor	DMS/PMU
	Road closures and traffic rerouting if required	Traffic Management Plan and EMP	all affected roads	one week in advance of the activity	Contractor	DMS/PMU
	Notifications and road signage	Traffic Management Plan and EMP	all affected roads	one week in advance of the activity	Contractor	DMS/PMU
Construction camp	Approval of location and facilities	EMP	as identified	prior to moving onto site	Contractor	DMS/PMU
Equipment Lay-down and Storage Area	Approval of location and facilities	EMP	as identified	prior to moving onto site and during site set-up	Contractor	DMS/PMU
Materials management – sourcing	Approval of recognize suppliers and technical specification	EMP	as identified	prior to procurement of materials	Contractor	DMS/PMU
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	ADB SPS and EMP	subproject site	prior to moving into site and ongoing	Contractor with NGO	DMS/PCU /PMU

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
	GRM Register	EMP	subproject site	prior to moving onto site and ongoing	Contractor with NGO	DMS/PCU /PMU
Noise Level	Baseline Data for noise level in dB(A) Leq Monitoring time Day time (1 hour) and night time (1 hour)	Noise Pollution Control Rule 2006 Schedule 1, Rule 5, NPCR, 2006	Pipe laying site within each DMA preferably near sensitive receptor- 3 (nos.) as specified by the Engineer	prior to site set-up	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU
Air quality	Baseline ambient data for particulate matters 10 and 2.5 (PM_{10}, $PM_{2.5}$), sulfur dioxides (SO_2), nitrogen dioxide (NO_2), monitoring time-day time 24 Hours.	Air pollution Control Rules 2022	Pipe laying site within each DMA preferably near sensitive receptor- 3 (nos.) as specified by the Engineer	prior to site set-up	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU
Water Quality	To determine baseline data for pH, Iron, Arsenic, Manganese, Chloride, Total Coliform (ground water) pH, turbidity, Dissolved Oxygen, Biochemical oxygen demand, (BOD5), Chemical oxygen demand, (COD), Total Suspended Solids, Total Coliform (surface	surface water and drinking water standards, Schedule-2, Rules 31, ECR 2023	Three locations ground water samples are to be collected near pump house or sensitive receptor area (school, mosque, hospital etc.) within each DMA. The reason of the selection is to compare the existing water quality with project standards and to ensure good potable water for the workers during	prior to site set-up	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
	water)		construction period; If surface water source available; in that case- Ground Water- 3 nos. Surface water- 1 no.			
Conservation of Natural Environment	Existing conditions	EMP	subproject sites	prior to site set-up	Contractor	DMS/PMU
Waste management procedure	Disposal sites	EMP	as determined	prior to site set-up and ongoing throughout the subproject	Contractor	DMS/PMU
2. Construction phase						
Access to Site	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP (table on management of construction and workforce activities	Contractor	DMS/PMU
Construction camp	Qualitative characteristics	Pre-subproject condition and EMP	all access and haul roads	refer to EMP (table on management of construction and workforce activities	Contractor	DMS/PMU
Staff conduct	Site Records (Accidents, Complaints)	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
Air quality	$PM_{2.5}$, PM_{10}, SO_2 NO_2, SPM and CO Monitoring time 24 hours	Air pollution Control Rules 2022	Pipe laying site within each DMA preferably near sensitive receptor- 3 (nos.) as specified by the Engineer	Prior to start, during work and on completion (total three times)	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU
Water Quality	pH, Iron, Arsenic, Manganese, Chloride, Total Coliform (ground water) pH, turbidity,	surface water and drinking water standards, Schedule-2, Rules 31, ECR 2023	Three locations ground water samples are to be collected near pump house or sensitive receptor	Prior to work and on completion (two times)	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
	Dissolved Oxygen, Biochemical oxygen demand, (BOD_5), Chemical oxygen demand, (COD), Total Suspended Solids, Total Coliform (surface water)		area (school, mosque, hospital etc.) within each DMA. The reason of the selection is to compare the existing water quality with project standards and to ensure good potable water for the workers during construction period; If surface water source available; in that case- Ground Water- 3 nos. Surface water- 1 no.			
Noise quality	Noise Level in dB(A) Leq Day time (1 hour) and night time (1 hour)	Noise Pollution Control Rule 2006 Schedule 1, Rule 5, NPCR, 2006	Pipe laying site within each DMA preferably near sensitive receptor- 3 (nos.) as specified by the Engineer	Before construction, during work and on completion (Three times)	Contractor in coordination with the recognized Environmental Monitoring Laboratory	DMS/PMU
Soil erosion	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
Storm water	Soil erosion management measures	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
Water quality	Qualitative characteristics	EMP and pre-existing conditions	subproject sites	Ongoing	Contractor	DMS/PMU
Conservation of Natural Resources	Number of scheduled trees	Tree-cutting permit and EMP	subproject sites	Ongoing	Contractor	DMS/PMU
	Vegetation conditions	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
Materials management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
Waste management	Qualitative characteristics	EMP	subproject sites	Ongoing	Contractor	DMS/PMU
	Disposal manifests	EMP	subproject sites	Ongoing	Contractor	DMS/PMU

Aspect	Parameter	Standards	location	duration / frequency	Implementation	Supervision
Social impacts	Public Consultations, Information Disclosure, Communication Strategy	ADB SPS and EMP	subproject sites	Ongoing	Contractor with NGO	DMS/PCU /PMU
	GRM Register	EMP	subproject sites	Ongoing	Contractor with NGO	DMS/PCU /PMU
C. Post-construction activities						
Construction camp	Pre-existing conditions	EMP	construction camp	subproject completion	Contractor	DMS/PCU /PMU
Replantation	Pre-existing conditions	Tree-cutting Permit and EMP	subproject sites	subproject completion	Contractor	DMS/PCU /PMU
Land rehabilitation	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DMS/PCU /PMU
Materials and infrastructure	Pre-existing conditions	EMP	subproject sites	subproject completion	Contractor	DMS/PCU /PMU
General	Records	EMP	subproject sites	subproject completion	Contractor	DMS/PCU /PMU

Environmental Quality Standards for NCB 02.12E

347. The environmental standards provided by the Environmental, Health and Safety Guidelines of the IFC/World Bank (2007) should also be consulted to supplement GOB standards if required.

348. The applicable environmental standards which provide a comparison between Government of Bangladesh (and standards per ADB SPS, and which should be applicable to the project based on ADB SPS requirements on pollution control and abatement.

G. Monitoring and Reporting

349. Environmental monitoring and inspection activities and findings will be documented for purposes of reporting, record keeping, verifying, referring and evaluating the environmental performance of the 4 DMA under NCB 02.12E Civil Contracts. The documentation shall also be used as basis in correcting and enhancing further environmental mitigation and monitoring. Environmental monitoring reports (EMRs) will be prepared as follows (see also **Table 39**):

i) Monthly internal progress reports will be prepared by the Contractors during construction, submitted to DMS and PMU. These monthly reports will include; (a) physical progress of the component; (b) mitigation measures implemented; (c) grievances received, resolved, closed and/or directed to other mechanisms; (d)emergencies responded to; and (e) corrective actions taken.
ii) Quarterly Environmental monitoring reports will be prepared by the DMS Consultants on performance of contractors on EMP implementation the reports will include the analysis results and assessment of compliance/non-compliance with the EMP, GoB and international standards.
iii) Semi Annual Environmental monitoring reports will be prepared by the PMU through the support from DMS Consultants for submission to ADB. These semi-annual monitoring

reports will include: (i) physical progress of subproject components; (ii) mitigation measures implemented; (iii) non-compliance with EMP; (iv) progress of capacity development; (v) unforeseen issues and concerns and status of corrective actions; (vi) findings of informal public consultations; (v) grievances received, resolved, closed and/or directed to other mechanisms; and (vi) performance evaluations of Contractors.

350. The format of the suggested SEMR along with Sample Environmental Site Inspection are given in **Appendix 11**.

Table 39: Environmental Reporting Plan

Report From	Report To	Purpose	Frequency
Contractor	PMU, DMS	Progress on EMP Implementation	Monthly
DMS Consultants	PMU	Performance of contractors on EMP implementation	Quarterly
PMU with support from DMS	ADB	Project progress reports (including section on EMP implementation progress)	Semi Annual

351. Based on environmental monitoring and reporting systems in place, the PMU shall assess whether further mitigation measures are required as corrective actions, or improvement in environmental management practices are require ed. The effectiveness of mitigation measures and monitoring plans will be evaluated by a feedback reporting system. The PMU will play a critical role in the feedback and adjustment mechanism. If the PMU identifies a substantial deviation from the EMP, or if any changes are made to the scope of Third Batch under Package (NCB 02.12E) that may cause significant adverse environmental impacts or increase the number of affected people, then the PMU shall immediately consult ADB to get their approval and identify EMP adjustment requirements.

H. Environmental Management Plan (EMP) Costs

352. The air quality, surface water quality, and noise level monitoring of construction and defect liability phases will be conducted as per requirement of PMU.

353. The activities identified in environmental monitoring plan mainly includes site inspections and informal discussions with workers and local people.

354. The operation phase mitigation measures are good operating practices, which would be the responsibility of implementing agency.

355. It is to be mentioned that all requirement will be done as per requirements of EMP.

356. Implementation of environmental provisions outlined in the EMP will be done as per requirement. All works undertaken towards protection of environmental resources as part of the EMP and as part of good engineering practices.

357. All expenses related to the above will be as mentioned in the contract documents or as per direction of the Entity.

EMP cost included in the contract document

2.14.1 IEE

Bangladesh Environmental law and ADB policy require that the environmental impacts of

development projects on the environment are identified and assessed as part of the planning and design process, and that action is taken to reduce those impacts to acceptable levels. An IEE with Environmental Assessment and Review Framework were prepared for the Project.

The nature of the assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project, the sensitivity, scale, nature and magnitude of its potential impacts, and the availability of cost-effective mitigation measures.

Projects are screened for their expected environmental impacts and are assigned to one of the following categories:

- Category A: Projects that could have significant environmental impacts. An Environmental Impact Assessment (EIA) is required;
- Category B: Projects that could have some adverse environmental impacts, but of less significance than those for category A. An Initial Environmental Examination (IEE) is required to determine whether significant impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report;

The project in question (DWSNIP) is considered under the category B.

Contractor's IEE

An Environmental Examinations (IEE's) shall be updated by contractor according to ADB safeguard policy statement (SPS) (2009). The draft IEE prepared by DWASA is in (**see Section 6.4.1**). The IEE shall include assessment of the environmental impacts of all infrastructures under the command area of the project and the required step(s) there have to be taken to avoid negative impacts if any or to mitigate at the pre, during and post implementation of any work or part thereof.

The project involves significant construction over 3 years in an overcrowded urban area so it may not be possible to avoid all negative impacts. However, none are expected to be highly significant, and all can be mitigated by relatively straightforward measures.

The Contractor shall incorporate all mitigation measures as per the IEE's and implement Environmental Monitoring Plan. All mitigation measures are to be included in his procedures considering the ADB and GoB requirements / guidelines and submit to the Project Manager for review and approval. The plan should also contain detailed Site Environmental Plan (SEP) for the work site, base camp, etc., showing arrangements for disposal of sanitary and other waste, location of fuel, oil and lubricant depots, sheds for equipment, labor and housing facilities, etc.

EMP Cost

The indicative cost to implement the EMP which included in the updated IEE Report are as follows**:**

Table 40: Indicative Cost for EMP Implementation

Component	**Description**	**Number**	**Cost per Unit (USD)**	**Cost (USD)**	**Cost covered by**
Capacity building/Training/Workshop expenses	Orientation workshop for PMU officials, Consultants and Contractors for - ADB Safeguards Policy Statement - GOB environmental laws and regulations and EIA Process included but not limited to core labor standards, occupational, health and safety etc. - Incorporation of EMP into project design and contracts - Monitoring, reporting and corrective action planning		Lump sum	$3500	Covered under DMS contract
Monitoring Measures: Before construction conducted by Contractors					
Air quality monitoring	**(Monitoring duration 24 hours)** Parameters are: SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO	Three sensitive receptors per DMA Preconstruction (3*1=3 nos.)	$ 500	$1500	Civil Works Contract (Included BOQ)

Noise Level monitoring	Day time (1 hour), Night time (1 hour)	Three sensitive receptors per DMA Preconstruction (3*2*1=6 nos.)	$125	$750	
Water Quality Monitoring	pH, Iron, Arsenic, Manganese, Chloride, Total Coliform, BOD5, COD, DO, Turbidity, TSS	Average Four sensitive receptors per DMA [depending on the DWT nos. in per DMA] (4*1=4 nos.)	$325	$1300	

Monitoring Measures during Construction conducted by Contractor					
Air quality monitoring	Parameters are: SPM, PM_{10}, $PM_{2.5}$, SO_2, NO_2, CO (24 Hours)	Three sensitive receptors per DMA (3*1= 3)	$ 500	$1500	
Noise Level monitoring	Day time (1 hour), Night time (1 hour)	Three sensitive receptors per DMA 3*2*1= 6	$125	$750	
Water Quality Monitoring	pH, Iron, Arsenic, Manganese, Chloride, Total Coliform, BOD5, COD, DO, Turbidity, TSS	Average Four sensitive receptors per DMA (4*1=4 nos.)	$325	$1300	

Mitigation

Measures					
Traffic management at work sites (Pavement Markings, Channelizing Devices, Arrow Panels and Warning Lights)	During Construction phase	As required	Contractor's liability	Covered under BOQ of bidding document	Civil Works Contract (Included BOQ)
Compensatory plantation measures	At a rate of 5 trees for every tree cut/remove	As required	Contractor's liability		
Dust suppression at work sites	Application of dust suppression measures during construction phase	As required	Contractor's liability		
Mitigating COVID-19 related threat	During construction phase, mask, hand washing facilities and others precaution for Covid-19 should be available in the construction site	As required	Contractor's liability		
Surveys	Ongoing before start of construction work along pipe replacement corridors	Lump sum	Contractor's liability		

9. CONCLUSION AND RECOMMENDATION

358. The process described in this document has assessed the environmental impacts of all

elements of Distribution Network Improvement subproject in DMA 705 of NCB 02.12E in Kadamtali Thana of Dhaka City. Potential negative impacts were identified in relation to pre-construction, construction and operation of the improved network distribution, but no environmental impacts were identified as being due to either the subproject design or location. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. These were discussed with specialists responsible for the engineering aspects, and as a result some measures have already been included in the designs for the infrastructure. This means that the number of impacts and their significance has already been reduced by amending the design.

359. Subproject include improvement of distribution network, mainly focusing on enhancing efficiency and coverage of the system. Subproject do not include any supply side measures (like water source augmentation, treatment etc.,) and therefore there are no impacts during operation envisaged. In the IEE the discussion focused mainly on construction phase activities, as water pipelines are not generally associated with any significant impacts during operation.

360. The subproject activities are mainly located in an urban area congested with traffic, pedestrians and activities. Moreover, many of the roads (internal) are very narrow, and the main roads are abutted with busy with commercial establishments frequented by people. Measure to align the pipeline to minimize the impacts are suggested.

361. During the construction phase, impacts mainly arise from the construction dust and noise; from the disturbance of residents, businesses, traffic and important buildings by the construction work, and from the need to dispose of large quantities of waste soil and import of construction material. The social impacts (access disruptions) due to construction activities are unavoidable, as the residential and commercial establishments exist along the roads where pipes will be laid. The baseline ambient air quality of Dhaka is poor with high particulate matter and therefore the generation of construction dust will further deteriorate the situation, though temporarily. Appropriate measures are suggested, including the use of documented procedures for construction and immediate restoration of road after the work. Also, to avoid impacts, about 65% of the total pipelines are proposed to be laid by trenchless method (HDD). HDD method will have minimal impacts, and all standard construction practices and safety precautions will be undertaken to further reduce the impacts.

362. The main impact of the operating water supply system will be beneficial as the citizens of Kadamtali Thana will be provided with a continuous pressurized supply of safe water, which will serve a greater proportion of the population, including the urban poor and other disadvantaged communities. This will improve the quality of life of people especially improving public health in particular and improving the environment in general. This will reduce the incidence of disease associated with poor quality of water supply and sanitation. This will also lead to economic gains as people will have a reliable and secure water supply available all the time relieving their efforts in coping with intermittent water supply, and the time thus saved would result in an increase in their income and savings in medical care costs.

363. Anticipated impacts of water supply during operation and maintenance will be related to detection and repair of leaks, pipe bursts. These are, however, likely to be minimal, as proper design and selection of good quality pipe material shall mean that leaks are minimal. Leak repair work will be similar to the pipe-laying work.

364. The public participation processes undertaken during project design ensure stakeholders are engaged during the preparation of the IEE. The planned information disclosure measures and process for carrying out consultation with affected people will facilitate their participation during project implementation.

365. The subproject's Grievance Redress Mechanism will provide the citizens with a platform for redress of their grievances and describes the informal and formal channels, time frame and mechanisms for resolving complaints about environmental performance.

366. The EMP will guide the environmentally-sound construction of the subproject and ensure efficient lines of communication between PMU, DMSC and the contractors. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site; (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (iv) ensure that safety recommendations are complied with.

367. A copy of the EMP/approved SEMP will be kept on site during the construction period at all times. The EMP has been made binding on all contractors operating on the site and included in the bid and contract documents. Non-compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

368. The subproject is unlikely to cause significant adverse impacts because: (i) most of the individual components involve straightforward construction and operation, so impacts will be mainly localized; (ii) in most cases the predicted impacts are likely to be associated with the construction process and are produced because the process is invasive, involving excavation, obstruction at specific construction locations, and earth movements; and (iii) being located mainly in the already constructed water supply facilities and built-up area will not cause direct impact on terrestrial biodiversity values. The potential adverse impacts that are associated with design, construction, and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

369. The draft updated IEE also confirmed that international best practices (specified in EHS Guidelines) have been incorporated in the detailed design.

370. Based on the findings of the IEE, there are no significant impacts and the classification of the project continues to be Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009).

APPENDIX 1: COPY OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE

Government of the People's Republic of Bangladesh
Department of Environment
Paribesh Bhaban, E-16, Agargaon
Sher-e-Bangla Nagar, Dhaka-1207
www.doe.gov.bd

Environmental Clearance Certificate

Section 12 of the Environment Conservation Act, 1995 (Amended 2002)

Clearance Certificate Number: 233

File number: 22.02.0000.018.72.43.19.

Clearance Certificate Issue Date: 12 June 2019

Renewal date not later than: 11 June 2020

A. Clearance Certificate Type
Environmental Clearance Certificate

B. Clearance Certificate Holder
Project Director Dhaka Water Supply Network Improvement Project Dhaka WASA,WASA Bhaban (8th Floor) 98, Kazi Nazrul Islam Avenue, Kawran Bazar Dhaka-1215.

C. Premises to which this Clearance Certificate Applies
The distribution pipelines will be laid within the RoW of Government roads. Total length of 1668 km distribution pipelines and reticulation will be laid in 29 Thana under DNCC and DSCC.

D. Activities for which this Clearance Certificate Authorizes and Regulates
The following components will be implemented through Dhaka Water Supply Network Improvement Project under Dhaka WASA - • Survey, GIS base Network Modelling and Design, Pressure Test, Pre-commissioning, commissioning/Guarantee Tests • Supplying and laying of 75-450 mm dia HDPE pipes (approx. 1668 km) water distribution lines by using open Trench, Pipe Bursting and Horizontal Drilling Technologies • Installation of Service connections to approx. 156,163 households including supplying of HDPE pipes, fittings and accessories etc. • Replacement/Up-gradation of approx. 50 Deep tubewells • Supplies of key plant of Regular and special valves, Domestic and Bulk-Water meters and welscreen are also part of the facility.

E. Terms and Conditions for Environmental Clearance Certificate

1. **Limit Condition for Discharges to Air and Water**: The Environmental Clearance Certificate must comply with schedule 2 and 10, rule 12 of the Environment Conservation Rules, 1997.

2. **Noise Limit**: The Environmental Clearance Certificate must comply with the Noise Pollution (Control) Rules, 2006.

In case of non-coverage of ECR 1997 the World Bank Environment, Health and Safety Guideline shall be adhered to.

3. **Operating conditions:**

3.1 Activities must be carried out in a competent manner. This includes:
(a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
(b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

3.2 All plant and equipment installed at the premises or used in connection with the Environmental Clearance activity:
(a) must be maintained in a proper and efficient condition; and
(b) must be operated in a proper and efficient manner.

3.3 Construction works shall be restricted to day time hours so as to avoid/mitigate the disturbance of local lives as well as implementation schedules of the works shall be notified in advance to nearby residents.

3.4 Storage area for soils and other construction materials shall be carefully selected to avoid disturbance of the natural drainage.

3.5 This shall be ensured that soil is obtained from nearby areas, which are free of invasive plants. Re-vegetation and replanting shall be undertaken if rehabilitation works involve extensive vegetation clearance.

3.6 Vegetation clearance shall be minimizing at the construction phase as to minimize soil erosion. Soils for embankments shall be properly tested and compacted to ensure stability.

3.7 Proper construction practices shall be followed that minimize loss of habitats and fish breeding, feeding & nursery sites.

3.8 Proper and adequate sanitation facilities shall be ensured in labor camps throughout the proposed project period.

3.9 In order to control noise pollution, vehicles & equipment shall be maintained regularly; working during sensitive hours and locating machinery close to sensitive receptor shall be avoided.

3.10 No solid waste can be burnt in the project area. An environment friendly solid waste management should be in place during whole the period of the project in the field.

3.11 Proper and adequate on-site precautionary measures and safety measures shall be ensured so that no habitat of any flora and fauna would be demolished or destructed.

3.12 All the required mitigation measures suggested in the EIA report are to be strictly implemented and kept operative/functioning on a continuous basis.

3.13 Any heritage sight, ecological critical area, and other environmentally and/or religious sensitive places shall be avoided during project construction phase.

3.14 Resettlement plan should be properly implemented and people should be adequately compensated, where necessary.

3.15 Construction material should be properly disposed off after the construction work is over.

3.16 The Environmental Management Plan included in the EIA report shall strictly be implemented and kept functioning on a continuous basis.

4.1 Monitoring and Recording conditions:

4.1.1 The results of any monitoring required to be conducted by this Clearance Certificate must be recorded.

4.1.2 The following records must be kept in respect of any samples required to be collected for the purposes of this Clearance Certificate:
(a) the date(s) on which the sample was taken;
(b) the time(s) at which the sample was collected;
(c) the point at which the sample was taken; and
(d) the name of the person who collected the sample.

4.2 Requirement to monitor concentration of pollutants discharged

For each monitoring, the Clearance Certificate holder must monitor (by sampling and obtaining results by analysis) the following parameter: air quality, water quality and Noise.

5. Reporting Conditions: Environmental Monitoring Reports shall be made available simultaneously to Head quarters and Dhaka Metropolitan office of the Department of Environment on a quarterly basis during the whole period of the project.

6. Notification of environmental harm: The Clearance Certificate holder or its employees must notify the Department of Environment of incidents causing or threatening material harm to the environment as soon as practicable after the person becomes aware of the incident.

F. Recording of pollution complaints

The certificate holder must keep a legible record of all complaints made to the certificate holder or any employee or agent of the certificate holder in relation to pollution arising from any activity to which this Environmental certificate applies. The record must include details of the following:

(a) the date and time of the complaint;
(b) the method by which the complaint was made;
(c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
(d) the nature of the complaint;

(e) the action taken by the certificate holder in relation to the complaint, including any follow-up contact with the complainant; and
(f) if no action was taken by the certificate holder, the reasons why no action was taken.

The record of a complaint must be kept for at least 4 years after the complaint was made. The record must be produced to any authorized officer of the DOE who asks to see them.

G. Validity of the Clearance Certificate

This Environmental Clearance is valid for one year from the date of issuance and the project authority shall apply for renewal to the Dhaka Metropolitan office with a copy to Head Office of DOE at least 30 days ahead of expiry.

Violation of any of the above conditions shall render this clearance void.

12.06.19

(Syed Nazmul Ahsan)
Director (Environmental Clearance)
Phone: 8181673

APPENDIX 1A: RENEWAL COPY OF THE ENVIRONMENTAL CLEARANCE CERTIFICATE

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NAL.

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
পরিবেশ অধিদপ্তর
ঢাকা মহানগর কার্যালয়
পরিবেশ ভবন, ই/১৬, আগারগাঁও, ঢাকা ১২০৭
www.doe.gov.bd

পরিবেশগত ছাড়পত্র নবায়ন

ছাড়পত্র নং: ২৩০১১০৩০৪

পরিবেশগত ব্যবস্থাপনা নিশ্চিতকরণ সাপেক্ষে সংযুক্ত শর্তে নিম্নবর্ণিত প্রতিষ্ঠান/প্রকল্পের অনুকূলে পরিবেশগত ছাড়পত্র নবায়ন প্রদান করা হলো :

প্রতিষ্ঠান/প্রকল্পের নাম	: Dhaka water supply Network Improvement project
উদ্যোক্তার নাম	: Dhaka Water Supply And Sewerage Authority
সনাক্তকরণ নং	: ৭৯৫১৯
প্রতিষ্ঠান/প্রকল্পের কার্যক্রম	: Water, power and gas distribution line laying/relaying/extension
প্রতিষ্ঠান/প্রকল্পের শ্রেণী	: Red
প্রতিষ্ঠান/প্রকল্পের ঠিকানা	: project director,Dhaka WASA, WASA Bhaban (8th floor), 98, Kazi Nazrul Islam Avenue, Kawran Bazar, Dhaka-1215
প্রদানের তারিখ	: ১৪ নভেম্বর ২০২৩
মেয়াদ উত্তীর্ণের তারিখ	: ১২ জুন ২০২৪

এ ছাড়পত্র সনদের সাথে পৃথকভাবে সংযুক্ত প্রদত্ত শর্তাবলী যথাযথভাবে প্রতিপালন করতে হবে,
অন্যথায় ছাড়পত্র বাতিল/ক্ষতিপূরণ আদায়সহ যে কোন আইনানুগ ব্যবস্থা গ্রহণ করা হবে।

বিঃদ্রঃ এটি একটি সিস্টেম জেনারেটেড ছাড়পত্র এবং এতে কোনোরূপ স্বাক্ষরের প্রয়োজন নেই।

ছাড়পত্রটি যাচাই করতে ভিজিট করুন: https://ecc.doe.gov.bd/certificate_verification

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NAL.

সনাক্তকরণ নং: ৭৯৫১৯ Dhaka water supply Network Improvement project ছাড়পত্র নং: ২৩-১১০৩০৪

পরিবেশগত ছাড়পত্র নবায়ন এর জন্য প্রযোজ্য শর্তাবলী:

১ . এ ছাড়পত্র শুধুমাত্র ঢাকা ওয়াটার সাপ্লাই নেটওয়ার্ক ইমপ্রোভমেন্ট প্রজেক্ট(ডিডব্লিউএসএনআইপি)-এর ক্ষেত্রে প্রযোজ্য হবে।

২ . বর্ণিত প্রকল্পের অনুকূলে পরিবেশ অধিদপ্তরের বিগত ১২.০৬.২০১৯ তারিখ মং-২২.০২.০০০০.০১৮.৭২.৪৩.১৯.২৩৩ সংখ্যক স্মারকে প্রদত্ত পরিবেশগত ছাড়পত্রের সকল শর্ত অপরিবর্তীত থাকবে।

৩ . প্রকল্পের কার্যক্রম দ্বারা কোন অবস্থায় রাস্তায় যানজট সৃষ্টি করা যাবেনা। এ বিষয়ে বিকল্প ব্যবস্থাপনা সার্বক্ষণিক কার্যকর রাখতে হবে।

৪ . প্রকল্পের এলাইনমেন্টে যানজট নিয়ন্ত্রণের জন্য নিজস্ব জনবল দ্বারা সার্বক্ষনিক যানজট নিয়ন্ত্রণের জন্য কার্যকর উদ্যোগ গ্রহণ করতে হবে।

৫ . কোন অবস্থায় প্রকল্পের কার্যক্রম দ্বারা কোন জলাজয়, ডোবা, নালা, বিল, খাল, পুকুর, বন্যা প্রবাহ এলাকা, ওয়াটার রিটেনশন এরিয়া ভরাট করা যাবেনা।

৬ . প্রকল্পের কার্যক্রম বাস্তবায়নের সময় রাস্তা খোড়া-খোঁড়ি করার সময় তাৎক্ষণিকভাবে রাস্তার মাটি নিরাপদে অপসারণ করতে হবে এবং কোন মাটি/বালি উন্মুক্ত অবস্থায় রাখা যাবেনা যাতে রোদে ভাষ্ট উত্থিত হয়ে বায়ু দূষণ না হয় এবং বৃষ্টির পানিতে স্ট্রম ওয়াটারের সাথে মিশে রাস্তা সংলগ্ন ড্রেনেজ ব্লক সৃষ্টি হয়ে জলাবদ্ধা সৃষ্টি না করে।

৭ . প্রকল্পের পাশের রাস্তায় কোন ধরনের নির্মাণ সামগ্রী রেখে ফুটপাত/রাস্তার প্রতিবন্ধকতা সৃষ্টি করা যাবেনা।

৮ . প্রকল্পের কার্যক্রম দ্বারা পরিবেশ ও প্রতিবেশের ক্ষতিসাধন করা হলে Polluters Pay Principle অনুসারে ক্ষতিপূরণ ধার্য করে নির্ধারিত সময়ের মধ্যে ধার্যকৃত ক্ষতিপূরণ আদায় করা হবে।

৯ . মহামান্য হাইকোর্ট বিভাগের রিট পিটিশন নম্বর ৯১৬/২০১৯ এর বিগত ২৯/০১/২০১৯ তারিখের আদেশ অনুযায়ী প্রকল্প নির্মাণকালে বায়ু/ভাষ্ট দূষণ নিয়ন্ত্রণকল্পে দৈনিক অন্ততঃ দুইবার পানি ছিটিয়ে বায়ু দূষণ নিয়ন্ত্রণ করতে হবে।

১০ . প্রকল্পের কার্যক্রমের মাধ্যমে কোন প্রকার বায়ু/শব্দ দূষণ সৃষ্টি করা যাবেনা। নির্মাণ কাজ চলাকালিন নির্মাণাধীন অবকাঠামো/বালু/মাটি যথাযথভাবে ঢেকে রাখতে হবে যাতে ধূলাবালি আশেপাশে ছড়িয়ে না পড়ে।

১১ . প্রকল্পের কাজ শেষ হওয়ার সাথে সাথে তাৎক্ষণিকভাবে খোঁড়া খোঁ ভকৃত রাস্তা পূর্বের অবস্থায় ফিরিয়ে আনতে হবে।

১২ . বায়ুদূষণ নিয়ন্ত্রণের জন্য নির্মাণ সামগ্রী ঢেকে রাখতে হবে এবং নির্মাণ সামগ্রী পরিবহনের সময়ও ঢেকে পরিবহণ করতে হবে।

১৩ . নির্মাণাধীন অবকাঠামো/প্রকল্পের এলাইনমান্ট এলাকায় নিয়মিত পানি ছিটিয়ে বায়ু দূষণ নিয়ন্ত্রণ করতে হবে।

১৪ . প্রকল্পের নির্মাণ কার্যক্রম চলাকালে শব্দ নিয়ন্ত্রণ/নিয়মন মাত্রা শব্দ দূষণ (নিয়ন্ত্রণ) বিধিমালা, ২০০৬ এবং পরিবেশ সংরক্ষণ বিধিমালা, ২০২৩ ও বায়ু দূষণ (নিয়ন্ত্রণ) বিধিমালা, ২০২২-এ বর্ণিত মানমাত্রার মধ্যে রাখতে হবে।

১৫ . সব ধরণের বর্জ্যের ক্ষেত্রে বিশেষতঃ কঠিন বর্জ্য ব্যবস্থাপনায়, উৎসে বর্জ্য পৃথকীকরণ করতে হবে এবং বর্জ্য হ্রাস, পুনঃব্যবহার ও পুনঃচক্রায়ন নীতিমালা তথা 3R(Reduce, Reuse, Recycle) Principles অনুসরণ করতে হবে। এছাড়া পৃথকীকৃত বর্জ্য আবৃত অবস্থায় উপযুক্ত সময় নিকটস্থ সিটি কর্পোরেশনের ট্রান্সফার ষ্টেশন/ডাম্পিং গ্রাউন্ডে হস্তান্তর/পরিবহনের বিষয়টি উদ্যোক্তা নিজস্ব উদ্যোগ/সিটি কর্পোরেশনের সহায়তায় নিশ্চিত করবেন।

১৬ . নির্মাণকাজ চলাকালে শ্রমিকদের পেশাগত স্বাস্থ্য সুরক্ষা সামগ্রী (পিপিই যেমন হেলমেট, গ্লাভস, নোজ মাস্ক ইত্যাদি) সার্বক্ষণিক ভাবে ব্যবহার করতে হবে।

১৭ . পরিবেশগত ছাড়পত্র ও সর্বশেষ নবায়নের কপি প্রকল্প অফিসে সংরক্ষণ করতে হবে।

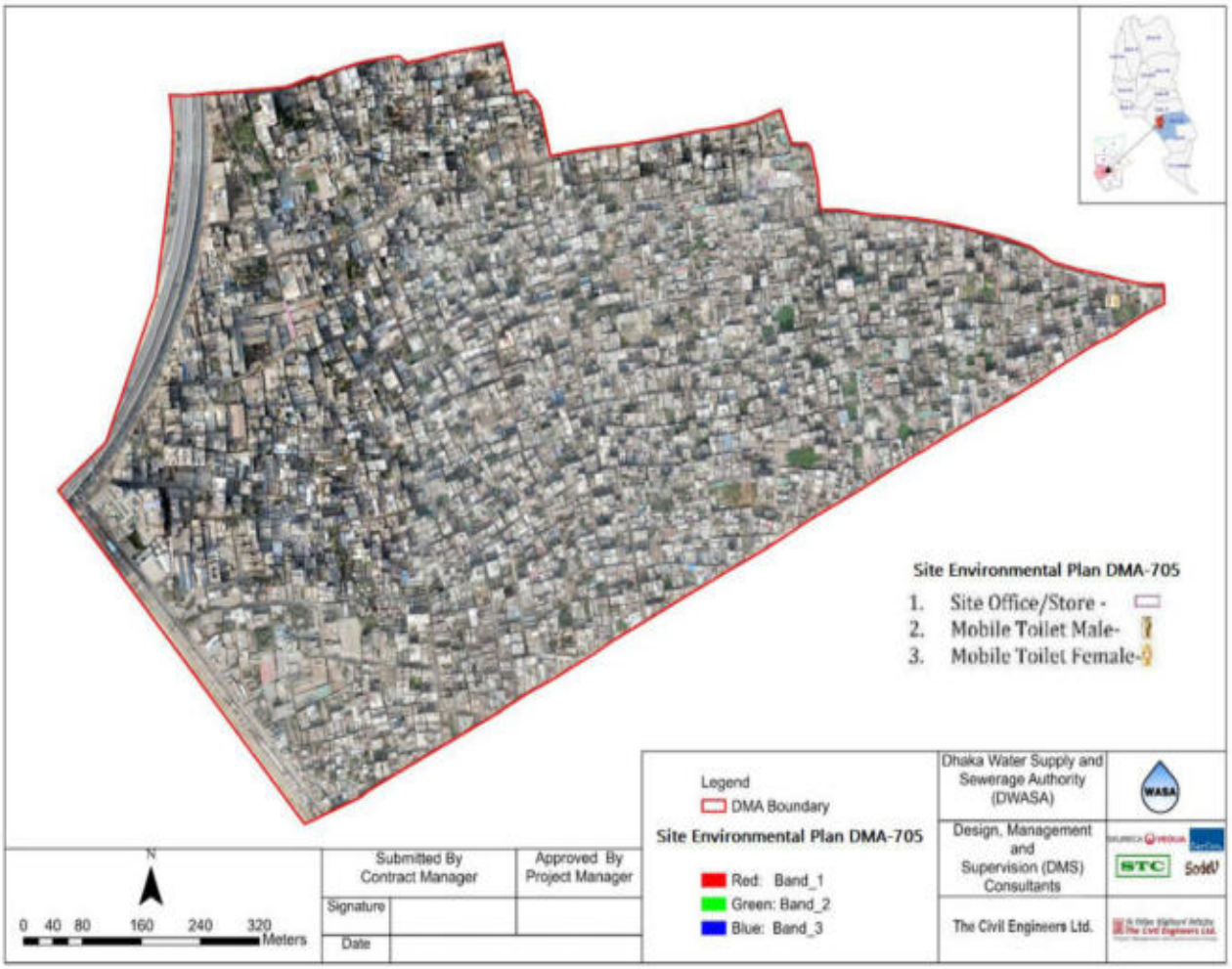
১৮ . ছাড়পত্র নবায়নের মেয়াদ শেষ হবার অন্ততঃ ত্রিশ দিন পূর্বে প্রাসঙ্গিক কাগজপত্রসহ অন-লাইনে নবায়নের জন্য আবেদন করতে হবে।

১৯ . উপর্যুক্ত শর্ত এবং অবস্থান বিষয়ক পরিবেশগত ছাড়পত্রের প্রদত্ত অন্যান্য শর্তাবলী প্রতিপালনে ব্যর্থ হলে ছাড়পত্র বাতিল বলে গণ্য হবে এবং বাংলাদেশ পরিবেশ সংরক্ষণ আইন, ১৯৯৫ (সংশোধিত-২০১০) এবং পরিবেশ সংরক্ষণ বিধিমালা, ২০২৩ অনুযায়ী আইনগত ব্যবস্থা গ্রহণ করা হবে

APPENDIX 2: EQUIPMENT LIST

Sl No.	Equipment Type and Characteristics	Quantity
1	Horizontal Directional Drilling (HDD) Machine	8
2	Pipe Bursting Machine	2
3	Ground Penetrating Radar (GPR)	2
4	Pipe Jointing Equipment (Butt Fusion Welding, Electro Fusion Welding)	30
5	Compaction equipment	12
6	Compaction testing equipment	16
7	Excavator	4
8	Asphalt Cutter	8
9	Pressure testing equipment	10
10	Water Leak Detection Equipment	2
11	Water Jetting Equipment	1
12	Water Truck	4
13	Air Compressor	1
14	Electricity Generator	8
15	Pump Motor Set	1
16	Drilling Rigs	1
17	Mechanical shaker	1
18	Burner / heater	1
19	BS 410 or ASTM standard sieve set	1
20	Mud Pump	24
21	Pipe Cutting Machine	4
22	Total Station Survey Machine / Level Machine	4
23	Personal Safety Equipment	300
24	Dump Truck	4
25	Pick up 1 ton	8
26	Pick up 1.5 ton	2
27	Pick up 3 ton	2
28	Unique Crane	2
29	Roller Stand for Pipeline	20
30	Vibrator Machine with Nozzle	4
31	Concrete Mixer Machine	2
32	Water Tank (6000ltr Capacity)	4
33	Welding Machine	2
34	Hammer Drill	20

APPENDIX 3: SITE ENVIRONMENTAL PLAN (DMA 705 UNDER NCB-02.12E)



APPENDIX 4: SPOIL MANAGEMENT PLAN

Sites should be located and prepared before the need for disposal areas arise. The spoil should be disposed of in a way that will prevent erosion. Disposal sites should be maintained periodically, depending on the season and type of material. Temporary disposal sites, or stockpiles, are useful when materials can be reused for other maintenance or construction activities. Stockpiles also require periodic maintenance to ensure no discharge into the stream system.

The primary Goals for this are:

- Maintain public safety and open roads for the traveling public.
- Prevent or minimize delivery of sediment and chemicals to streams.
- Prevent or minimize the interruption of normal runoff into streams
- Mange onsite spoil handling to minimize environmental impacts on resident and other receivers
- Minimize any further site contamination of land, water, soil
- Manage the transportation of spoil with consideration of traffic impacts and transport related emissions.

Spoil Disposal:

Spoil disposal includes site selection, site permitting, maintaining the site to control erosion, and the temporary or final closure of the disposal site. This is having three parameters like Site

Selection, Disposal Site Maintenance and Disposal Site Closure

This action involves disposing excess materials from excavations, others at designated long-term disposal sites. Once the materials are properly disposed of, the site should be maintained on a regular basis.

Quantification of Spoil Materials- within DMA 705 under NCB 02.12E

	Open Cut Method (m3)	Horizontal Directional Drilling HDD(m3)	Total (m3)
Total Excavation	5695.2	360.75	6055.95
Balance Materials for Disposal	4721.4	270.75	4992.15

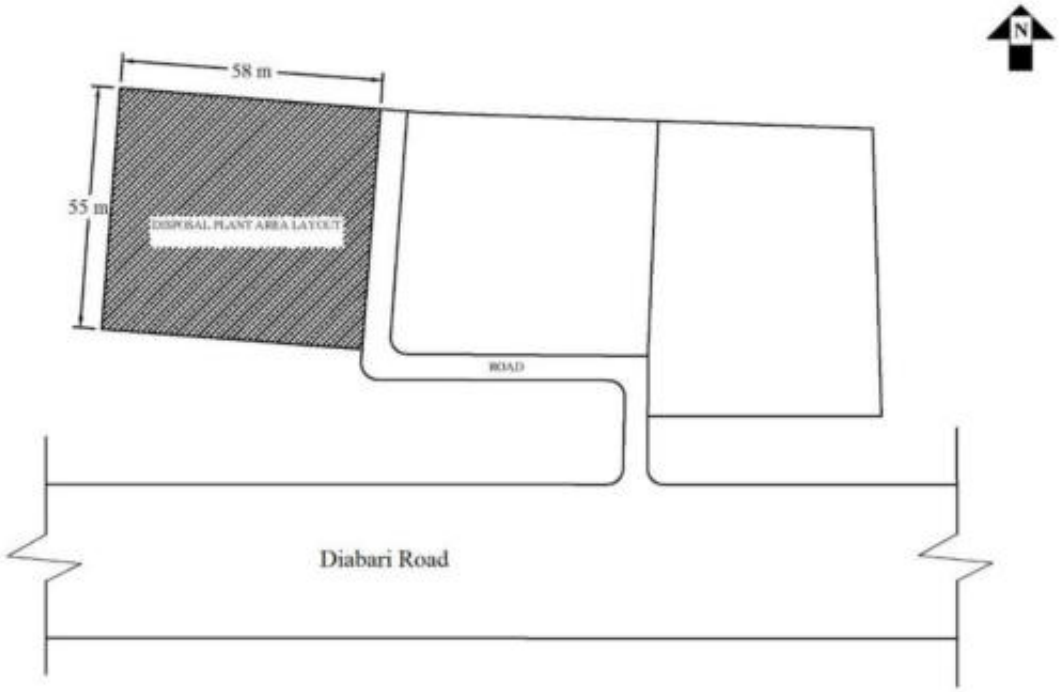
Transportation of Spoil Materials: Transportation will be done by dump trucks fully covered with tarpaulin.

Disposal Site: Disposal site is at Diyabari, Uttara, Dhaka. The following is the detail of

disposal site:

Sl No.	Location of Site	Latitude/ Longitude	Ownership	Google Map	Total Accumulated volume in the disposal site
1	North of Dhaka Demra Road near Storage area at Dellah, Demra, Dhaka	23.876528, 90.356487	Rented land of the contractor for storage area		For details, please see Layout Map of Disposal site in the following page

Layout of Disposal Area NCB 02.12E:



Site Photo of the Disposal Site:

INTER
NAL.

APPENDIX 5: APPLICABLE ENVIRONMENTAL STANDARDS

Applicable Ambient Air Quality Standards for Bangladesh Projects

Parameter	Bangladesh Ambient Air Quality Standard (µg/m³) [a]	WHO Air Quality Guidelines (µg/m³)		Applicable to Subproject Per ADB Safeguard Policy Statement[d] (µg/m³)
		Global Update[b] 2005	Second Edition[c] 2000	
TSP	200 (8-h)	-	-	200 (8-h)
PM_{10}	50 (1-year) 150 (24-h)	50 (24-h) 500 (10-min)	-	50 (24-h)
$PM_{2.5}$	15 (1-year) 65 (24-h)	10 (1-year) 25 (24-h)	-	25 (24-h)
SO_2	80 (1-year) 365 (24-h)	20 (24-h) 500 (10-min)	-	20 (24-h)
NO_2	100 (1-year)	40 (1-year) 200 (1-h)	-	40 (1-year) 200 (1-h)
CO	10,000 (8-h) 40,000 (1-h)	-	10,000 (8-h) 100,000 (15-min)	10,000 (8-h)
Lead	0.5 (1-year)			0.5 (1-year)
Ozone (O_3)	235 (1-h) 157 (8-h)	100 (8-h)		100 (8-h)

ADB = Asian Development Bank, CO = carbon oxide, h = hour, µg/m³ = microgram per cubic meter, min = minute, NO_2 = nitrogen dioxide, $PM_{2.5}$ = particulate matter 2.5, PM_{10} = particulate matter 10, SO_2 = sulfur dioxide, TSP = total suspended particle, WHO = World Health Organization.

[a] Based-on SRO 220-Law 2005 (Amendment of Schedule 2 of ECR, 1997). Air Quality Management Project of Bangladesh; http://www.doe-bd.org/aqmp/standard.html

[b] IFC World Bank Group. 2007. *Environmental, Health and Safety General Guidelines*. Washington, D.C.

[c] WHO Regional Office for Europe. 2000. *Air Quality Guidelines for Europe, Second Edition*. Copenhagen.

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

Applicable Noise Levels for Bangladesh Projects

Receptor/ Source	National Noise Standard Guidelines, 2006[a] (dB)		WHO Guidelines Value For Noise Levels Measured Out of Doors[b] (One Hour LA_q in dBA)		Applicable to Subproject Per ADB Safeguard Policy Statement[c] (dBA)	
	Day (06:00-21:00)	Night (21:00-6:00)	07:00 – 22:00	22:00 – 07:00	Day time	Night time
Industrial area	75	70	70	70	70	70
Commercial area	70	60	70	70	70	60
Mixed Area	60	50	55	45	55	45
Residential Area	55	45	55	45	55	45
Silent Zone[d]	50	40	55	45	50	40

[a] Schedule 4 of ECR, 1997, Amended in 2006.

[b] WHO. 1999. Guidelines for Community Noise; World Bank Group. 2007. Environmental, Health and Safety General Guidelines. Washington, D.C.

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

[d] Area up to a radius of 100 meters around hospitals or educational institutions or special institutions/establishments identified/to be identified by the Government is designated as Silent Zones where use of horns of vehicles or other audio signals, and loudspeakers are prohibited.

Applicable Effluent Discharge Standards (Schedule 10 Standards for Waste from Industrial Units or Projects Waste [See Rule 13]) for Bangladesh Projects

Sl. No.	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated Land
1	Ammoniacal nitrogen (as elementary N)	mg/L	50	75	75
2	Ammonia (as free ammonia)	mg/L	5	5	15
3	Arsenic (as As)	mg/L	0.2	0.05	0.2
4	BOD_5 at 20°C	mg/L	50	250	100
5	Boron	mg/L	2	2	2
6	Cadmium (as Cd)	mg/L	0.5	0.05	0.05
7	Chloride	mg/L	600	600	600
8	Chromium (as total Cr)	mg/L	0.5	1.0	1.0
9	COD	mg/L	200	400	400
10	Chromium (as hexavalent Cr)	mg/L	0.1	1.0	1.0
11	Copper (as Cu)	mg/L	0.5	3.0	3.0
12	Dissolved oxygen (DO)	mg/L	4.5-8	4.5-8	4.5-8
13	Electro-conductivity (EC)	micromho/cm	1200	1200	1200
14	Total dissolved solids	mg/L	2100	2100	2100
15	Flouride (as F)	mg/L	2	15	10

Sl. No.	Parameters	Unit	Discharge To		
			Inland Surface Water	Public Sewerage system connected to treatment at second stage	Irrigated Land
16	Sulfide (as S)	mg/L	1	2	2
17	Iron (as Fe)	mg/L	2	2	2
18	Total kjeldahl nitrogen (as N)	mg/L	100	100	100
19	Lead (as Pb)	mg/L	0.1	1	0.1
20	Manganese (as Mn)	mg/L	5	5	5
21	Mercury (as Hg)	mg/L	0.01	0.01	0.01
22	Nickel (as Ni)	mg/L	1.0	2.0	1.0
23	Nitrate (as elementary N)	mg/L	10.0	Not yet set	10
24	Oil and grease	mg/L	10	20	10
25	Phenolic compounds (as C_6H_5OH)	mg/L	1.0	5	1.0
26	Dissolved phosphorus (as P)	mg/L	8	8	15
27	Radioactive substance	(To be specified by Bangladesh Atomic Energy Commission)			
28	pH	----	6-9	6-9	6-9
29	Selenium (as Se)	mg/L	0.05	0.05	0.05
30	Zinc (as Zn)	mg/L	5	10	10
31	Temperature	^oC (summer) ^oC (winter)	40 45	40 45	40 45
32	Suspended solids (SS)	mg/L	150	500	200
33	Cyanide (as Cn)	mg/L	0.1	2.0	0.2

Notes:

(1) These standards shall be applicable to all industries or projects other than those specified under the heading “Standards for sector wise industrial effluent or emission.”

(2) Compliance with these standards shall be ensured from the moment an industrial unit starts trial production, and in other cases, from the moment a project starts operation.

(3) These standards shall be inviolable even in case of any sample collected instantly at any point of time. These standards may be enforced in a more stringent manner if considered necessary in view of the environmental conditions of a particular situation.

(4) Inland Surface Water means drains/ponds/tanks/water bodies/ ditches, canals, rivers, springs and estuaries.

(5) Public sewerage system means treatment facilities of the first and second stage and also the combined and complete treatment facilities.

(6) Irrigable land means such land area which is sufficiently irrigated by waste water taking into consideration the quantity and quality of such water for cultivation of selected crops on that land.

(7) Inland Surface Water Standards shall apply to any discharge to a public sewerage system or to land if the discharge does not meet the requirements of the definitions in notes 5 and 6 above.

Applicable Water Quality Standards for Bangladesh Projects

Sl. No.	National Standards for Drinking Water (Schedule 3, Rule 12B of ECR 2023)			WHO Guidelines for Drinking Water Quality 4th Edition incorporating the first addendum, 2017	Applicable per ADB SPS
	Parameter	Unit	Standards	Standards	Standards
1	Coliform (fecal)	n/100 ml	0	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
2	Coliform (total)	n/100 ml	0	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample
3	Chlorine (residual)	mg/l	0.2	0.2[c]	0.2
4	Nitrate (NO_3^-)	mg/l	45	50	10
5	Arsenic	mg/l	0.05	0.01	0.01
6	Turbidity	NTU	5	-	10
7	Aluminum	mg/l	0.2	None established	0.2
8	Ammonia (NH_3)	mg/l	1.5	None established	0.5
9	Barium	mg/l	0.7	1.3	0.01
10	Benzene	mg/l	0.01	0.01[b]	0.01
11	Boron	mg/	1	2.4	1
12	Cadmium	mg/l	0.003	0.003	0.003
13	Calcium	mg/l	75	-	75
14	Chloride	mg/l	250*	None established	150-600
15	Carbon tetrachloride	mg/l	0.005	0.004	0.01
16	1,1-Dichloroethylene	mg/l	0.03	-	0.001
17	1,2-Dichloroethylene	mg/l	0.03	0.05	0.03
18	Tetrachloroethylene	mg/l	0.04	0.04 (tetrachloroethene)	0.03
19	Trichloroethylene	mg/l	0.02	0.02 (trichloroethene)	0.02
20	Pentachlorophenol	mg/l	0.009	0.009	0.0009
21	2,4,6 -Trichlorophenol	mg/l	0.2	0.2 (2,4,6 trichlorophenol)	0.03
22	Chloroform	mg/l	0.09	0.3	0.09
23	Chromium	mg/l	0.05	0.05	0.05
24	Color	Hazen unit	15	None	15
25	Copper	mg/l	1.5	2	1
26	Cyanide	Mg/l	0.05	None	0.1
27	Fluoride	mg/l	1	1.5	1
28	Hardness (as $CaCO_3$)	mg/l	500	-	200-500
29	Iron	mg/l	0.3-1.0	-	0.3 - 1.0
30	Kjeldahl nitrogen (total)	mg/l	1	-	1
31	Lead	mg/l	0.01	0.01	0.01
32	Magnesium	mg/l	30-35	-	30-35
33	Manganese	mg/l	0.4	-	0.1
34	Mercury	mg/l	0.001	0.006	0.001
35	Nickel	mg/l	0.05	0.07	0.1
36	Nitrite	mg/l	1	3	<1
37	Odor	mg/l	Odorless	-	Odorless
38	Oil and grease	mg/l	0.01	-	0.01

Sl. No.	National Standards for Drinking Water (Schedule 3, Rule 12B of ECR 2023)			WHO Guidelines for Drinking Water Quality 4th Edition incorporating the first addendum, 2017	Applicable per ADB SPS
	Parameter	Unit	Standards	Standards	Standards
39	pH	--	6.5-8.5	-	6.5 – 8.5
40	Phenolic compounds	mg/l	0.002	-	0.002
41	Potassium	mg/l	12	-	12
42	Radioactive materials (gross alpha activity)	Bq/l	0.01	-	0.01
43	Radioactive materials (gross beta activity)	Bq/l	1	-	0.1
44	Selenium	mg/l	0.01	0.04	0.01
45	Silver	mg/l	0.02	-	0.02
46	Sodium	mg/l	200		200
47	Suspended particulate matters	mg/l	10	-	10
48	Sulfide as H_2S	mg/l	0.05	-	0
49	Sulfate (SO_4^{-2})	mg/l	250	-	400
50	Total dissolved solids	mg/l	1000	-	1,000
51	Temperature	°C	20-30	-	20-30
52	Tin	mg/l	2	-	2
53	Zinc	mg/l	10	-	5
54	Aldrin/ Dieldrin	mg/l	0.03	0.05	0.05
55	Detergents	mg/l	0.2	-	0.2
56	BOD5 20°C	mg/l	0.2	-	0.2
57	COD	mg/l	4	-	0.4
58	DO	mg/l	6	-	6
59	Phosphate	mg/l	6	-	6
60	Phosphorus	mg/l	0	-	0

[a] in coastal area 1000. Reference: Bangladesh Gazette, Addendum, August 28,1997 Source: Department of Environment (DOE).

[b] for substances that are considered carcinogenic, the guidance value is the concentration in drinking water associated with an upper-bound excess lifetime cancer risk of 10^{-5} (one additional case of cancer per 100,000 of the population ingesting drinking water containing the substance as the guidance value for 70 years). Concentrations associated with upper-bound estimated excess lifetime cancer risks of 10^{-4} and 10^{-6} can be calculated by multiplying and dividing, respectively, the guideline value by 10 (WHO, 2017).

[c] for effective disinfection, there should be residual concentration of free chlorine of $\geq$ 0.5 mg/l after at least 30min contact time at pH < 8.0. A chlorine residual should be maintained throughout the distribution system. At the point of delivery, the minimum residual concentration of free chlorine should be 0.2 mg/l.

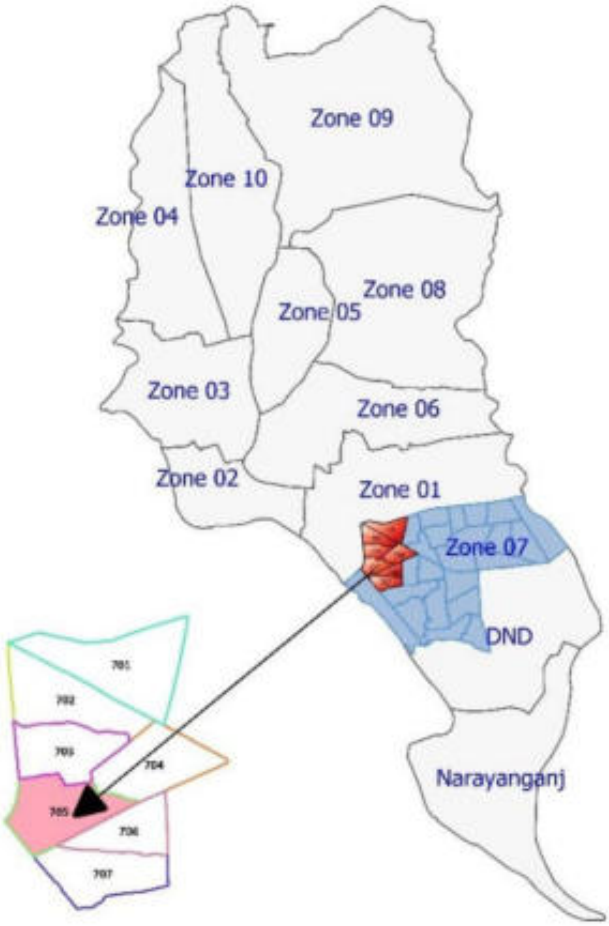
[d] The FS advises producing treated water that conforms to WHO guidelines and Bangladesh drinking water quality ECR 1997. One of the two most important parameters reduced by the WTP is turbidity (the other is microbiological matter, by providing a multi-stage barrier). In Section 10.3, the FS quotes WHO and Bangladesh standards of 10 and 5 NTU respectively. We recommend that the turbidity in the treated water leaving the WTP should never exceed 1.0 NTU and that the operational guideline should be set at 0.5 NTU, to be achieved 95% of the time. The design of the process units and their controls should accommodate these recommendations. Operational procedures must be devised to achieve these recommendations. Computerized monitoring equipment must be provided and staff trained in its use to display real-time trends and record events. Laboratory staff must monitor, record, and report treated water quality parameters to review past trends and predict operational changes, if required.

APPENDIX 6: OUTLINE TRAFFIC MANAGEMENT PLAN

INTER
NAL.

The Contract is part of the Dhaka Water Supply Network Improvement Project (DWSNIP). The DWSNIP is jointly funded by the Asian Development Bank (ADB) and the Government of Bangladesh (GoB), and is executed by the Dhaka Water and Sewerage Authority (DWASA).

This Contract Package No.: NCB-02.12E Mods Zone 7- 1 DMA includes the rehabilitation and Extension of Distribution Network in the Zone(-s) including all the DMA's (705) under Package no. 02.12E only which includes (i) survey and documentation including detailed design, specifications, preparation of quality assurance and design report, and design control services of 1 DMA (705); (ii) supply, laying and commissioning of distribution, transmission, and reticulation pipes; (iii) rehabilitation of service connections; and (iv) rehabilitation of production tube wells (PTWs) head works. Under Package No. and 02.12E, the proposed project is expected to have the following benefits: (i) rehabilitation of distribution network which will result in substantial reduction in water losses in the project area; and (ii) proper accounting for use of water and system losses by installation of metered connections.
The location of this project is shown as the following map:



1. Scope of Traffic Management Plan

The scope of the main works includes the upgrade of the existing distribution networks, replacement, expansion and optimization of the transmission and distribution water supply networks including the establishment of District Metering Areas (DMA).
On balance this route is considered to be the most suitable option for the following reasons

- Minimizes interface with housing.

- Route avoids of Schools.
- Where the existing road network is used as part of the route it is of sufficient width and standard with the exception of some widening on lane.
- Traffic claiming measures proposed will improve the route.
- Better visibility along the route and at junctions compared to other routes.

The traffic volumes generated by the scheme during construction will include:

- Site worker's vehicles and our staff vehicles
- Subcontractors' vehicles
- Movement of earthworks plant by Pay loader
- Bulk supply trucks for delivery of concrete, aggregate, precast concrete, steel, process equipment.
- Bulk earthmoving trucks for removal of unsuitable material, rubble and surplus materials offsite.
- Street works plant and equipment
- Office Setup deliveries
- Fencing and hoarding deliveries
- Plant and Tool deliveries
- Operating equipment deliveries
- Visitors to site

2. Objective of Traffic Management Plan

- To provide a safe route for site traffic to enter and leave the DMA sites.
- To identify any risks to the general public and local traffic from construction vehicles and to put control measures in place to protect all members of the public, drivers & site workers, from any injury involving traffic travelling to and from the site.
- To place restriction on heavy vehicles to use the selected route only.
- To provide measures to control the speed of construction traffic.
- To prevent parking within the local estates.
- To outline control procedures for all site vehicles during movement along the selected route and to provide traffic control measures limiting reversing and turning movements.
- To outline procedures for dealing with emergencies.
- To outline plans to keep the residents in the locality informed of intense truck movements.
- To consider the safety of all road users including pedestrians / cyclists and particular attention to the safety of children, the elderly and the disabled.
- To reduce the need for vehicles to reverse wherever possible.
- To provide control measures to reduce the speed of vehicles using the route.
- To provide a safe route for pedestrians crossing the temporary roads.
- To prevent off-loading on the public road or public areas.
- To allow pedestrians walk/access across the designated route in a safe manner.

3. Element of and Effective Traffic Management Plan

The Traffic Management Plan must consider the following issues:

Issues-I: Roads, Public Rights of Way and Bridleways:

In the implementation process of project area, normal traffic increases due to the construction

works causing an increase movement in the site area and with a significant quantity of material transfer to the site. During the construction phase, the traffic travels to and from the treatment works is required in a safe and controlled manner along the selected route. During the planning of our project implementation work in the site, it must be considered which roads, paths and bridleways may be affected. It should not be permitted to close any public roads, paths and bridleways without the permission of any lawful authority. If further required to close any public roads, arrange an alternative road as well as accordingly inform public about that earlier (at least before 7 days).

Issue- II: Road Directional Signing:

Contractor will take all necessary measures to the acceptable level of the road users for the safety of traffic during construction, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required for the information and protection of traffic approaching, through the section of the implementing roads. Before taking up any construction, an agreed phased program for the diversion of traffic on the implementing roads (narrow strips, road shoulders, rickshaw lanes and residential roads etc.) shall be drawn up in consultation with the approval of consultant.

Different types of signs used in Traffic Management Plan, are as follows:

Barricade:
The barricades erected on either side of the carriageway/ portion of the carriageway closed to traffic, shall be of strong to resist violation and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept it throughout from sunset to sunrise.

Barrier:
The barriers shall be fixed around trenches and pits in streets and pedestrian areas and properly sign posted. All barriers on roads and pedestrian areas shall be lit with warning lights during night time or when there is poor visibility.

Marking:
At the point where traffic is to deviate from its normal path (whether on temporary diversion or part width of the carriage way) the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device as per the directions of the consultant. At nights, the passage shall be delineated with lanterns or other suitable light source.

Flagmen:
For the elimination of more costing of road users in the saturated road for operating and using the vehicle, flagmen should be positioned on opposite sides during 24 hours. For the regulation of traffic, the flagmen should be equipped with red and green flags and lights.

The following criteria will be used to determine whether signs will be permitted on the roads under implementation process:
In the project area, there must be a substantial number of drivers who are not familiar with the area, who are seeking the construction site. The existing signing to the construction site

location is inadequate to guide people about the project area.
The signing should only be used to guide traffic intent on finding the destination and therefore would normally only be erected in the surrounding area of the location in question. Through signing contractor should ensure safe and hazardless access to the area so that people living in that locality as routing. Not only that, it should be ensured emergency access to and exit from the area. Signs will not be approved if they are proposed purely as advertisements in order to attract motorists and encourage extra trade.

Issue- III: Public Transport:

Getting to and from the construction site should be made as easy as possible. One-way traffic operation shall be established whenever the traffic to be passed over part of the carriageway inadequate for two-lane traffic. We will do it to ease the traffic movement in other alternative connecting roads as most of the alternative connecting roads are in saturated condition in terms of carrying capacity. Moreover, the contractor should ensure that the road users do not incur more cost for operating or using the vehicles. By talking with the public transport operators an early stage, it may be possible to increase the frequency of buses; free buses may be an alternative to incur less cost in this purpose. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours.

Issue-IV: Non-motorized vehicles (NMVs) and pedestrians

The non-motorized vehicles (NMVs), such as bicycles, rickshaw-van (three-wheel pedal vehicles for transporting passenger and goods), thelagari (two-wheel pulling vehicles for transporting goods) and pedestrians will face tremendous hardship in the narrow roads during construction work. In many developing Asian countries, NMVs are a major transport mode and source of employment. With rising incomes also comes an oft-prevailing view that NMVs are inferior transport modes that degrade the particular society's image. As a result, attempts are often made to ban or severely restrict NMV use.

However, NMVs often cater to a high proportion of daily urban area trips (such as transport to local schools, mosques, temples and shopping) and freight transport, particularly in old town centers with narrow streets. Most cities with high NMV use have ample space to inexpensively segregate NMVs and provide integrated NMV networks, thus achieving high economic returns.

Once traffic volumes increase, the usual response is to allocate as much road space as possible to vehicles at expense of NMVs and pedestrians. NMVs and pedestrian often fare badly when new roads are constructed or when existing roads are widened. The space they formerly used for movement and parking is often allocated to traffic, without any consideration of how to mitigate NMV displacement. Good planning requires that essential NMV movements be catered for with well-designed, safe and convenient facilities.

Many transport planning models were applied during construction work in their consideration of vehicle types. Since closures of all nearby roads are not expected during pipe laying work, it might be needed to halt movement of pedestrians and vehicles during the pipeline installation in relatively narrower roads. There are several roads in a locality. While a narrow road is in full closure, there are other roads which should be used. The contractors should address the issue and redress the grievances.

Issue-V: Road Closure & Traffic Diversion Application

On occasions, it may be necessary to build that a road is closed to hold a construction site or to ensure that visitors are safely guided to the construction site.

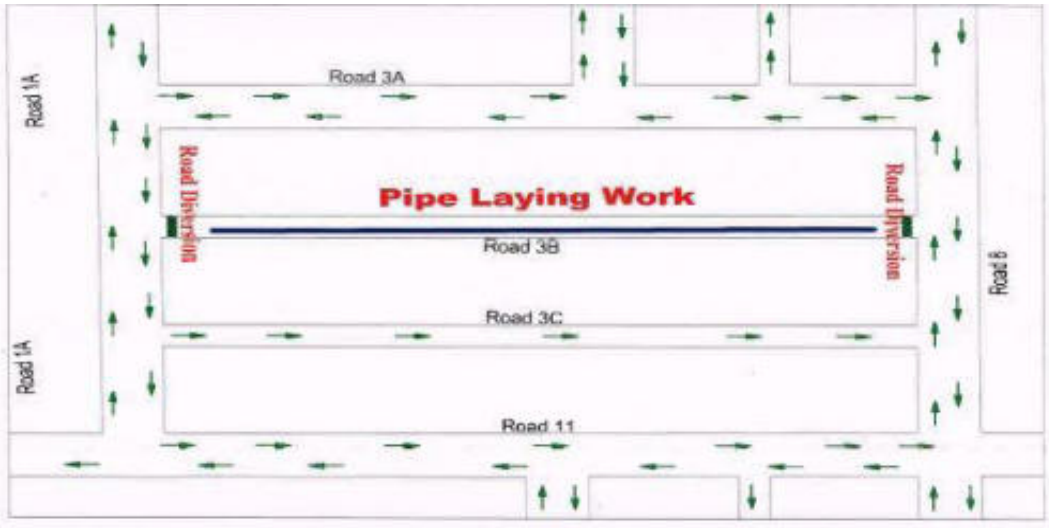
Where the diversion or closure of any existing carriageway, walkway or public right of way is temporarily necessitated by the works, we will provide and maintain an alternative. The

alternative shall be operational before interference with the existing way. We will do this with the approval of consultant by the concern of proper authority. We should inform all the information related to the road closure including the duration of closure to everybody living and working in that project area. Due to the road closer or traffic diversion work signs, lights, barriers and other traffic control devices as well as the riding surface of diversions shall be maintained in a satisfactory condition till the required time. The temporary carriageway and walkway should be kept free from dust by frequent applications of water, as required. It should be kept usable by women, children, patients and disables.

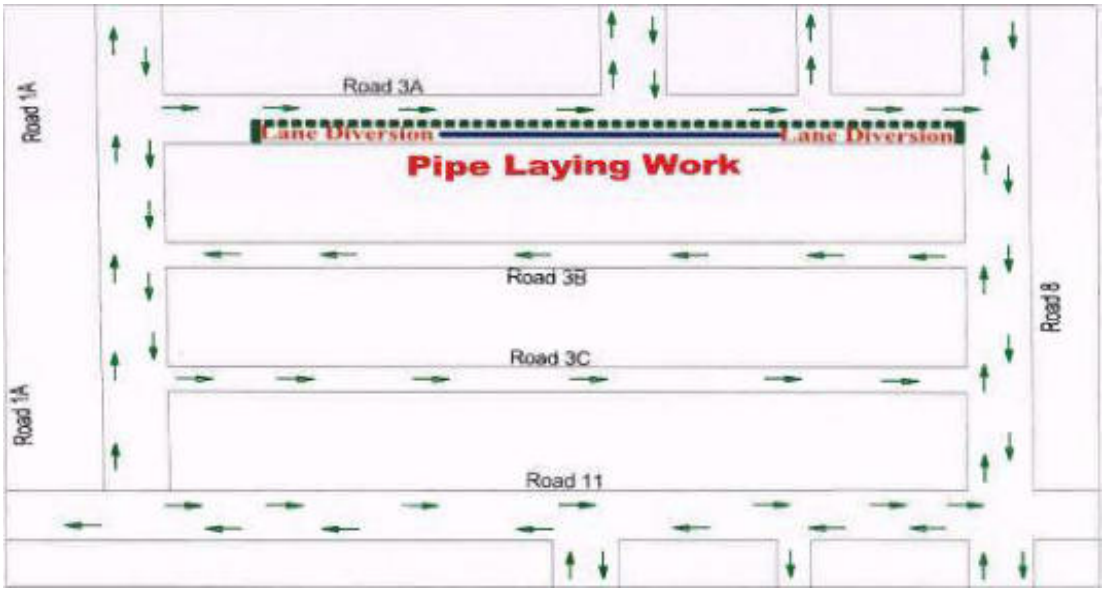
Road closure or Diversion work related issues:

It will not be necessary to divert the traffic, as works will mainly be done only on the flanks and not in the center line of the roads; nevertheless, yellow and red tape will be tied around the trenches/pits to alert the traffic. TCEL will take steps to ensure that traffic flow will remain smooth and unaffected by the works.

- Traffic Control Plan Drawing for Road width < 5 m



- Traffic Control Plan Drawing for Road width > 5 m



Temporary cross drainage structures:

TCEL will manage all arrangements for traffic during construction of temporary diversion including provision of temporary cross drainage structures including their maintenance, dismantling and clearing debris where necessary which is considered as incidental to the works.

Ramp:

In the diversion or existing carriage way, where ramps are required contractor should be provided and maintained to a standard level as well as suitable in all respects for the class or classes of traffic or pedestrians requiring using way.

Road crossing arrangement:

TCEL will provide and maintain suitable crossing arrangement in order to ensure uninterrupted traffic flow in the cross roads for the existing traffic movement across the construction work. In these crossing arrangements, all categories of roads crossing the roads under construction area should be considered till the time that alternative arrangement for the traffic will be made.

Issue- VI: Parking on Site

TCEL will designate parking in the compound for the use of its employees, including subcontractors during construction phase. The number of cars will be monitored on an ongoing basis to ensure that there is no parking in local estates.

Depending on the stage the project is at and the number of employees on site, other options such as carpooling, incentives to use the Dart, minibuses and alternative parking will be utilized if parking becomes a problem.

When subcontractors are appointed to the project they will be advised that there is minimum parking on site and they will be advised of the parking prohibition in the local estates and in the Dart car park. Parking by employees or subcontractors is prohibited in the temporary Dart car park. Barriers will be used where necessary to prevent parking adjacent to the construction site and along the access roads towards the site.

Issue- VII: Delivery Protocol

The loading and unloading of plant and equipment on site is a high-risk activity. To minimize the risk of an accident or injury the following should be put in place. The following are some of the key items needed to be considered for any loading / unloading process:
It is up to the delivery driver and sub-contractor to co-ordinate the delivery. The sub-contractor must also have site personnel available to assist gate security with traffic & pedestrian safety management as appropriate.
Safe access onto the vehicle body or onto the load to unload the lorry:
The load needs to be stacked / loaded in a manner that will allow a safe means of unloading. The receiver of the delivery needs to be aware of the resources to be in place to unload the vehicle.
It is important subcontractors and delivery vehicles have reviewed the adequacy of their safety statements and company procedures to take into consideration the aspects outlined above. All drivers when collecting and after loading the particular machine, piece of plant or any other type of load need to ensure the load is secured and any restraints that are required to be in place are in place even where the vehicle is moving a short distance.
Where the driver is delivering to a subcontractor the driver will need to have a contact name and number for a person from that subcontractor's management team to oversee the loading or unloading of the delivery.

Issue-VIII: Visitors to Site

Security cabin and security personnel will be positioned at the site entrance. Access to the construction site is controlled and manned by a trained security guard at the site entrance. Visitors to site must sign in and out at security. The security guard will issue a copy of the site rules to all visitors. All visitors must be accompanied at all times while on site.

Issue-IX: Control on Traffic Movement to and for the Site:

It will be the duty and responsibility of our Site Supervisors to maintain safe traffic movement onto and off site. Site security will also assist in controlling the movement of construction vehicles on / off site at the main gate to the site. We shall be responsible for providing information to relevant parties on the requirements of the site traffic access rules and delivery protocol. Traffic movement control will remain under constant review.

Issue-X: Safety of Construction Required Machineries:

TCEL will require HDD, Pipe bursting and Water Lorry, excavation equipment, supported by trucks and light weight vehicles. All plant & equipment shall have a plant & equipment hazard identification conducted prior to commencing work.

To the extent practical construction will take place within a 5m corridor which has been defined around the pipe centerline, however it will be necessary for some activities and parking to take place outside of this corridor.

Outside of working hours any equipment not returned to a secured yard will be parked well away from the roadway and where appropriate hazard lights or warning signs will be placed near the parked equipment.

Issue-XI: Construction & Removal of the Traffic Claiming Measures:

As per the contract requirements, traffic claiming works will be carried out prior to the commencement of construction DMA Works. This will provide for adequate vehicular speed

reduction on the existing road network and provide cyclist, pedestrian and disabled access for safety measures. The existing road network will be used to construct the traffic claiming measures and establish the construction traffic route as outlined in the drawings attached. The street works will be planned in a manner to minimize disruption.
All required precautions will be taken to secure the safety, health and welfare of pedestrians and cyclists. Particular attention will be given to children walking to and from all local schools and the walking school buses in the area.
The traffic claiming measures will be installed using the existing road network. we will implement safe temporary traffic measures to construct the works. We will formulate a traffic claiming works traffic plan and method statement in relation to the construction works and submit them to consultant for approval.

Issue-XII: Elimination of Dirt from the Construction Traffic Route:

A wheel wash system will be installed at the site entrance to clean wheels on trucks leaving the plant. All trucks carrying clay material will cover the load with tarpaulin sheeting. At all times measures will be implemented to reduce the potential of dust impacts. Drivers will be required to check their vehicles are clean prior to leaving the site. In the event of dust nuisance occurring outside the site boundary, procedures will be put in place to minimize the source of dust emissions. A road sweeper will be in operation as required to remove mud from the route. Trucks carrying soil from site will be covered to reduce dust. As appropriate a review of these measures will take place on a regular basis.

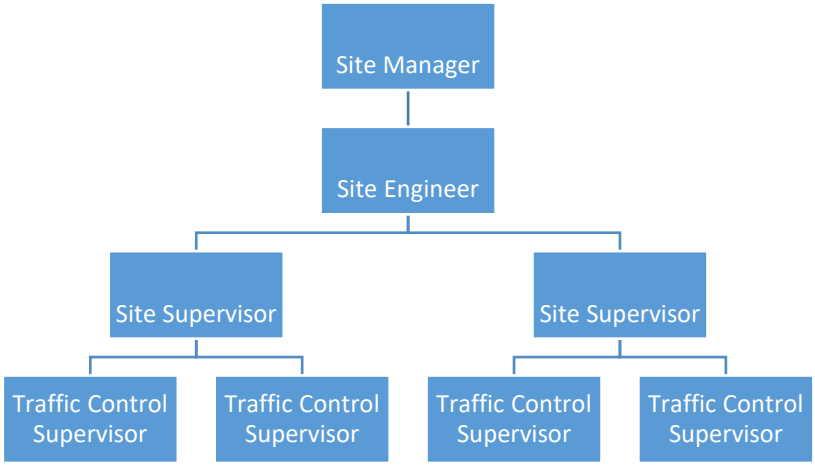
Issue-XIII: Traffic Route Safety Control Measures

All of our personnel and traffic officer will be obliged to monitor the traffic route to ensure the safety of the public. Site Security fencing and construction route fencing must be inspected on a daily basis, particularly after weekends and/or inclement weather by our personnel and recorded as part of the general Health & Safety protocol.
We will provide a drop-off zone within the main site compound to accommodate construction deliveries. We will provide a turning area for trucks at the site. Great care must be taken to protect the public with regard to slips, trips and falls. Security personnel and site supervisor will monitor conditions and report to the Contractor Management. Deliveries will be planned and controlled by Contractor and the sub-contractors.
A 1.2m high fence will secure the temporary roads. Pedestrians will be guided through the construction works safely using a combination of signage and fencing.
A working drawing showing exactly where the work is being performed, and vehicle movements around the work site. Be sure to identify the following aspects

- One-way Streets,
- Number of Lanes affected and total number of lanes,
- The exact location and speed limit of all speed limit signs at or in a work site
- Traffic signals,
- Turning lanes,
- Location of Skip Bins,
- Any other information resulting from a physical survey of the location
- A section for the site supervisor and/or traffic control supervisor to approve the TMP.

4. Site Team Member's Responsibilities

Organogram for Traffic Management team is shown in a figure below:



Site safety officer will act as site Traffic Officer and will have a specific role to manage the route and he/she will walk the route regularly monitoring traffic and enforcing the site traffic rules of this plan.

- **Site Manager**
  - I. Communication with DMS/DWASA/DSCC/DMP (traffic) and other relevant authorities as required.
  - II. Ensure that the Traffic Management Plan is implemented as planned, including arrangements for periodic audits.
  - III. Prepare the emergency water distribution vehicle movement plan for the DMA wise working zones and send it to control specialist for review in order to send it to DMS through CM. Ensure water supply during scarcity to the respective DMA.
  - IV. Implement emergency response measures if required.

- **Site Engineer**
  - I. Coordination with the DSCC/DMP (traffic) and other relevant authorities as instructed by the site manager.
  - II. Prepare the draft emergency water distribution vehicle movement plan for the DMA wise working zones including mentioning the probable date in consultation with the local public representatives and submit to Site Manager.
  - III. Hold discussion with the local transport agencies regarding traffic route diversion Supervise the road blockage and barricades that are being maintained by the Site supervisors and traffic control supervisor and give proper instruction to ensure the rightly placing and opening of the barricades.

- **Site Supervisor**
  I. Day to day onsite co-ordination of construction crews in accordance with the objectives of this plan.
  II. Regularly check the integrity of the temporary traffic control and warning measure erected to ensure their continued effectiveness.
  III. Work with traffic control supervisor to make improvements to the traffic control measures where appropriate.
  IV. Provide daily reports of any issues of concern regarding traffic.

- **Traffic Control Supervisor:**

Regularly inspect the placement of temporary traffic control and warning measures for continued effectiveness Move or replace traffic control measures as required by the progress of the works obtain all relevant approvals from DSCC and Dhaka Metropolitan Police (DMP)

5. Training

Only trained and accredited traffic controllers and supervisors will be permitted to plan traffic arrangements, place and monitor signage, control traffic and conduct required audits. Copies of training and competencies will be kept on file at the site office with project induction records.

Traffic control will be conducted by internal personnel, who will be accredited to conduct works through North side of the Dhaka city. Where required due to works conditions or changes, DMP may be utilized to assist if additional controls are needed.

TCEL will put into practice at least disturbance policy and will implement the specific traffic arrangements identified in this document. We will actively communicate with the residents of the locality relaying information to them regarding the works program and we will coordinate the timing of critical activities to mitigate adverse traffic impacts.

6. Enforcement of the Site Traffic Rule and Disciplinary Procedure

- Each and every driver and equipment operator should have their valid driving license.
- Any driver who breaches the rules shall have their license plate noted and reported to their employer. The driver will be spoken to by our management and the disciplinary procedures applied and they will be supervised by our traffic officer. The first offence will imply a one-day ban from site. If it is a minor breech as determined by our management a warning will be given.
- Second offence will imply a one week ban from site. A third offence by any driver who consistently or knowingly breaks the rules shall be refused further access to the site. There are no exceptions to these rules.

Any driver reported to break the traffic rules outside the project area and penalized by the traffic police authority may also be refused further access to the site.

7. Coordination with the Traffic police for the work implementation.

On the basis of the road cutting permission, Road cutting plan is chalked out on day-to-day basis, road blockage and traffic control plan are set in consultation with the

Metropolitan Police (Traffic) as per site requirement. JV Engineers is working with the DMA by maintaining close coordination with the DMP (Traffic South) or any other zone, if necessary, as per requirement. Per DMA Environmental and Social Safeguard, Health and Safety officer and Transport officer are working with their respective field in the issue of traffic management**.**

APPENDIX 7: GUIDANCE PROVISIONS FOR ASBESTOS CEMENT HANDLING

Civil works in this project includes 33.9 km of new pipe laying work. About 65% of the pipe will be laid using HDD method and rest (35%) will be laid by open cut method. The contractor will have to install new pipes in an area with an existing AC pipe. The best option for the AC pipes for the project is to be left undisturbed or left in site.

Breathing in asbestos fibers can lead to asbestos-related lung diseases, mainly cancer, killing more people than any other single work-related illness. It is carcinogenic. The diseases can take from 15 to 60 years to develop – so employees will not be immediately aware of a change in someone's health after breathing in asbestos fibers The body gets rid of any asbestos fibers taken in with food and water naturally. Asbestos fibers cannot be absorbed through the skin. The danger, therefore, from exposure to asbestos fibers arises when asbestos fibers become airborne. Therefore, there is guideline to work with asbestos cement material by Health and Safety Authority, US EPA and other organizations. This document is prepared based on the guideline of USEPA.

A. Pre-Demolition/Renovation Survey

Asbestos regulation establishes that owner and operators (including contractors) are responsible for determining whether cement pipe in a particular utility conduit that will be subject to demolition or renovation contains asbestos. It is required to determine the location of asbestos containing materials before starting demolition or renovation.136 PMU, PCU and contractor will follow the guideline. However, PCU/PMU, DMS and contractor (including utilities conducting pipe repair or replacement), must conduct a "thorough inspection" to determine the location of any asbestos-containing pipe, insulation or other materials. PCU, PMU, and contractor of underground cement pipes may satisfy this requirement with:

(i) As-built plans or other documents identifying the content of particular cement pipes or pipe segments and any other material in the conduit that may be affected by a removal or repair project, provided that the documentation has been updated to reflect any repairs or alterations; or

(ii) Other measures that demonstrate that a "thorough inspection" has been completed to identify asbestos cement pipe that will be affected by a removal or repair project. These measures can include visual identification through field observations of the pipe to be worked on (e.g., the manufacturer's brand-label markings indicating transit material or the source of the pipe); or sampling and analysis of cement pipe material at a laboratory approved by Department of Environment (DOE).

In addition, PCU/PMU and contractor may presume that a pipe or pipe segment contains asbestos and manage any repairs or removals in accordance with this guidance and the other applicable requirements of US EPA. The PCU, PMU and contractor of the utility system at which the asbestos cement pipe will be removed, repaired or replaced must keep documentation of the pre-demolition/renovation survey, signed and dated by the person who conducted the inspection, for a minimum of two (2) years in the project file.

The documentation must indicate what information was relied upon to determine whether the pipe contained asbestos. thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos…" 40 CFR part 61.145(a).

B. Handling Practices

When repairing, removing or replacing asbestos cement pipe, it is important to handle the pipe in a manner that will minimize the risk of making it friable or releasing asbestos dust into the environment. Start by exposing the asbestos cement pipe with minimal disturbance. Excavate no closer than 6 inches of the pipe. Carefully uncover the remainder of the soil surrounding the pipe by hand or with a shovel. An assessment should then be made to determine if the pipe is damaged, cracked or broken.

(i) Not Damaged Asbestos Cement Pipe (intact and not deteriorated):

- Place 6 mil (0.006 inch) thick polyethylene ("poly") sheeting under the asbestos cement pipe to prevent soil contamination.
- Adequately wet the asbestos cement pipe with amended water using surfactant or liquid soap before and during removal to avoid creating airborne dust.
- Separate the asbestos cement pipe at the nearest coupling (bell or compression fitting).
- Slide the pipe apart at the joints (no saw cutting) or use other methods that do not cause the pipe to break, become friable or otherwise create the potential to release asbestos fibers.
- Wrap the wet asbestos cement pipe in two layers of 6 mil polyethylene sheeting, seal with duct tape and label in accordance with all applicable regulatory requirements. This can be done in the trench or adjacent to the trench.
- If the trench is filled with water, the placement of polyethylene sheeting is not required.
- Refer to Section of this guidance document for packaging, labeling, disposal, and record retention requirements.

(ii) Damaged Asbestos Cement Pipe (deteriorated or not intact) or when cutting or mechanical breakage (e.g., with saws, snap or blade cutting, and/or tapping) is necessary:

- Place 6 mil (0.006 inch) thick polyethylene ("poly") sheeting under the asbestos cement pipe to prevent soil contamination.
- Adequately wet asbestos cement pipe with amended water where cutting or breaking will occur.
- Saw cutting of asbestos cement pipe shall only be conducted with a HEPA shrouded vacuum attachment or wet cutting equipment, unless it is conducted within a small enclosure that isolates the area in which the saw

cutting is being conducted to prevent the release of asbestos fibers to ambient air,

- Wrap wet asbestos cement pipe in two layers of 6 mil polyethylene sheeting, seal with duct tape and label. This can be done either in the trench or adjacent to the trench.
- Manage wrapped asbestos cement pipe, polyethylene sheeting and any other material contaminated with visible asbestos debris as ACWM in accordance with USEPA.
- Refer to Section of this guidance document for packaging, labeling, disposal, and record retention requirements.

C. Packaging, Labeling, Disposal and Record Retention

All Asbestos-Containing Waste Material (ACWM) must be packaged, labeled, transported, stored and disposed of in accordance with USEPA requirements, including but not limited to the following:

(i) Place properly wrapped and labeled ACWM pipe as well as all other containerized ACWM and debris in a roll-off container(s), or covered trucks, trailers or vans that are lined with 2 layers of 6 mil polyethylene sheeting.

- The container shall be an enclosed and sealed leak-tight container having proper labels and U.S. Department of Transportation placards as required.
- If open-top roll-off containers are used, they must be properly sealed, labeled and secured inside a locked fenced area when they are not being loaded to prevent access by unauthorized personnel, and covered to prevent water accumulation.

(ii) Package, transport and dispose of ACWM in accordance with local, state, and federal regulations.

(iii) Complete waste shipment records must be retained for 2 years by the owner/operator of the facility that generated the ACWM.

(iv) Dispose of ACWM at a landfill permitted to accept ACWM.

(v) Design the landfill site for accepting asbestos cement

D. Visual Inspection Requirement

The asbestos project monitor (a person from PMU/DMSC should take this responsibility having training or experience) must inspect all surfaces within the work area for visible debris and if any is found, the contractor must re-clean the work areas until there is no visible debris.

When asbestos cement pipe removal is performed using the methods specified in this guidance document, the final visual inspection may be performed by an asbestos project monitor, provided that the following conditions have been met:

(i) The qualified person is physically present to conduct the final visual inspection of the work area prior to backfilling the trench;

(ii) The qualified person documents in writing that there was no visible debris remaining in the excavation trench, in soil excavated from the trench, in the

surrounding area adjacent to the trench after the removal of the asbestos cement pipe, and on any tools used during the removal/repair/replacement activities; and

(iii) All ACWM has been removed for proper storage/disposal; and

(iv) The qualified person signs and dates the documentation of the final inspection as evidence that the inspection was performed and that the condition of no remaining visible debris was met.

The PIU, PMU and contractor of the utility system at which the asbestos cement pipe was repaired, removed or replaced must keep the documentation of the post-abatement visual inspection, signed and dated by the person who conducted the inspection, for a minimum of two (2) years in the project file.

APPENDIX 8: HEALTH AND SAFETY PLAN

Health and Safety Management Responsibilities

(1) Contract Manager will:

- Be responsible for the development, assessment and performance of the health and safety management.
- Implement the laws, regulations and policies about the health and safety of the Bangladesh; allocate sufficient resources for the implementation of health and safety management.
- Sign on all relevant documents about health and safety management.

(2) HSE Manager will:

- Be responsible for health and safety management throughout the contract period, and cooperate with the project manager to keep the health and safety management system effective.
- Arrange for scheduled health and safety meetings and carry out health and safety audits and inspections of the project.
- Review performance condition of HSE department.

(3) The HSE Department will:

- Be responsible for the establishment of the health and safety management system documents and carry out the health and safety laws, regulations and other requirements.
- Conduct assessment of health and safety hazards, and supervise the performance of control measures.
- Conduct health and safety training for all health and safety critical activities and skills.
- Be responsible for the health and safety inspection.
- Provide progress summary of health and safety management to HSE manager.

(4) Health and Safety Officer will:

He will be accountable to the Contract Manager for fulfilling the duties assigned to him and ensure implementation of HS Plan.

His / Her duties will include:

- Monitor and advise relevant personnel on compliance with HS compliances at site;
- Facilitate inclusion of safety elements into work Method Statement.
- Highlight the requirement of safety through Tool-Box / other meetings.

- Conduct investigation of all accident/dangerous occurrences and recommend appropriate safety measures.
- Provide copies of site / office inspection report to relevant managers
- Plan procurement of PPEs and safety devices and inspect their healthiness.
- Report to Contract /Site Manager on all matters pertaining to status of safety and promotional program at site level.
- Facilitate administration of FIRST- AID.
- Conduct fire drill and facilitate emergency preparedness.
- Attend and participate in Site HS Management Review Meetings;
- Access and advise PI on the perceived HS training needs of project personnel; Monitor HS performance of subcontractors and make appropriate recommendations for performance improvement.

(5) Employees

All employees will be accountable for conforming to the requirement of the HS Plan and statutory requirements. In particular, every employee will be required to: -

- Take care of environmental protection and safety of himself & others;
- Conform to requirement of Project HS plan.
- Report defects in lifting appliances, lifting gears, transport equipment and any other equipment or tools & tackles to your immediate superior.
- Take care of personal protective equipment
- Do not let your work put another worker in danger.
- Use only means of access provided for specific work at site.
- Don't use drugs or alcohol on the job.
- Keep the latrines, urinals, wash points, canteen and other facilities provided in a clean and hygiene condition
- Report any unsafe work practice and any injury or accident to your supervisor.

SAFETY AND HEALTH OPERATIONAL CONTROL PROCEDURES

To minimize hazards and risks, control measures shall be introduced in the following order of priority: -

- ✓ Engineering controls
- ✓ Administrative controls
- ✓ PPE

SITE SAFETY RULES

- No one (including staff and workers etc.) will be allowed to enter the work site without prior induction training & without required PPE.
- Before start of work every day, five minutes pre work briefing shall be conducted by each respective front engineers / supervisor with subcontractor's job supervisor present. The job to be undertaken that day shall be explained.
- Once every week toolbox talks on specific topics will be conducted by the front engineer/supervisor in the presence of safety officer, all talks will be documented on the company's specified format. Toolbox talks will also be given whenever a new activity is taken up or a new gang turns up for work.
- No Staff or workers will be allowed to enter the work site or to start his everyday activity without necessary job-related PPE's. If there is any non-compliance, Safety Officer or Site Management will issue a warning and if it is repeated impose fine on he concerned person and concerned Sub contractors.
- Smoking is strictly prohibited in all parts of the worksites except specific smoking zone as authorized by the Health Safety Officer
- All employees including workers must know about the exact location and use of firefighting equipment. Never restrict the access towards the firefighting equipment, always keep the access free from any obstructions.
- Considering emergency situation always keep the access around the work site area free from any obstruction for rescue operation.
- Everyone including workers should inform about the accident / incident and dangerous Occurrence to Site In charge, Site Engineer & Health Safety Officer.

SAFETY PLAN

- Always Safety first
- Prevent all occupational accidents by implementing the necessary safety procedures for such purposes.
- Install an effective safety inspection system by establishing the adequate safety organization chart that delegates authority and responsibilities.
- We will evaluate critical safety activities during the construction and present methods and procedures for preventing accidents.
- Necessary safety tools, items and equipment will be provided for taking necessary Taking necessary protective measures including providing all instrument for safety as stated in SCC Health and Safety of the tender document.
- Comply with the requirement of Section-6, Employers requirement of the Contract document requirements.
- Health Safety unit will promote safety procedures through proper safety awareness program in the safety coordination meeting, if required involving Project related NGO.
- The provision of information concerning protection of hazard, by developments of "SAFETY
- SIGN".
- Protect the health and wellbeing of personnel during worksite activities and ensure that safety is the prime consideration during execution of the project.

Assessment of Personnel Competence

Prior to the commencement of the project, competence assessments shall be used in order to perform an initial selection of project personnel and to determine the amount and degree of additional training that has to be performed in order to ensure proper education, skill and training of all contractor's personnel.

Health and Safety Training & Drills

Contractor's training activities shall extend to occupational and non-occupational aspects of personnel health and safety.

Site Induction Training

- Contractor's personnel, as well as temporary site visitors shall receive site induction training prior to entering into the construction site.
- Upon completion of the induction training every construction personnel shall receive a work ID card showing his photograph, identification number and occupation, etc., which shall be carried by the card holder at all times.
- All visitors to the site shall receive a temporary ID card confirming participation in the site induction training.

Non-Occupational Health and Safety Training

Contractor shall conduct non-occupational health and safety training targeting the overall education of his personnel in order to maintain an overall status of health and safety. Non occupational health and safety training shall include, but not be limited to:

- Personal Fitness;
- Disease prevention.

Occupational Health and Safety Training

Contractor shall perform occupational health and safety training for all health and safety critical activities and skills. Contractor's occupational health and safety training shall include, but not be limited to:

- Permit to Work System;

- Driving and Vehicle Safety;
- General Operation Safety (personal protective equipment, working at height, etc.);
- Electrical Safety;
- Emergency Response and First Aid;
- Escape and Survival Techniques.

Health and Safety Drills

Contractor shall conduct regular drills to verify the effectiveness of the emergency response plan and procedures and to provide "hands on training" for his emergency response personnel.

Health and Safety drills shall be performed at all sites and shall include but not be limited to:

- Fire Safety and Fire Alarms;
- Emergency Response;
- Medical evacuation.

FIRST - AID FACILITIES AND MEDICAL TREATMENT

- ✓ Each worksite/area shall be equipped with it's a first aid box catering to the needs of particular work front.
- ✓ Medical causality evacuation and treatment procedures involving the nearest clinic /Hospitals shall be instituted.
- ✓ Appointment of trained first aider.

Fire Prevention

TCEL has own firefighting team well equipped with modern firefighting devices. The team will be stand by for the local minor incidents. Besides there are good numbers of Govt. fire brigade station within the area of NCB – 02.12E, all necessary telephone numbers will always keep for using in worst or uncontrolled situation. TCEL will obtain and follow any instructions of the competent authorities with respect to fire hazard when working in the vicinity of gas installations. Should a fire occur in the natural vegetation or plantations adjacent to the road for any reason, firefighting people will immediately suppress it.

Bi- Monthly Fire drill continues throughout the working period at the central Stockyard campus of Della, Demra Central Store Compound. The practice become one of the favorite training items among the workers.

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

Approach

The aim of this emergency preparedness and response plan is to guide personnel in an accident or emergency situation to prevent or minimize injury, damage and material loss and also to prevent or mitigate environmental impact from the accident or emergency.

Emergency Preparedness facility

Following emergency preparedness facilities have been provided at the site

- ✓ All the buildings and structures are well supplied with firefighting devices.
- ✓ Proper security arrangements are functioning round the clock.
- ✓ There is quick and efficient transport as well as communication system.
- ✓ Smoking is prohibited throughout the flammable premises.
- ✓ Water is kept available for firefighting purpose.
- ✓ Sufficient number of trained manpower is available to extinguish any fire and attend

emergency
- ✓ Sufficient number of Personal Protective Equipment like helmet and gloves are available
- ✓ Audible emergency alarm/whistles are provided.
- ✓ First Aid Kit is available.
- ✓ All key personnel have been provided communication mean such as telephone
- ✓ Mobiles. Any message can be communicated immediately.
- ✓ Main electrical equipment is switched off when not in use.
- ✓ All workers and staff are familiarized with the firefighting system.
- ✓ Escape routes are well defined.
- ✓ The POL dumps and gas cylinders are barricaded.
- ✓ Fire extinguishers are refilled on time.

Important Telephone Nos.

Services	Name	Phone No
Hospital	Dhaka Medical College	02-55165088
	Mojibunnessa Eye Hospital Limited	02-9130701
	Dhaka Mahanagar Shishu Hospital	02-57319737
	Maternal and Child Heath Training Institute	02-58610045
	Chowdhury General Hospital	01797-260671
Ambulance	Khaled Ambulance Service	01933-246577
	Zoom Ambulance Service in Dhaka	01715-942067
	Al Amin Ambulance	01720-448666
	Salman Ambulance Service	01941-354079
	Anju-Man- Mafidul Islam	9336611, 9340970
Fire Service	Bangladesh Fire Service and Civil Defense, Dhakeshwari Rd	02-8628688
	Lalbagh Fire Station	02-58617171
	Bangladesh Fire Service and Civil Defence Head Quarter	02-9555555
	Sadarghat Fire Service and Civil Defense Station	02-7119759
	Fire Service and Civil Defence Station, Hazaribag, Dhaka.	02-58616222
	Sutrapur Fire Station	02-7119759
	Khilgaon Fire Station	02-7218329

APPENDIX 9: SAMPLE GRIEVANCE REGISTRATION FORM

(To be available in Bengali and English)
The Project (DWSNIP) welcomes complaints, suggestions, queries and comments regarding project implementation. We encourage persons with grievance to provide their name and contact information to enable us to get in touch with you for clarification and feedback. Should you choose to include your personal details but want that information to 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 included 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: (Name 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:					

GRIVENCE REDRESS REGISTAR GRIVENCES RECORD AND ACTION TAKEN

Sr. No.	Date	Name and Contact No. of Complainer	Type of Complain	Place	Status of Redress	Remarks

APPENDIX 10: GRIEVANCE REDRESS FORM (BANGLA VERSION)

অভিযোগ দাখিল ও নিরসন ফর্মের নমুনা

প্রকল্প বাস্তবায়নের ক্ষেত্রে যে কোন আপত্তি, অভিযোগ, পরামর্শ, প্রশ্ন এবং মতামতকে প্রকল্পে (Project) স্বাগত জানাই। আমরা অভিযোগকারিকে অভিযোগের সাথে নাম-ও যোগাযোগের ঠিকানা দিতে উৎসাহ দেই যাতে তাঁদের অভিযোগ নিরসনকল্পে প্রয়োজনীয় যোগাযোগ করতে ও পদক্ষেপ সম্বন্ধে তাদের সময় মতো জানানো যায়। অপনি যদি আপনার পরিচয় জানাতে চান অথচ তা জনসম্মুখে গোপন রাখতে ইচ্ছা পোষণ করেন তাহলে **গোপনীয়** শব্দটি ফর্মের উপরে উলেস্নখ করন্নন। ধন্যবাদ।

তারিখঃ	**রেজিস্টেশনের স্থানঃ**				
যোগাযোগের ঠিকানা/ব্যক্তিগত তথ্যঃ					
নামঃ		**লিঙ্গ ঃ (টিক দিন)**	**পুরুষঃ** ☐ **নারী ঃ** ☐	**বয়সঃ**	
বর্তমান ঠিকানাঃ					
ফোন নং					
ই-মেইল (যদি থাকে)					
আপত্তি/ অভিযোগ/ পরামর্শ/ প্রশ্ন /মতামত অনুগ্রহ করে আপনার অভিযোগের সাথে বিস্তারিত বর্ণনা (কে, কি, কোথায়, কিভাবে ইত্যাদি) প্রদান করন্নন। যদি এর সাথে কোন সংযুক্তি/নোট/চিঠি/ছবি যোগ করা হয় তাহলে টিক দিনঃ ☐					

শুধুমাত্র দাপ্তরিক কাজে ব্যবহারের জন্যে

নামঃ (যে কর্মকর্তার দ্বারা অভিযোগ রেজিস্ট্রিকৃত)	
যে-মাধ্যমে অভিযোগ **গৃহীতঃ (টিক দিন)**	**১. নোট /চিঠিঃ** ☐ **২. ই-মেইল ঃ** ☐ **৩. টেলিফোনে/সশরীরে-মৌখিক ঃ** ☐
যে কর্মকর্তা অভিযোগটি পর্যালোচনা করেনঃ	
এই অভিযোগের প্রেক্ষিতে যে পদক্ষেপ গ্রহণ করা হয়েছেঃ	
পদক্ষেপটি জনসম্মুখে প্রচার করা হয়েছে কি ? **(টিক দিন)**	**১. হ্যাঁ ঃ** ☐ **২. না ঃ** ☐
যে-মাধ্যমে পদক্ষেপটি জনসম্মুখে প্রচার করা হয়েছেঃ	

APPENDIX 11: SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT TEMPLATE

1. INTRODUCTION

- Overall project description and objectives
- Environmental category as per ADB Safeguard Policy Statement, 2009
- Environmental category of each subproject as per national laws and regulations
- Project Safeguards Team

Name	Designation/Office	Email Address	Contact Number
1. PMU			
2. PIUs			
3. Consultants			

- Overall project and sub-project progress and status
- Description of subprojects (package-wise) and status of implementation (preliminary, detailed design, on-going construction, completed, and/or O&M stage)

Package Number	Components/List of Works	Status of Implementation (Preliminary Design/Detailed Design/On-going Construction/Completed/O&M)	Contract Status (specify if under bidding or contract awarded)	If On-going Construction	
				%Physical Progress	Expected Completion Date

2. COMPLIANCE STATUS WITH ENVIRONMENTAL REQUIREMENTS

Package No.	Subproject Name	Statutory Environmental Requirements	Status of Compliance	Validity if obtained	Action Required	Specific Conditions that will require environmental monitoring as per Environment Clearance, Consent/Permit to Establish

3. COMPLIANCE STATUS WITH ENVIRONMENTAL LOAN COVENANTS

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

4. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT PLAN (REFER TO EMP TABLES IN APPROVED IEE/S)

Confirm if IEE/s require contractors to submit site-specific EMP/construction EMPs. If not, describe the methodology of monitoring each package under implementation.

Package-wise Implementation Status

Package Number	Components	Design Status (Preliminary Design Stage/Detailed Design Completed)	Final IEE based on Detailed Design				Site-specific EMP (or Construction EMP) approved by Project Director? (Yes/No)	Remarks
			Not yet due (detailed design not yet completed)	Submitted to ADB (Provide Date of Submission)	Disclosed on project website (Provide Link)	Final IEE provided to Contractor/s (Yes/No)		

- Identify the role/s of Safeguards Team including schedule of on-site verification of reports submitted by consultants and contractors.
- For each package, provide name/s and contact details of contractor/s' nodal person/s for environmental safeguards.
- Include as appendix all supporting documents including **signed** monthly environmental site inspection reports prepared by consultants and/or contractors.
- With reference to approved EMP/site-specific EMP/construction EMP, complete the table below

- Provide the monitoring results as per the parameters outlined in the approved EMP (or site-specific EMP/construction EMP when applicable).
- In addition to the table on EMP implementation, the main text of the report should discuss in details the following items:

(i) **Grievance Redress Mechanism.** Provide information on establishment of grievance redress mechanism and capacity of grievance redress committee to address project-related issues/complaints. Include as appendix Notification of the GRM (town-wise if applicable).

(ii) **Complaints Received during the Reporting Period.** Provide information on number, nature, and resolution of complaints received during reporting period. Attach records as per GRM in the approved IEE. Identify safeguards team member/s involved in the GRM process. Attach minutes of meetings (ensure English translation is provided).

- Confirm if any dust was noted to escape the site boundaries and identify dust suppression techniques followed for site/s.
- Identify muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads.
- Identify type of erosion and sediment control measures installed on site/s, condition of erosion and sediment control measures including if these were intact following heavy rain;
- Identify designated areas for concrete works, chemical storage, construction materials, and refueling. Attach photographs of each area.
- Confirm spill kits on site and site procedure for handling emergencies.
- Identify any chemical stored on site and provide information on storage condition. Attach photograph.
- Describe management of stockpiles (construction materials, excavated soils, spoils, etc.). Provide photographs.
- Describe management of solid and liquid wastes on-site (quantity generated, transport, storage and disposal). Provide photographs.
- Provide information on barricades, signages, and on-site boards. Provide photographs.
- Provide information on
- Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary of Environmental Monitoring Activities (for the Reporting Period)

Impacts (List from IEE)	Mitigation Measures (List from IEE)	Parameters Monitored (As a minimum those identified in the IEE should 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

5. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING

- Brief description on the approach and methodology used for environmental monitoring of each sub-project

6. MONITORING OF ENVIRONMENTAL IMPACTS ON 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 should be presented as per the tables below.

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

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 (Monitoring Results)					
			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) (Monitoring Results)	
			Day Time	Night Time

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

7. 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

Site Inspection Checklist

DMA No/Package: . . . . . Date: . . . . . .

Location: . . . . . .

	Description	Observation			Remarks
1.	**Supervision and Management On-Site**	Yes	No.	NA	
	a. Is an EHS supervisor available?				
	b. Is a cope of the SEMP available at construction site?				
	c. Are daily toolbox meetings conducted on site?				
2.	**Facilities**	**Yes**	**No.**	**NA**	
	a. Are there a medical first aid kit available on site?				
	b. Are emergency contact details available on-site?				
	c. Are there PPEs available; Helmet, HI-VIS Vest, Gumboots, Eye Wear, Dust Mask, Safety Gloves, Earplugs?				
	d. Are the PPEs in good condition?				
	e. Are there firefighting equipment on site?				
	f. Are there separate mobile sanitary facilities for male and female workers?				
	g. Are sanitary facilities cleaned and disinfected regularly?				
	h. Is drinking water supply available for workers?				
3.	**Occupational Health and Safety**	**Yes**	**No.**	**NA**	
	a. Are the PPEs being used by workers?				
	b. Is breaktime for workers provided?				
	c. Is construction work site barricated with caution tape?				
4.	**Community Health and Safety**	**Yes**	**No.**	**NA**	
	a. Are safety signages posted around the sites?				
	b. Are temporary and safe walkway for pedestrians available near work sites?				
	c. Are consultation meeting/focus group discussion/tea stall meeting arranged regularly on site?				
	d. Are existing users notified in available in advance about temporary disruption of water supply?				
	e. Are Leaflets distributed on site to inform the local residents about the projects work?				
	f. Is complain book available on work site to receive complain from local people?				
5.	**Solid Waste Management**	**Yes**	**No.**	**NA**	
	a. Are excavated materials placed sufficient away from water courses?				
	b. Are debris and waste materials tranported to selected disposal places from temporary disposal site?				
6.	**Excavation Work**	**Yes**	**No.**	**NA**	
	Trenchs up to 2m:				
	a. Are excavation area Safety tapes and barriers surrounded?				

	Description	Observation			Remarks
	b. Whether excavated material is dumped at least 1m away from trench wall				
	c. Whether the extra materials is removed?				
	d. In case of Ground water whether pump water is drained properly?				
	Trenches & pits depth of more than 2m:				
	a. Whether firm barricades are provided?				
	b. In case of loose soil strata whether shoring is provided?				
	c. Are Display Board, Traffic diversion, Clean & Clear passage way provided?				
	d. Whether NGO has done the IEC activities?				
7.	**Dust Control**	**Yes**	**No.**	**NA**	
	a. Is the construction site watered to minimize generation of dust?				
	b. Are roads within and around the construction sites sprayed with water on regular intervals?				
	c. Is there a speed control for vehicles carrying soils and other spoisl covered?				
	d. Are stockpiles of sand, cement and other construction materials covered to avoid being airborne?				
	e. Are construction vehicles carrying soils and spoiled covered?				
	f. Are generators provided with air pollution control devices?				
	g. Are all vehicles regularly maintained to minimize emission of black smoke? Do they have valid permits?				
8.	**Noise Control**	**Yes**	**No.**	**NA**	
	a. Is the work only taking place between 7am to 7pm, week days?				
	b. Do generators operate with doors closed or provided with sound barrier around them?				
	c. Do workers use ear plugs/hearing protections at noise generating locations?				
	d. Is idle equipment turned off or throttled down?				
	e. Are neighbouring residents notified in advance of any noisey activities expected at construction sites?				
9.	**Traffic Management**	**Yes**	**No.**	**NA**	
	a. Are traffic signages available around the construction sites and nearby roads?				
	b. Are re-routing signage sufficient to guide motorists?				
	c. Are flagmen present to diret traffic during rush hours?				
	d. Are the excavation sites along roads provided with barricades with reflectors?				
	e. Are the excavation sites provided with sufficient lighting at night?				
10.	**Electrical Work**	**Yes**	**No.**	**NA**	
	a. Whether the workers are using proper gloves?				
	b. Weather required earthing is provided for equipment?				

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	Description	Observation			Remarks
	c. Weather proper wiring & connection boards with RCCB (30mA) fuse are being used?				
	d. Is the electrical equipment are kept on dry place, barricaded to avoid accidental contact by stakeholder?				
11.	**Recording System**	**Yes**	**No.**	**NA**	
	a. Do the contractors have recording system for SEMP implementation?				
	b. Are the daily monitoring sheets accomplished by the contractor EHS supervisor (or equivalent) properly complied?				
	c. Are laboratory results of environmental sampling conducted since the commencement of construction activities properly complied?				
	d. Are these records readily available at the site and to the inspection team?				
	e. Are utility accidents recorded and proper actions are taken immediately?				
	f. Are public complaints recorded at construction site and addressed quickly and properly?				
	g. Are there any registered book available at construction site/stockyard for visitors/inspection team?				
	h. Is there any complain box available for anonymous complain at construction site/stockyards?				

Contractor's Representative:

Signature:

Name:

Designation: Site Engineer(SE)/SM/CM

DMS Representative:

Signature:

Name:

Designation: SARE/ARE/CM

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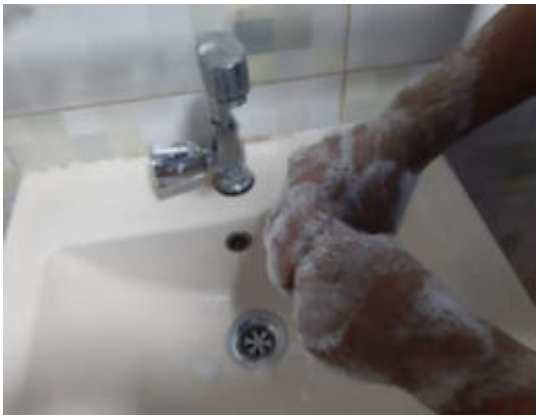
APPENDIX 12: ADDENDUM HEALTH AND SAFETY PLAN {IN RESPONSE TO CORONAVIRUS DISEASE (COVID 19) PANDEMIC}

Disinfection to the office furniture machineries and door sides.



Hand wash using soap at least for 20 second each time

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IMPLEMENTATION ARRANGEMENT

Occupational, Health and Safety (OHS) Officer[34] who shall oversee compliance to the OHS requirements particularly on prevention of COVID-19 transmission in the workplace. This shall include but not limited to the following:

- Orientation of workers on OHS, disaster and emergency response procedures, and COVID-19;
- Provision and use of personal protective equipment (PPE), fire suppression system and appropriate medical emergency response logistics;
- Placement of safety signs, posters (e.g., WHO posters on COVID-19, MOHFW/DGHS posters/banner), information and warning signs within the worksite and adjacent areas;
- Implementation and maintenance of good housekeeping;
- Monitoring of occupational health and environmental controls (e.g., airborne contaminants, noise, illumination, ventilation, temperature and humidity); and
- Conduct of regular safety inspection and incident reporting/ recording.
- Certify that the Contractor and all sub-contractors are in full compliance of these guidelines.

The contractor shall ensure that the person thus nominated should be present on site at all times. The Implementation arrangement for COVID 19 prevention are as follows:

All government and WHO guide lines publis will be followed.

[34] The existing Environmental Officer OR Health & safety officer OR Site Manager of the contractor can be designated as OHS officer by undergoing the training available at

(a) https://www.who.int/emergencies/diseases/novel-coronavirus-2019/training/online-training
(b) https://openwho.org/courses/eprotect-acute-respiratory-infections
(c) https://openwho.org/courses/COVID-19-IPC-EN

APPENDIX 13: WASTE MANAGEMENT PLAN

1. PURPOSE

A Waste Management Plan (WMP) plays a key role in achieving sustainable waste management. The purpose of this plan is to ensure that effective procedures are implemented for the handling, storage, transportation and disposal of waste that is generated from the activities on site. The plan prescribes measures for the collection, temporary storage and safe disposal of the waste streams associated with the project and includes provisions for the recovery, re-use and recycling of waste.

This WMP has been compiled as part of the project Environmental Management Plan (EMP) and includes waste stream information available at the time of compilation. This plan should be further updated should further detail regarding waste quantities and categorization become available, during the construction stages.

2. RELEVANT ASPECTS OF THE SITE

Waste generated on site, originates from various sources including:

- Concrete waste generated during RCC work i.e. chamber construction etc.
- Old Pipes, HDPE Pipes and fittings from pipe laying activities
- Hydrocarbon waste from vehicle, equipment and machinery parts (oil cans, filters, rags etc.), and servicing.
- Recyclable waste in the form of paper, cardboard, glass, metal offcuts, wood/ wood pallets and plastic.
- Organic waste from food waste and alien vegetation removal.
- Sewage from portable toilets.
- Inert waste from excess rock and soil from site clearance and trenching works.

3. WASTE MANAGEMENT PRINCIPLES

An integrated approach to waste management on site is needed. Such an approach is illustrated in the figure below.

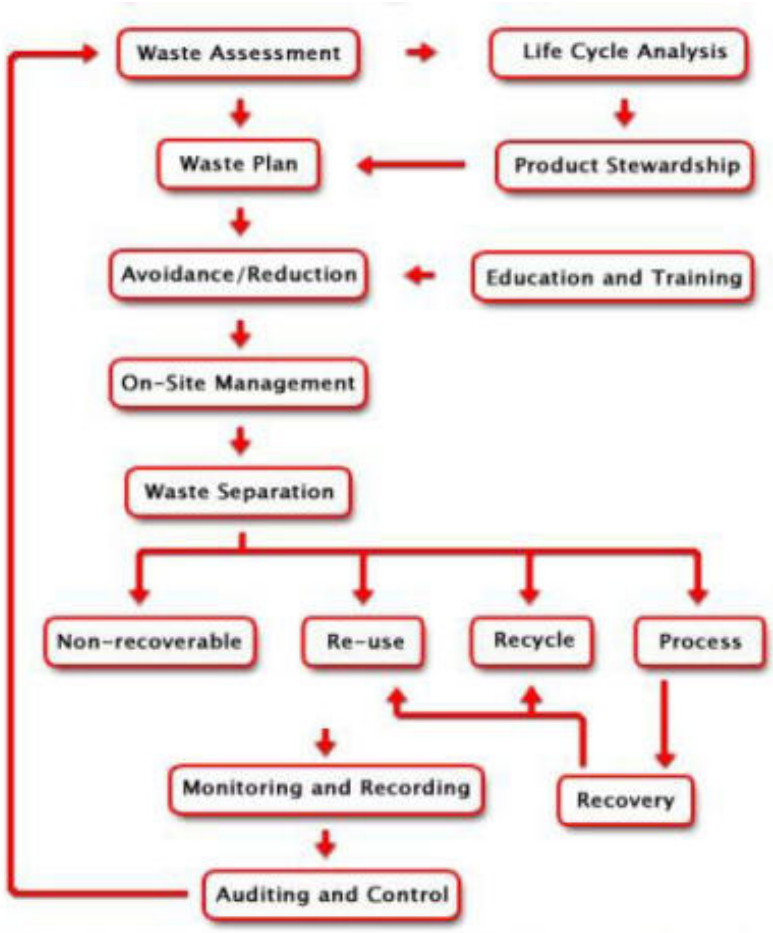

Figure: The integrated waste management approach to waste

- Reducing volumes of waste is a priority;
- If reduction is not feasible, the maximum amount of waste is to be recycled; and
- Waste that cannot be recycled is to be disposed of in the most environmentally responsible manner as possible.

3.1 Construction phase

A plan for the management of waste during construction is detailed below. A Method Statement detailing specific waste management practices during construction will be prepared by the TCEL prior to the commencement of construction.

3.1.1 Waste Assessment / Inventory

- The Environmental Officer of TCEL must develop, implement and maintain a waste inventory reflecting all waste generated during construction for both general and hazardous waste streams.
- Construction method and materials should be carefully considered in view of waste reduction, re-use, and recycling opportunities.
- Once a waste inventory has been established, targets for recovery of waste (minimization, re-use, recycling) should be set.

3.1.2 Waste collection, handling and storage

- TCEL will implement their own waste recycling system, i.e. separate bins for food waste, plastics, paper, wood, glass cardboard, metals, etc.
- Portable toilets will be monitored and maintained daily.
- Below ground storage of septic tanks, if installed, must withstand the external forces of the surrounding environment. The area above the tank will be demarcated to prevent any vehicles or heavy machinery from driving around the area.
- Waste collection bins and hazardous waste containers will be provided by TCEL and placed at various areas around site for the storage of organic, recyclable and hazardous waste.
- A dedicated waste area will be established on site for the storage of all waste streams, before removal from site.

- Signage/ colour coding must be used to differentiate disposal areas for the various waste streams (i.e. paper, cardboard, metals, food waste, glass etc.).
- Hazardous waste must be stored within a bunded area.
- The location of all temporary waste storage areas must aim to minimize the potential for impact on the surrounding environment, including prevention of contaminated runoff, seepage, and vermin control.
- Waste storage shall be in accordance with all Regulations and best-practice guidelines and under no circumstances may waste be burnt on site.
- Vegetation removed from the site will be chipped, removed from the site and disposed of at an appropriate waste disposal facility or used as mulch on site.
- A dedicated waste management team will be appointed by TCEL Environmental Officer, whom will be responsible for ensuring the

continuous sorting of waste and maintenance of the area. The waste management team must be trained in all areas of waste management and monitored by the Environmental Officer.

- All waste removed from site will be done so by a registered/ licensed subcontractor, whom must supply information regarding how waste recycling/ disposal will be achieved. The registered subcontractor must provide waste manifests for all removals at least once a month.

3.1.3. Management of waste storage areas

- The position of all waste storage areas must be located away from water courses and ensure minimal degradation to the environment. The main waste storage area must have a suitable storm water system separating clean and dirty storm water.
- Waste storage areas must be under roof or the waste storage containers must be covered with tarpaulins (or similar material) to prevent the ingress of water.
- Collection bins placed around site and at subcontractors' camps must be maintained and emptied on a regular basis by the principal contractor.
- Waste must be stored in designated containers and not on the ground.

- Inspections and maintenance of bunds must be undertaken daily. Bunds must be inspected for leaks or cracks in the foundation and walls.
- It is assumed that any rainwater collected inside the bund is contaminated and must be removed and stored as hazardous waste, and not released into the environment. If any leaks occur in the bund, these must be removed immediately.

3.1.4. Disposal

- Waste generated on site must be removed on a regular basis, as determined by the Environmental Officer of TCEL. This frequency may change during construction depending on waste volumes generated at different stages of the construction process.
- Waste must be removed by a suitably qualified contractor and disposed at an

appropriately licensed landfill site. Proof of appropriate disposal must be provided by TCEL.

3.1.5. Record keeping

The success of the waste management plan is determined by measuring criteria such as waste volumes, cost recovery from recycling, cost of disposal. Recorded data can indicate the effect of training and education, or the need for education.

It will provide trends and benchmarks for setting goals and standards. It will provide clear evidence of the success or otherwise of the plan.

- Documentation (waste manifest, certificate of issue or safe disposal) must be kept detailing the quantity, nature, and fate of any regulated waste for audit purposes.
- Waste management must form part of the monthly reporting requirements in terms of volumes generated, types, storage and final disposal.

3.1.6. Training

Training and awareness regarding waste management shall be provided to all employees and contractors as part of the toolbox talks or on-site awareness sessions.

4. MONITORING OF WASTE MANAGEMENT ACTIVITIES

Records must be kept of the volumes/ mass of the different waste streams that are collected from the site throughout the life of the project. TCEL is to provide the following information in monthly reports:

- Monthly volumes/ mass of the different waste streams collected;
- Monthly volumes/ mass of the waste that is disposed of at a landfill site;
- Monthly volumes/ mass of the waste that is recycled; and
- Data illustrating progress compared to previous months.

This report will aid in monitoring the progress and relevance of the waste management procedures that are in place.

APPENDIX 14: PUBLIC CONSULTATION RECORDS

Attendance sheets

Attendance Sheet of Focus Group Discussion at DMA-705 (Date-25.10.23)

Initiative of Livelihood Development (ILD) Ltd.
Dhaka Water Supply Network Improvement Project (DWSNIP)
NCB-02.12E

Selection of Consulting Services for: NGO for Demand Management and public Awareness Campaign
Place/Venue of Meeting: DMA-705
Date: 25.10.23
Packaga No: NCB-02.12E
Time: 10.00 AM
DMA No: 705

Participants Attendance(Continued)

SL No	Name of Participant	Occupation/ Position	Adsress/Organization	Mobile No	Signature	Remarks
1.	মো: [illegible]	[illegible]	-	01300[illegible]47	[illegible]	
2.	মো: [illegible]	[illegible]	-	0168263801	[illegible]	
3.	[illegible]	গৃহিনী	-	0187640597	[illegible]	
4.	[illegible]	"	-	0318939[illegible]	[illegible]	
5	[illegible]	"	-	0187645292 0	[illegible]	
6.	[illegible]	"	-	01735770[illegible]	[illegible]	
7.	[illegible]	"	-	01959[illegible]38	[illegible]	
8.	কমলা	"	-	01743497125	কমলা	
9.	[illegible]	"	-	0174907008 67	[illegible]	
10.	মো: ইব্রাহিম [illegible]	Business	-	01712117121	[illegible]	
11.	[illegible]	[illegible]	-	0140061942 0	[illegible]	
12.	[illegible]	[illegible]	-	0191367355 65	[illegible]	
13.	[illegible]	"	-	01726466693	[illegible]	
14.	[illegible]	TCEL	-	0167822451 0	[illegible]	
15.	[illegible]	TCEL	-	0175627949 4	[illegible]	
16.	[illegible]	TCEL	-	01724160137	[illegible]	

Conducted by:
Name: Nurun nahar
Pavel

Dasignation: Coordinator
F.O

Male: 7
Female: 9
Total Participants: 16

Photographs of Public Consultation Sessions:

	
Public Consultation at a tea stall **Location: DMA 705**	**Public Consultation at a local office** **Location: DMA 705**

APPENDIX 15: LABORATORY TEST REPORT ENVIRONMENTAL MONITORING REPORT (NOISE LEVEL)

EnviroCare International Ltd.
A house of Inspection, Testing, Assessment &Consultancy

Ref: ECIL/October-2023/ DWSNIP/NL-01

Test Result of Noise Level Analysis

Name of Project	Dhaka Water Supply Network Improvement Project (DWSNIP_DMA-705)
Description of Sample	Noise Level Analysis
Sample Collector	Collected by Envirocare Technical Team
Sample Date	19th October, 2023
Date of Analysis	21th October – 2nd November, 2023
Reporting Date	2nd November, 2023

Sampling Location

Sl.	Location	Location ID	GPS Coordinate
1.	In front of Muradpur Water Pump, Donia, Jurain	NL 01	N-23.695333 E-90.435972
2.	Madrashatul Daril Hafezia Madrasha, Paterbagh Water Pump, South Donia, Jurain	NL 02	N-23.695678 E-90.447712

Description of Analysis

Location ID	Monitoring Time	Noise level [dB(A)]			Standard* (dBA)	Land Use Category
		Leq	L_{max}	L_{min}		
NL 01	Day	58.94	66.2	46.5	60	Mixed
	Night	46.63	57.6	41.7	50	
NL 02	Day	63.39	70.2	52.2	60	
	Night	42.26	54.3	38.9	50	

*Standard: The Environment Conservation Rules (ECR), 1997 and Subsequent amendment in 2006
Leq-Equivalent Continuous Sound Pressure Level

Envirocare International Ltd. Dhaka

Prepared By	Reviewed By	Approved By:
Md. Golam Saclayen	Sanjoy Kumar Mondol	Shorov Roy
B.Sc. in Environmental Science and Resource Management (MBSTU)	B.Sc. in ESRM (MBSTU)	B.Sc. in ESRM (MBSTU)
Environmental Analyst	MS in Environmental Science (MBSTU)	MS in Environmental Science (BAU)
	Technical Manager	Quality Manager

Address: House #9 (3rd Flr), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

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TEST REPORT Environmental Monitoring Report (Ambient Air Quality)

EnviroCare International Ltd.
A house of Inspection, Testing, Assessment & Consultancy

Test Result

Sampling has been done between 10:30 AM to 6:45 PM according to the *Envirocare Work Instruction* ***WI-01and 02.***

Test Result

Sl. No	Ambient Air Quality Result									
	Location	GPS Coordinator	SPM	$PM_{2.5}$	PM_{10}	SO_2	NO_2	CO	O_3	Pb
			µg/m³	µg/m³	µg/m³	µg/m³	PPb	PPb	PPb	µg/m³
1	In front of Muradpur Water Pump, Donia, Jurain	N-23.695333 E-90.435972	159	94	141	7.73	29	0.065	1.009	BDL
2	Madrashatul Darul Hafezia Madrasha, Paterbagh Water Pump, South Donia, Jurain	N-23.695678 E-90.447712	181	98	149	8.47	24	0.042	0.993	BDL

Note:
SPM *= Suspended Particulates Matter,* ***O₃*** *= Ozone,* ***CO*** *= Carbon Monoxide,* ***PM*** *= Particulate Matter,* ***SO₂*** *= Sulpher Di Oxide,* ***NO₂*** *= Nitrogen Di Oxide,* ***NYS*** *= Not Yet Set,* ***PPM*** *= Parts per Million,* ***BDL*** *= Below of Detection Level*

Address: House #9 (3rd Flr.), Road # 6, Sector # 12, Uttara, Dhaka-1230, Bangladesh. Cell: 01925687029,
Phone: +88 0255087283, Web: www.envirocarebd.com, Email: info@envirocarebd.com

Total seven parameters (SPM, PM_{10}, $PM_{2.5}$, NO_2, SO_2, CO and O_3) of ambient air quality have been analyzed for each location. Overall, the results show that the level of air pollutants in all of the monitoring locations were found within the permissible limit. The concentration of fine particulate matter ($PM_{2.5}$) varies from 94 µg/m_3 in AQ 01 to 98 µg/m_3 in AQ 02 area. Similarly, the concentration of PM_{10} also varies from 141 µg/m_3 in AQ 01 to 149 µg/m_3 in AQ 02 areas. The details analysis is given in Annex of the report. According to the test result the working environment of this area is good. But it is recommended to providing mask to the relevant peoples of those areas where the concentration of the pollutant was found closed to the standard level to avoid health hazard.

TEST REPORT Environmental Monitoring Report (Ground Water Analysis)

EnviroCare International Ltd.
A house of Inspection, Testing, Assessment &Consultancy

Ref: ECIL/2023/2613/GW

Test Results of Ground Water Quality Analysis

Name of the Client : The Civil Engineers Limited
Client Address : Civil Engineers Bhaban (11th Floor), 69 Mohakhali C/A, Dhaka-1212
Name of project : Dhaka Water Supply Network Improvement Project (DWSNIP_DMA-705)
Description of sample : Sample was collected from project area.
Sample of Collector : Collected by Envirocare Technical Team
Sampling Date : 5th November, 2023
Reporting Date : 9th November, 2023

Description of Analysis:

SL. NO.	Parameter	Unit	Sample ID:GW-1	Sample ID:GW-2	Bangladesh ECR-2023	WHO-2011	Analysis Method
01	pH	-	7.17	7.35	6.5-8.5	6.5-8.5	Electrometric
02	Turbidity	NTU	21.7	24.1	5	5	Nephelometric method
03	Total Suspended Solids (TSS)	mg/l	04	06	10	--	Gravimetric
04	Dissolved Oxygen (DO)	mg/l	7.61	7.94	-	--	Electrometric
05	Chloride	mg/l	46	39	250	250	Argentometric
06	Iron (Fe)	mg/l	1.37	1.14	0.3-1.0	0.3	AAS
07	Manganese (Mn)	mg/l	0.450	0.529	0.4	0.4	AAS
08	Arsenic (As)	mg/l	<0.01	<0.01	0.05	0.01	AS-test kit
09	Total Coliforms	CFU/100 ml	0	0	0	0	Membrane Filtration

NB: Test Conducted from Dhaka WASA Central Laboratory

Envirocare International Ltd. Dhaka

Prepared By	*Reviewed By*	*Approved By:*
Md. GolamSaclayen	Sanjoy Kumar Mondol	Shorov Roy
B.Sc. in Environmental Science and Resource Management (MBSTU)	B.Sc. in ESRM (MBSTU)	B.Sc. in ESRM (MBSTU)
Environmental Analyst	MS in Environmental Science (MBSTU)	MS in Environmental Science (BAU)
	Technical Manager	Quality Manager

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APPENDIX 16: PHTOGRAPH OF ENVIRONMENTAL PARAMETERS (AIR, NOISE, WATER) QUALITY MONITORING




Photos of Air Quality Monitoring

Photos of Noise Level Monitoring

Photos of Groundwater Sampling

APPENDIX 17: CALIBRITION CERTIFICATES FOR AIR QUALITY AND NOISE LEVEL MONITORING EQUIPMENT

ISO/IEC : 17025
Accredited Laboratory

STANDARD CALIBRATION SERVICE PRIVATE LIMITED

www.scsbd-ltd.com

Corporate Office
Rabeya Commercial Complex, 33/Kha (5th Floor)
Section-6, Mirpur Circle-10, Dhaka-1216, Bangladesh
Cell: +8801712 789 321

Laboratory Location
House # 427, Road # 6/2
Shaheenbagh, Tejgaon, Dhaka-1215
Tel: +88-02-48117267, Cell: +880 1921 612324, +880 1919 958147-50
E-mail: info@scsbd-ltd.com, www.scsbd-ltd.com

CERTIFICATE of CALIBRATION

Certificate No. 02224075552
Issue Date 24/07/2022

Customer Details:

Name	**Envirocare International Ltd.**
Address	House No # 05, Road No # 06, Sector # 12, Uttara, Dhaka, Bangladesh.
Tel	+880 1533 904911
E-mail	shorove.az.08@gmail.com

Details of Unit Under Calibration (UUC):

Description	Air Quality Monitoring Station
Manufacturer	Henan OCEANUS Import & Export Co., Ltd.
Model/Type	AQM-09
Serial Number	N/P
ID No.	**EIL-AQM-001**
Range/working Range	Ref on Obs
Least Count	Ref on Obs
Accuracy	As Per Instrument
Location of Calibration	Laboratory
Visual Inspection	OK
Date of Calibration	24/07/2022
Suggested Due Date	23/07/2023
Calibration Procedure	The calibration had been performed in accordance with calibration procedure CDP/SCS/115 (Procedure based on Comparision Method).
Calibration Result	The details of standard equipment used for calibration & result of calibration are given in page 2 to 5.
Conclusion	For the status of measurements please refer to the guidance notes.

Environment: (certified against calibrated digital temperature & humidity meter)

Temperature (°C)	25±3
Relative Humidity (%RH)	40 to 60

Change in temperature and relative humidity of the Laboratory during the calibration was less than 0.3°C per hour and 5.0% per 4 hours respectively.

This certificate is issued strictly in accordance with the requirements of ISO 17025:2017. All calibration equipments are traceable to the International Standards . Documentary evidence is available upon request.

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ISO/IEC : 17025
Accredited Laboratory

STANDARD CALIBRATION SERVICE PRIVATE LIMITED

www.scsbd-ltd.com

Corporate Office
Rabeya Commercial Complex, 33/Kha (5th Floor)
Section-6, Mirpur Circle-10, Dhaka-1216, Bangladesh
Cell: +8801712 780 321

Laboratory Location
House # 427, Road # 6/2
Shaheenbagh, Tejgaon, Dhaka-1215
Tel: +88-02-48117267, Cell: +880 1921 612324, +880 1519 958147-50
E-mail: info@scsbd-ltd.com, www.scsbd-ltd.com

CERTIFICATE of CALIBRATION

Details of Standard Equipment Used for Calibration:

Sl. No.	Description	Make	Inst. Sl. /ID NO.	Certificate No.	Validity	Calibrated By
01	Multi-function Calibrator	FLUKE	SCS/MFC/01	FL900012	20/12/2022	FLUKE
02	RTD with Indicator	Eurotherm/ Tempsens	SCS/RTD/01	QSI/0683/21/12	22/12/2022	QSI-INDIA
03	Sound Level Meter	CEM	SCS/SLM/01	QSI/1222/21/02	17/02/2023	QSI-INDIA
04	Thermal Anemometer	Testo	SCS/TAM/01	QSI/1096/21/02	03/02/2023	QSI-INDIA
05	Angle Protractor	DXL	SCS/SLM/01	QSI/0259/22/02	01/02/2023	QSI-INDIA
06	Portable Flue Gas Analyzer	LOOBO	SCS/PFGA/01	QSI/0775/22/02	17/02/2023	QSI-INDIA
07	Digital Thermo Hygrometer	CEM	SCS/DL/05	QSI/0527/21/10	11/10/2022	QSI-INDIA
08	Standard Sample	NIST Traceable				

Status A The measurement is within tolerance, due allowances having been made for the uncertainty of the measurement.

Status B The measurement may be out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status C The measurement is out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status D No conclusion can be drawn, because the standard(s) do(es) not specify a tolerance for this measurement.

OBSERVATION:

Carbon Monoxide CO :(upto 200 ppb)

Sl. No.	Target Value (ppb)	Actual Value (ppb)	Error	Tolerance	Status	Uncertainty
01	0	0.0	0.0	N/S	D	±0.05 % of rdg.
02	10	10.0	0.0	N/S	D	
03	50	50.2	-0.2	N/S	D	
04	100	100.4	-0.4	N/S	D	
04	180	180.8	-0.8	N/S	D	

Nitrogen Dioxide NO_2 :(upto 2000 ppb)

Sl. No.	Target Value (ppb)	Actual Value (ppb)	Error	Tolerance	Status	Uncertainty
01	0	0	0	N/S	D	±0.05 % of rdg.
02	100	100	0	N/S	D	
03	500	501	-1	N/S	D	
04	1000	1001	-1	N/S	D	
04	1500	1502	-2	N/S	D	

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Standard Calibration Service
ISO/IEC : 17025
Accredited Laboratory

STANDARD CALIBRATION SERVICE PRIVATE LIMITED
www.scsbd-ltd.com

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Ozone O_3 :(upto 2000 ppb)

Sl. No.	Target Value (ppb)	Actual Value (ppb)	Error	Tolerance	Status	Uncertainty
01	0	0	0	N/S	D	±0.05 % of rdg.
02	100	100	0	N/S	D	
03	500	501	-1	N/S	D	
04	1000	1002	-2	N/S	D	
04	1500	1504	-4	N/S	D	

Sulfur Dioxide SO_2 :(upto 2000 ppb)

Sl. No.	Target Value (ppb)	Actual Value (ppb)	Error	Tolerance	Status	Uncertainty
01	0	0	0	N/S	D	±0.05 % of rdg.
02	100	101	-1	N/S	D	
03	500	502	-2	N/S	D	
04	1000	1002	-2	N/S	D	
04	1500	1503	-3	N/S	D	

PM 2.5 (0 to 1000) µg/m³: (Verified against traceable sample)

Sl. No.	Standard Value (µg/m³)	U.U.C Value (µg/m³)	Error (µg/m³)	Tolerance (µg/m³)	Status	Uncertainty
01	100	99.982	0.018	N/S	D	±0.4% of rdg.
02	300	299.965	0.035	N/S	D	
03	500	499.937	0.063	N/S	D	
04	900	899.914	0.086	N/S	D	

PM 10 (0 to 1000) µg/m³: (Verified against traceable sample)

Sl. No.	Standard Value (µg/m³)	U.U.C Value (µg/m³)	Error (µg/m³)	Tolerance (µg/m³)	Status	Uncertainty
01	100	99.977	0.023	N/S	D	±0.4% of rdg.
02	300	299.951	0.049	N/S	D	
03	500	499.912	0.088	N/S	D	
04	900	899.890	0.110	N/S	D	

TSP (0 to 1000) µg/m³: (Verified against traceable sample)

Sl. No.	Standard Value (µg/m³)	U.U.C Value (µg/m³)	Error (µg/m³)	Tolerance (µg/m³)	Status	Uncertainty
01	100	99.955	0.045	N/S	D	±0.4% of rdg.
02	300	299.939	0.061	N/S	D	
03	500	499.902	0.098	N/S	D	
04	900	899.976	0.024	N/S	D	

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Output Sound : (verified against calibrated master equipment)

Obs. No.	Standard Value (dB)	U.U.C. Value (dB)	Error (dB)	Tolerance (dB)	Status	Uncertainty (dB)
01	93.9	94.0	0.1	N/S	D	±1.2
02	113.6	114.0	0.4	N/S	D	

Temperature: (verified against calibrated instruments)

Sl. No.	Standard Value (°C)	U.U.C. Value (°C)	Error (°C)	Tolerance	Status	Uncertainty (°C)
01	-10.13	-10.0	0.13	N/S	D	±0.20
02	0.00	0.0	0.00	N/S	D	
03	9.94	10.0	0.06	N/S	D	±0.30
04	19.87	20.0	0.13	N/S	D	
05	29.70	30.0	0.30	N/S	D	
06	49.62	50.0	0.38	N/S	D	

Humidity: (verified against calibrated instruments)

Sl. No.	Standard Value (%)	U.U.C. Value (%)	Error (%)	Tolerance	Status	Uncertainty (%)
01	19.9	20.0	0.1	N/S	D	±0.5
02	29.9	30.0	0.1	N/S	D	
03	39.7	40.0	0.3	N/S	D	
04	49.3	50.0	0.7	N/S	D	
05	68.8	70.0	1.2	N/S	D	
06	88.7	90.0	1.3	N/S	D	

Air Pressure : (verified against calibrated instruments)

Sl. No.	UUC Value (HPa)	STD Avg. Value (HPa)	Error (HPa)	Tolerance	Status	Uncertainty (HPa)
01	0.0	0.0	0.0	N/S	D	±0.01
02	650.0	650.2	-0.2	N/S	D	
03	700.0	700.7	-0.7	N/S	D	
04	800.0	801.1	-1.1	N/S	D	
05	1000.0	1001.4	-1.4	N/S	D	

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Wind Speed : (verified against calibrated instruments)

Sl. No.	U.U.C. Readings (m/s)	STD. Readings (m/s)	Error (m/s)	Tolerance	Status	Uncertainty (m/s)
01	0.00	0.0	0.000	N/S	D	±0.002
02	5.00	5.008	-0.008	N/S	D	
03	10.00	10.011	-0.011	N/S	D	
04	20.00	20.015	-0.015	N/S	D	
05	30.00	30.021	-0.021	N/S	D	
06	50.00	50.026	-0.026	N/S	D	

Wind Direction : (verified against calibrated instruments)

Sl. No.	STD. Readings (°)	U.U.C. Readings (°)	Error (°)	Tolerance	Status	Uncertainty (°)
01	0.0	0.0	0.00	N/S	D	±0.01
02	5.0	5.00	0.00	N/S	D	
03	10.0	10.00	0.00	N/S	D	
04	30.0	30.00	0.00	N/S	D	
05	50.0	50.05	-0.05	N/S	D	
06	90.0	90.05	-0.05	N/S	D	

The overall uncertainty shall be calculated as per ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level.

Notes:
1. The values mentioned above are the mean readings.
2. No adjustment was done during the calibration.
3. Any section marked, "N/A" means Not Applicable, "N/P" means Not Provided, "N/R" means Not Readable, "N/S" means Not Specified.
4. Each sample is collected by drawing a known volume of air into a five-layer gas sampling bag.

Calibrated By:

Md. Shamim Khan
(Calibration Engineer)

Issued By:

Md. Arman Ahmed Razu
(Asst. Technical Manager)

End of Calibration Certificate

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CERTIFICATE of CALIBRATION

Certificate No. 0222504702
Issue Date 25/04/2022

Customer Details:

Name	**Envirocare International Ltd.**
Address	House No # 09, Road No # 06, Sector # 12, Uttara, Dhaka, Bangladesh.
Tel	+880 1533 904911
E-mail	shorove.az.08@gmail.com

Details of Unit Under Calibration (UUC):

Description	Sound Level Meter
Manufacturer	Lutron
Model/Type	SL-4010
Serial Number	I.412780
ID No.	**EIL/SLM-01**
Range/working Range (dB)	35 to 130
Least Count (dB)	0.1
Accuracy	As Per Instrument
Location of Calibration	Laboratory
Visual Inspection	OK
Date of Calibration	25/04/2022
Suggested Due Date	24/04/2023
Calibration Procedure	The calibration had been performed in accordance with calibration procedure SCS.WI-09M (Procedure based on comparision method).
Calibration Result	The details of standard equipment used for calibration & result of calibration are given in page 2.
Conclusion	For the status of measurements please refer to the guidance notes.

Environment: (certified against calibrated digital temperature & humidity meter)

Temperature (°C)	20±2
Relative Humidity (%RH)	40 to 60

Change in temperature and relative humidity of the Laboratory during the calibration was less than 0.3°C per hour and 5.0% per 4 hours respectively.

This certificate is issued strictly in accordance with the requirements of ISO 17025:2017. All calibration equipments are traceable to the international Standards . Documentary evidence is available upon request.

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CERTIFICATE of CALIBRATION

Details of Standard Equipment Used for Calibration:

Sl. No.	Description	Make	Inst. Sl. /ID NO.	Certificate No.	Validity	Calibrated By
01	Sound Level Meter	CEM	SCS/SLM/01	QSI/0259/21/02	15/02/2023	QSI-INDIA
02	Digital Thermo Hygrometer	CEM	SCS/DL/05	QSI/0527/21/10	11/10/2022	QSI-INDIA

Guidance Notes:

Status A The measurement is within tolerance, due allowances having been made for the uncertainty of the measurement.

Status B The measurement may be out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status C The measurement is out of tolerance, due allowances having been made for the uncertainty of the measurement.

Status D No conclusion can be drawn, because the standard(s) do(es) not specify a tolerance for this measurement.

OBSERVATION:

Sound Weighting: (verified against calibrated master equipment)

Sl. No.	Description	Standard Value (dB)	U.U.C. Value (dB)	Error (dB)	Tolerance (dB)	Status	Uncertainty (dB)
01	Before Adjustment	94.0	91.1	-2.9	N/S	D	±1.2
02		114.0	109.1	-4.9	N/S	D	
03	After Adjustment	94.0	94.0	0.0	N/S	D	
04		114.0	114.0	0.0	N/S	D	

The overall uncertainty shall be calculated as per ISO "Guide to the Expression of Uncertainty in Measurement" (GUM). The uncertainty represents an expanded uncertainty using a coverage factor k=2 to approximate a 95% confidence level.

Notes:
1. The values mentioned above are the mean readings.
2. Adjustment was done during the calibration.
3. Any section marked, "N/A" means Not Applicable, "N/P" means Not Provided, "N/R" means Not Readable, "N/S" means Not Specified.

Calibrated By:

Abdullah Al Mamun
(Calibration Engineer)

Md. Arman Ahmed Babu
(Asst. Technical Manager)

End of Calibration Certificate

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