Initial Environmental Examination

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Bangladesh: Narayanganj Green and Resilient Urban Development Project - Development of Priority Drainage in Narayanganj City

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Prepared by Narayanganj City Corporation, Government of Bangladesh, for the Asian Development Bank (ADB).

CURRENCY EQUIVALENTS

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Currency unit	–	Bangladesh Taka (BDT)
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$1.00	=	BDT 109.63

ABBREVIATIONS

ADB	–	Asian Development Bank
AAQ	–	ambient air quality
BDT	–	Bangladesh Taka
BNBC	–	Bangladesh National Building Code
BOD	–	biochemical oxygen demand
BOQ	–	bill of quantities
COD	–	chemical oxygen demand
DMA	–	district metering area
DMZ	–	district metering zone
DO	–	dissolved oxygen
DOE	–	Department of Environment
DTW	–	deep tube well
EA	–	executing agency
EIA	–	environmental impact assessment
ECA	–	Environmental Conservation Act
ECR	–	Environmental Conservation Rules
ECC	–	environmental clearance certificate
EMP	–	environmental management plan
GOB	–	Government of Bangladesh
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
IEE	–	initial environmental examination
NCC	–	Narayanganj City Corporation
NGO	–	nongovernment organization
NOC	–	no objection certificate
O&M	–	operation and maintenance
PMU	–	project management unit
REA	–	rapid environmental assessment
ROW	–	right of way
SPS	–	safeguard policy statement

WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
m	–	meter
mg/l	–	milligram per liter
MLD	–	million liters per day
mm	–	millimeter
km/h	–	kilometer per hour

NOTE

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

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EXECUTIVE SUMMARY

The Government of Bangladesh (GOB), under its Eighth Five-Year Plan targets to provide 100% of the urban population with access to an improved water source, and 80% of city dwellers with safely managed sanitation services by 2026. Narayanganj is the fourth most populated city in Bangladesh and economically important because it is adjacent to Dhaka City. However, capacity and quality of infrastructures necessary to keep pace with the economic development need to be improved, ranging from reliable piped water supply, drainage system and public spaces. Thus, with ADB loan support, Narayanganj City Corporation (NCC) is proposing the Narayanganj Green and Resilient Urban Development Project (NGRUDP or project or overall project) which comprises subprojects on water supply, drainage, and community parks overlooking Shitalakhya River.

The project is aligned with the following impacts: (i) sustainable and inclusive urban development achieved, and (ii) safe and climate-resilient delta area achieved. The project will have the following outcome: NCC's resilience, and access to inclusive, reliable, and sustainable urban services improved. An output of the project will be a climate-resilient and inclusive infrastructure developed and/or improved for NCC. The project will improve and expand the existing water supply system for inclusive, resilient, and safely managed continuous drinking water supply services in the priority area in NCC to serve 0.4 million people. These will include improvements to the existing WTP, an upgrade and expansion of the network with DMA approaches for reducing nonrevenue water, and installation of deep tube wells (DTWs) in selected areas including low-income communities, for supply augmentation. The project will also establish and improve stormwater drainage system in the priority area to reduce water logging and flood risk with climate and disaster-resilient design and nature-based solutions such as introducing soil and vegetation. Further, the project will develop green public parks to improve quality of life of the citizens, with features responsive to women and vulnerable, to provide recreational spaces and reduce urban heat. The public parks will be attached with walkway along the eastern side of the Shitalakshya river that also function as embankment.

Scope of the Subproject. The subproject will aim to improve the waterlogging issues in selected and priority alignments in two drainage zones of NCC based on the overall drainage masterplan of the city. It is envisaged that in longer term, the subproject would lead to improved public-health and standard of living and thereby sustained economic growth for NCC. The improved drainage system will reduce resurgence of malaria, the spread of diarrhea diseases, damage to housing and property, disrupted communications, loss of income and environmental degradation.

Subproject has been prepared based on preliminary design, which includes rehabilitation and upgrading of existing drainage systems. Subproject components are as follows:

(i) renovation of inadequate existing drains with aggregate length of 23.230 km;
(ii) cleaning of the remaining existing drains with aggregate length of 160.520 km; and
(iii) construction of new drains with aggregate length of 6.056 km;

The subproject will be awarded under a civil works contract modality. Therefore, NCC through the PMU will finalize the detailed designs of these components prior to bidding. At the same time, NCC through PMU will update this IEE based on the final detailed design to reflect any changes. The updated IEE will be attached to the bidding and contract documents.

Categorization. In accordance with ADB Safeguard Policy Statement (SPS) 2009, an initial screening using ADB rapid environmental assessment (REA) checklist was conducted for the sites (Appendix 1) Result of this initial assessment reveals that there are no environmentally sensitive areas near the sites and that the subproject is unlikely to cause significant adverse impacts to the environment and people. But with the subproject sites being near Shitalakhya river and other receptors in the urban center of Narayanganj City, the assessment reveals that the subproject may still pose likely negative environmental impacts during construction phase and operations phase. These impacts, however, are deemed manageable and can be mitigated through proper design and engineering measures. Therefore, the project has been classified as Category B for environment, and this initial environmental examination (IEE) is prepared. For national requirement, the project will obtain one Environmental Clearance Certificate (ECC) that will cover all subprojects, which include the water supply subprojects. Therefore, per Government of Bangladesh's Environment Conservation Rules (ECR, 2023), the project falls under Red Category and will require a Site Clearance Certificate and ECC from the Department of Environment (DOE).

This IEE report aims to (i) provide facts, findings, and recommended actions from environmental assessment; (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 subproject 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 subproject implementation; (vii) describe the overall project's grievance redress mechanism (GRM) 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) 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.

Description of the Environment. The subproject is located within the NCC area with urban setting. The drainage alignments are scattered in all zones, with some of these alignments near or ending at Shitalakhya river as ultimate discharge point. The topography in the whole of NCC is relatively flat. Satellite images show that the subproject area is generally higher than the level of Shitalakhya river by 3 – 5 m. Shitalakhya river is not protected water body and is generally used as vital navigational route and storm water/drainage catchment in central Bangladesh including NCC. There are no known agricultural activities along this river. There are no land-based or aquatic natural habitats and environmentally sensitive areas (forest area, protected area, wetlands, mangroves, or estuaries) within and immediate vicinities of the proposed subproject sites. The drainage alignments will pass through existing roads in the city. Therefore, all sites and alignments of the subproject components are within existing rights of way.

The drainage system in NCC has experienced persistent waterlogged conditions in certain pockets and many parts of the city during extreme torrential rains. The exponential increase in population and built-up area (hence, less surface area for absorption and percolation of surface runoff), on a relatively flat topography with inadequate minimum longitudinal natural slope surface, has been adding to the volume of water to be carried away and discharged by the existing drainage network. As the same time, practice of haphazardly disposing both bio-degradable and

non-biodegradable domestic waste into drainage channels is common in many places. With lack of maintenance, this practice clogs the existing channels leading to overflowing conditions in many areas. Apart from these, poorly defined secondary and tertiary drainage channels, absence of an intermediate network of secondary drainage channel, absence of an integrated network of roadside drains are some of the technical flaws in the existing network. Additionally, outfalls to the canals (khals) which work as intermediate retaining basins before the final outfall to Shitalakhya river are found to be encroached at many places by various infrastructures such as buildings, residential and commercial structures, concreted walkways and view decks, and ferry docking stations. Thus, existing drainage network is unable to serve is full purpose and this leads to waterlogged conditions in many parts of the city.

Primary and secondary data on baseline environmental quality reveal mixed results. Ambient air quality shows general compliance with most standard parameters except for particulate matter. Noise level is generally high all around Narayanganj city compared to the standards, primarily due to the traffic noise that is inherent in urban setting in Bangladesh. Water quality of the Shitalakhya river shows seasonal variation, but generally above the standards due to its use as a major navigational route and discharge point of drains from all over the city conveying combination of storm water, and residential and commercial/industrial discharges. Groundwater quality registered general elevated concentrations in terms of some parameters such as manganese, biochemical oxygen demand (BOD), chemical oxygen demand (COD) and coliform, among others.

Assessment of Environmental Impacts and Proposed Mitigation Measures. Potential environmental impacts were identified based on review and analysis of the primary and secondary data or information, stakeholder consultations, and visits to the sites and their vicinities. Impacts were identified in relation to the different phases of subproject implementation — design/pre-construction, construction, and operation of the built infrastructure. In consultation with various experts, including the design team, evaluation of the likely degree of impacts has been done on each of identified potential impacts. Based on this evaluation, mitigation measures have been developed to reduce all negative impacts to acceptable levels based on national and/or internationally accepted standards.

Potential impacts to the physical environment. Impacts to air quality, acoustic environment, surface water and groundwater quality, waste disposal, and other forms of nuisance during construction phase are similar to impacts expected from other construction activities elsewhere, which can be mitigated through good international construction and engineering practices. Potential occupational hazards have been assessed due to exposure of workers to drainage silts or soils that could be contaminated with hazardous elements such as heavy metals and pathogens. This potential impact can be mitigated through the implementation of international best practices on occupational health and safety (OHS) such as those in the World Bank's EHS guidelines on OHS. Mitigation measures to avoid all potential impacts are included in the EMP, This EMP will be further updated as needed based on final detailed design. The updated IEE and EMP will be attached to the bidding and contract documents. As such, after the award of contract (pre-construction phase), the Contractor will develop a site-specific EMP (SEMP) based on the EMP of the final IEE, including the preparation of other allied work plans (e.g. traffic management plan), following applicable international best practices that will include World Bank's EHS Guidelines on Construction and Decommissioning Activities.[1] In addition, the NCC, with support from PMU and MDSC, will develop an operation and maintenance (O&M) manual for the entire

[1] IFC World Bank Group. 2007. Environmental, Health, and Safety (EHS) Guidelines – General EHS Guidelines: Construction and Decommissioning.

drainage system. The O&M manual will be used as reference guide during operation phase in (i) ensuring all drainage, canals, and allied facilities and components operate according to design; (ii) addressing operational issues from troubleshooting to emergency procedures regarding any part of the drainage system; and (iii) effective transport and disposal of dredged materials. Thus, the O&M manual will define all the steps required for cost effective, efficient, safe, and reliable drainage system; which then lead to avoiding or minimizing waterlogging or flooding in the NCC area.

Potential impacts to physical cultural resources. The alignments of the drainage network will pass through many roads within residential and commercial areas in NCC, which easements have varying widths in the range of 1 – 20 meters. Some sections of the alignments are also near two locally important protected cultural heritage monuments, namely: Sonakanda Fort and Hajiganj Fort. Site visits reveal that the boundaries of these two monuments are at considerable distance of approximately 10 – 20m from the roads where drainages will be rehabilitated, and that no significant impact is expected. There are also other physical cultural resources (PCRs) found all over Narayanganj City (524 mosques, 61 temples, 5 pagodas and 1 church). Easements and rights of way separate the boundaries of these PCRs from the roads where civil works will be undertaken. These easements and rights of way have varying widths (1 – 20 meters), which are deemed enough to ensure pipelaying during construction phase will not impact the PCRs. Typical and inherent in community setting in Bangladesh are properties or structures, such as mosques or eidgahs (prayer areas), built very near the boundaries of roads. For works in these relatively constricted or congested areas, the excavation protocol provided in this IEE report will be followed to ensure no impact occurs to the PCRs. Specific methodologies and protocols are clearly defined in this IEE report for all types of excavation works in narrow roads and areas where fragile structures may be at risk, including the vicinities of heritage sites such as Hajiganj Fort and Sonakanda Fort. A detailed chance finds procedure has also been developed to ensure any heritage assets found along the excavation sites are preserved or handled properly per Bangladesh Department of Archaeology. These procedures and protocol are discussed and outlined in this IEE report.

Potential impacts to biodiversity. Despite being located in a built-up and developed urban area, the subproject sites have been assessed in terms of biodiversity. The Integrated Biodiversity Assessment Tool was used to screen and assess potential risks on the protected areas or critical habitat that may exist around the project sites (default area of analysis of 50 km radius). Results show that there are no protected areas or key biodiversity areas around the vicinities of the subproject sites. The results also show biodiversity species of concern that could potentially occur within the default 50-km radius. However, the subproject sites are already in a built-up area and the probability of these species of concern being found at the sites is very low. Site visits have also been conducted which confirmed that none of these species are found or sighted at the subproject sites. . The relatively bigger canals in the area are natural drains within the city that only serve as conveyance of storm water from inland areas to the Shitalakhya river. These canals are not environmentally sensitive and none of these is declared as ecologically critical either.

Potential impacts to socio-economic condition. Consultations have been conducted throughout the study to ensure that the knowledge, experience, and views of stakeholders and the general public are taken into account during the IEE work. Initial consultations conducted were well participated in by the different stakeholders, such as the ward officials, community-based groups, professional groups (teachers, medical practitioners), labor groups (fishermen, hawkers, drivers), representatives from the Bangladesh Inland Waterways and Transport Authority, and ward residents. All findings from the consultations were considered in the development of environmental management plans (EMPs), especially in identifying the potential impacts of the

proposed subproject and developing the corresponding mitigation measures to address these impacts. Overall, wide public acceptance of the subproject has been earned out of these consultation activities. During the course of subproject implementation, new rounds of consultations will be scheduled to present the final components and designs, and other subproject-related developments to all stakeholders.

During the operation phase, it is expected that the new drainage system will convey combined storm water and discharges from both residential and commercial/industrial establishments in NCC. This scenario brings about a new drainage system being the conduit of wastewaters with varying pollution load. Inspection of the alignments of drains and canals revealed that both grey water and black water from these establishments are discharged into stormwater drainage channels. While the subproject was envisaged to improve the drainage system and eliminate the occurrence of persistent flooding/waterlogging in low lying areas of NCC, the IEE process noted the medium to long term plan of the city where future investments on wastewater and sewage collection and treatment will likewise be put as a priority. Accordingly, budget constraints hinder the undertaking of all these sanitation facilities and services at the same time. Once the drainage infrastructures are improved and rehabilitated, construction of sewerage facilities will come as next priority. The IEE process noted NCC's the next plan to establish a sewerage collection and treatment system which will ensure that all household discharges will be collected in a separate sewer system and conveyed to a centralized sewage treatment plant. However, this may be realized after the drainage subproject is completed through another government funding and/or ADB loan in the future. By the meantime until this sewerage and sanitation plan is implemented, NCC will work towards limiting pollution to the drainages and Shitalakhya river. Under its mandate and through any of its sanitation-related programs, NCC shall take more specific and measurable actions to stop sewage (black water or septage) discharge into drains by encouraging the people to construct properly design septic tanks for both households and community toilet facilities. For industrial effluents, NCC will work towards strict enforcement of pollution laws and regulations along with the Department of Environment, Ministry of Industries and local industry associations in Narayanganj city.

Environmental Management Plan. The EMP will guide the environmentally sound construction of the subproject and ensure efficient lines of communication among stakeholders, including the NCC as implementing agency, the project management unit (PMU), consultants, Contractor, and the general public. The EMP will (i) ensure that the activities are undertaken in a responsible non-detrimental manner; (ii) provide a pro-active, feasible, and practical working tool to enable the measurement and monitoring of environmental performance on site; (iii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject; (iv) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and (v) ensure that safety recommendations are complied with. With the various sites of the subproject, the Contractor will be required to develop corresponding site-specific environmental management plans (SEMPs) including other work plans necessary to fulfil related environmental mitigation measures in the EMP (i.e. Traffic Management Plan, Spoil Management Plan, Waste Management Plan, Sewage Facility Design Considerations, and Health and Safety Plan). The Contractor will submit its SEMPs and other work plans to the PMU through the MDSC for approval. The SEMPs and work plans will be able to elaborate further on the environmental impacts specific to each of the subproject sites.

A copy of the EMP and SEMPs, including the other work plans, shall be always kept by Contractor on-site during the construction phase. The Contractor appointed will be responsible for the organization, direction, and execution of environmental management related activities during construction of the proposed subprojects. The Contractor will undertake all activities in

accordance with the relevant environmental requirements, including consent documentation and other regulatory and/or statutory and contractual requirements. As the ultimate administrator of the subproject, NCC through the PMU shall likewise keep copy of the EMP and SEMPs, including the other work plans, during construction phase, and during the operation phase or when the subproject infrastructures are completed and used for the purposes.

Implementation Arrangement. The Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) will be the executing agency and NCC will be the implementing agency for the overall project. A Project Coordination Committee (PCC) will be formed within the NCC to engage with policymakers, obtain guidance on key policy issues and oversee overall project implementation. A Project Management Unit (PMU) will be created under the overall supervision of PCC. The PMU will ensure that the subproject will be implemented in accordance with the ADB SPS and relevant government laws, rules and regulations, including the recently Environmental Conservation Rules, 2023, among others. The PMU will be supported by a Management, Design and Supervision Consultant (MDSC) team, comprising individual consultants that will provide all necessary management and supervision expertise in implementing the project. The management and supervision will come at varying degrees during design phase and pre-construction phase, construction phase, and operation phase.

PMU will be established within NCC to oversee the day-to-day activities of the project and corresponding subprojects. The PMU will be supported by the MDSC team, which will comprise various individual consultants with distinct areas of specialization necessary to support the implementation of the overall project, and thus to all subprojects. MDSC will be responsible for: (i) support to project management and administration by PMU; (ii) contract documents preparation; (iii) support the PMU in the review and finalization of detailed designs; (iv) supervision and monitoring of safeguards implementation; (v) assistance in supervising construction; (vi) support in the conduct of continuing meaningful consultations for the project; (vii) support PMU to ensure that the current investment project is implemented to time and budget constraints, and to provide a clear path for the development of a long-term water supply solution in Narayanganj; (viii) ensure significant improvement in the institutional capacity of NCC in such areas as sustainable O&M and DMA management, revenue enhancement, public awareness, GESI implementation, management system digitization; and (ix) develop service improvement plans including financial aspects for sustainable O&M; among others.

Consultation, Disclosure and Grievance Redress. The stakeholders were involved in undertaking the IEE through on-site discussions and public consultation. Their views were incorporated into the IEE process and in the planning and development of the subproject. 27 focus group discussions (FGD) have been conducted in various wards of the city. These were participated in by different stakeholders, with each FGD had target group. A total of 332 people participated in these consultation activities, consisting of 311 males and 21 females. The participants were informed about the subproject with the aim to improve the drainage system of NCC and minimize the persistent waterlogging and flooding being experienced in many areas of the city. The participants conveyed their unconditional support to the subproject, and thankful for the government and NCC for taking pragmatic plan. They also expressed their understanding that the subproject will be very important as part of improving their social life and wellbeing. However, they also expressed their concerns about the possible impacts of the construction activities in their livelihoods, especially to those who are doing businesses near the road alignments of the subproject. In response, NCC assured the participants that the subproject will implement all necessary measures in order to avoid or mitigate potential impacts of activities to livelihoods and to the environment.

This IEE report which documents the environmental assessment process, including updated versions as may be needed in the future, will be made available at public locations in the city and will be disclosed to a wider audience via the ADB and project/NCC websites. Meaningful consultation will be a continuing activity during project implementation, including design period, to ensure that stakeholders are fully engaged in the subproject and have the opportunity to participate in its implementation.

A grievance redress mechanism (GRM) is described within this IEE report to ensure that any public grievance is addressed adequately and efficiently. The GRM 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 of the overall project and/or each individual subproject. The GRM will be proportionate to the potential risks and impacts of the project or subprojects, and will be accessible and inclusive, and handling of grievances will be done in a culturally appropriate manner and be discreet, objective, sensitive and responsive to the needs and concerns of the project/subproject-affected parties.

Monitoring and Reporting. The PMU, with support from MDSC, will be responsible for monitoring and reporting. The Contractor will also be responsible for its own monitoring based on the EMP, SEMP and work plan activities, and reporting of status and progress of implementation. The Contractor will submit monthly report to PMU through the MDSC. The PMU, with support from MDSC, will conduct its own monitoring of the implementation of the EMP and SEMPs by all contractors. MDSC will support PMU in consolidating all monthly reports from contractors. Based on results of its own monitoring activities and consolidated monthly reports from contractors, PMU, with support from MDSC, will prepare semi-annual environmental monitoring reports (SEMRs) to ADB. PMU and ADB will post the cleared SEMRs on project/NCC website and ADB website, respectively. ADB will monitor the project on an ongoing basis until a project completion report is issued.

Conclusions and Recommendations. It is envisaged that the proposed subproject will contribute to providing reliable, sustainable, and inclusive urban services in NCC, the fourth most populated city in Bangladesh and one of the major growth engines of the country being adjacent to Dhaka and a vital transport hub. Once implemented, the subproject will have direct benefits to the people of NCC with a reliable drainage system that could abate the persistent flooding and waterlogging issues in many parts of the city.

This IEE has been prepared based on preliminary design of the subproject. The baseline environmental conditions have been gathered with respect to the subproject locations and NCC as a whole, and all potential impacts to the environment as a result of implementing the subproject have been identified. Based on these impacts, corresponding mitigation measures have been developed and compiled in the EMP. There are no environmentally sensitive areas that will be affected by the subproject. Consultations with the stakeholders have been conducted and the subproject received very wide acceptance

Overall, the full IEE process confirms that the subproject is unlikely to cause significant adverse impacts considered as diverse, irreversible and unprecedented. The construction phase will only involve straightforward civil works and operation phase will only involve common or traditional maintenance works for the drainage system, so impacts will be mainly localized. These impacts can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures in the EMP

and O&M manual. On a positive note, the IEE process also confirms the beneficial impacts of the subproject over the long term.

e PMU will update this IEE based on the final detailed design ensuring the compliance with the design measures suggested in this document. The updated IEE shall be submitted to ADB for review, clearance and disclosure prior to bidding. The cleared updated IEE shall be treated as the final IEE. No bidding can commence until the final IEE is cleared by ADB and attached as part of the bidding and contract documents. If circumstances would require, the IEE will be further updated for ADB's review during the implementation period. In the event of unanticipated impact and/or any design change and/or non-compliance during subproject implementation period, the IEE shall be updated to include (i) assessment of the unanticipated impact and corresponding mitigation measures; and/or (ii) information on the design change and assessment of associated environmental impacts, if any; and/or (iii) corrective actions, associated cost and schedule; respectively. Further, the PMU shall:

- Obtain all statutory clearances and ensure relevant conditions or requirements are incorporated in the detailed design;
- Conduct safeguards induction to the Contractor after award of contract;
- Ensure Contractor appoints qualified environment, health and safety (EHS) officer prior to start of works;
- Disclose information and establishment of GRM in a timely manner;
- Strictly supervise EMP implementation;
- Continue consultations with stakeholders; and
- Monitor and report status of implementation of the EMP on a regular basis as indicated in the IEE.

During the pre-construction phase, the Contractor shall prepare its SEMP, including other work plans, and submit to NCC, through the PMU or MDSC, for approval. No works shall commence until the SEMP and any relevant or required work plan is approved.

- Traffic Management Plan;
- Spoil Management Plan;
- Waste Management Plan; and
- Health and Safety Plan (Community and Occupational).

This IEE report has been prepared in accordance with ADB SPS requirements for projects classified as Category B for environment. With the above premises considered, the classification of Category B for environment is confirmed. Separately, per ECA, 1995 and ECR, 2023 of Bangladesh, the overall project or NGRUDP is classified under "Red" category. Hence, preparation of an environmental impact assessment (EIA) based on DOE approved terms of reference is mandatory. Upon approval of the submitted EIA, ECC must be obtained from the DOE prior to award of contracts.

I. INTRODUCTION

A. Background

1. The Government of Bangladesh (GOB), under its Eighth Five-Year Plan targets to provide 100% of the urban population with access to an improved water source, and 80% of city dwellers with safely managed sanitation services by 2026. In response to this and to design ensuing investment projects in selected secondary towns and city corporations of Bangladesh, ADB under Project Readiness Financing (PRF) has constituted an Urban Infrastructure Improvement Preparatory Facility (UIIPF) for Bangladesh to help manage the technical and implementation issues upfront and secure high readiness of the ensuing investment projects for ADB financing. Under UIIPF, the Department of Public Health Engineering (DPHE) in preparing water supply and sanitation investment projects where development is lagging.

2. Narayanganj City is the fourth most populated city in Bangladesh and economically important because it is adjacent to Dhaka. The UIIPF facility thus aims to build NCC's capacity to ensure the sustainability of urban infrastructure investments, and their operation and management. As part of capacity building, the facility is supporting the NCC in developing Narayanganj Green and Resilient Urban Development Project (hereafter referred to as “project” or “overall project” or “NGRUDP”) comprising preparation of master plans, feasibility studies, detailed design for the proposed infrastructure facilities for water supply, drainage, and river-front development in NCC.

B. Outcome and Outputs of the Project

3. **Outcome**. The project is aligned with the following impacts: (i) sustainable and inclusive urban development achieved, and (ii) safe and climate-resilient delta area achieved. The project will have the following outcome: NCC’s resilience, and access to inclusive, reliable, and sustainable urban services improved.

4. **Output 1: Climate-resilient and inclusive infrastructure developed and/or improved.** The project will improve and expand the existing water supply system for inclusive, resilient, and safely managed continuous drinking water supply services in the priority area in NCC to serve 0.4 million people. These will include improvements to the existing WTP, an upgrade and expansion of the network with DMA approaches for reducing nonrevenue water (NRW),[2] and installation of deep tube wells in selected areas including low-income communities, for supply augmentation.[3] The project will also establish and improve stormwater drainage system in the priority area to reduce water logging and flood risk with climate and disaster-resilient design and nature-based solutions such as introducing soil and vegetation. Further, the project will develop total 15 hectares of green public parks to improve quality of life of the citizens, with features responsive to women and vulnerable, to provide recreational spaces and reduce urban heat.[4] The public

[2] Improvements in the existing network will be part of long-term strategy to ensure judicious use of existing water supply, and prepare for switching from ground to surface water source. The phased shift to surface water resource will be based on Dhaka Water Supply and Sewerage Authority’s experience in similar projects. Digital applications such as smart water meters, and online billing and collection will be introduced or strengthened to augment revenue and improve operational efficiency.

[3] Sustainability of the ground water yield was confirmed through survey including water quality and impact to depletion. Selected areas where these were not confirmed were excluded from the project scope. The support would be an interim solution to meet the demand until completion of switching to surface water resource using the Meghna river.

[4] The western side of the river has an ongoing government-funded project to develop a road with embankment.

parks will be attached with total 6 kilometers (km) walkway along the eastern side of the Shitalakshya river that also function as embankment.

5. Output 2: Capacity and awareness of NCC and local community in climate-resilient, sustainable, and inclusive urban services strengthened. To improve sustainability and quality of services through the facilities developed under output 1, the project will strengthen NCC staff capacity (at least 90% of female staff) in climate-resilient, sustainable, and gender equality and social inclusion (GESI) responsive service delivery. It will develop service improvement plans including financial aspects for sustainable O&M. For water supply, NCC's capacity on O&M will be improved through on-the-job training by the contractor that will be responsible for O&M for the initial five years. DMA management and water quality monitoring will be supported. A water supply master plan will be prepared to improve the services in wider areas in NCC, and to set the longer-term development strategy for transformation toward climate- and disaster-resilience.[5] The project will also support preparation of masterplans for wastewater, solid waste management, and urban planning to improve living environment in an integrated manner, combined with the intervention for drainage, and advance climate and disaster resilience. The project will also support GESI-sensitive community awareness and behavior change campaigns on water, sanitation and hygiene, climate resilience, and sustainable services to maximize the health and economic impact of the investments.[6] This output, together with the infrastructure to be developed under the output 1, is expected to lead to achieving the intended outcome.

6. **Output 3. Institutional capacity and governance of other municipal services strengthened.** To improve other municipal services, the project will support trainings of the NCC staff and elected representatives covering laws, regulations, city planning, and development. An action plan for urban governance and service improvement with monitoring tools will be prepared, involving citizen participation. It will build on NCC's successful past performance in governance improvement. The project will also support establishing a unit within NCC for giving trainings and implementing the action plan. The unit will also function as a data center for assets inventory and digital archiving of documents and records. The project will build capacity of NCC staff to gradually take over full responsibility of these as their routine operation. The project will also strengthen NCC's administrative efficiency through digitalization of management systems in areas such as customers records, asset management, and procurement. For NCC's revenue augmentation including strengthening property tax and municipal fees, a separate technical assistance (TA) by ADB's Office of Markets Development and Public-Private Partnership (OMDP) is under discussion with NCC.[7] Combination of these support is expected to help NCC establish creditworthiness and become an investable city. This output is expected to contribute to achieving the outcome through consolidated financial, administrative, and governance strengthening.

C. Overview and Location of the Overall Project (NGRUDP)

7. The location the overall project (NGRUDP) is within the jurisdiction of Narayanganj City Corporation (NCC), the fourth most populated in Bangladesh. NCC is about 16 km southeast of

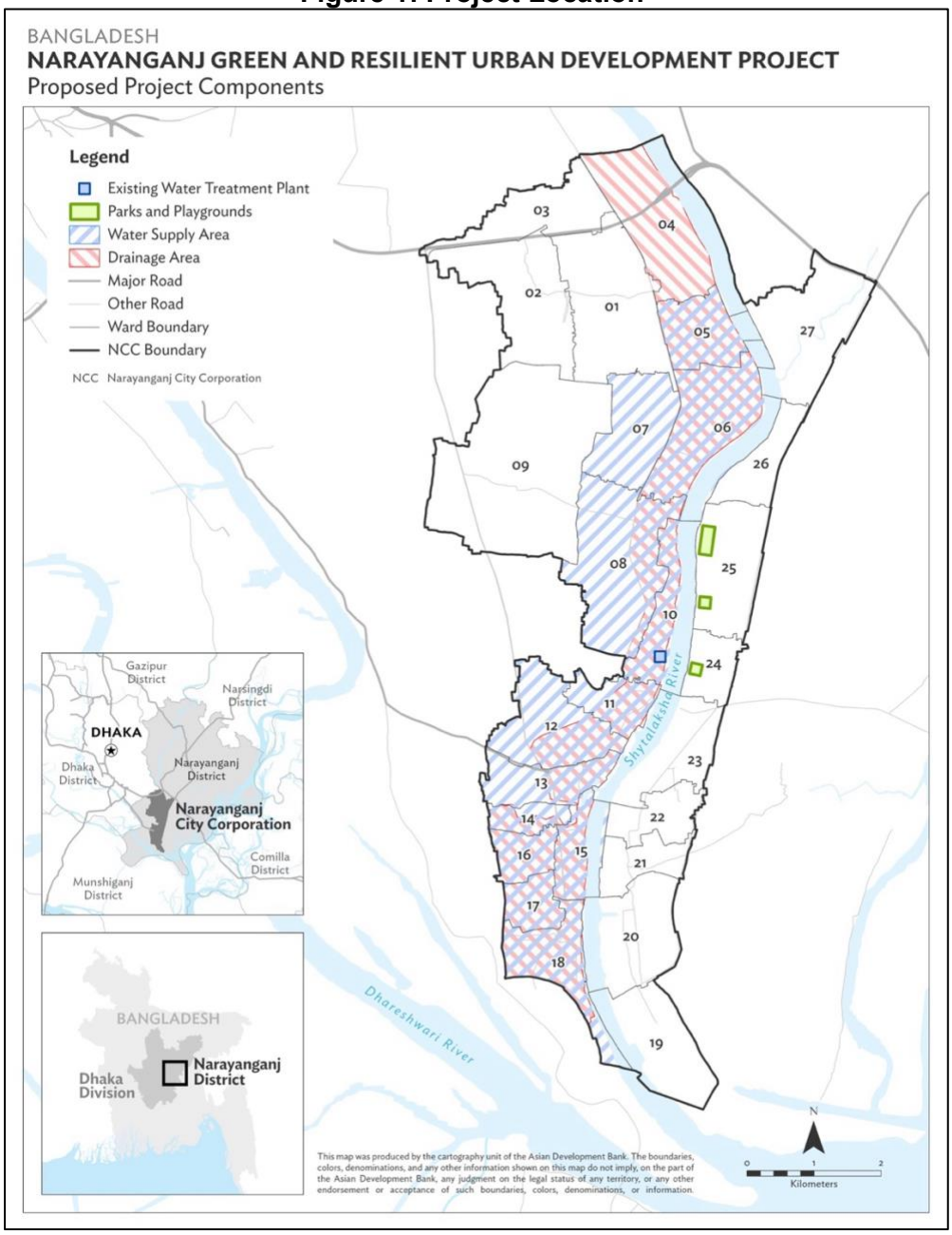
[5] The masterplan will also explore wider climate adaptation responses through new technology, policies, and governance. Output 2 will build on ADB's experience in the ADB. 2014. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Administration of Loan Grants to the People's Republic of Bangladesh for the Coastal Towns Environmental Infrastructure Project*. Manila.

[6] For drainage, setting design codes to reduce runoffs, flood risk mapping, and early warning systems will be explored.

[7] The project will support establishing web-based geographic information system mapping and survey to complement the capacity building support through OMDP.

the capital city of Dhaka and has a population of about 709,381 as of 2011.[8]. The location of NCC shown in **Figure 1** below.

Figure 1: Project Location[a]



[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

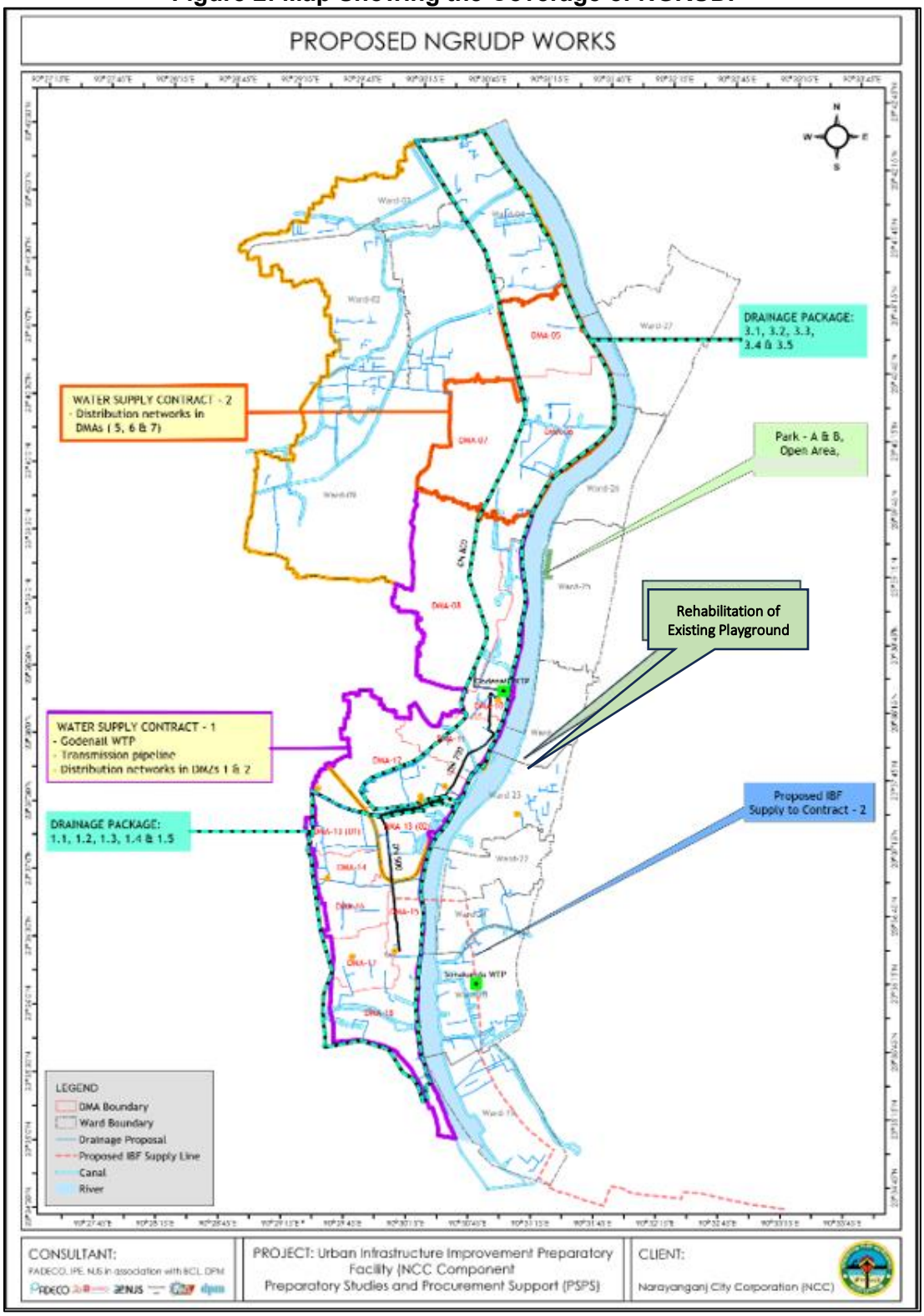
[8] Adjusted Population 2011. Statistical Yearbook of Bangladesh 2022. Bangladesh Bureau of Statistics. June 2023.

8. NGRUDP will provide reliable, sustainable, and inclusive urban services in NCC. It includes a safely managed drinking water supply, drainage, and public parks; and improved capacity of NCC and local communities which altogether will strengthen climate adaptation and sustainability of urban services. Consistent with Output 1 above, the proposed project will have four subprojects, namely:

(i) **Water Supply Contract 1 Subproject**, which involves the rehabilitation and upgrading of existing WTP at Godenail, rehabilitation of existing DTWs and OHTs, construction of transmission main, and construction of new distribution network in selected District Metering Zone (DMZs) of NCC;
(ii) **Water Supply Contract 2 Subproject**, which involves development of new production tube wells (PTWs) using the induced bank filtration (IBF) technology including construction or installation of disinfection units for each PTW, construction of collector pipeline from these PTWs to existing OHTs in the NCC area, construction of river crossing, and construction of new distribution network in selected District Metering Areas (DMAs) of DMZ3 of NCC;
(iii) **Drainage Subproject**, which involves rehabilitation of existing drainage, and construction of new drainage; and
(iv) **Parks Development Subproject**, which involves rehabilitation and upgrading of existing parks and public spaces.

9. Figure 2 below shows the location of NCC and the coverage areas of the four subprojects.

Figure 2: Map Showing the Coverage of NGRUDP[a]



[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

D. Purpose of the Initial Environmental Examination

10. This IEE report covers **Drainage Subproject**. The overall objective of the IEE undertaken for the subproject is to capture the environmental setting of the proposed subproject components, including physical, biological, and socioeconomic conditions; national and local legal frameworks; as well as international environmental agreements that are relevant to the subproject. Based on these, the IEE further identifies and analyses potential direct, indirect, cumulative, and induced impacts and risks of the subproject to these environmental aspects, in the context of the subproject's areas of influence. Subsequently, measures are formulated to address these impacts by avoiding them, or if total avoidance is not possible, at least reduce them to acceptable levels based on GOB or internationally recognized standards. The IEE also identifies the parties who will monitor and report the implementation of these measures. Thus, this IEE report is a documentation of the IEE process undertaken that will provide guidance to NCC, the contractor and other operators on how to plan, build and operate the subproject in an environmentally responsible manner, ensuring that all negative effects are prevented or mitigated, and positive impacts are enhanced.

E. Methodology

11. This IEE report has been prepared on the basis of available preliminary subproject design, field investigations, stakeholder consultations, and literature and online sources to meet the requirements for environmental assessment process and documentation per ADB SPS, 2009. Environmental assessment was conducted through the following:

(i) Review of the available preliminary subproject designs, in particular to the technology to be employed;
(ii) Primary data collection during site visits and secondary data from various sources, socio-economic, hydrological, topographic, and engineering surveys at subproject sites, meaningful consultation with the stakeholders, including concerned government officials, project personnel and the general public;
(iii) Appropriate assessment of impact of the subproject implementation on cultural and heritage assets, including other public- and private-owned structures, that may likely be disturbed or damaged during construction works;
(iv) Gathering of baseline information from most recent secondary sources on environmental quality such as air quality, noise level, surface water quality, and groundwater quality within the corridor of impact of the subproject, and against which predictions of changes to these environmental media during the construction period will be compared to assess such changes, if any, and their significance; and
(v) Screening and assessment of potential risks on the biological environment, which include the protected areas or critical habitats that may exist around the subproject sites. The Integrated Biodiversity Assessment Tool (IBAT) was initially used to screen and assess potential risks on the protected areas or critical habitat that may exist around the subproject sites.

12. Field reconnaissance surveys and follow up verification field visits were conducted at subproject sites to establish the potential impacts and categorization of subproject activities. Formal and informal public consultation activities were conducted with the affected stakeholders and communities and kept notes on the impacts of the proposed subproject. The methodology of the IEE study was then conveyed and elaborated to these stakeholders to address all impacts and for those impacts requiring mitigation measures were proposed to reduce impacts within acceptable limits.

13. **Project Area of Influence.** For linear works, a 10 m on both sides of the alignment has been considered as project area of influence. Whereas for spot structure, a radius of 50 – 100m surrounding the target sites, has been considered as the project area of influence. These distances are approximate and actual corridor of impact may vary depending on the sensitivity of receptors around the different subproject components. The various construction activities under the subproject will have environmental aspects whose impacts may go beyond the distances.

14. **Basis and Scope of Assessment.** Preliminary design and technology, and indicative alignments were provided as basis of the assessment. Final designs, technological specifications and other information such as final cost estimates are not yet finalized. This subproject will be awarded under a civil works contract modality. Thus, the IEE has utilized relevant aspects and impacts that could be encountered in conventional drainage and flood control projects. The IEE has also utilized results of visual observations during transect walks and drive through sample alignments, visits around the vicinity of site-specific components such as the existing drainage needing rehabilitation, and alignments where new drainages are to be constructed, on the spot interviews with the locals, and other primary and secondary information available.

F. Structure of the Report

15. The report has been structured in compliance with ADB SPS, 2009.

(i) **Executive Summary.** This section describes concisely the critical facts, significant findings, and recommended actions.

(ii) **Introduction.** Presents a brief overview of the overall project along with its background, objectives, and purpose and specific subproject scope of the IEE, among others.

(iii) **Policy, Legal, and Administrative Framework.** This section discusses both ADB SPS and GOB's national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which GOB is a party.

(iv) **Description of the Subproject.** This section describes the proposed subproject in terms of its major components, geographic location, and interaction with the environment in terms of ecological, socio-cultural, and economic standpoint, etc., including any associated facility required by and for the subproject.

(v) **Description of the Environment.** This section describes relevant physical, biological, and socio-economic conditions within the subproject area. It also looks at current and proposed development activities within the subproject's area of influence, including those not directly connected to the subproject. It indicates the accuracy, reliability, and sources of the data.

(vi) **Anticipated Environmental Impacts and Mitigation Measures.** This section predicts and assesses the subproject's likely positive and negative direct and indirect impacts to physical, biological, socioeconomic (including occupational health and safety, community health and safety, and impacts on livelihoods through environmental media), and physical cultural resources in the subproject's area of influence, in quantitative terms to the extent possible; identifies mitigation measures and any residual negative impacts that cannot be mitigated; explores opportunities for enhancement; identifies and estimates the extent and quality of available data, key data gaps, and uncertainties associated with predictions and specifies topics that do not require further attention; and examines global, transboundary, and cumulative impacts as appropriate.

(vii) **Information Disclosure, Consultation, and Participation.** This section (i) describes the process undertaken during subproject design and preparation for

engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders; (ii) summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in subproject design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women; and (iii) describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during subproject implementation.

(viii) **Grievance Redress Mechanism.** This section describes the grievance redress mechanism (both formal and informal channels), setting out the timeframe and mechanisms for resolving complaints about environmental performance.

(ix) **Environmental Management Plan.** This section deals with the set of mitigation and management measures to be taken during subproject implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts (in that order of priority). It may include multiple management plans and actions (mitigation, monitoring and performance indicators).

(x) **Monitoring and Reporting.** Outlines the environmental monitoring program and reporting system including the cost of implementing the EMP.

(xi) **Conclusion and Recommendations.** Presents the conclusion and recommendations of the IEE study.

II. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

16. Alongside ADB Safeguard Policy Statement (SPS, 2009), each component of the project must comply with the relevant legal and policy framework of Government of Bangladesh, such as the Environment Conservation Act 1995 (ECA, 1995) with amendments in 2000, 2002 and 2010, and the Environment Conservation Rules 2023 (ECR, 2023), which are the primary environmental law and rules of the country.

A. ADB Safeguard Policy Statement 2009

17. The ADB Safeguards Policy Statement (SPS, 2009) provides guidance on the environment category of projects based on the degree of anticipated environmental impacts. ADB environmental safeguards objectives are: (i) to ensure the environmental soundness and sustainability of projects; and (ii) to support the integration of environmental considerations into the project decision-making process. ADB environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts. The initial process of categorization involves filling out a sectoral rapid environmental assessment (REA) checklist. A project is classified to be under any of the four environmental categories (A, B, C, or FI) based on the most environmentally sensitive component. Categories are as follows:

(i) **Category A:** Project that is likely to have significant adverse environmental impacts which 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 (EIA), including an environmental management plan (EMP), is required.

(ii) **Category B:** Project with potential adverse environmental impacts that 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 (IEE), including an EMP, is required.

(iii) **Category C:** Project that is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.

(iv) **Category FI:** Project is classified as category FI if it involves the investment of ADB funds to, or through, a financial intermediary.

18. Initial screening using ADB REA checklist for general and urban development (Appendix 1) was conducted, and results of the rapid assessment show that the subproject is unlikely to cause any significant adverse impacts, and therefore classified under Category B per ADB SPS. Thus, this IEE report has been prepared in accordance with ADB SPS requirements for project with Category B classification.

19. **Environmental Management Plan.** 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 subproject's impact and risks.

20. **Public Disclosure.** Upon review and confirmation that a safeguard document complies with the requirements of ADB SPS, ADB will post such safeguard document on its website as well as disclose relevant information in accessible manner in local communities:

(i) for environmental category A projects, draft EIA report at least 120 days before ADB Board consideration;

(ii) final or updated EIA and/or IEE upon receipt; and

(iii) environmental monitoring reports submitted by the PMU during project implementation upon receipt.

21. **Consultation and Participation.** The PMU, with support from MDSC, shall carry out meaningful consultation[9] with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. The consultation process and its results are to be documented and reflected in the environmental assessment report.

22. **Grievance Redress Mechanism.** NCC, through PMU, shall establish a mechanism to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the subproject's environmental performance. The grievance mechanism shall be scaled to the risks and adverse impacts of the subproject. As of the ADB loan processing for the overall project, a grievance redress mechanism (GRM) has been established and discussed in detail in Section VIII below. This GRM applies to all subprojects.

23. **Monitoring and Reporting.** PMU, with support from MDSC, shall monitor, measure and document the progress of implementation of the EMP and SEMPs. If necessary, PMU will identify the necessary corrective actions, and reflect them in a corrective action plan. PMU will prepare and submit to ADB semi-annual environmental monitoring reports that describe progress with

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

implementation of the EMP and SEMPs, and compliance issues and corrective actions, if any. Reporting will continue until ADB issues a project completion report.

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

25. **Pollution Prevention and Control Technologies.** During the design, construction, and operation of the subproject, the PMU 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.[10] 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 will achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific subproject circumstances, the PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS.

26. **Occupational Health and Safety.** PMU[11] shall ensure that workers[12] are provided with a safe and healthy working environment, considering risks inherent to the sector and specific classes of hazards in the subproject work areas, including physical, chemical, biological, and radiological hazards. PMU shall ensure to take steps to prevent accidents, injury, and disease arising from, associated with, or occurring during the course of work by (i) identifying and minimizing, as far as reasonably practicable, the causes of potential hazards to workers; (ii) providing preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances; (iii) providing appropriate equipment to minimize risks and requiring and enforcing its use; (iv) training workers and providing them with appropriate incentives to use and comply with health and safety procedures and protective equipment; (v) documenting and reporting occupational accidents, diseases, and incidents; and (vi) having emergency prevention, preparedness, and response arrangements in place.

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

28. PMU shall ensure to apply preventive and protective measures for both occupational and community health and safety consistent with international good practice, as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines.[13] PMU shall also adhere to necessary protocols in response to infectious diseases such as COVID-19 and any other new diseases that may emerge in the future,

[10] World Bank Group Environmental, Health, and Safety Guidelines (ifc.org)
[11] In case where responsibility is delegated to subproject contractors during construction phase, PMU shall ensure that the responsibilities on occupational health and safety as described herein are included in the contract documents.
[12] Including nonemployee workers engaged by NCC through contractors or other intermediaries to work on project sites or perform work directly related to the project's core functions.
[13] World Bank Group, 2007. *Environmental, Health, and Safety General Guidelines.* Washington, DC. Final - General EHS Guidelines_APRIL 29.doc (ifc.org)

consistent with the guidelines of relevant government healthcare agencies and the World Health Organization.

29. **Physical Cultural Resources**. PMU is responsible for siting and designing the subproject to avoid significant damage to physical cultural resources. Such resources likely to be affected by the subproject will be identified, and qualified and experienced experts will assess the subproject's potential impacts on these resources using field-based surveys as an integral part of the environmental assessment process. The chance finds procedure or protocol included in this IEE shall be used as mandatory guide for the Contractor.

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

31. **Bidding and Contract Documents.** This IEE report, which contains the EMP, shall be included in bidding and contract documents and verified by PMU. The PMU shall also ensure that bidding and contract documents include specific provisions requiring the Contractor to (i) comply with all other conditions required by ADB,[14] and (ii) to submit to PMU, for review and approval, site-specific environmental management plans (SEMPs), including (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program per EMP; and (iv) budget for SEMP implementation, among others as may be required. No works can commence prior to approval of relevant SEMP. A copy of the EMP and/or approved SEMPs will be kept on site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP and/or SEMPs constitutes a failure in compliance and shall require corrective actions.

32. **Conditions for Award of Contract and Commencement of Work.** PMU shall not award any works contract under the subproject until (i) relevant provisions from the EMP are incorporated into the works contract; (ii) this IEE report is updated to reflect subproject's final detailed design and PMU has obtained ADB's clearance of such updated IEE report; and (iii) DOE-approved EIA (i.e. EIA in compliance with ECR, 2023) and other necessary permits from relevant government agencies have been obtained. For "design, build, and operate" type contracts, PMU shall ensure no works for a subproject which involves environmental impacts shall commence until (i) relevant provisions from the EMP are incorporated into the works contract; and (ii) this IEE report is updated to reflect subproject's detailed design and PMU has obtained ADB's clearance for such updated IEE.

[14] 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.

B. Environmental Legislation Framework

1. Overview of the Environmental Approval Process

33. Key legislation governing the environmental approvals process for the proposed overall project (and hence the subproject) is the Bangladesh Environmental Conservation Act, 1995 (ECA, 1995) and the Environmental Conservation Rules (ECR, 2023).

34. According to Rule 5 of the ECR, 2023 proposed developments within Bangladesh are classified as one of four categories, as follows:

(i) Green;
(ii) Yellow;
(iii) Orange; and
(iv) Red.

35. The categorization of a project determines the procedure for issuance of an Environmental Clearance Certificate (ECC). All proposed industrial units and projects that are considered to be low polluting are categorized under "Green" and shall be granted Environmental Clearance. For proposed industrial units and projects falling in the Yellow, Orange and Red Categories, firstly, a Location Clearance Certificate (LCC) and thereafter an ECC will be required from the DOE depending on geographical location of project, extent of project activities and possible pollution load, human health and possible adverse impacts on environment. A detailed description of those four categories of industry/projects are documented in Rules 9 – 19 of ECR (2023).

36. Key milestones in the approvals process are outlined in **Figure 3**. These comprise:

(i) **Location Clearance Certificate:** An LCC will be issued by DOE upon approval of all requirements, including compliance with the site selection requirements as minimum for Yellow category projects. In addition to this compliance with site selection requirements, IEE study is required for Orange category projects and EIA study for Red category projects.
(ii) **Environmental Clearance Certificate:** The ECC will be issued by DOE upon approval of requirements. ECC is issued to Green category project upon approval of the General Description of project; and to Yellow, Orange and Red category projects after issuance of LCC.

2. Procedure for Obtaining Location Clearance Certificate and Environmental Clearance Certificate

37. The environmental assessment process consists of three stages: screening, IEE, and detailed EIA per ECR, 2023. The ECR also contains the procedures for obtaining the LCC and ECC from the DOE for different categories of proposed industrial units or projects. Any person or organization wishing to establish an industrial unit or project must obtain an LCC and ECC from the Director General of DOE. The application for such certificate must be in the prescribed forms provided together with the prescribed fees laid down in Schedule 6 and Schedule 7, through the deposit of a Treasury *Chalan* in favor of the Director General of DOE. The procedure of getting the LCC and ECC of four categories of project are briefly described as follows and the process flow outlined in Figure below.

(i) **Green:** Projects categorized as Green projects are listed in Schedule 1. The proponent has to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1),

Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents;

In addition, as per Schedule 9: Industry or Project Site Selection Guideline, Rule 8 Sub-Rule (kha), Rule 9 Sub-Rule (2), Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), and Rule 14 Sub-Rule (2) must be followed by the proponent; and

The Client must Deposit/Pay the mentioned amount of fees to DOE per Schedule 7: Location Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4).

DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction on the submitted documents. The ECC needs to be renewed every 5 years.

(ii) **Yellow:** Projects categorized as Yellow are listed in Schedule 1. The proponent has to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application, Rule 9 Sub-Rule (1), Rule 10 Sub-Rule (1), Rule 11 Sub-Rule (1), Rule 12 Sub-Rule (1), Rule 14 Sub-Rule (1), and Rule 23 Sub-Rule (4) along with specified documents;

Deposit/pay the mentioned amount of application processing fee to DOE per Schedule 6: Location Clearance or Environmental Clearance Certificate Application Process Fee, Rule 10 Sub-Rule (2), Rule 12 Sub-Rule (2), Rule 14 Sub-Rule (2), and related documents and detail information per Schedule 9: Industry or Project Site Selection Guideline, which shall be followed;

The relevant DOE office will conduct a site visit to the project and prepare a report with justification and opinion. Within 8 working days of receiving the application, the concerned DOE office will notify the applicant to pay the fee specified in Schedule-7, provided the information in the application is satisfactory and the on-site inspection is completed;

The Client must Deposit/Pay the mentioned amount of location clearance fee to DOE per Schedule 7: Location Clearance or Environmental Clearance Certificate Received and its Renewal Fee; Rule 9 Sub-Rule (3), Rule 10 Sub-Rule (3), Rule 12 Sub-Rule (6), Rule 84 Sub-Rule (3), Rule 21 Sub-Rule (14), Rule 22 Sub-Rule (1), and Rule 23 Sub-Rule (4); and

After issuance of LCC, the Client submits its application for issuance of ECC to DOE. DOE will provide the ECC to the applicant within seven (7) days of application subject to their site investigation and satisfaction on the submitted documents. The ECC needs to be renewed every 2 years.

(iii) **Orange:** Projects categorized as Orange require proponents to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application for Location Clearance, along with Deposit /Payment of the mentioned amount of fees for the project to DOE per Schedule 6, submission of related documents and detailed information, an Initial Environmental

Examination (IEE) Study report, and compliance with Schedule 9: Industry or Project Site Selection Guideline. After approval from the Authority, the Client must Deposit/Pay the mentioned amount of fees for the project to DOE per Schedule 7 for obtaining the Location Clearance for the project.

The relevant DOE office will visit the project site and prepare a report. This report, along with the application, will be sent to the appropriate ECC committee based on the project's serial number listed in Schedule 1. The ECC committee will review the application and the report and make a decision. The applicant will then be notified to pay the fee listed in Schedule 7 for the LCC issuance;

Within 21 days from payment of fees per Schedule 7, DOE issues the LCC. Upon obtaining the LCC, the Proponent/Client will apply for an ECC from the DOE. The DOE office will then perform a site visit to ensure LCC compliance and review relevant issues. A report justifying the issuance or rejection of the ECC will be prepared and forwarded, along with the application, to the appropriate ECC committee. The committee will make a decision within 20 working days of the application date and issue the ECC. If an initial environmental examination of an Orange Category project reveals significant pollution impacts, the ECC Committee may recommend an Environmental Impact Assessment (EIA). With approval from the Director General, the proponent must conduct the EIA. The ECC needs to be renewed every year.

(iv) **Red**. Projects categorized as Red Projects require proponents to submit an application in a prescribed format Form 3: Location Clearance / Environmental Clearance Certificate Application for Location Clearance, along with Deposit /Payment of the mentioned amount of fees for the project to DOE per Schedule 6, related documents, detail information, draft Terms of Reference (ToR) of Environmental Impact Assessment (EIA) and compliance with Schedule 9: Industry or Project Site Selection Guideline~~;~~

Per Schedule 10: Environmental Impact Assessment Scope of Works Guidelines, Rule 14 Sub-Rule (3), a draft Terms of Reference (TOR) will be prepared for the conduct of an Environmental Impact Assessment and submitted to the DOE for approval;

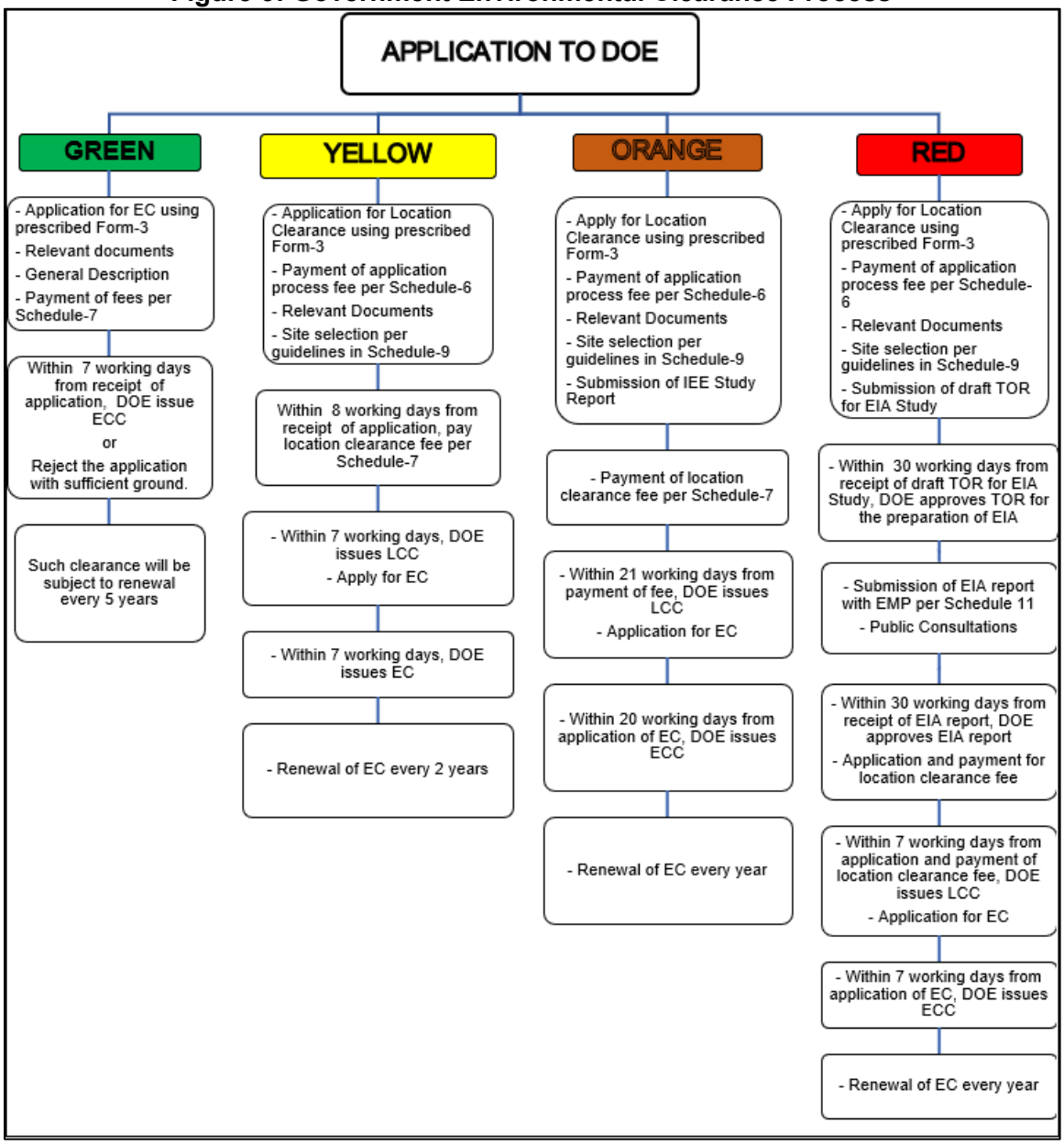
The relevant DOE office will visit the project site to review the documents and all pertinent issues. A report with justifications and findings on the rationale for issuing the location clearance certificate and draft ToR for the EIA will be forwarded to the ECC Committee. Upon receiving the documents, the ECC Committee will review and evaluate them, then submit a report to the Director General (DG) for approval. With the DG's approval, the concerned office will approve the ToR for the EIA within 30 working days;

An EIA study shall be prepared based on DOE's approved TOR. An Environmental Management Plan should be prepared as an integral part of the EIA study according to Schedule 11: Industry or Project Environmental Impact Assessment study Preparation Guidelines, and Rule15 Sub-Rule (3). Public consultations for the EIA study shall be carried out;

The proponent has to submit the EIA report to the ECC Committee as per Schedule 11. If the EIA is approved by the DG, the proponent has to pay the fee specified in Schedule-7 within a maximum of 7 working days and the LCC will be issued within 7 working days of submission of fee to the concerned DOE office; and

After issuance of the LCC, proponent/client will submit the application for issuance of ECC. The relevant DOE office will conduct a site visit to verify the conditions of the LCC and the recommendations of the EIA etc. A report will be prepared and forwarded to the ECC committee. Upon reviewing the reports and documents, the ECC Committee will make recommendations to the DG regarding the issuance of the ECC. Once the DG approves these recommendations, the concerned office will issue the ECC within 30 working days. The ECC needs to be renewed every year.

Figure 3: Government Environmental Clearance Process



DOE = Department of Environment, EC = Environmental Clearance, ECC = Environmental Compliance Certificate, EIA = environmental impact assessment, EMP = environmental management plan, IEE = initial environmental examination, LCC = Location Clearance Certificate, TOR = terms of reference.

3. Government Environmental Categorization

38. Environmental Conservation Rules, 2023 clearly defines the classification of all industrial and project schemes into four broad categories. The categorization considers all the physical interventions in implementation of those project or industries and operational procedures and risk associated therein. Susceptibility of the location where the projects would be implemented also determines the categories; sometimes stringent management issues are levied on the project implementation and operation.

39. Large projects are likely to have different segments and types of interventions under a single project umbrella, where each part of larger interventions is taken into consideration and categorization are made individually for each segments and highest category among those are set for the overall project in order to keep the environment safer and reduce the risk of adverse consequences. The subproject falls within the Red Category, bringing the overall project within the Red Category as well. Thus, the overall project needs to comply with the requirements of the of Red Category. Similar to any other infrastructure projects that have different components or subprojects, the implementing agency of each project would normally process environmental assessment and obtain one ECC for the whole project. Currently, NCC is coordinating with the DOE, and preparing for activities necessary to comply with the requirements under the Red Category classification including the completion of the required EIA. Application for ECC will be submitted once the EIA is approved and LCC is issued by DOE.

Table 1: Categorization of the Project

Subproject/ Component	Interventions	ECR Category
Construction and Rehabilitation of Drinking Water Supply System	Rehabilitation of Water Treatment Plant, Deep Tube Wells, Overhead Tanks, and laying of water pipelines along the existing road network, including crossing water bodies and railway systems.	Red
Construction and Rehabilitation of Drainage System	Construction and/or rehabilitation of drainage canals	Red
Improvement of Parks and Public Spaces	Rehabilitation of existing parks and public spaces	Yellow

C. National Environmental Act and Laws

40. Table below provides a summary of policies, plans and strategies which deal with the drinking water supply sector, including climate change.

Table 2: Summary of Relevant National Environmental Acts and Laws

Laws, Regulations, and Standards	Details	Relevance to the Subproject
The Constitution of the People's Republic of Bangladesh	The constitution of the country was adopted in 1972, but the 15th amendment to this constitution made in 2011 included the concept of the protection and improvement of environment and biodiversity under fundamental principles of state policy (part II). To this end, Article 18A clearly states that the state shall endeavor to protect and improve the environment and to preserve and safeguard the natural resources, biodiversity, wetlands, forests and wild life for the present and future citizens. Inclusion of this clause into the constitution underscores the requirement for the protection and improvement of environment and	The clauses stated in the constitution clearly put directives to protection and improvement of natural environment and biodiversity, social justice and conservation of monuments, objects or places having special artistic or historical importance, during the planning, construction and O&M phases of the subproject.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	biodiversity, and also has influenced to develop and promulgate further environmental laws, rules and directives in Bangladesh. The constitution also proclaims that the state shall adopt effective measures to remove social and economic inequality between man woman and to ensure the equitable distribution of wealth among citizens endeavor to ensure equality of opportunity and participation of women in all spheres of national life. The same also emphasizes to adopt measures for the protection against disfigurement, damage or removal of all monuments, objects or places of special artistic or historic importance or interest.	
Environmental Conservation Act (ECA), 1995 (and subsequent amendments)	Provides for the conservation of environment, improvement of environmental standards and control and mitigation of environmental pollution. In line with these provisions of the Act, the Environmental Conservation Rules have been framed with various amendments. This Act provides for (i) remedial measures for injury to ecosystem; (ii) provides for any affected person due to environmental pollution to apply to Department of Environment (DOE) for remediation of the damage; (iii) discharge of excessive environmental pollutants; (iv) inspection of any activity for testing any equipment or plant for compliance to the environment act, including power to take samples for compliance; (v) power to make rules and standards with reference to environment; and (vi) penalty for non-conformance to environment act under the various sections. The main strategies of the Act can be summarized as: • Declaration of ecologically critical areas (ECAs), and restriction on the operation and process, which can be carried, out or cannot be initiated in the ecologically critical areas. • Regulation in respect of vehicles emitting smoke harmful for the environment. • Environmental clearance.	According to this law, no industrial unit or project shall be established or undertaken without obtaining, in the manner prescribed by rules, an Environmental Clearance Certificate (ECC) from the Director General. The subproject forms part of the overall project that is required to obtain ECC. Additionally, Shitalakhya river is also declared by the Department of Environment as an ECA due to its deteriorating water quality. Therefore, no activity should be allowed that could further pollute this river. This ECA declaration is very relevant to the subproject because some drainage alignments are adjacent Shitalakhya river and will have the potential to pollute the said river with runoffs during construction phase.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	• Regulation of the industries and other development activities – discharge permit. • Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes • Promulgation of standard limit for discharging and emitting waste. • Formulation and declaration of environmental guidelines. Amendment 2000 of the Bangladesh Environmental Conservation Act focuses on: (i) ascertaining responsibility for Compensation in cases of damage to ecosystems, (ii) increased provision of punitive measures both for fines and imprisonment, and (iii) fixing authority on cognizance of offences. The next amendment in 2002 emphasizes on: (i) restriction on polluting automobiles, (ii) restriction on the sale and production of environmentally harmful items like polythene bags, (iii) assistance from law enforcement agencies for environmental actions, (iv) break up of punitive measures, and (v) authority to try environmental cases. The latest amendment in 2010 declares demarcation of wetlands and water bodies, and imposes restrictions on hazardous waste import, transportation, storage etc.; and activities on cutting of hills and/or mountains along with Ecologically Critical Areas. Failure to comply with any part of the Environment Conservation Act 1995 may result in punishment to a maximum of 5 years' imprisonment or a maximum fine of BDT 100,000, or both.	
Environment Conservation Rules, 2023	The Environment Conservation Rules, 2023 (ECR, 2023) provide the set of rules under the Environment Conservation Act, 1995. These provide, amongst other items, standards and guidelines for: • Categorization of industries and development projects; • Procedure for obtaining environmental clearance; and • Environmental quality standards in relation to inland surface water, coastal	In accordance with the ECR, 2023, the overall project is classified under Red Category, requiring an EIA for the issuance of ECC from DOE. This ECC has to be obtained prior to commencement of the project and thus with the subproject.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	water, drinking water, sewage water and industrial waste water quality parameters are mentioned under schedule 2, 3, 4 and 5. Whereas, standards for air pollution and noise, are referenced to the Air Pollution Control Rules, 2022 and Noise Pollution Control Rules, 2006, respectively. ECR, 2023 classifies industrial units and development projects into four categories for the purpose of issuance of Environmental Clearance Certificate (ECC). These categories are: Green; Yellow; Orange; and Red. Per ECR 2023, all existing and new industries and projects in Orange and Red category require an Environmental Management Plan (EMP) to be prepared (after conducting an IEE or EIA) and submitted along with other necessary papers while applying for environmental clearance.	
Bangladesh Climate Change Strategy and Action Plan 2009	The Government of Bangladesh prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2008 and revised in 2009. This is a comprehensive strategy to address climate change challenges in Bangladesh. It is built around the following six themes: • Food security, social protection and health to ensure that the poorest and most vulnerable in society, including women and children, are protected from climate change. All programs focus on the needs of this group for food security, safe housing, employment and access to basic services, including health. • Comprehensive disaster management to further strengthen the country's already proven disaster management systems to deal with increasingly frequent and severe natural calamities. • Infrastructure to ensure that existing assets (e.g., coastal and river embankments) are well maintained and fit for purpose and that urgently needed infrastructures (cyclone shelters and urban drainage) is put in place to deal	This strategy and action plan is relevant to the subproject. The subproject is required to consider in its design mitigation measures that will ensure the infrastructures (e.g. drainage openings, cross-sectional area and throughput volume, concrete materials) 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.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	with the likely impacts of climate change. • Research and knowledge management to predict that the likely scale and timing of climate change impacts on different sectors of economy and socioeconomic groups; to underpin future investment strategies; and to ensure that Bangladesh is networked into the latest global thinking on climate change. • Mitigation and low carbon development to evolve low carbon development options and implement these as the country's economy grows over the coming decades. • Capacity building and Institutional strengthening to enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change.	
National Water Policy 1999	The National Water Policy was promulgated in 1999 with the intention of guiding both public and private actions to ensure optimal development and management of water in order to benefit both individuals and the society at large. The policy aims to ensure progress towards fulfilling national goals of economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people and protection of the natural environment. According to the policy, all agencies and departments entrusted with water resource management responsibilities (regulation, planning, construction, operation, and maintenance) will have to enhance environmental amenities and ensure that environmental resources are protected and restored while executing their activities. Environmental needs and objectives will be treated equally with the resources management needs. The policy has several clauses related to the protection and conservation of the natural environment to ensure sustainable development.	Clause 4.6b of this policy states that natural depressions and water bodies in major urban areas must be preserved in order to recharge underground aquifers and rainwater management. Moreover, measures must be taken to minimize disruption to the natural aquatic environment in streams and water channels (Clause 4.9b). In addition, this policy requires each water resources development project or rehabilitation program to give full consideration to environmental protection, restoration and enhancement measures consistent with National Environmental Management Action Plan and the National Water Management Plan and adhere to a formal environment impact assessment process, if required by the Government (Clause 4.12a and clause 4.12b). All these elements are directly associated with the nature of the subproject. The policy also applies to the subproject due to the subproject's potential to pollute surface water bodies and groundwater during construction and operation phases. Therefore, the subproject is bound to comply with

Laws, Regulations, and Standards	Details	Relevance to the Subproject
		the requirements under this policy in its design.
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 sectoral action guidelines. The policy has the following objectives: (i) To manage water supply and sanitation related basic needs for all; (ii) To bring about a positive change of peoples' attitude towards water and sanitation; (iii) To reduce the outbreak of water-borne diseases; (iv) To increase the efficiency of the Local Government and associated communities for handling the problems related to water supply and sanitation; (v) To improve sustainable water supply and sanitation system; (vi) To promote proper conservation, management and use of surface water and to control water pollution in light of the scarcity of groundwater; and (vii) To take necessary steps to capture and use rain water.	This policy covers the subproject as far as managing water supply is concerned. The subproject is one of the means to realize the many objectives, in particular the ones related to improving the water supply system and reducing problems related to water scarcity, etc.
The Forest Act (1927) and the Forest (Amendment) Act (2000)	The Forest Act (1927) was enacted to control trespass, illegal resources extraction from forests and to provide a framework for the forestry revenue collection system. It is the main legislative context for forestry protection and management in Bangladesh. The Act allows for the notification of forest reserves in which the government, through the Forest Department, regulates the felling, extraction and transport of forestry produce in Bangladesh. The Act grants the government several basic powers, largely for conservation and protection of government forests, and limited powers for private forests.	Although there are no forests around the subproject areas and alignments, the relevance of this Act is only on the potential cutting of trees in some subproject sites or alignments. The subproject will be required to obtain permits on cutting of any trees prior to start of civil works.
Bangladesh Public Procurement Rule (PPR), 2008	This rule applies to the Procurement of Goods, Works or Services by any government, semi-government or any statutory body established under any law. The rule includes the adequate measure regarding the "Safety, Security and	NCC is a government entity that needs to comply with the environment-related requirements under this Rule, as explicitly specified herein.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	Protection of the Environment' in the construction works. This clause includes contractor responsibility to take all reasonable steps to (i) safeguard the health and safety of all workers working on the site and other persons entitled to be on it, and to keep the site in an orderly state and (ii) protect the environment on and off the site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of the Contractors methods of operation.	
National Environmental Policy, 2018	The central theme of the policy is to ensure protection and improvement in environment. The policy gives a thrust to sustainable development and long-term use of natural resources. The National Environment Policy contains policy statements and strategic options with regard to population and land-use management, management and utilization of natural resources and other socio-economic sectors, as well as the necessary arrangements for the implementation of the policy.	Subproject will have site-specific impacts and will require implementation of mitigation measures to ensure protection and improvement of the environment.
Environment Court Act, 2000 and subsequent amendments in 2003	The Environment Court Act, 2000 has been enacted in order to establish environmental courts in each administrative division of Bangladesh. This Act sets out policy for effective pursuance and completion of legal proceedings related to environmental crimes. Under this Act the Director General of the DOE has the power to impose heavy penalties to industrial polluters who are dumping untreated wastewater into the environment or not operating their legally mandated effluent treatment plants.	This Act covers the subproject because design includes the provision of water treatment technology or process, from which waste may be generated and discharged to the environment. Therefore, the operation phase of the subproject may have the potential to release untreated wastewater into the environment. According to this Act, government can take legal actions if any environmental problem occurs due to the subproject operations.
National Water Act 2013 National Water Rules 2018	Ensures Bangladesh water sources are free from any type of pollution. Pollution from water in urban outfalls and reservoirs, e.g., lakes, canals, ponds and ditches may result in amenity losses, fisheries depletion, health problems and fish and aquatic species contamination.	The subproject is required to implement measures to ensure that water source pollution is avoided, in particular to the Shitalakhya river.
Wetland Protection Act 2000	Advocates protection against degradation and resuscitation of natural waterbodies such as lakes, ponds, beels, khals, tanks, etc. affected by man-made	The subproject is required to implement measures to ensure that water bodies around the subproject sites are not impacted.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	interventions 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.	
National Land Use Policy, 2001	Sets out guidelines for improved land-use and zoning regulations. The main objective of this policy is to ensure criteria-based uses of land and to provide guidelines for usage of land for the purpose of agriculture, housing, afforestation, commercial and industrial establishments, rail and highway and for tea and rubber gardens.	Siting of subproject components need to comply with land use and zoning regulations
The Pourashava Act 2009 / Ordinance issued for the amendment of local government (municipality) ordinance, 2009 and 2010; The Pourashava Ordinance, 1977; Municipal Administration Ordinance, 1960	Provides guidance for subproject integrated community and workers health and hygiene at the construction and operation and maintenance stages of the project.	Mandated coordination with pourashava committees on disaster management measures, water and sanitation and waste management.
Building Construction (Amendment) Act and Building Construction Rules, Bangladesh National Building Code	Regulates technical details of building construction and to maintain standards of building construction	Subproject designs for any building structures need to comply with the Act and Rules.
Air Pollution Control Rules, 2022	APCR, 2022 contains air quality standards based on WHO Guidelines (Interim Goals); emissions limits and technical specifications for key sectors; mandates and coordination mechanisms among relevant line ministries to control both household and outdoor air pollution. The rules elevated the air quality management dialogue and leadership beyond the environment sector, by establishing the National Committee on Air Pollution Control, a muti-sector decision-making body presided by the Cabinet Secretary to coordinate the	Subproject construction activities will potentially generate air pollution (dust and smoke emissions), and thus need to comply with the emission standards specified in the Rules.

Laws, Regulations, and Standards	Details	Relevance to the Subproject
	APCR implementation and instruct relevant agencies on specific interventions to comply with the new rules.	
Noise Pollution (Control) Rules, 2006	The Noise Pollution Rules, 2006 addresses that the sound levels to be no more than 50dB in Silent Zones[a] during daytime (6 am to 9 pm) and 40 dB at night-time (9 pm to 6 am). In residential areas these levels are 55 dB and 45 dB, in mixed area[b] 60 dB and 50 dB, in commercial and industrial areas 70 dB and 60 dB and in industrial areas 75 dB and 70 dB for daytime and night-time respectively.	Subproject activities, particularly the linear works, will be in various locations of NCC with different land uses. Thus, the subproject needs to comply with the corresponding noise level standards at all sites.
Solid Waste Management Rules 2021	The Rules provides a comprehensive set of rules based on national 3R strategy and other national and international policies and guidelines pertaining to solid waste management. It defines the roles and responsibilities of relevant government ministries and agencies, including local government authorities and other stakeholders in implementing solid waste management undertakings. It also includes the environmental requirements necessary for these undertakings, provision of incentives for the promotion of sustainable waste management practices, etc.	The subproject will generate solid wastes, such as the expected dredged materials from canals and drains. With this the subproject will be required to implement measures to comply with the integrated waste management rules.

[a] The area within 100 meters from hospital, academic institutions or places identified/identifiable by the government
[b] An area, which is primarily a residential area with either or both commercial and industrial parts in it

4. Legislation Relating to Occupational Health and Safety

41. Relevance of occupational health and safety are presented in the below Table.

Table 3: Relevance of Occupational Health and Safety Legislation

Title of Laws and Rules	Relevance
Social Security under the Act, 1923 and an amendment in 1980	According to the Act social impact assessment includes the processes of analyzing, monitoring and managing the intended and unintended social consequences, both positive and negative of planned interventions (policies, programs, plans, projects) and any social change processes invoked by those interventions.
Bangladesh Labor Law of 2006	- Compliance to the provisions on employment standards, occupational safety and health, welfare and social protection, labor relations and social dialogue, and enforcement - Prohibition of employment of children and adolescent.
The Employer's Liability Act, 1938	The Act declares that the doctrine of common employment and of assumed risk shall not be raised as a defense in suits for damages in

Title of Laws and Rules	Relevance
	respect of employment injuries. Under the Maternity Benefit Act, 1939, the Maternity Benefit Act, 1950, the Mines Maternity Benefit Act, 1941, and finally the rules framed thereunder, female employees are entitled to various benefits for maternity, but in practice they enjoy leave of 6 weeks before and 6 weeks after delivery.
Public Health (Emergency Provisions) Ordinance, 1994	The ordinance calls for special provisions with regard to public health. Whereas if an emergency has arisen, it is necessary to make special provision for preventing the spread of human disease, safeguarding public health and providing them adequate medical service and other services essential to the health of respective community and workers in particular during the construction related work.
The Employees State Insurance Act, 1948	It has to be noted that health, injury and sickness benefit should be paid to people, particularly respective workers at work place under the Act.
Bangladesh Factory Act, 1979	The Act requires every workplace including small or large scale construction where women are employed to have an arrangement of childcare services. Based on this Act and Labor Laws - medical facilities, first aid and accident and emergency arrangements are to be provided by the authority to the workers at workplaces.

5. Relevant International Conventions, Treaties

42. Relevant International Conventions, Treaties and Protocols (ICTPs) are given in the following Table.

Table 4: International Environmental Conventions Relevant to the Subproject Activities

Sl. No.	International Treaties	Ratified/ Accessed (AC)/ Accepted (AT)/ Adaptation (AD)	Relevance
1	International Plant Protection Convention (Rome, 1951) & Plant Protection Agreement for SE Asia and Pacific (1999 Revision)	01.09.1978 04.12.1974 (AC)	Ensures that component work or construction materials do not introduce plant pests.
2	Convention on Wetlands of International Importance, 1971 (Ramsar Convention)	20.04.1992 (ratified)	Protection of significant wetland and prevention of draining or filling during construction.
3	Convention Concerning the Protection of World Cultural and Natural Heritage (Paris, 1972)	03.11.1983 (ratified)	Prevention of damage or destruction of culturally and/or historically significant sites, monuments, etc.
4	Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal 1987)	02.08.90 31.10.90 (AC) (entry into force)	Use of equipment or facilities (e.g., refrigeration and air-conditioning units) that utilize ozone friendly chemicals or substances.
5	Convention on Biological Diversity, 1992 (Rio de Janeiro)	03.05.1994	Protection of biodiversity during construction.
6	Cartagena protocol on Biosafety to the Convention on Biological Diversity	In the process of Ratification	Protection of biodiversity during construction.
7	Convention on Persistent Organic Pollutants, 2001	In process	Restriction of use of pesticides and herbicides.

Sl. No.	International Treaties	Ratified/ Accessed (AC)/ Accepted (AT)/ Adaptation (AD)	Relevance
8	United Nations Framework Convention on Climate Change, 1997	22.10.2001 13.11.2003 (amended)	Reduce greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system.

6. Gaps in Legal and Guiding Instruments

43. Comparative analysis of Environmental Safeguard principles is shown in the following Table.

Table 5: Comparative Analysis of Environmental Safeguard Policy

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
1	Use of screening process to determine the appropriate environmental assessment	Uses sector-specific rapid environmental assessment checklist for screening and assigns categories based on potential impacts: A- EIA required (irreversible, diverse or unprecedented adverse environmental impacts); B- IEE required; C- No environmental assessment required but a review of environmental implications; FI - ESMS required.	ECA 1995 and ECR 2023 set screening criteria to classify industries/ projects based on potential environmental impacts as follows: Green, Yellow, Orange and Red (cause significant environmental impacts). The screening criteria is based on the project or industry type and do not consider the scale and location. The category determines the level of environmental assessment.	No major gaps
2	Conduct an environmental assessment	EIA and IEE - Identify potential impacts on physical, biological and socioeconomic aspects in the context of project's area of influence (i.e., primary project site and associated facilities) ESMS for FIs	Industry/project category Green- no environmental assessment required. Yellow – compliance with site selection criteria. Orange – compliance with site selection criteria and conduct of IEE required; Red – compliance with site selection criteria, and both IEE and EIA required.	No major gaps
3	Examine alternatives	Analyze alternatives to the project's location, design, and technology Document rationale for selecting the particular project location, design, and technology Consider "no project" alternative	Regulations (i.e., ECA 1995 and ECR 2023) do not require specifically the identification and analysis of alternatives	Not required by law but the ToR for EIA to be approved by the DOE now includes a discussion on

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
				analysis of alternatives.
4	Prepare an environmental management plan (EMP)	EMP to include monitoring, budget and implementation arrangements.	EMP and procedures for monitoring included in the IEE and EIA (i.e., Yellow, Orange, and Red category projects)	No major gaps
5	Carry out meaningful Consultation	Starts early and continue during implementation; Undertaken in an atmosphere of free intimidation Gender inclusive and responsive tailored to the needs of vulnerable groups Allows for the incorporation of all relevant views of stakeholders Establish a grievance redress mechanism	For projects classified Red Category, public consultation is required based on ECR 2023 Grievance redress mechanism is not mentioned in ECA 1995 and ECR 2023; EIA format required by DOE includes stakeholders' consultation.	Approval of the ToR of EIA by DOE includes mandatory consultation with stakeholders.
6	Timely disclosure of draft environmental assessment (including the EMP)	Draft EIA report posted on ADB website at least 120 days prior to Board consideration; Draft EA/EARF prior to appraisal Final or updated EIA/IEE upon receipt Environmental monitoring report submitted by borrowers upon receipt.	No requirement for public disclosure of environmental reports but DOE posts the minutes of the meeting on the application for environmental clearance certificate to its website, http://www.doebd.org/ minutes.php	Still no requirement for public disclosure of environmental assessment
7	Implement EMP and monitor effectiveness	Prepare monitoring reports on the progress of EMP Retain qualified and experienced external experts or NGOs to verify monitoring information for Category A projects Prepare and implement corrective action plan if noncompliance is identified Requires submission of quarterly, semi-annual, and annual reports to ADB for review	For project classified under Orange and Red Categories, ECC is subject to annual renewal based on compliance of the conditions set by DOE .	No major gaps
8	Avoid areas of critical habitats (use of precautionary approach to the use, development and management of	Provides guidance on critical habitats.	ECA 1995 and ECR 2023 identifies ecologically-critical areas and the rules to protect them.	No major gaps

Sl. No.	ADB SPS, 2009		GOB Principles	Gaps (if any)
	Principles	Delivery Process		
	renewable natural resources)			
9	Use pollution prevention and control technologies and practices consistent with international good practices	Refers to World Bank's Environmental Health and Safety (EHS) General Guidelines 2007 (or any update) If national regulations differ, more stringent will be followed. If less stringent levels are appropriate in view of specific project circumstances, provide full and detailed justification	Effluent standards, ambient and emission standards included in ECA 1995 and ECR 2023. Ambient noise levels included in Noise Pollution Control Rules 2006.	No major gaps
10	Provide workers with safe and healthy working conditions	Refers to WB EHS General Guidelines 2007 (or any update).	Occupational health and safety standards included in the Factories Act 1965, the Bangladesh Labour Act 2006, and its 2013 amendment.	No major gaps
11	Conserve physical cultural resources (PCR) and avoid destroying or damaging them	Use of field-based surveys and experts in the assessment. Consult affected communities on PCR findings Use chance find procedures for Guidance.	Preservation and protection of cultural resources are within the Antiquities Act 1968.	No major gaps

7. Permits and Clearance

44. Per ECA, 1995 (amended 2010) and ECR, 2023, it is mandatory for each and every type of industry and project to obtain ECC from the DOE. For the issuance of ECC, any proponent should follow the steps described above in part B of this section.

45. The application and requirement for issuance of ECC are described in the ECR, 2023 and summarized in Part B above. This involves the completion and submission of an application using a form available from the DOE website,[15] which is revised from time to time. The accomplished application form is submitted to DOE together with requirements as enumerated in Part B above. The proponent is also required to pay equivalent application fee prescribed in ECR, 2023.

46. The ECC is issued within 30 working days from receipt of the application by DOE, provided that SCC has been issued prior. LCC is normally issued within approximately within 7 working days from receipt of DOE of the EIA report, provided that such report is approved by DOE. Once issued, ECC is required to be renewed every year from the date of its effectivity for Orange and Red category projects. For the overall project, NCC, through PMU, is responsible for application for ECC. This ECC will cover all subprojects identified under the overall project. Completion of

[15] Government of Bangladesh. Department of Environment.

the EIA is ongoing and application for ECC will be submitted once the EIA is approved and SCC is issued by DOE.

D. Applicable Environmental Standards

47. ECR, 2023 also provides the environmental standards applicable to the subproject. The ECR presents the national standards as presented in this chapter. Following requirements of ADB SPS, the subproject 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 subproject shall achieve whichever is more stringent. If less stringent levels or measures are appropriate in view of specific project circumstances, NCC through PMU will provide full and detailed justification for any proposed alternatives that are consistent with the requirements presented in ADB SPS. The tables below show the comparison of the national standards and internationally recognized standards, including the applicable standards to be followed under the subproject per ADB SPS requirements.

Table 6: Bangladesh National Drinking Water Quality Standards

Sl No	Parameter	Unit	Standard
1.	1,1 Dichloroethane (1,1 $C_2H_4C_{12}$)	mg/l	0.030
2.	1,2 Dichloroethane (1,2 $C_2H_4C_{12}$)	mg/l	0.030
3.	2,4,6 Trichlorophenol	mg/l	0.200
4.	Aldrin/Dieldrin	mg/l	0.030
5.	Aluminium (Al)	mg/l	0.200
6.	Ammonia (NH_3)	mg/l	1.500
7.	Anionic Detergents	mg/l	0.200
8.	Arsenic (As)	mg/l	0.050
9.	Barium (Ba)	mg/l	0.700
10.	Benzene (c_6H_6)	µS/cm	0.010
11.	Boron (B)	mg/l	1.000
12.	Cadmium (Cd)	mg/l	0.003
13.	Calcium (Ca)	mg/l	75.000
14.	Carbon Tetra Chloride (CCl_4)	mg/l	0.005
15.	Chloride	mg/l	250.000*
16.	Chloroform ($CHCL_3$)	mg/l	0.090
17.	Color	Hazen Unit	15.000
18.	Copper (Cu)	mg/l	1.500
19.	Cyanide (CN)	mg/l	0.050
20.	Fecal Coliform	NFU/100ml	0
21.	Fluoride (F^-)	mg/l	1.000
22.	Free Residual Chlorine	mg/l	0.20
23.	Hardness as $CaCO_3$	mg/l	500.000
24.	Iron (Fe)	mg/l	0.3-1.0
25.	Lead (Pb)	mg/l	0.010
26.	Magnesium (Mg)	mg/l	30-35
27.	Manganese (Mn)	mg/l	0.400
28.	Mercury (Hg)	mg/l	0.001
29.	Nickel (Ni)	mg/l	0.050
30.	Nitrate (NO_3^-)	mg/l	45
31.	Nitrite (NO_2^-)	mg/l	1.000
32.	Odor	---	Odorless
33.	Oil and Grease	mg/l	0.010
34.	Overall Beta variance	BQU/L	1.000
35.	Pentachlorophenol	mg/l	0.009
36.	pH	---	6.5-8.5
37.	Phenols	mg/l	0.002
38.	Potassium	mg/l	12.000
39.	Radioactive Materials Emitting Alpha Radiation	BQU/L	0.100
40.	Selenium (Se)	mg/l	0.010
41.	Silver (Ag)	mg/l	0.020
42.	Sodium (Na)	mg/l	200.000
43.	Sulfate (SO_4^{-2})	mg/l	250.000
44.	Sulfide as H_sS	mg/l	0.050
45.	Suspended Solid (SS)	mg/l	10.000
46.	Temperature	°C	20-30
47.	Tetrachloroethane ($C_2H_4C_{14}$)	mg/l	0.040

Sl No	Parameter	Unit	Standard
48.	Tin (Sn)	mg/l	2.000
49.	Total Chromium (Total Cr)	mg/l	0.050
50.	Total Coliform	NFU/100ml	0
51.	Total Dissolved Solids (TDS)	mg/l	1000.000
52.	Total Kjeldal Nitrogen	mg/l	1.000
53.	Trichloroethane ($C_2H_3C_{13}$)	mg/l	0.020
54.	Turbidity	NTU	5.000
55.	Zinc (Zn)	mg/l	5.000

* 1,000 mg/l in coastal areas
Source: ECR, 2023

Table 7: Bangladesh Inland Surface Water Standards

Best Practice Based classification	pH	DO mg/l	BOD mg/l	NO_3-N mg/l	NH_4-N mg/l	PO_4-P mg/l	Total Cr mg/l	Pb mg/l	Hg mg/l	Total Coliform cfu/100mg	TDS mg/l	COD mg/l
a. Source of drinking water for supply only after disinfecting:	6.5-8.5	≥6	≤2	7.0	0.1	0.1	0.02	0.03	0.001	≤100	1000	10
b. Water usable for recreational activity	6.5-8.5	≥5	≤3	7.0	0.3	0.5	0.2	0.05	0.001	≤50	1000	10
c. Source of drinking water for supply after conventional treatment	6-9	≥5	≤3	7.0	0.3	0.5	0.02	0.03	0.001	≤5000	1000	25
d. Water usable by fisheries	6-9	≥5	≤6	7.0	0.3	0.5	0.05	0.1	0.004	≤5000	1000	50
e. Water usable by various process and cooling industries	6.5-8.5	≥1	12	-	2.7	-	0.1	0.1	0.05	-	1000	100
f. Water usable for irrigation	6.5-8.5	-	≤12	5.0	1.5	2.0	0.1	0.1	0.002	≤50000	1000	100

Note: Electrical conductivity for irrigation water 2250 -µS/cm (at a temperature of 25^0C); Sodium less than 26%; boron less than 0.2%.
Source: ECR, 2023

Table 8: Applicable Ambient Air Quality Standards for Bangladesh Projects

Parameter	Bangladesh Ambient Air Quality Standard (µg/m³) and Averaging Time[a]	WHO Air Quality Guidelines (µg/m³) Global Update[b] 2021
PM_{10}	50 (1-year) 150 (24-h)	15 (1-year) 45 (24-h)
$PM_{2.5}$	35 (1-year)	5 (1-year)

Parameter	Bangladesh Ambient Air Quality Standard (µg/m^3) and Averaging Time[a]	WHO Air Quality Guidelines (µg/m^3) Global Update[b] 2021
	65 (24-h)	15 (24-h)
SO_2	80 (24-h) 250 (1-h)	40 (24-h)
NO_x	40 (1-year) 80 (24-h)	10 (1-year) 25 (24-h)
CO	5,000 (8-h) 20,000 (1-h)	4 (24-h)
Lead	0.25 (1-year) 0.50 (24-h)	
Ozone (O_3)	180 (1-h) 100 (8-h)	60 (peak season) 100 (8-h)
NH_3	100 (1-year) 400 (24-h)	

ADB = Asian Development Bank, CO = carbon oxide, h = hour, µg/m^3 = microgram per cubic meter, min = minute, NO_x = oxides of nitrogen, $PM_{2.5}$ = particulate matter 2.5, PM_{10} = particulate matter 10, SO_2 = sulfur dioxide, WHO = World Health Organization.

[a] Air Pollution Control Rules 2022

[b] Recommended 2021 WHO Global Air Quality Guidelines. https://www.who.int/

Table 9: Applicable Noise Levels for Bangladesh Projects

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

[a] Noise Pollution Control Rules 2006

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

[c] 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.

Table 10: Applicable Effluent Discharge Standards

Sl. No	Parameter	Unit	Maximum Tolerable Limit at Discharge point except pH		
			Internal Surface Water	2nd Stage process of public sewage	Coastal Areas
1.	Nitrogen (N)	mg/l	50	50	50
2.	Ammonia (NH_3)	mg/l	5	5	5
3.	Arsenic (As)	mg/l	0.2	0.2	0.2
4.	BOD_5 at 20°C	mg/l	30	250	100
5.	Boron (B)	mg/l	2	2	4
6.	Cadmium (Cd)	mg/l	2	1	2

Sl. No	Parameter	Unit	Maximum Tolerable Limit at Discharge point except pH		
			Internal Surface Water	2nd Stage process of public sewage	Coastal Areas
7.	Chlorine (Cl^-)	mg/l	600	600	---
8.	Total Chromium	mg/l	0.5	1	1
9.	COD	mg/l	200	400	250
10.	Hexavalent Cr	mg/l	0.1	2	1
11.	Copper (Cu)	mg/l	3	3	3
12.	Fluoride (F)	mg/l	2	15	15
13.	Sulphide (S)	mg/l	1	--	5
14.	Iron (Fe)	mg/l	3	3	3
15.	Total Kjeldal nitrogen	mg/l	100	--	100
16.	Lead (Pb)	mg/l	0.1	1	2
17.	Manganese (Mn)	mg/l	2	2	2
18.	Mercury (Hg)	mg/l	0.01	0.01	0.01
19.	Nickel (Ni)	mg/l	1	2	5
20.	Nitrite (N)	mg/l	10	--	20
21.	Oil & Grease	mg/l	10	20	20
22.	Phenol (C_6H_5OH)	mg/l	1	5	5
23.	Phosphorus (P)	mg/l	5	--	--
24.	Radioactive Material a) Alpha Particle b) Beta Particle	Micro Curie/L	Standard Set by Bangladesh Atomic Energy Commission	---	----
25.	pH	---	6-9	6-9	6-9
26.	Selenium (Se)	mg/l	0.05	0.05	0.05
27.	Zinc (Zn)	mg/l	5	15	15
28.	Temperature	°C	Not more than 5°C of reservoir water temperature	--	Not more than 5° C of reservoir water temperature
29.	Suspended Solids	mg/l	100	500	100
30.	Cyanide	mg/l	0.1	2.0	0.2
31.	Total Residual Chlorine	mg/l	1.0	--	1.2
32.	Bio Assay Test		90% fishes remain alive after 96 hours in the treated liquid waste	90% fishes remain alive after 96 hours in the treated liquid waste	90% fishes remain alive after 96 hours in the treated liquid waste

Source: ECR, 2023

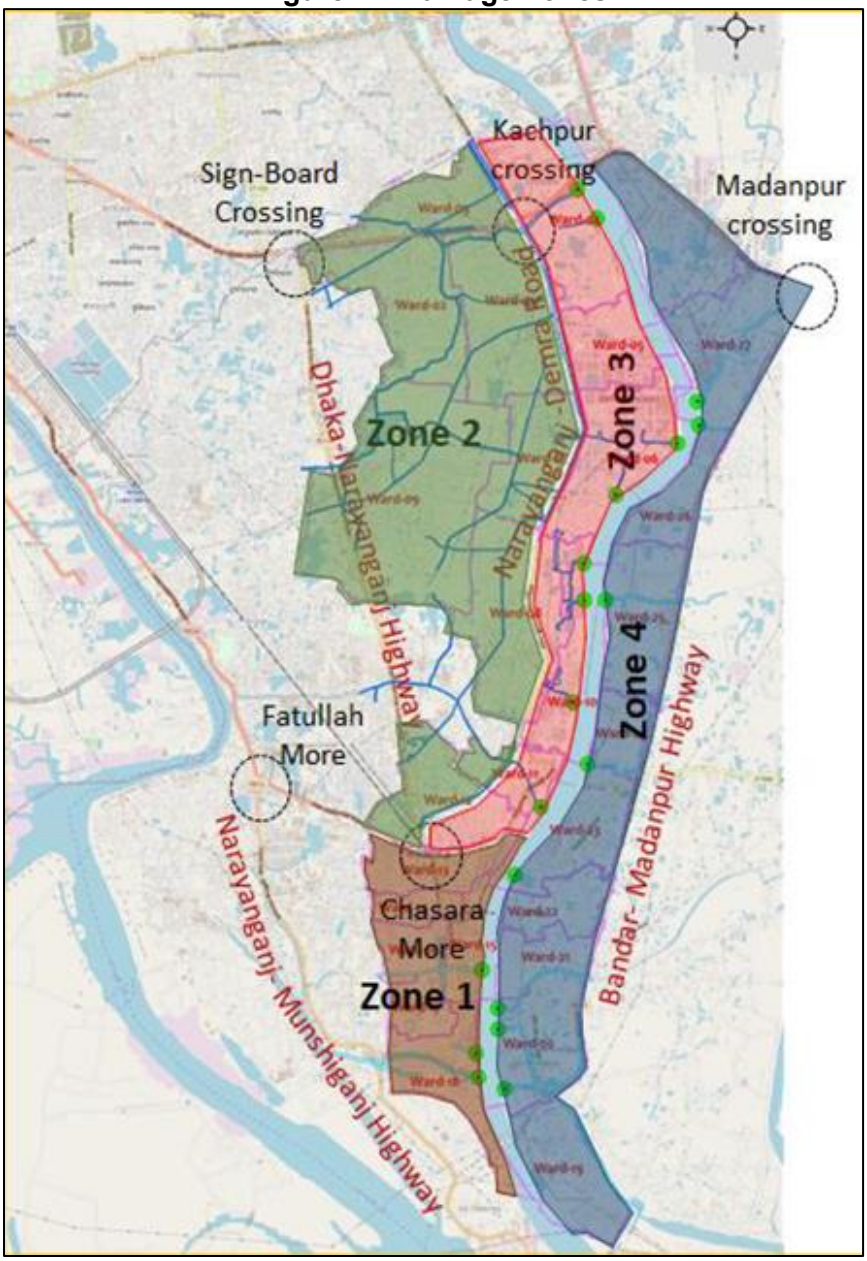
III. DESCRIPTION OF THE SUBPROJECT

A. Subproject Location

48. The location of the drainage subproject is within the jurisdiction of Narayanganj City Corporation (NCC), the fourth most populated and sixth largest city in Bangladesh. NCC is about

16 km southeast of the capital city of Dhaka, and has a population of about 709,381 as of 2011.[16] The location of NCC and the coverage area of the drainage subproject is shown in **Figure 1** and the zone-wise locations in Figure 4 below. This zoning is adopted from the drainage master plan that was developed as part of preparing the subproject. See Appendix 2 for a copy of the master plan. Accordingly, these zones are hydraulically independent and exclusive.

Figure 4: Drainage Zones



[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

[16] Adjusted Population 2011. Statistical Yearbook of Bangladesh 2022. Bangladesh Bureau of Statistics. June 2023.

B. Subproject Components

49. The subproject will involve rehabilitation and upgrading of part of the drainage network in NCC based on the overall drainage masterplan of NCC. As envisaged, the drainage masterplan will be implemented on phase-wise basis in view of funding considerations. For the subproject that will be funded under NGRUDP, it will involve rehabilitation and upgrading of existing drainage systems. The subproject has been prepared based on preliminary design, with components as follows:

(i) renovation of inadequate existing drains with aggregate length of 23.230 km;
(ii) cleaning of the remaining existing drains with aggregate length of 160.520 km; and
(iii) construction of new drains with aggregate length of 6.056 km.

50. The subproject will be awarded under a civil works contract modality. Therefore, NCC through the PMU will finalize the detailed designs of these components prior to bidding. At the same time, the NCC through PMU will update this IEE based on the final detailed design and attached to the bidding and contract documents.

51. The summary of the subproject components on a zone-wise basis is in table below. Drawings showing the alignments are in Appendix 3.

Table 11: Total Length of Drainage Works (Rehabilitation of Existing and Construction of New Drain)

Components	Zones and Zone-wise Lengths, km		Total Length, km / Total Nos.
	Zone 1	Zone 3	
Rehabilitation and upgrading of existing drainage system			
i. renovation of inadequate drains	11.57	11.66	23.230
ii. cleaning of the remaining existing drains	84.53	75.99	160.520
iii. proposed new drains	2.196	3.86	6.056

C. Rationale and Details of the Drainage Rehabilitation (Overall Drainage Masterplan)

52. Currently, many parts of Narayanganj City have inadequate and inefficient drainage network which could hardly convey storm water to the intended discharge points along Shitalakhya river. Low lying areas with no drainage canals continue to be inundated by water during downpour and remains flooded for long periods of time. This flooding or waterlogging issue has since been a perennial difficulty of the city. This situation leads to both social and economic losses, including loss of productive days, poor sanitation conditions causing ill health of the citizens especially the poor and vulnerable. A drainage infrastructure development initiative is therefore needed by the city to address the problem.

53. Thus, the subproject was envisaged to help improve this existing problem related to drainage and waterlogging issues. It will involve rehabilitation of existing drains and construction of new drains with footpaths on top, which follows the traditional and appropriate approach of

combining drainage channels along road arteries. Rehabilitation of existing drains will include desilting and relining the walls and replacements of existing degraded and undersized primary drainages. Construction of new secondary or tertiary drains will be located in road alignments with no drainages. The network of drainage alignments will eventually drain out to Shitalakshya river. All these components of civil works have been proposed after detail survey and field inspections.

1. Existing Condition of Drainage Network

54. A topographic survey of existing drains within NCC area was carried out and a total of 556 km of existing main drains were identified. The total length of roads within NCC area extends to approx. 662 km, thus indicating 85% drainage coverage only. The existing network consists of primary/ trunk drains, the canal system and the secondary and tertiary drains. The tertiary drains join the secondary network flowing to join trunk lines which are either the main drains or the canals/ khals which acts as final catchment of the discharge network. There are also retention ponds to allow sedimentation and screening.

55. **Drain Size and Condition**. The adequacy of the existing drainage system has been assessed, by using the software (SEWER GEMS). After modelling the entire existing stretches, it is found that about 38.155 km of existing network will require renovation including expansion in size to accommodate additional stormwater, maintain correct slope angle, and repair the lining lost due to operational wear and tear. Out of the total existing drainage network of 556 km, 38.155 km require structural rehabilitation, while the rest of the 518 km will require desilting and relining (where needed).

56. **Canal System.** The canal system is the vertebrae of the drainage system in NCC. Some of the canals are natural and some are man-made, being excavated under DND[17] project which falls under Siddirganj Pourashava. The length of canals within NCC boundary that is attributed to the drainage of the catchment basin is about 61 km (including 7 km retention pond). Majority of the canals in general have existing slope from east to west, i.e., away from Shitalakhya river, except a few small stretches from east to west. The canals have the following issues:

(i) Poorly defined boundary/edge of primary canals, secondary and tertiary canals;
(ii) Some canals are not connected to primary canals;
(iii) Inadequately sized drainage outlets and culverts.
(iv) Disposal of solid wastes directly into drainage canals.
(v) Encroachment of canals by land fill and constructions (buildings, culverts and bridges);
(vi) Some drains outfalls are below or underneath the jetty/walkway or other public infrastructure, which hinder easy maintenance; and
(vii) Lack of coordinated and planned maintenance programs to effectively maintain the drainage system.

[17] DND- Dhaka-Narayanganj-Demra, administered by Department of Defence, Bangladesh

Figure 5: Current Conditions of Some Canals

	
Apparent Encroachment of Canals	**Canal Width restriction by colonial bridge**
	
Undefined canal edges	**Narrow passage for drainage inlet to pump station**
	
Canal erosion- causing damage to wall	**Canal Rehabilitation works (under progress)**

57. **Waterlogging Areas**. From a survey conducted under the subproject,[18] more than half of the areas occupied by households in NCC is affected by waterlogging. Wards 1, 2, 3, 7, 8, and 9 are the worst affected areas. It was also found out that about 23.75 km of drains remains submerged during rainy season. From the same survey, the causes for waterlogging are the following: (i) lower level of main canals relative to the river, which prevent gravity flow at the outfalls; (b) presence of low-lying areas, which are naturally formed; (c) entrapped areas due to infrastructure development (railway and roads); and (d) mismanagement of drainage system by adjacent neighborhood.

58. **Drainage Water Quality**. As most areas are of mixed-use type (residential, commercial and SMEs), drainage water contains domestic sewage and septage (soak pits/septic tank connected with drain), kitchen waste, and chemical wastes from small/medium industries. Samples of drain/khal water were taken from 9 different points to identify the constituents and concentration. The drain water test results (collected from 8 different sampling areas) indicate very high BOD and COD levels, along with high presence of suspended solid, ammonia and nitrate as against Bangladesh permissible limit for discharge in land waters.

[18] A Focal Group Discussion (FGD) survey was conducted by the consultant, ARRA Research and Consultancy, in late 2022, identifying the actual water logging areas and root causes, with the help of the communities.

Table 12: Storm Water Quality
(Date of Sampling: 11 September 2022)

Location/ Parameter	Limits [a]	B.K. Road	Tribeni Canal	Godenail	School Ghat	Alomjinha Ghar	Ekrampur Khal	Adamjhee Road Drain	Haripur Khal	Shimrail
pH	6-9	6.55	6.77	6.62	7.26	6.65	6.77	6.82	6.61	6.55
DO	-	3.94	3	3.4	3.87	3.52	3.51	2.24	4.3	3.6
BOD	30	136	3.5	144	8.8	3	272	30	4.5	200
COD	200	229	12	354	35	15	409	106	16	335
TSS	100	76	60	48	15	26	131	24	20	173
NO3-N	-	0.5	0.3	0.7	0.2	1.6	0.8	0.3	1	0.3
NH3-N	-	32.5	0.65	42	4.05	0.2	53	11.5	1.3	23.75
Phosphorous	5	13.6	0.37	17.2	2.65	0.37	23.3	5.2	1.25	11.25
Mercury	0.01	0.0022	-	0.006	-	-	-	-	-	-
NH4-N	-	34.4	0.69	44.5	4.3	0.21	-	12.2	1.4	25.1

Source: Drainage Masterplan for Narayanganj City Corporation. June 2023.
[a] ECR, 2023. Standards for Effluent Discharged to Inland Waters.

59. **Domestic Grey and Black Water.** From a visual inspection of selected properties, it would appear that a significant proportion of the approx. 30,000 household water connections are discharging their domestic wastewater directly to the stormwater drainage system, instead of discharging to properly constructed septic tanks. But where septic tanks exist, these are often old and require desludging. As a result, all untreated and partially treated wastewater from households drain directly to the channels causing frequent blockages.

60. **Solid Waste Dumping.** Solid waste is dumped on the canals in an indiscriminate manner. It has a direct adverse effect on proper functioning of the drainage system. The current solid waste management system of NCC is evidently not enough to address this issue. Accordingly, NCC attributes this problem with the persistent manpower and resource constraints.

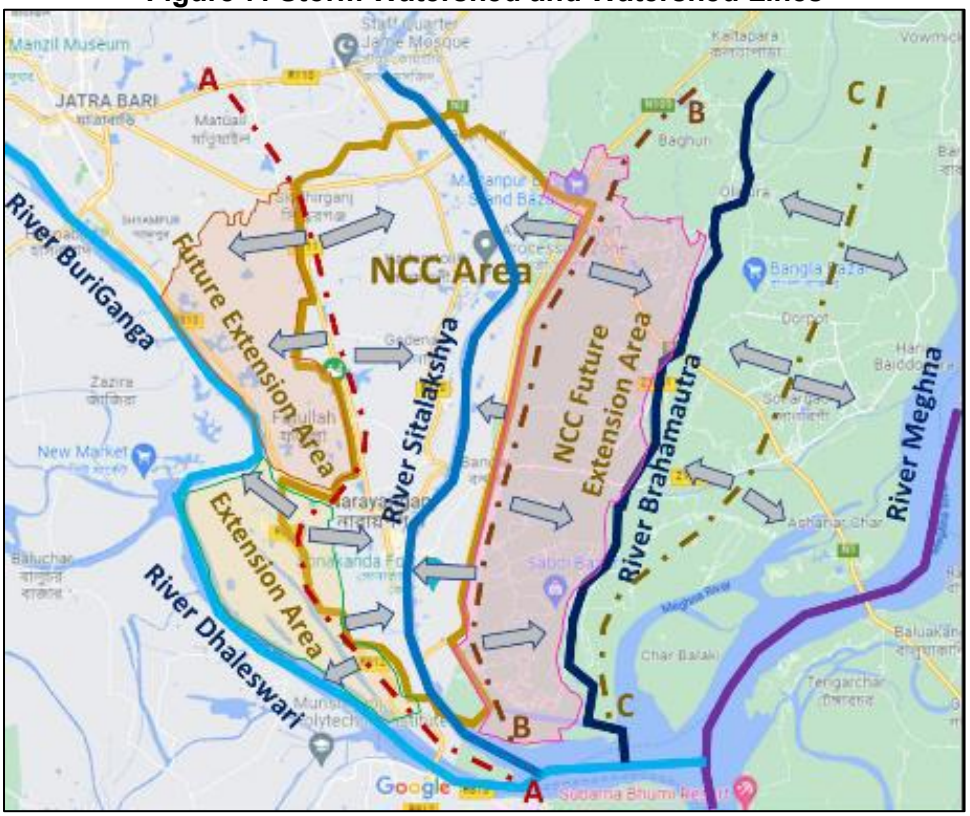
Figure 6: Solid Wastes in Some Canals

Picture (a) and (b) showing solid waste being dump across the water channels in uncontrolled manner

61. **Storm Watershed and Watershed Line**. The watershed of the rivers (i.e. natural drainage systems) around NCC and its neighboring areas comprised of (i) Buriganga –

Dhaleswari (ii) Shitalakshya, (iii) Brahmaputra, and (iv) Meghna. These rivers run almost parallel and converging at the southernmost confluence at Meghna, as shown in Figure below. Considering the topography and the highest elevation points of most parts of the city, the natural tendency of storm water is to flow into Shitalakhya River. This forms the basis of entire planning for drainage improvement.

Figure 7: Storm Watershed and Watershed Lines



[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

62. This watershed was then divided into four (4) zones to form clusters of trunk drainage line along with secondary and tertiary lines. For ease of implementation, these zones were matched with administrative boundaries - Siddhirganj, Narayanganj, Khanpur and Kadam Rasul.

2. Drainage Rehabilitation Works

63. **Renovation of inadequate existing drains**. Based on the SEWER Gem model, each of the delineated catchment based on topography and outfall to the Shitlakhaya River were mapped, and the adequacy against the total calculated run-off based on current and future rainfall were assessed. It was found that significant length of existing drains across the four zones need renovation. The renovation works will include expansion of drains, modification in accordance with the slope and invert depth as per design requirement, and desilting of the entire stretch. Final designs and specifications will be determined during the detailed design phase by NCC through the PMU.

64. **Cleaning of the remaining existing drains**. Majority of the existing drains are found to be adequate in size and slope, but would require desilting and cleaning, including relining where required. About 0.45m to 0.6m thickness of mud or sludge deposition is expected out of this desilting and cleaning.

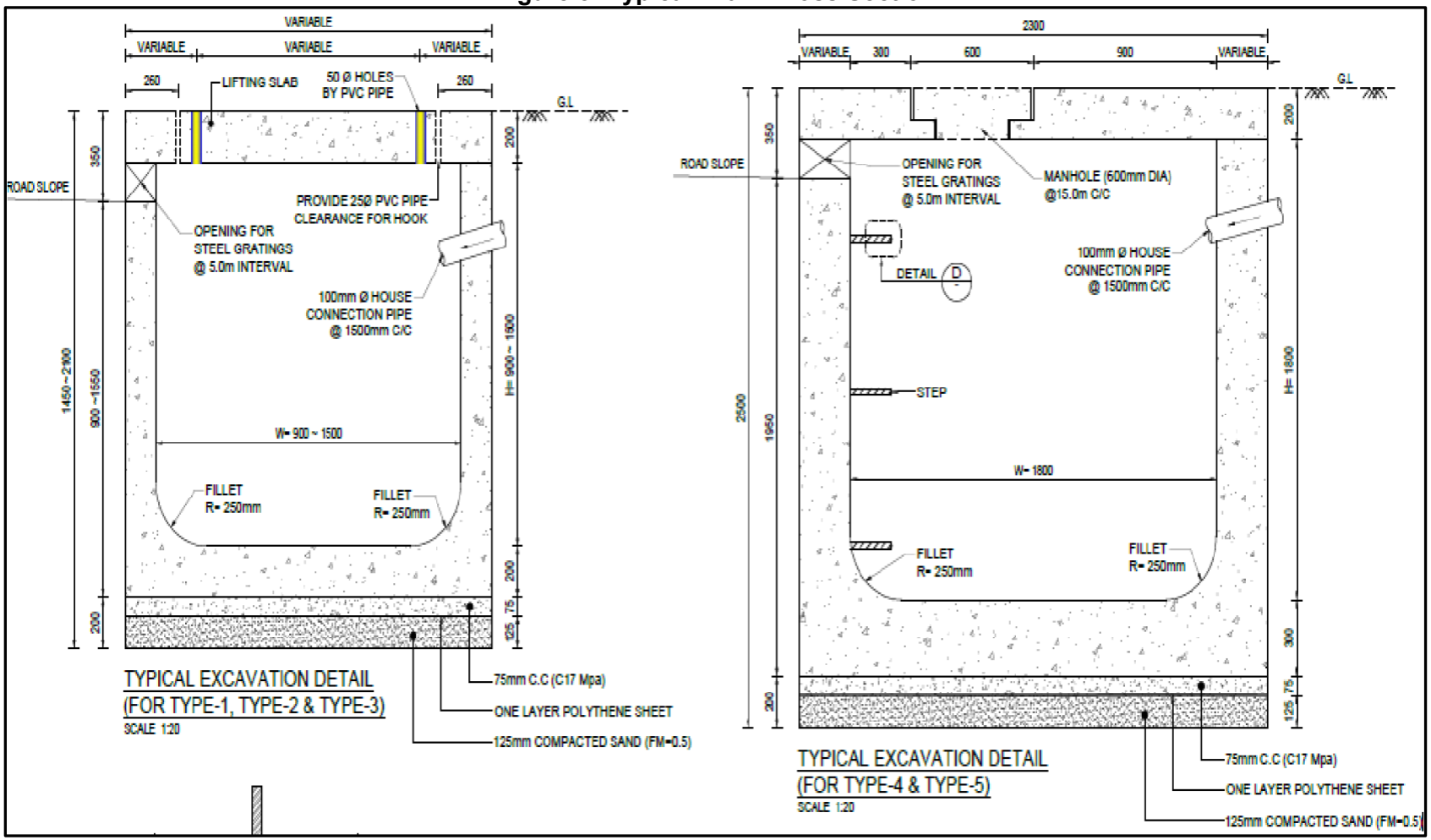
65. **Construction of New drains.** New drains are proposed to be constructed on the roads where there are no existing drains. These are basically new roads, smaller in size, and terminal

ones (i.e. starting stretches). These new drains will have 600mm depth and will be connected to the existing drainage system. New drains are also proposed to replace existing drains that are directed to unknown destinations or terminate to borrow pits or ponds/lakes or ditches. This replacement of new drains have been proposed to divert all drains to organized and known drainage alignments that lead to the canals and ultimately to the rivers. Excavation works for these new drains will follow the typical drain cross section and slab cover as shown in figure below. Final designs and specifications will be determined during the detailed design phase by NCC through the PMU.

Table 13: Zone-Wise Distribution of Existing Drains for Rehabilitation and New Drains for Construction

Zone	Drain categories	Length, m	Remarks
Zone 1	Existing drains to be cleaned and retained	84,530	85.30 %
	Proposed new drains	2,1960	3.00 %
	Existing drains to be renovated	11,570	11.70 %
	TOTAL	**99,060**	
Zone 3	Existing drains to be cleaned and retained	75,990	83.04 %
	Proposed new drains	3,860	4.22 %
	Existing drains to be renovated	11,660	12.74 %
	TOTAL	**91,510**	

Figure 8: Typical Drain Cross Section



Source: Standard Details of Drain Section. UIIPF for NCC. June 2023.

66. **Construction of outfall structures, silt chambers and screens.** Improvement in outfall structures where needed and installation of silt chambers and screen guards have been proposed. The improvement of the outfall structures will align the outfall with the river. The installation of silt chambers at the outfall will reduce the solid as well as unwarranted pollution load to the river. The installation of screens will also help in avoiding solid wastes from flowing into the river.

67. In order to ensure that the drainage system does not become clogged with solid waste and to prevent silt from being conveyed and discharged to the Shitalakshya river; a series of desiltation tanks fitted with bar screens has been proposed to be installed along the major drains and integrated at the end of the outfalls as shown in figure below.

Figure 9: Typical Outfall Arrangement with Silt Chamber

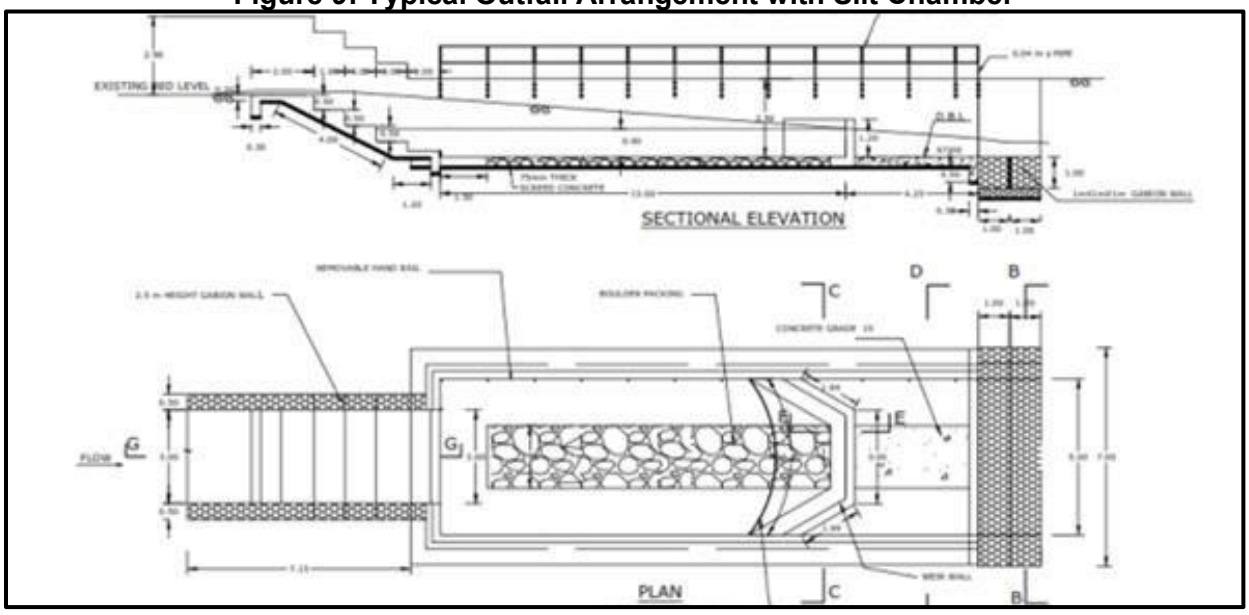
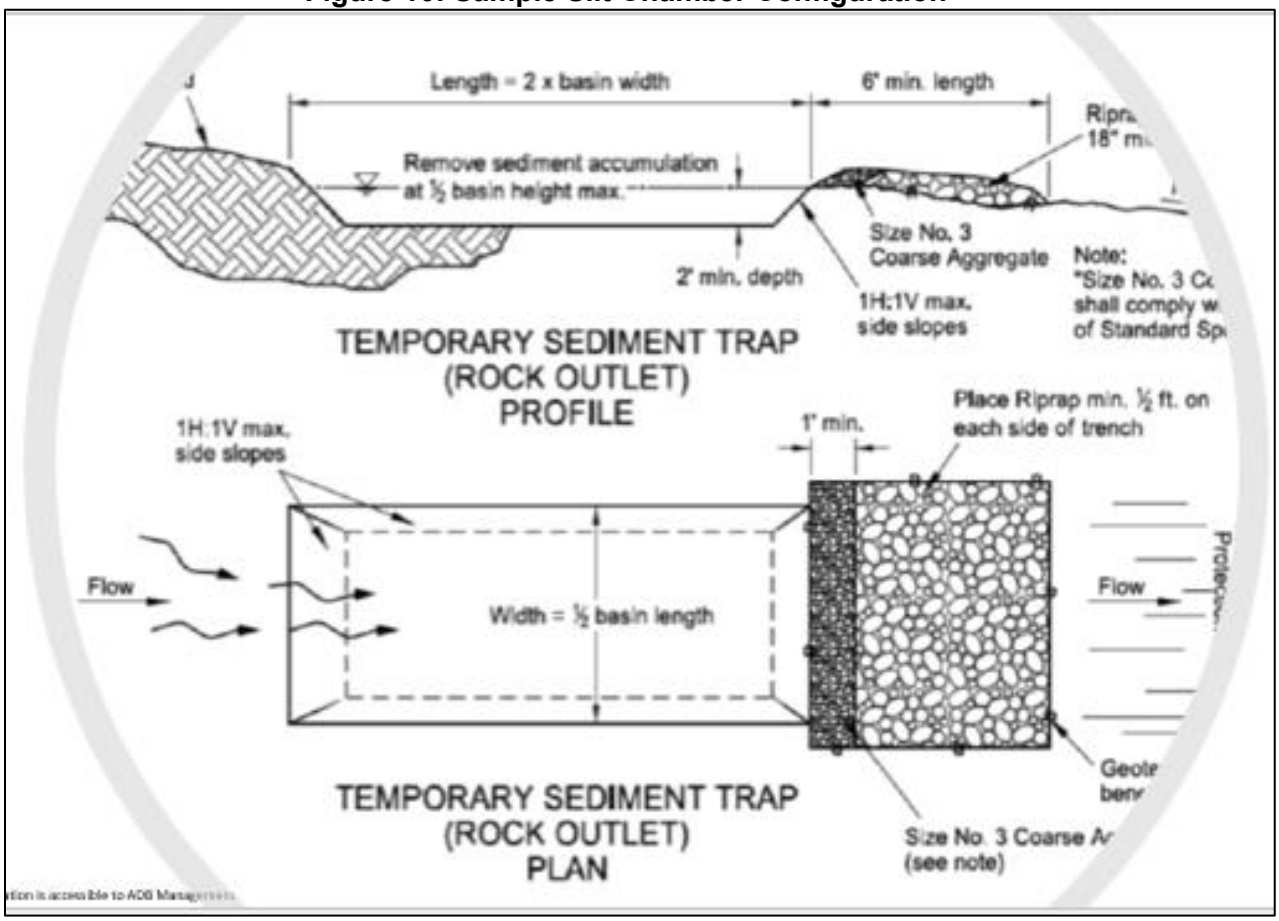


Figure 10: Sample Silt Chamber Configuration



68. It has been envisaged that provision of screens at strategic locations, mainly at the outfall locations of drains to canals/river, will be advantageous to the authority from maintenance point of view. It will prevent unwanted bigger size materials to get carried with the flow in canals and river to flow with it. Size of screens shall be calculated based on clear spacing of 80mm between bars or 1.5 times the width of drain whichever is maximum. It shall be of stainless-steel quality. In case of non-availability of stainless-steel (SS), mild steel (MS) rod epoxy painted can be used as an alternative. Maintenance frequency for MS rod will be less than SS rod. Figure below shows a visual of the proposed upgrading for the screens.

Figure 11: Existing Drainage Screening Infrastructure and Proposed Upgrading

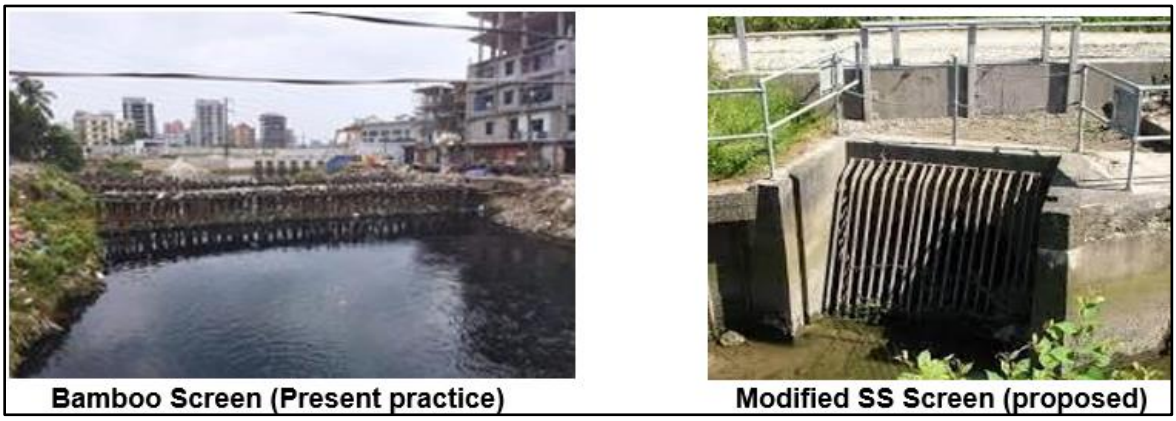


Figure 12: Sample of Proposed Screen

69. All the plans and figures shown above with respect to the construction of outfall structures, siltation chambers and screen are preliminary in nature. All the final designs and specifications of these components will be determined during the detailed design phase by NCC through the PMU.

70. Solid waste disposal in the drains shall be discouraged and enforced by law. However, if there is any requirement for removal of solid waste it shall be cleaned through maintenance schedule of NCC. It is proposed to include high pressure jetting equipment, trucks, etc. to ensure that NCC would have sufficient resources to clean and maintain the drainage system.

8. Future Rehabilitation Activities

71. The drainage masterplan of NCC has various complementing activities that will be undertaken in future. A phase-wise approach will be implemented to realize the masterplan due to budget constraints of the government. The government has limited funds that these rehabilitation activities cannot be accommodated or implemented all at the same time. Among these future activities include coverage of the remaining unrehabilitated drains coverage of the remaining needed new drains, natural drainage canal rehabilitation works, and wastewater management to control pollution due to discharges from domestic sources, as discussed in Chapter V Section D hereof (Impact Due to Continuing Discharge of Wastewater into Drains and Canals).

72. The improvement and rehabilitation of the natural drainage canal system in NCC is necessary to solving the persistent waterlogging issues in the city. This includes the canal desilting/re-excavation, canal re-lining for erosion control, and other landscaping works. These undertakings are an integral part of the operation and maintenance and the overall drainage masterplan of NCC and will be implemented as a priority in the immediate future through the phase-wise implementation approach for the said masterplan.

73. Another complementing rehabilitation activity in the future will be the installation of flap gates. Since in many of the outfalls are lower than river level and expected to have back-flow, in such outfall, the rehabilitation of the existing canals will include the installation of flap gates similar to the one shown on figure below. A total of 46 number of flap gates have been proposed (9 nos. for Zone 1.; 10 nos. for Zone 3; and 27 nos. for Zone 4). These flap gates will also act as flood barriers and therefore protect the city from flooding due to possible river overflows.

Figure 13: Typical Flap Gate

D. Methodology of Construction and Rehabilitation

74. The renovation or rehabilitation works for the existing drains, and the construction of new drains, outfalls with silt chambers and footpaths along the canals under rehabilitation, will use reinforced cement concrete (RCC). For the drainage canals, pre-casted cement concrete channels which will be installed or laid after preparing the drain bed. Since these are existing drains, the expansion will remain within the right of way (ROW). Temporary bocking of the pathways (for 24 hours to 48 hours) is expected to happen. Affected stakeholders along the alignments will be consulted to decide on date to execute the works which would depend on when there is low traffic and people movement. Subsequently, these stakeholders will also be informed before starting of work.

75. Other components such as the metal screens and flap gates will be fabricated offsite after confirmation of sizes. They will be installed manually after all the RCC-based construction and renovation/rehabilitation are completed. Final sizing and specifications will be determined during the detailed design phase..

76. For the desilting and cleaning activities, these will be done mechanically using High Pressure Jetter and vacuuming the silt into tankers installed on trucks. Four numbers of such Sewer Desilting and Jet Vacuuming Trucks have been considered for procurement under the project, which will be used for this purpose. All solid waste materials recovered from the drains

and canals will be immediately disposed to the Jalkuri Sanitary Landfill Site. As a precautionary measure, silt material or excavated soils will be tested prior to deciding their disposal. If results show high level of inorganic or heavy metals concentration, the excavated materials will be safely disposed to the Jalkuri Sanitary Landfill. Whereas if results show no heavy metals contamination, the excavated materials may be disposed in low-lying areas identified by NCC, provided that proper compaction will be undertaken.

77. In cases where segregation of solid wastes and silts/excavated soils in the mixture is impractical, the ultimate disposal plan is to dispose all materials to the Jalkuri Sanitary Landfill Site. Expected volume and final disposal plan will be prepared during the detailed design phase after all necessary testing is done. Topsoil or silt sampling will be done for each of the major canals to be rehabilitated, and strategic silt sampling will be done on the existing drains in the city. Contractor, with support from NCC, PMU and MDSC, will also coordinate with the management of Jalkuri Sanitaty Landfill Site to fix a specific disposal location at the landfill site.

E. Implementation Schedule

78. The overall NGURDP is to be implemented over a period of 5 years. The subproject's construction period will be 18 months.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Introduction

79. This chapter provides the environmental baseline of the proposed subproject. Baseline data includes an inventory of parameters describing physical environment, ecological or biological environment, socio-economic environment, and physical cultural resources. Covering these environmental domains, data has been compiled for the following specific sub-domains:

(i) Land Environment;
(ii) Water Environment;
(iii) Atmospheric Environment;
(iv) Acoustic Environment;
(v) Ecological Environment;
(vi) Socio-economic Environment; and
(vii) Physical Cultural Resources.

80. Baseline environmental data gathering used both primary and secondary sources. The Integrated Biodiversity Assessment Tool (IBAT) was used to screen and assess potential risks on the protected areas or critical habitat that may exist around the subproject sites. Results of the screening were validated at the subproject sites and with relevant government agencies.

81. Statistical data on socio-economic environment used in this IEE report are the latest data available from official and published records of the government. The recency of some sets of data are as of previous years because these are the most recent data officially published or released so far. Nevertheless, the sources of data are indicated in the respective illustrations or tabulations.

B. Subproject Influence Area

82. The subproject influence area or impact zone varies per the type of interventions and the environmental and socio-economic settings of the area where the subproject is to be implemented. For the subproject which involves linear works for drainage systems and canals, the area of influence may be 10 – 15m on each side especially if these are located along the existing road alignment. However, in alignments nearby residential or busy areas, the areas of influence may extend beyond 15m due to access issues.

C. Land Environment

1. Topography

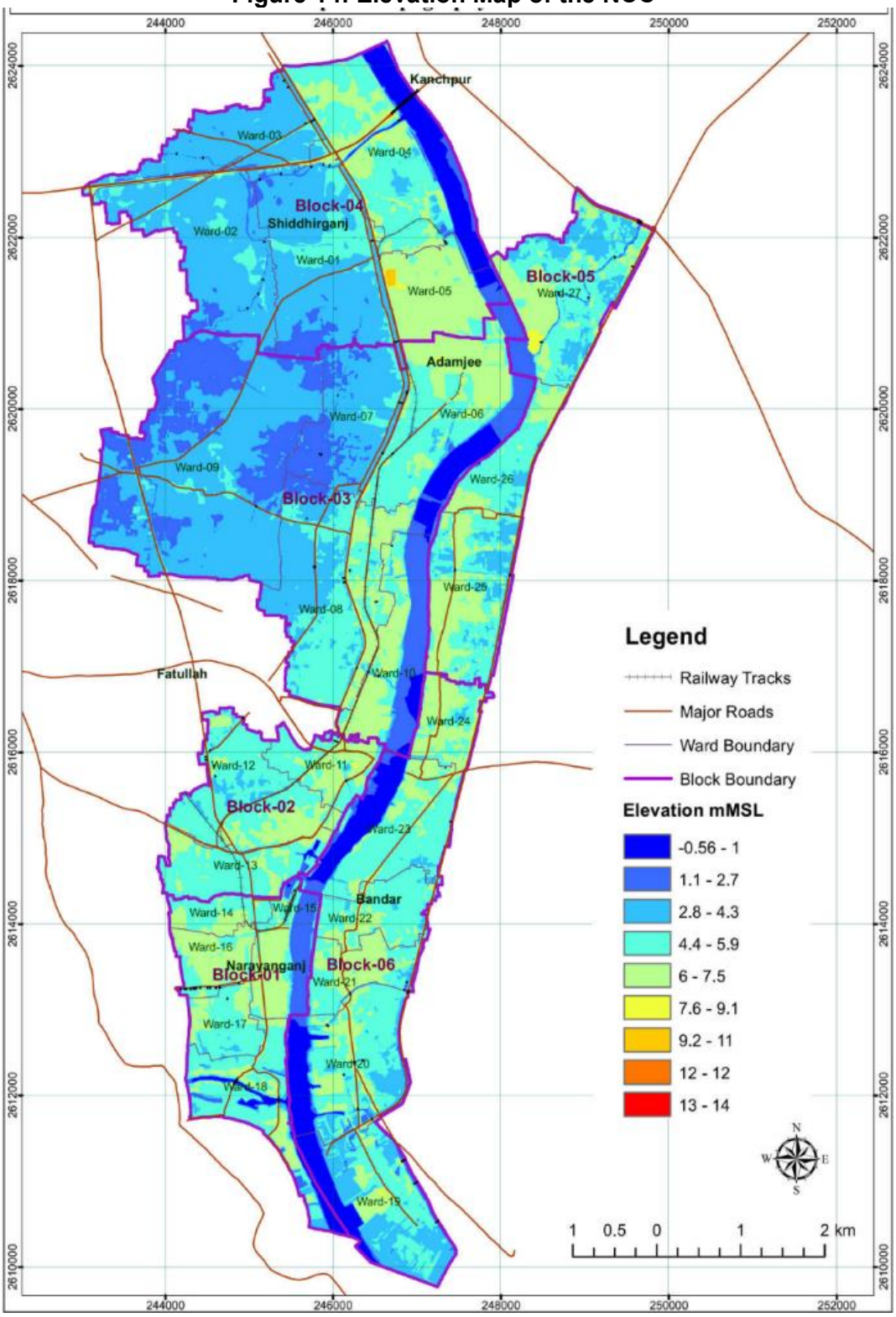
83. Block-wise elevation of NCC is prepared in the NCC Action Area Plan in 2016. Table and Figure below show a summary of the findings. It is revealed that Block 3 has comparatively lower elevation than all other blocks with an average elevation of 3.71m and the land slope of Block 1, Block 2, Block 3 and Block 4 are to the opposite direction of Shitalakhya River. It is noted that the outfall of some runoff of these blocks is Buriganga River, which is located at the South-West of the subproject area. Block 2 has comparatively higher elevation than other blocks with an average elevation of 5.43m. The subproject area overlaps all these blocks. All drains within the subproject area flow down to the Shitalakhya river on the eastern side.

Table 14: Elevation of NCC as Block wise spot height

Values	**Block-01**	**Block-02**	**Block-03**	**Block-04**	**Block-05**	**Block-06**
Maximum Elevation (m, MSL)	8.711	8.802	8.144	13.954	10.115	9.224
Minimum Elevation (m, MSL)	-0.102	-0.292	-0.369	0.151	0.433	-0.561
Average Elevation (m, MSL)	**5.031**	**5.430**	**3.711**	**4.093**	**5.249**	**4.584**
Standard Deviation	1.664	0.788	1.604	1.623	1.212	1.910
Variance	2.769	0.620	2.572	2.633	1.469	3.648

Source: Topographic Survey, NCC Action Area Plan, 2016

Figure 14: Elevation Map of the NCC[a]



Source: Topographic Survey, NCC Action Area Plan, 2016

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

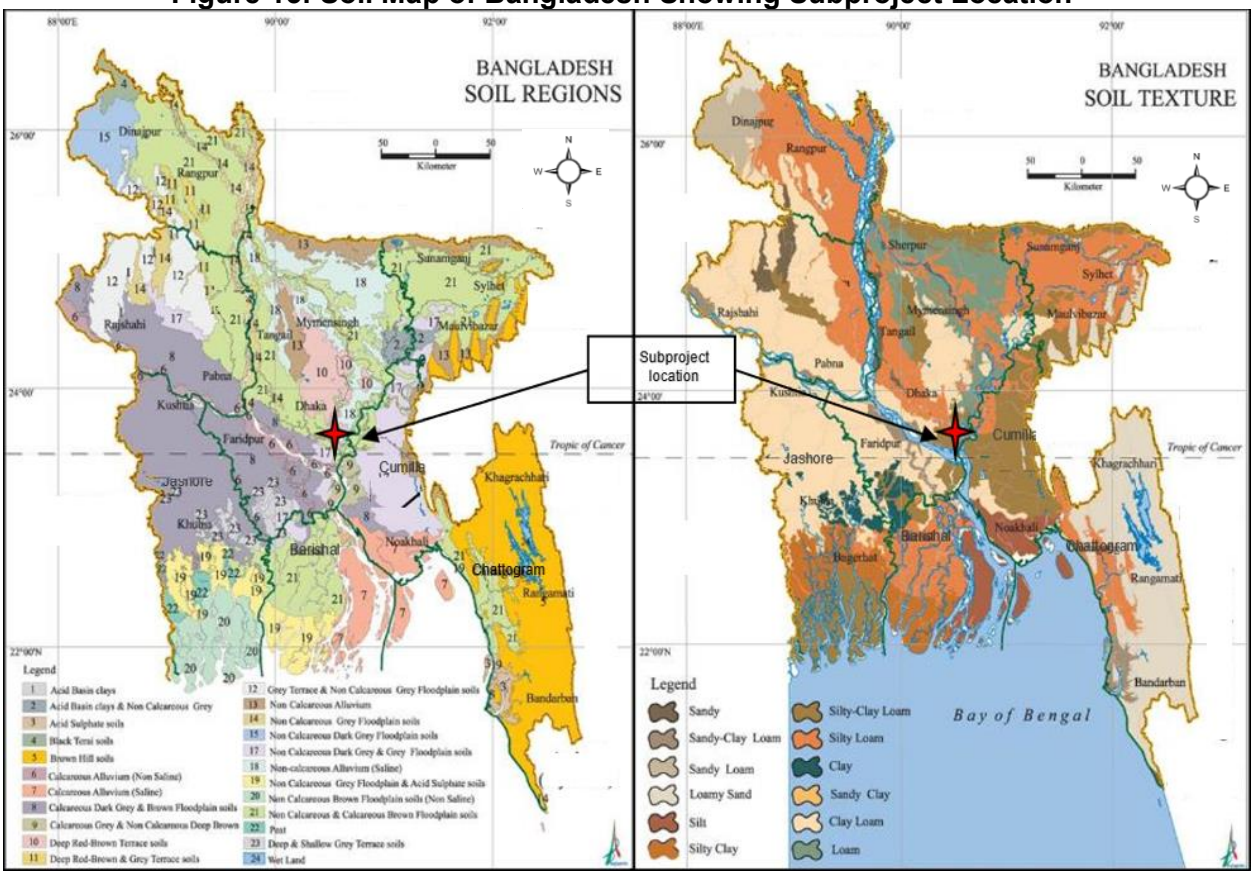
2. Geology and Soil

84. Dhaka region, where NCC is located, is situated on the southern tip of a Pleistocene terrace, the Madhupur Tract. Two characteristic geological units cover the region and surrounding areas; the Madhupur Clay of the Pleistocene age and alluvial deposits of recent age. The Madhupur Clay is the oldest sediment exposed in and around the area and characterized by reddish plastic clay with silt and very fine sand particles. This Madhupur Clay unconformable overlies the Dupi Tila Sand of Plio Pleistocene age, which is composed of medium to coarse yellowish-brown sand and occasional gravel.

85. The channels and depressions within the city are floored by recent alluvial floodplain deposits and are subdivided into Lowland Alluvium and Highland Alluvium. The alluvial deposits are composed of fine sand, silt and clay in different combinations.

86. The alluvial soils of these floodplains mainly consist of ridges of loamy material like silty clays and silty sands with large areas of shallow clays in the basins. The soil pattern can become more irregular close to river channels due to more recent deposits. With regard to the youngest activities (natural as well as anthropogenic) organic soils of swamps may be found locally as well as areas where the ground level has been raised using loose sands (hydraulic sand filling) dredged and pumped from nearby rivers.

Figure 15: Soil Map of Bangladesh Showing Subproject Location[a]



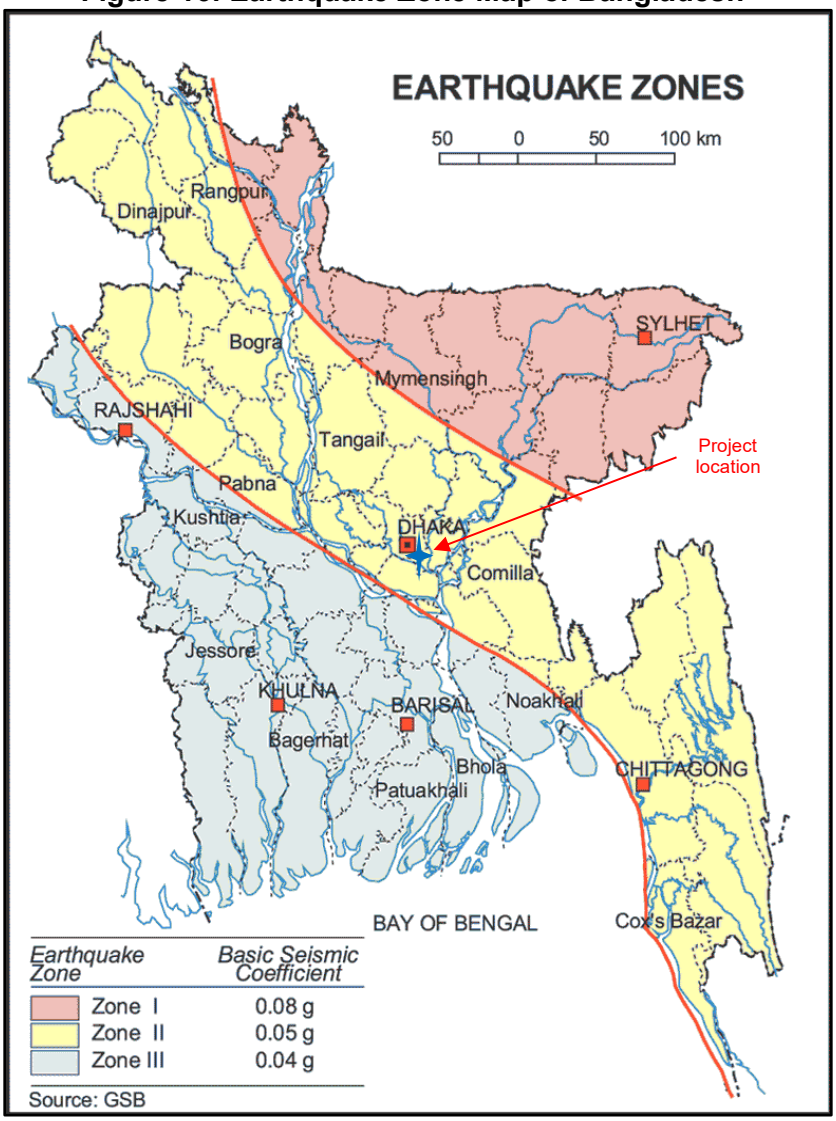
Source: FAO 1988 and Banglapedia

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

3. Seismicity

87. Narayanganj lies in central Bangladesh it does not lie in risk area and high wind area. The seismicity map of Bangladesh shows that Narayanganj lies in Zone-2 which shows intermediate level of seismic activity. As per tectonic classification, the area falls under Faridpur trough of Western platform flank which is adjacent to the hinge line. Tectonically this area is inactive and no apparent major structure like fault or fold exists in the region that might be geologically significant.

Figure 16: Earthquake Zone Map of Bangladesh[a]



Source: Geological Survey of Bangladesh. https://gsb.portal.gov.bd/

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

4. Land Use

88. The main uses of land of the city comprised administrative, agricultural, residential, commercial, educational, research, health facilities, community facilities, industrial, mixed use,

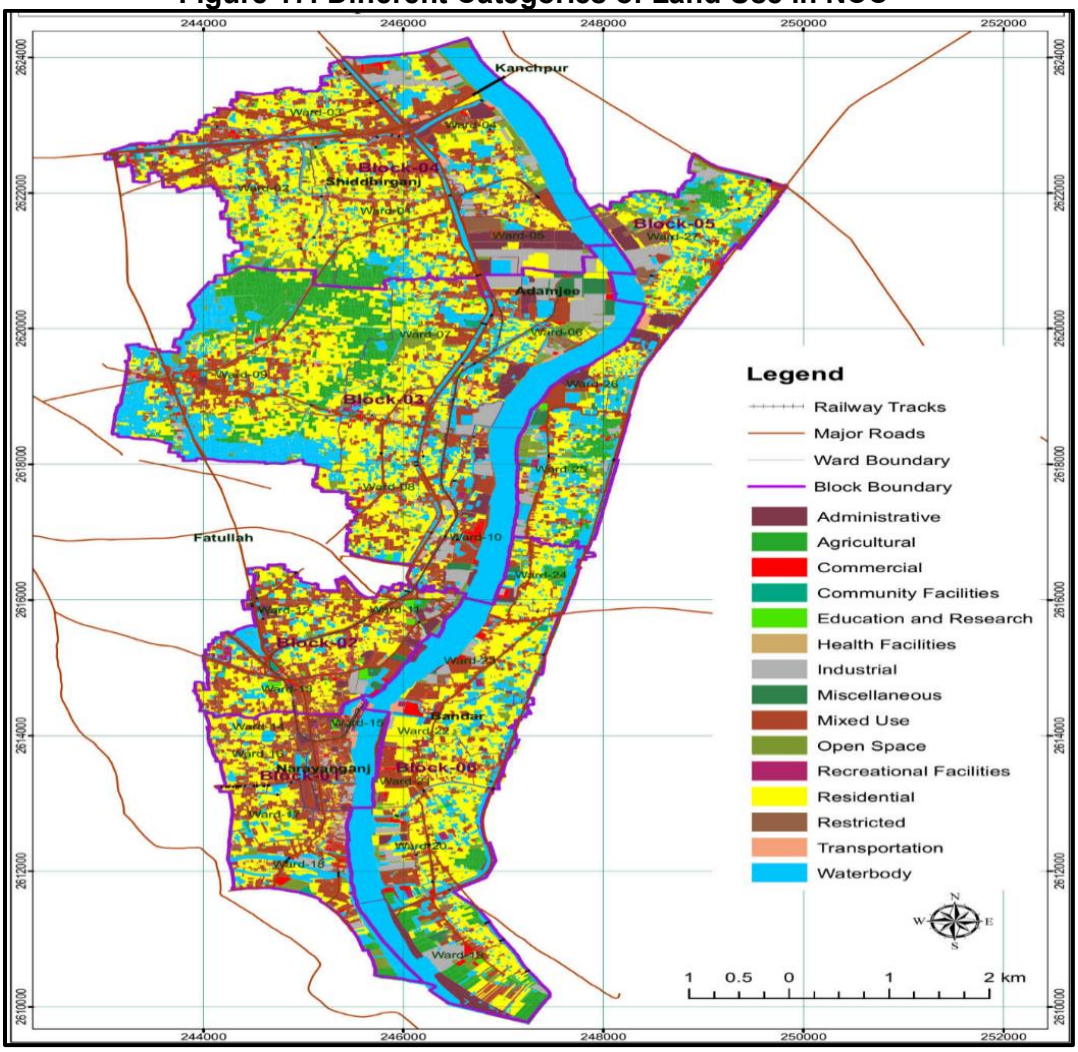
open space, recreational facilities, restricted, transportation and communication water body and miscellaneous. Table below shows that the residential area is highest (30.65%) followed by water bodies, (23.4) mixed use (20.19), etc. in the NCC area. Whereas agricultural and industrial setting are about 5.7 and 5.04 %, respectively. Recreational facilities establishment is lowest.

Table 15: Distribution Land Uses in NCC

Land Use	Area in acre	
	Total	**%**
Administrative	525.59	4.51
Agricultural	658.90	5.66
Commercial	174.68	1.5
Community Facilities	55.18	0.47
Education and Research	74.58	0.64
Health Facilities	4.47	0.04
Industrial	586.43	5.04
Miscellaneous	131.16	1.13
Mixed Use	2350.21	20.19
Open Space	587.64	5.05
Recreational Facilities	45.47	0.39
Residential	3568.51	30.65
Restricted	85.52	0.73
Transportation and Communication	69.09	0.59
Water body	2723.68	23.4
Grand Total	**11641.11**	**100**

Source: NCC Action Area Plan, 2016

Figure 17: Different Categories of Land Use in NCC[a]

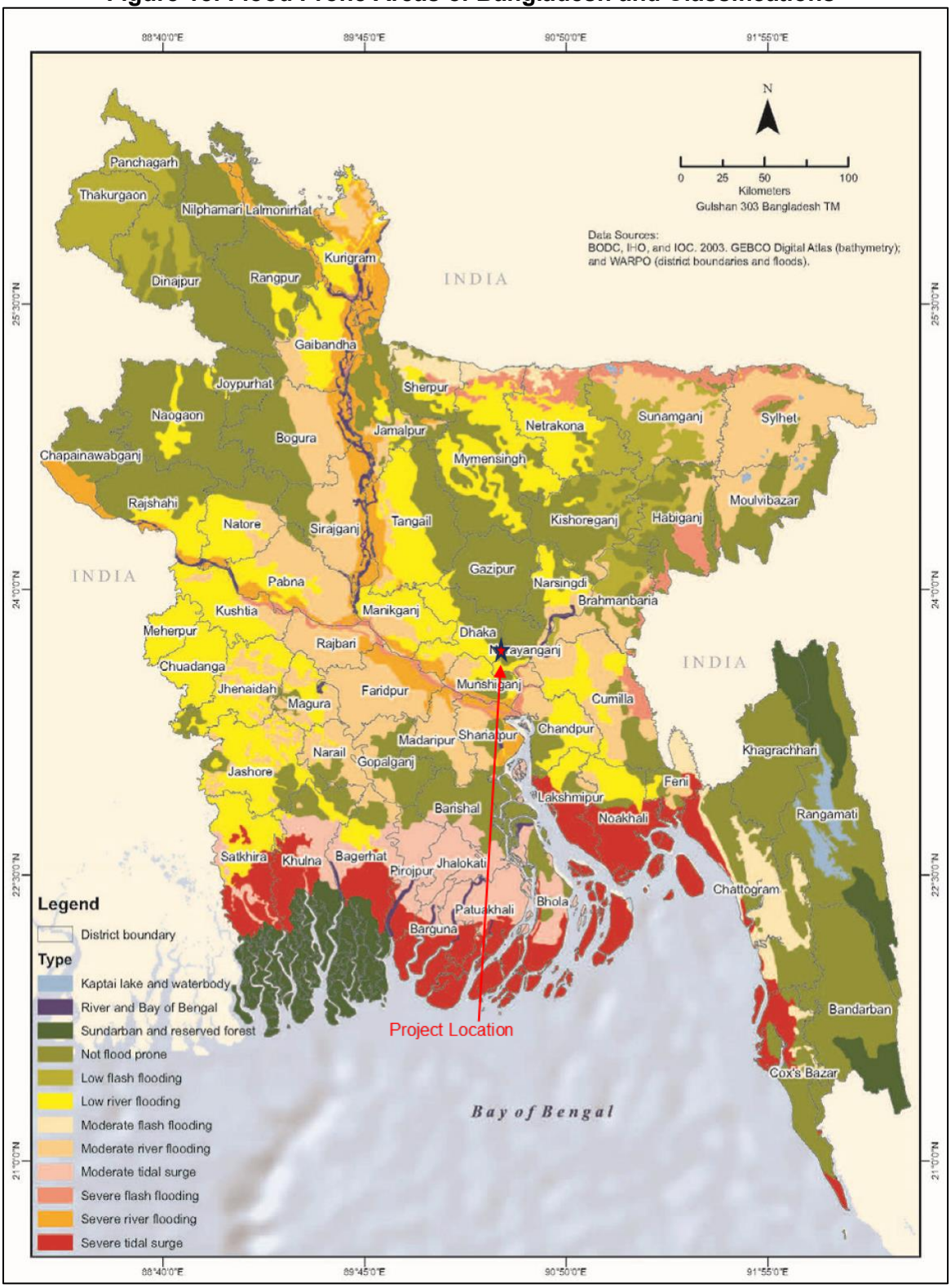


[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

5. Other Natural Hazards

89. Flooding is a common phenomenon in Bangladesh. The major cause of flood is monsoon rainfall runoff from upstream catchments, with more than 90 percent from outside Bangladesh. A flood season in Bangladesh may start as early as May and can continue until November. Five floods during the last fifty years were extensive and devastating and these are the floods of 1955, 1974, 1987, 1988, and 1998. Figure below shows that NCC generally falls within a no flood zone, but low river/flash flooding is likely in the southern part of the NCC which is near the subproject sites.

Figure 18: Flood Prone Areas of Bangladesh and Classifications[a]



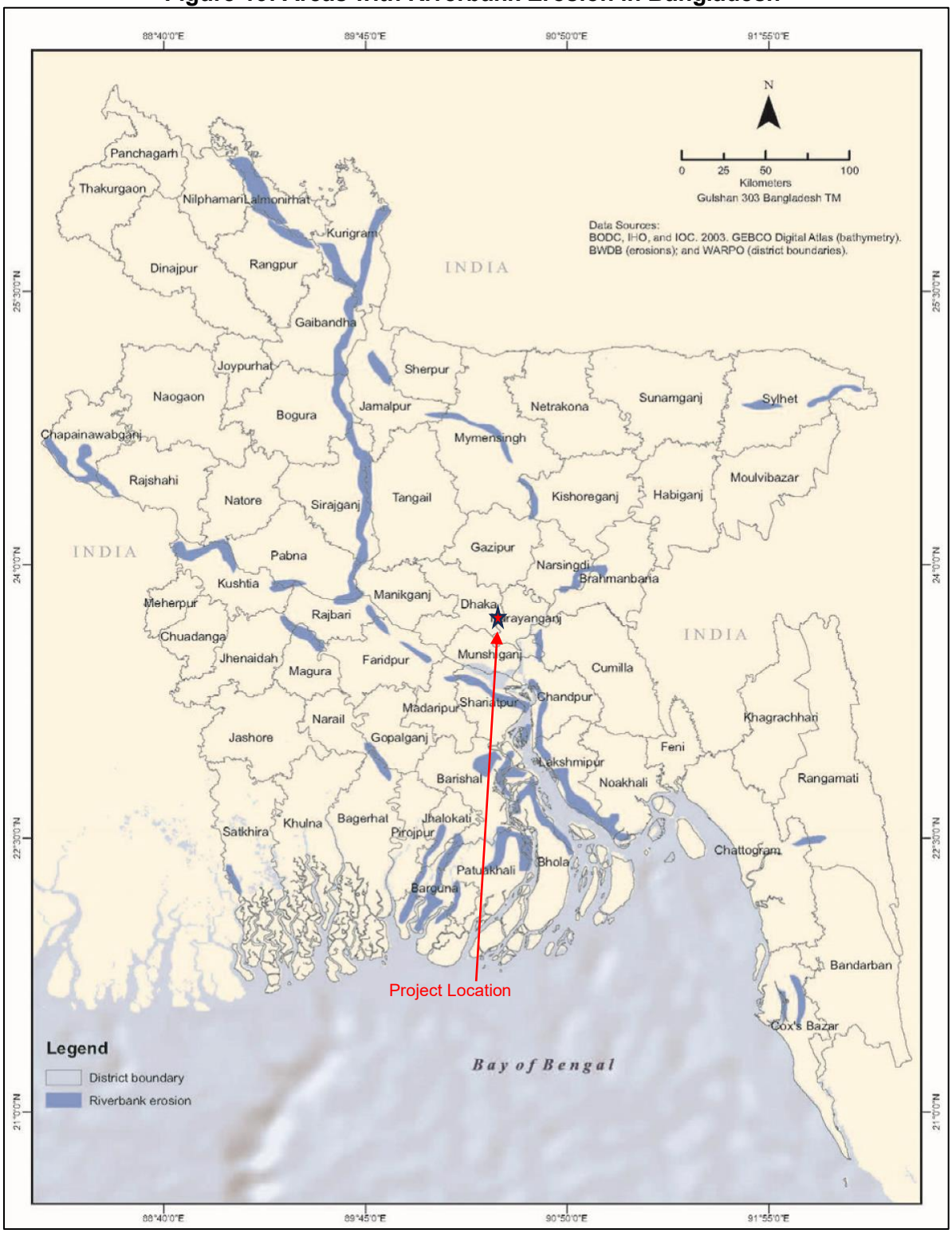
Source: Bangladesh Climate and Disaster Risk Atlas. ADB. December 2021

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

90. Although the subproject sites are located near the Shitalakhya river, areas adjacent to the river have no historical record of riverbank erosion.[19] Figure below shows the maps confirming that the subproject area is not within erosion-prone landscape.

[19] Studies undertaken by ADB that led to the publication of Bangladesh Climate and Disaster Risk Atlas dated December 2021.

Figure 19: Areas with Riverbank Erosion in Bangladesh[a]



Source: Bangladesh Climate and Disaster Risk Atlas. ADB. December 2021

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

D. Water Environment

1. Surface Water Bodies

91. Shitalakhya River is the major channel in the Narayaganj City, which are the ultimate discharge points of smaller streams. Shitalakshya River is about 110 km in length, which originates from the northern part of central Bangladesh, and traverses various towns and cities down to the southern tip of NCC where it meets with Daleshwari, Brahmaputra and Meghna rivers. The width of this river varies from about 100m in the upper reach and to about 300m near Narayanganj. Its highest discharge in the last 10 years has been measured at 1,638.31 m^3/s. The river is navigable throughout the year and shows little erosional tendency. Several heavy industries, such as manufacturing companies and factories, jute mills, navigational vessel ports, etc., stand on the banks of Shitalakshya river. Shitalakhya River passes through the NCC jurisdiction, and practically separating the city into two areas (Siddhirganj Pourashava and Narayanganj Pourashava on the west, and Kadam Rasul Pourashava on the east). Majority of canals in NCC end towards Shitalakhya River. Meanwhile, Daleshwari river is on the western side of NCC, while Bahmaputra river and Meghna River are on the eastern side of NCC. Other canals and streams flowing through the different Upazilas (sub-districts) end towards these rivers, depending on the terrain allowing natural hydraulic or gravity flows. Narayanganj lies in monsoon flood affected area. The approximate flooding is about 5 – 6 feet at certain places. [20,21]

2. Surface Water Quality

92. Surface water quality testing was done along the Shitalakhya river at Demra ghat in 2020. Water quality parameters used were pH, BOD, DO and SS. Results show that Shitalakhya river has relatively high level of pollutants based on the standard values for sources per ECR, 2023. However, technical assessment revealed that Shitalakhya river water can still be considered as a source of drinking water, provided that properly designed treatment plant or facility is in place.[22]

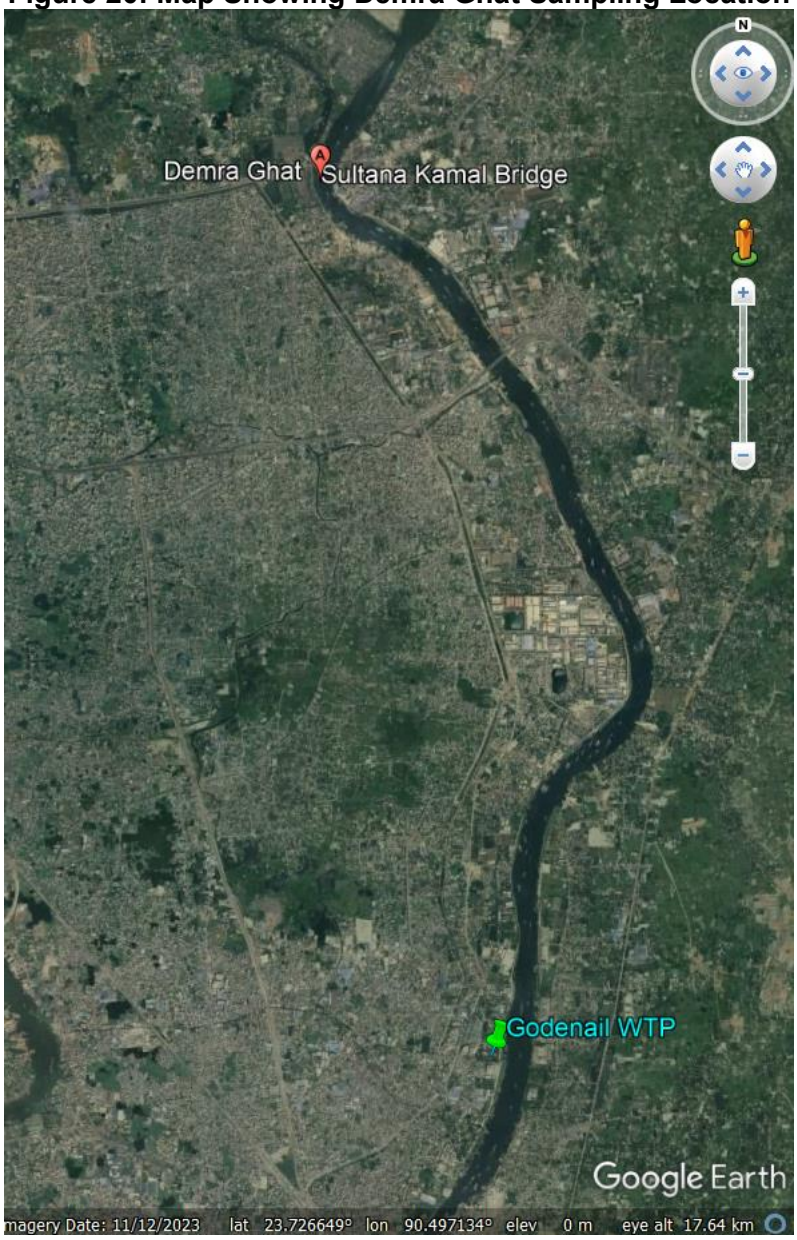
Table 16: Water Quality of Shitalakhya River

Parameters	River Quality Standards[a]	Year 2020											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BOD, mg/l	≤3	10	19	49	9.6	9.6	9.6	10			14	8	18
pH, units	6-9	7.8	7.29	7.19	7.4	7.12	7.88	7.32	-	-	6.99	7.23	7.48
SS, mg/l	-	38.8	4.5	24	14	14	20	24			21	15	15
DO, mg/l	≥5	0	0	0	1.3	1.9	3.5	4.5			2.9	1.6	0.8
Turbidity, NTU	-	12	16	34.2	23.6	23.4	21.1	20.1			16.6	37	86.9

Source: Feasibility Report on Rehabilitation and Expansion Existing Water Supply Infrastructure, 2022
[a] Standards per ECR 2023 on Sources of Drinking Water for Supply after Conventional Treatment.

[20] Banglapedia: National Encyclopedia of Bangladesh. https://en.banglapedia.org/.
[21] Feasibility Report on Rehabilitation and Expansion Existing Water Supply Infrastructure, 2022
[22] Design Report For Rehabilitation of Godenail Water Treatment Plant. October 2022.

Figure 20: Map Showing Demra Ghat Sampling Location



93. Primary data was gathered for Shitalakhya river water quality in December 2022 to determine the level of pollution in terms of heavy metal parameters. Samples were taken at about 100 m upstream of the intake point of the WTP and at the vicinity of the intake point. Results show that the quality of river is within the standards for the tested parameters, as tabulated below. However, when compared with the national drinking water quality standards, the values for lead concentration appear to be marginally above the limit.

Table 17: Water Quality of Shitalakhya River on Heavy Metals

			Date of Sampling: 21 December 2022	
Parameters	**River Quality Standards[a]**	**NDWQS**	Upstream of Intake	Intake
Arsenic, mg/l	-	0.05	0.002	0.003
Cadmium	-	0.003	0.00015	0.00015
Copper, mg/l	-	1.5	0.03	0.03
Chromium (Total), mg/l	0.02	0.05	0.005	0.005
Lead, mg/l	0.03	0.01	0.014	0.027
Nickel, mg/l	-	0.05	0.03	0.03
Zinc, mg/l	-	5.0	0.03	0.02

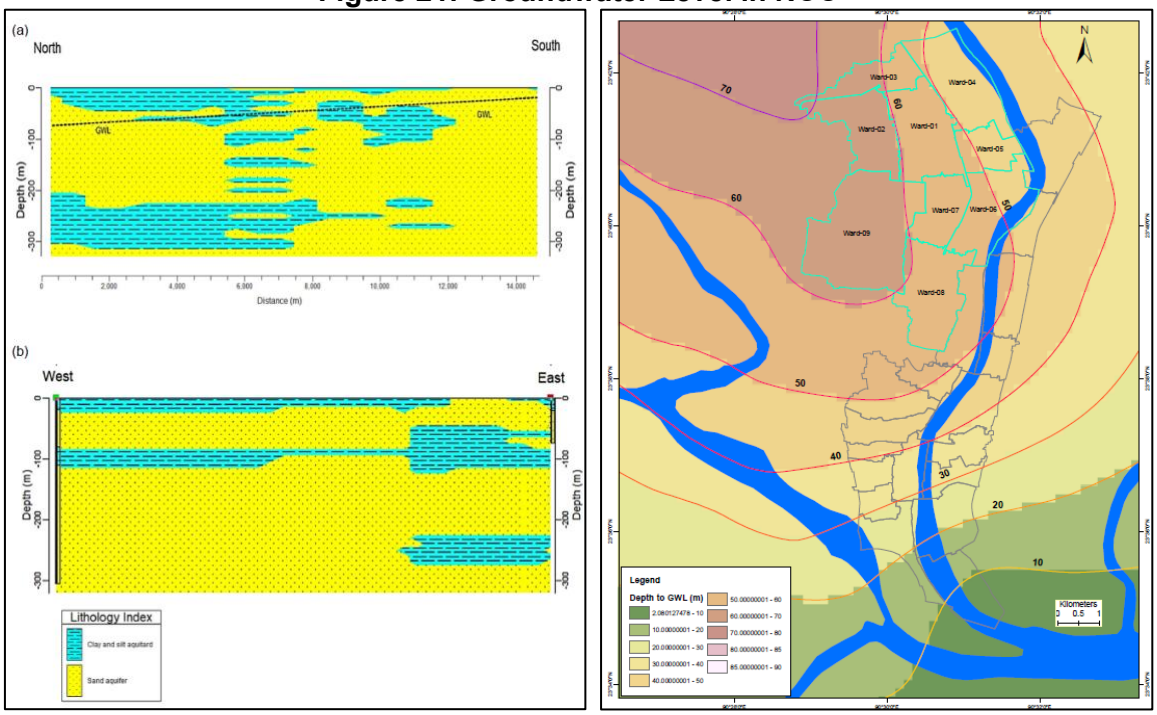
[a] Standards per ECR 2023 for surface water sources of drinking water supply but requiring conventional treatment.

3. Groundwater Level and Quality

94. **Groundwater Level**. Groundwater is abundant in Bangladesh. Water tables are generally shallow, and aquifers are productive. The main aquifer, which is the source of water supply, is found at a depth of greater than 50m. The ground water level (GWL) of shallow aquifer is decreasing day by day and safe drinking water is not accessible to a great extent in the NCC area. The water table depth map of Narayanganj area below shows that the groundwater is flowing from the south to the northern part of Narayanganj area. In the southern part of Narayanganj area adjacent to the Dhaleswari river, the maximum depth of GWL is about 6m below ground level (bgl) in the upper aquifer and about 15m bgl in the lower aquifer. But in the northern part of the NCC area the depth of GWL is more than 70m bgl.[23]

[23] Feasibility Study for Setting Up IBF System on Bank fo Dhaleswari-Shitalakhya Rivers in Southern Narayanganj. Bangladesh. 2022.

Figure 21: Groundwater Level in NCC



Source: Feasibility Study for Setting Up IBF System on Bank fo Dhaleswari-Shitalakhya Rivers in Southern Narayanganj. Bangladesh. 2022.

95. **Groundwater Quality**. To establish the baseline groundwater quality data in the vicinity of the subproject locations, groundwater sampling was carried out on 21 December 2022 from the existing DTWs that are to be rehabilitated under the subproject. The locations of these DTWs are in Figure and Table below, and corresponding results are presented in Table 19 below. Compared with the NDWQS, the quality of groundwater registered general elevated concentrations in terms of manganese, BOD and COD parameters. There are other parameters that are also exceeding the standards such as hardness, turbidity, iron, TDS, and coliform.

Figure 22: Map Showing Locations of Groundwater Quality Sampling

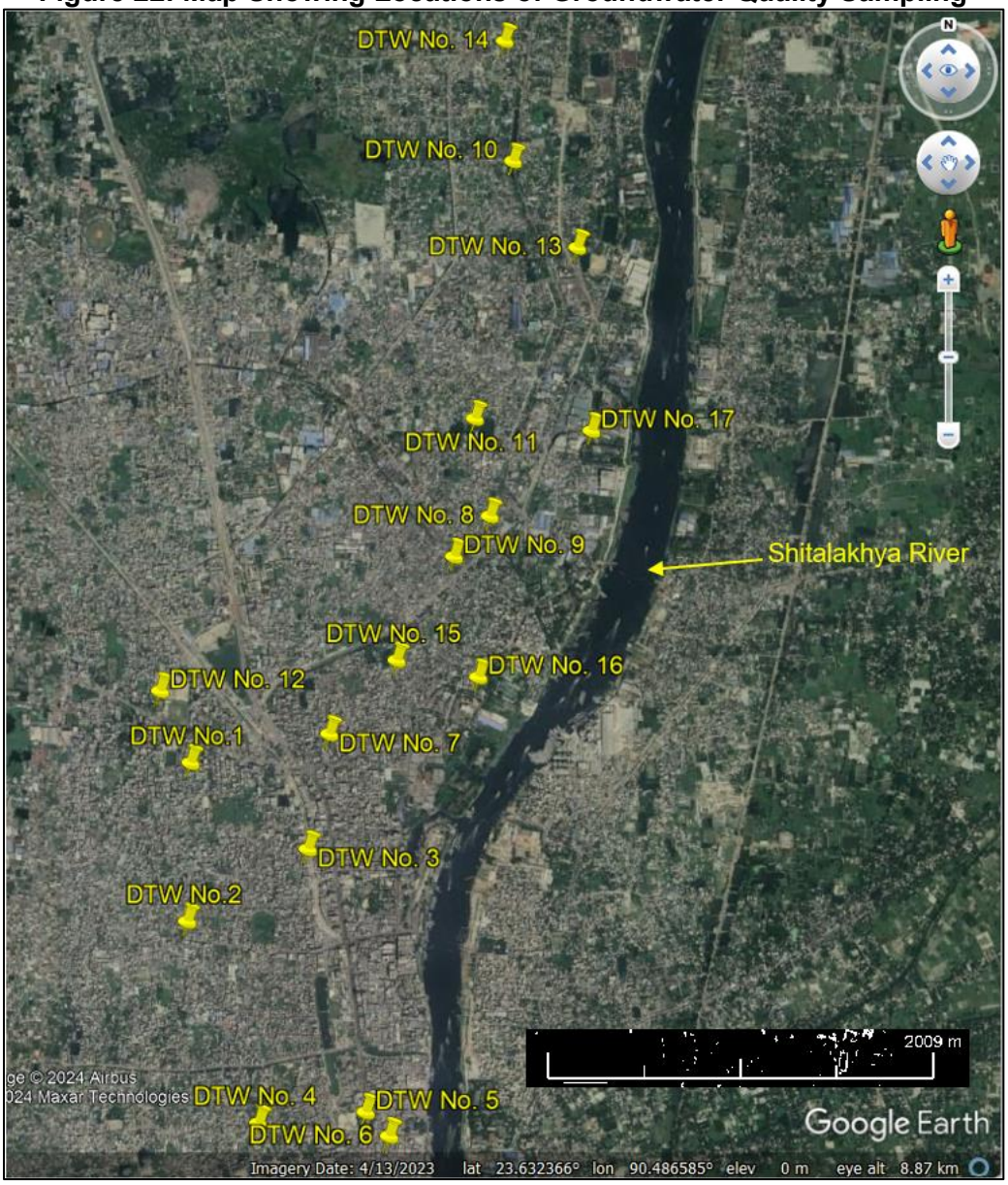


Table 18: Groundwater Quality Sampling Location Details

Serial ID	Name of DTW	Latitude	Longitude	DMZ	DMA	Ward_No
DTW No. 1	Bhuiyar Bagh DTW	23.623491	90.493359	DMZ-1	DMA-13 (1)	Ward-13
DTW No. 2	Dewbhog DTW	23.615912	90.493136		DMA-14	Ward-14
DTW No. 3	Golachipa DTW	23.619355	90.499503		DMA-14	Ward-14
DTW No. 4	Paikpara DTW	23.606409	90.496788		DMA-17	Ward-17
DTW No. 5	Nitaigonj DTW	23.606927	90.502371		DMA-15	Ward-15
DTW No. 6	Shitalakhya DTW	23.605805	90.503575		DMA-18	Ward-18
DTW No. 7	Bag E Jannat DTW	23.624874	90.500696	DMZ-2	DMA-12	Ward-12
DTW No. 8	Killarpul Mazar DTW	23.635464	90.509369		DMA-11	Ward-10

Serial ID	Name of DTW	Latitude	Longitude	DMZ	DMA	Ward_No
DTW No. 9	Poschim Tolla DTW	23.633488	90.507432		DMA-11	Ward-11
DTW No. 10	Chowdhuri Bari DTW	23.653133	90.510961		DMA-8	Ward-08
DTW No. 11	Pathan Tuli DTW	23.640273	90.508659		DMA-8	Ward-08
DTW No. 12	Masdair DTW	23.62695	90.49177		DMA-13 (1)	Ward-12
DTW No. 13	Arambag DTW	23.648791	90.514342		DMA-8	Ward-08
DTW No. 14	Dhanokunda DTW	23.659238	90.510637		DMA-8	Ward-08
DTW No. 15	Khanpur Bank Colony DTW	23.628438	90.504303		DMA-12	Ward-12
DTW No. 16	DC Bungalow DTW	23.627625	90.508614		DMA-12	Ward-12
DTW No. 17	Godenail DTW	23.639668	90.514887		DMA-10	Ward-10

Table 19: Groundwater Quality in NCC

Parameters	Ammonia	BOD	COD	Coliform (Fecal)	Colour	Cr (Total)	EC	Hardness	Fe	Mn	Nitrogen (Nitrate)	pH	Phosphate	Salinity	(TDS)	Turbidity
Unit	mg/L	mg/L	mg/L	N/100ml	Hazen	mg/L	µS/cm	mg/L	mg/L	mg/L	mg/L		mg/L	%	mg/L	NTU
GW1	0.12	2	12	0	0.9	0.009	420	165	0.8	0.03	0.8	7.4	0.8	0.21	210	0.79
GW2	0.1	11	48	45	0.85	0.009	325	120	0.44	0.03	0.2	7.4	0.94	0.16	162	0.82
GW3	0.14	3	12	0	0.91	0.007	370	130	0.8	0.06	1.2	7.3	0.37	0.18	185	1.4
GW4	0.14	1	4	2	1	0.01	471	225	1.4	0.53	1.3	7.2	1.1	0 .21	208	9.2
GW5	0.1	11	40	0	1.2	0.008	366	140	0.37	0.48	1.9	7.2	0 .20	0.18	183	2
GW6	0.12	5	24	0	0.96	0.01	1550	2100	0.2	2.04	0.1	6.3	0.26	0.78	776	1.1
GW7	0.11	2	8	0	0.9	0.009	415	160	0.26	0.08	0.1	7.1	0.27	0.21	207	0.8
GW8	0.12	1	4	0	0.97	0.011	410	205	0.64	0.24	0.7	7.1	0.38	0.21	205	1.1
GW9	0.1	2	8	20	0.92	0.006	510	140	0.31	0.17	1.5	7	0.46	0.26	255	0.8
GW10	0.1	1	4	2	0.9	0.016	1840	2350	0.23	1.97	0.8	6.5	0.4	0.92	920	1.3
GW11	0.1	2	8	0	0.98	0.008	1245	1300	0.42	2.06	0.7	7.1	0.17	0.62	622	1
GW12	0.12	7	24	0	0.97	0.012	320	195	0.46	0.06	2.3	7.1	0.13	0.16	160	1
GW13	0.1	3	8	0	1	0.006	460	215	0.66	0.31	1	7	0.24	0.23	230	5.1
GW14	0.1	2	8	2	0.96	0.007	760	230	0.6	1.31	1.1	6.8	0.25	0.38	380	1.7
GW15	0.14	1	4	0	1.1	0.009	980	307	0.76	1.35	0.4	6.7	0.13	0.49	490	6.5
GW16	0.12	1	4	0	0.98	0.006	350	180	0.55	0.5	0.7	7.1	0.19	0.18	175	2.1
GW17	0.19	7	32	0	2.3	0.014	2750	2600	3.6	5.21	0.1	6.5	0.44	1.38	1375	35.2
Standards (ECR, 2023)	1.5	0.4[a]	4[a]	0	15	0.05	-	500	0.3-1.0	0.04	45	6.5-8.5	-	-	1000	5

[a] Values for BOD and COD are taken from ECR, 1997. The ECR, 2023 does not have standards for BOD and COD.

E. Atmospheric Environment

1. Climate and Meteorology

96. Bangladesh is located in a sub-tropical monsoon zone and has four main seasons namely pre-monsoon or summer (March to May), monsoon (June to September) and post-monsoon (October to November) and lean or winter (November to February). Climatic variations on temperature, rainfall, humidity and wind speed are recorded in the nearest meteorological station at Narayanganj, Bangladesh Meteorological Department (BMD).

97. In subproject area, temperature varies from 28.8 to 29.5°C during April to September. Temperature ranges from 7.2 to 14.8 °C during winter from November to February. Pre-monsoon or summer is hot and humid from March to May with annual average temperature ranging from 18.9 to 29.5°C. Long periods of steady rainfall persisting over several days are common during the monsoon, but sometimes, local high intensity rainfall of short duration is also occurring during other seasons of the year. About seventy (75%) percent of rainfall over Bangladesh occurs between the months from June to September. Climatic variations on temperature, rainfall, humidity and wind speed of the meteorological stations are presented in table below.

Table 20: Monthly Average of Climate Variables of Narayanganj City, 2012-2021

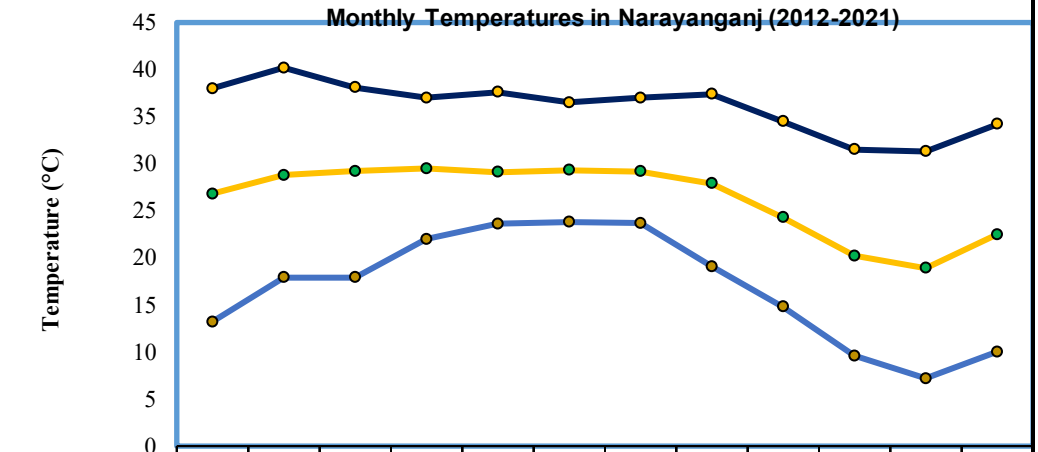
Seasons	Pre-Monsoon/Summer			Monsoon			Post-Monsoon			Lean/Winter		
Months	**Mar.**	**Apr.**	**May**	**Jun.**	**Jul.**	**Aug.**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Jan.**	**Feb.**
Average Temp °C	26.8	28.8	29.2	29.5	29.1	29.3	29.2	27.9	24.3	20.2	18.9	22.5
Avg. Max Temp °C	32.6	34.2	33.9	33.3	32.6	32.9	33.2	32.4	30.1	25.9	24.9	28.7
Avg. Min Temp °C	21.6	24.3	25.4	26.6	26.7	26.8	26.7	24.6	19.8	16.0	14.0	17.1
Maximum Temp °C	38.0	40.2	38.1	37.0	37.6	36.5	37.0	37.4	34.5	31.5	31.3	34.2
Minimum Temp °C	13.2	17.9	17.9	22.0	23.6	23.8	23.7	19.1	14.8	9.6	7.2	10.0
Avg. Rainfall (mm)	0.78	3.89	4.75	6.70	9.27	5.77	4.19	3.21	0.35	0.19	0.04	0.63
Avg. Humidity (%)	63.4	70.3	75.9	78.6	77.9	76.9	78.9	76.7	72.4	78.5	71.6	65.0

Source: Dhaka Meteorological Station, Bangladesh Meteorological Department (2012-2021)

9. Temperature

98. The meteorological data on temperature as monthly highest maximum, monthly lowest minimum, monthly and annual mean temperature were collected for the period of 2012 to 2022 from meteorological station at Dhaka. Temperature varies from 28.8 to 29.5°C during April to September and from 18.9 to 24.3°C during November to January. Summary data on highest maximum and lowest minimum temperatures from 2012 to 2022 are presented in Figure 23. Annual average temperatures range from 18.9 to 29.5°C.

Figure 23: Temperature Variations in Dhaka Division on from 2012 to 2021



	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
	Pre-Monsoon			Monsoon				Post-Monsoon		Winter		
Average	26.8	28.8	29.2	29.5	29.1	29.3	29.2	27.9	24.3	20.2	18.9	22.5
Maximum	38.0	40.2	38.1	37.0	37.6	36.5	37.0	37.4	34.5	31.5	31.3	34.2
Minimum	13.2	17.9	17.9	22.0	23.6	23.8	23.7	19.1	14.8	9.6	7.2	10.0

Source: Dhaka Meteorological Station. Bangladesh Meteorological Department. 2022

10. Ambient Air Quality

99. Narayanganj City is one of the congested cities of Bangladesh with high concentrated population, busy marketplaces and heavy traffic on the main arteries of the city. There are cement plants and power plants at the west-side of the Shitalakhya river which crosses through the city. Additionally, there are many jute mills along the side of the river, which emissions contribute to the air pollutants in the city.

100. To establish the baseline air quality data in the vicinity of the subproject locations, ambient air quality monitoring was carried out during the period 25 January – 4 February 2023. The locations of monitoring are in Figure 24 and Table 21 below and corresponding results are presented in Table 24 below. Copies of laboratory analysis is in **Appendix 4**. In general, the particulate matter (PM10 and PM2.5) is relatively high in subproject area.

Figure 24: Map Showing Ambient Air Sampling Locations

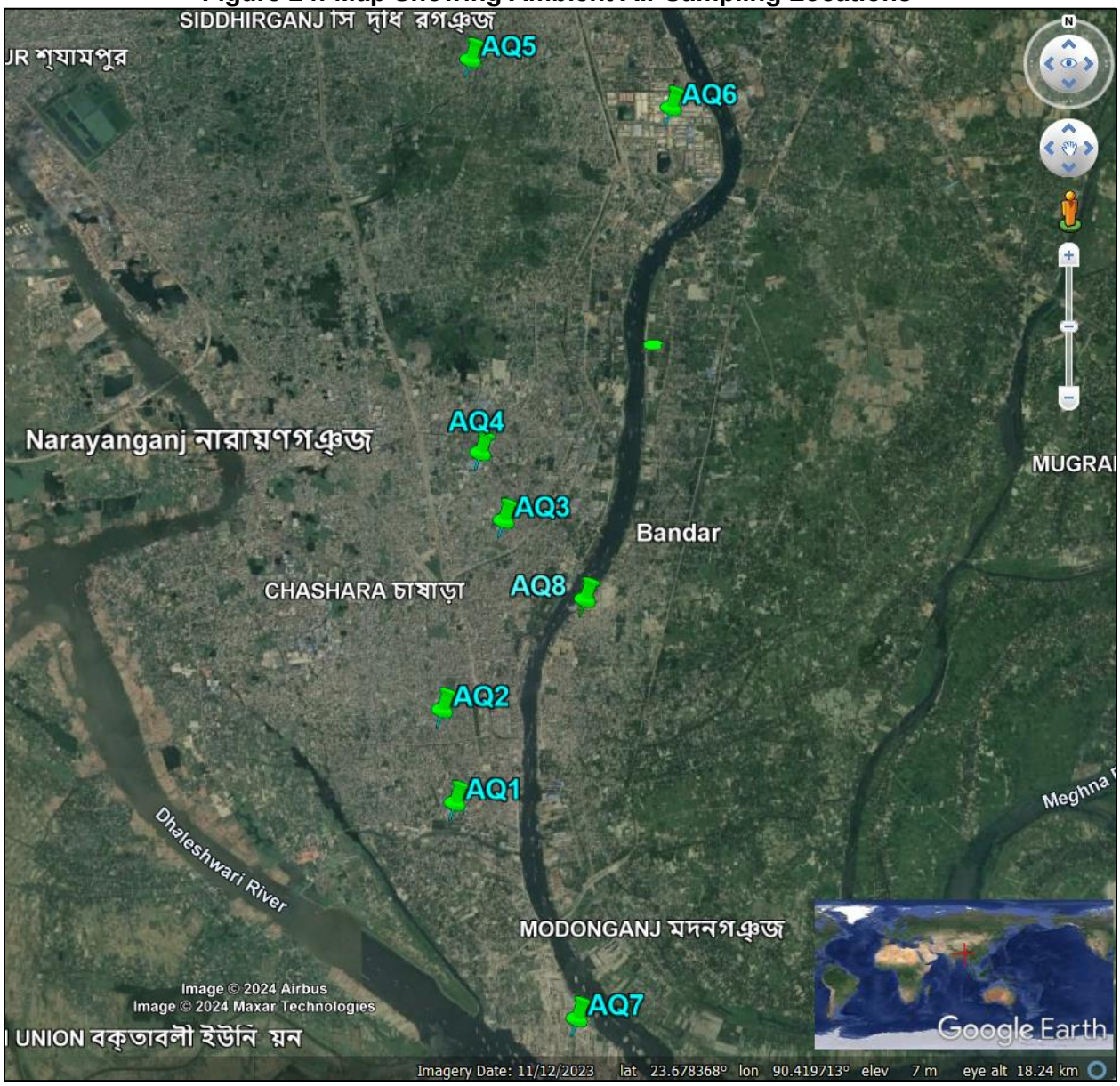


Table 21: Ambient Air Quality Within NCC (Working Day)

Location	Sampling Date	Ambient Air Pollutants' Concentration in µg/m³							CO mg/m³
		PM_{10}	$PM_{2.5}$	SO_2	NO_2	Pb	NH3	O3	
AQ1	25.01.2023	353.87	177.43	30.25	61.79	0.031	2.48	41.39	2.33
AQ2	25.01.2023	133.28	101.35	30.19	33.98	BDL	0.00	21.71	0.15
AQ3	26.01.2023	182.85	122.97	27.68	52.24	0.070	0.00	13.02	0.20
AQ4	-	-	-	-	-	-	-	-	-
AQ5	01.02.2023	108.18	68.33	14.49	22.18	0.068	0.00	42.90	0.31
AQ6	01.02.2023	190.75	98.89	105.67	75.63	0.059	6.04	29.11	1.80
AQ7	02.02.2023	205.97	94.61	43.24	47.88	0.034	6.04	29.12	1.80
AQ8	02.02.2023	93.78	59.89	16.07	19.66	BDL	0.00	18.44	0.14

Location	Sampling Date	Ambient Air Pollutants' Concentration in µg/m³							CO mg/m³
		PM_{10}	$PM_{2.5}$	SO_2	NO_2	Pb	NH3	O3	
Durations, hr		**24**	**24**	**24**	**24**	**24**	**24**	**8**	**8**
Air Pollution (Control) Rules, 2022		**150**	**65**	**80**	**80**	**0.50**	**400**	**100**	**05**
Method of Analysis		*Light Scattering Nephotometer*	*Light Scattering Nephotometer*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*Mixed Metal Oxide*	*High Sensitivity Electrochemical*

Note: * Air Pollution (Control) Rules, 2022, Legend: PM_{10} -Particulate Matter of a diameter of 10 microns or less. $PM_{2.5}$ -Particulate Matter of a diameter of 2.5 microns or less, SO_2 –Sulphur Dioxide; NO_2 –Nitrogen Dioxide; NH3 (ammonia); O_3 –Ozone; CO –Carbon Monoxide, BDL – Below detection limit

Table 22: Air Quality Within NCC (Non-Working Day)

Location	Sampling Date	Ambient Air Pollutants' Concentration							
		PM_{10}' µg/m3	$PM_{2.5}$ µg/m3	SO_2 µg/m3	NO_2 µg/m3	Pb µg/m3	NH3 µg/m3	O3 µg/m3	CO mg/m3
AQ1	25.01.2023	256.59	159.58	66.24	39.65	0.032	4.39	38.93	1.19
AQ2	25.01.2023	128.72	96.72	27.20	45.67	BDL	0.00	14.36	0.20
AQ3	26.01.2023	147.53	106.85	20.81	24.15	0.021	0.00	51.97	0.17
AQ4	-	-	-	-	-	-	-	-	-
AQ5	01.02.2023	113.99	82.42	26.67	13.21	0.065	0.00	37.78	0.18
AQ6	01.02.2023	226.16	133.19	89.03	73.79	0.060	5.27	33.06	2.03
AQ7	02.02.2023	335.70	131.59	59.84	66.04	0.052	4.85	42.28	1.61
AQ8	02.02.2023	116.76	84.29	37.99	26.67	BDL	0.00	9.15	0.21
Durations, hr		**24**	**24**	**24**	**24**	**24**	**24**	**8**	**8**
Air Pollution (Control) Rules, 2022		**150**	**65**	**80**	**80**	**0.50**	**400**	**100**	**05**
Method of Analysis		*Light Scattering Nephotometer*	*Light Scattering Nephotometer*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*High Sensitivity Electrochemical*	*Mixed Metal Oxide*	*High Sensitivity Electrochemical*

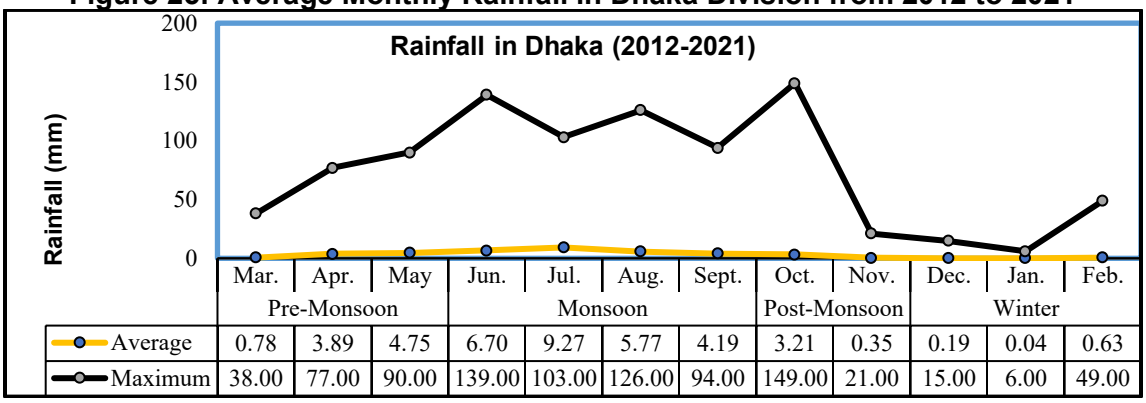
Note: * Air Pollution (Control) Rules, 2022, Legend: PM_{10} -Particulate Matter of a diameter of 10 microns or less. $PM_{2.5}$ -Particulate Matter of a diameter of 2.5 microns or less, SO_2 –Sulphur Dioxide; NO_2 –Nitrogen Dioxide; NH3 (ammonia); O_3 –Ozone; CO –Carbon Monoxide, BDL – Below detection limit

11. Rainfall

101. The rainfall data on daily, monthly and annual total for the 10-years from 2012 to 2021 of Dhaka meteorological station were collected. About 15% of the annual rainfall occurs in the pre-monsoon season. About 80% occur in the wet season and only 5% during the winter months. Monthly highest maximum and average monthly rainfall is illustrated in **Figure 25** below, and the annual total rainfall is illustrated in Figure 26 below**.** Long periods of steady rainfall persisting over several days are common during the monsoon, but sometimes, local high intensity rainfall of short

duration is also occurring. About seventy five percent of rainfall over Bangladesh occurs between the months from June to September.

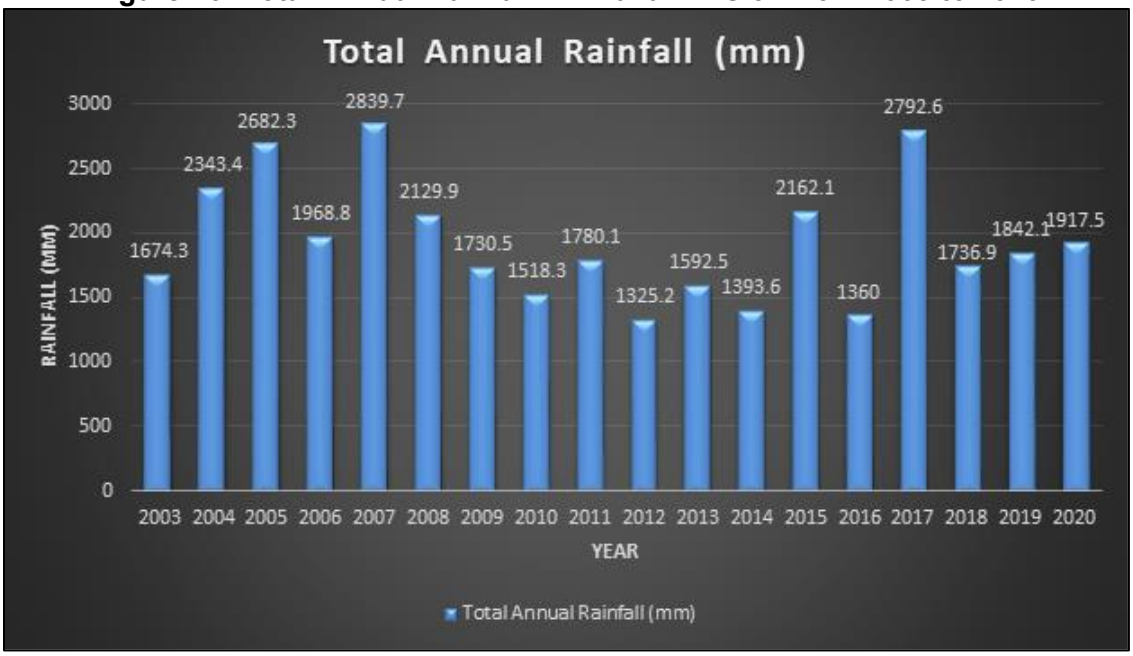
Figure 25: Average Monthly Rainfall in Dhaka Division from 2012 to 2021



	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
	Pre-Monsoon			Monsoon				Post-Monsoon		Winter		
Average	0.78	3.89	4.75	6.70	9.27	5.77	4.19	3.21	0.35	0.19	0.04	0.63
Maximum	38.00	77.00	90.00	139.00	103.00	126.00	94.00	149.00	21.00	15.00	6.00	49.00

Source: Dhaka Meteorological Station. Bangladesh Meteorological Department. 2022

Figure 26: Total Annual Rainfall in Dhaka Division from 2003 to 2020

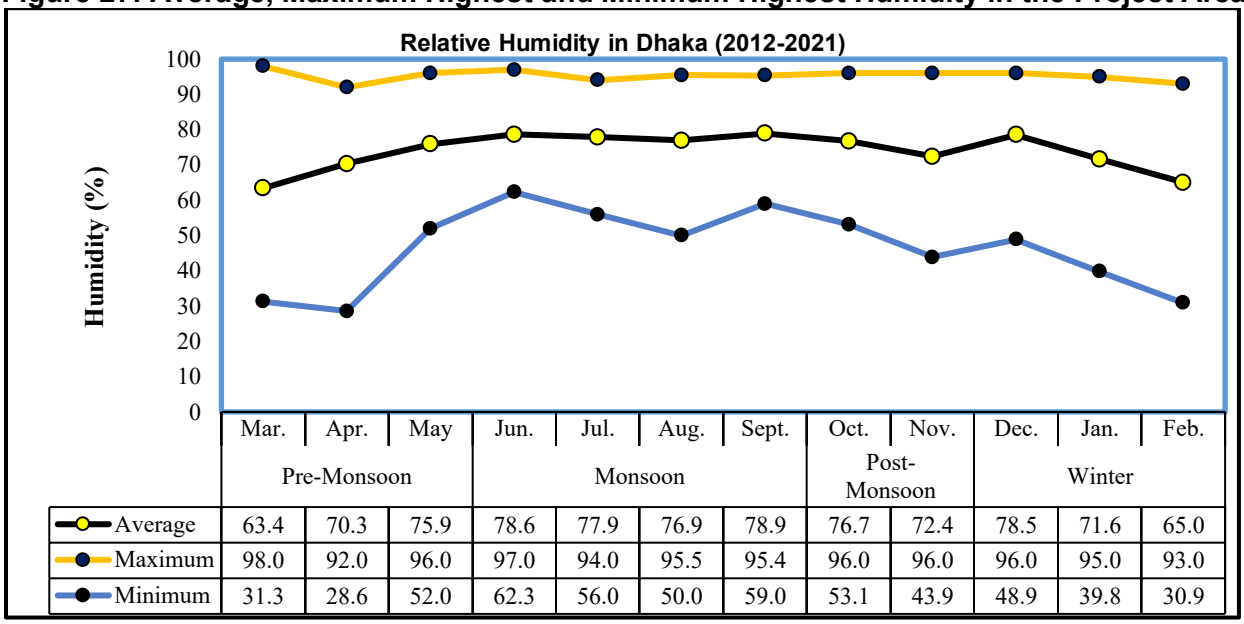


Source: Drainage Masterplan for Narayanganj City Corporation. 2023. Data taken from Bangladesh Meteorological Department.

12. Humidity

102. The humidity data on monthly maximum and minimum, monthly and average over the 10 years shows that, 80-85 percent humidity in the hot season is common and the humidity remains high year-round, producing thick fogs in winter in the study area of the project. Based on the collected data, a summary on highest maximum, lowest minimum and average humidity in percentage is given in figure below.

Figure 27: Average, Maximum Highest and Minimum Highest Humidity in the Project Area



	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
	Pre-Monsoon			Monsoon				Post-Monsoon		Winter		
Average	63.4	70.3	75.9	78.6	77.9	76.9	78.9	76.7	72.4	78.5	71.6	65.0
Maximum	98.0	92.0	96.0	97.0	94.0	95.5	95.4	96.0	96.0	96.0	95.0	93.0
Minimum	31.3	28.6	52.0	62.3	56.0	50.0	59.0	53.1	43.9	48.9	39.8	30.9

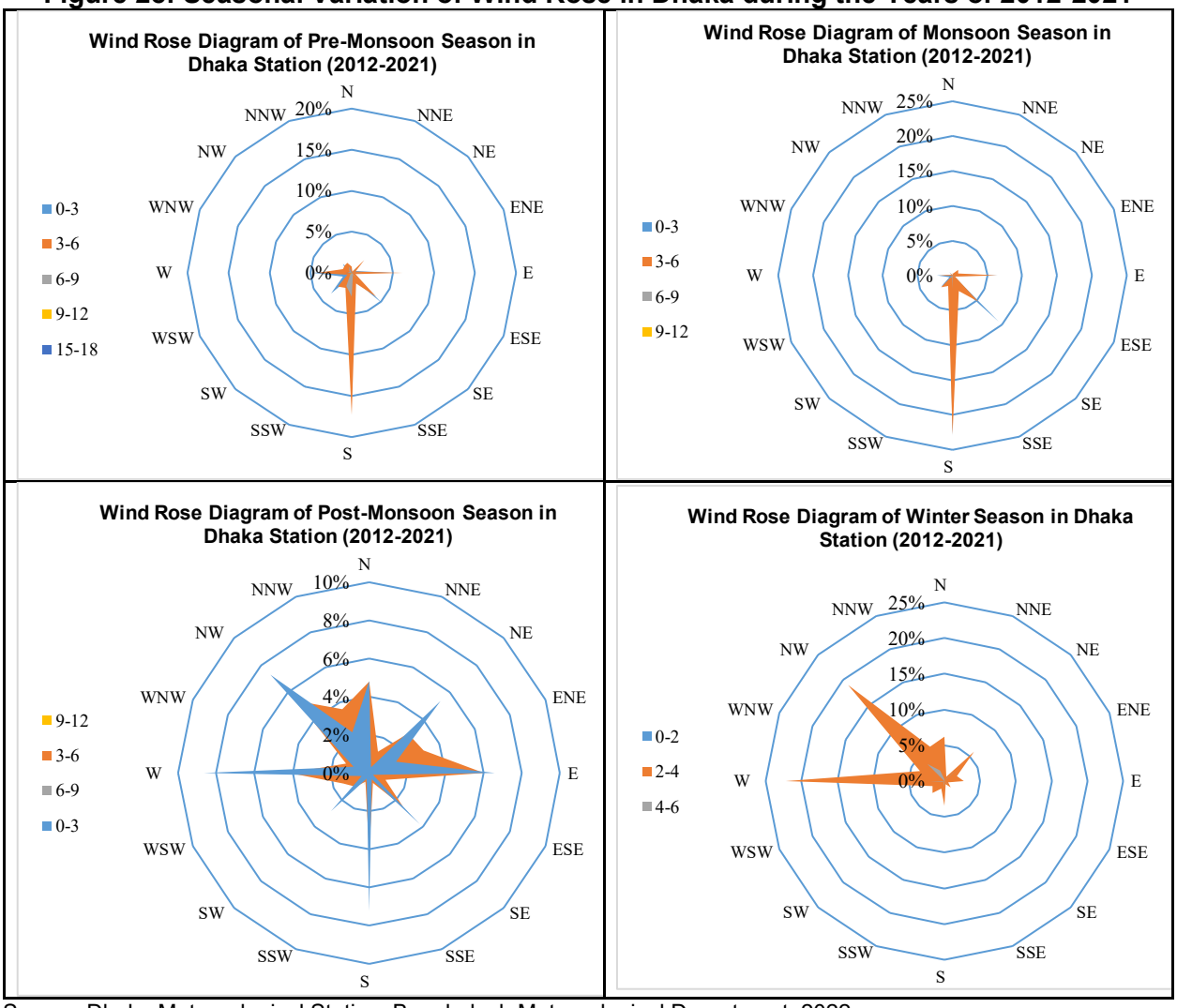
Source: Dhaka Meteorological Station. Bangladesh Meteorological Department. 2022

13. Wind

103. The most important and crucial weather aspect may be the wind. Knowing the direction and velocity is crucial because of this. The Wind Rose model, which depicts the project area's predominant wind conditions based on seasonal change, is used to understand wind variables. The wind rose shows how many hours a year the wind blows in the specified direction. The region is predominantly characterized by South, West, West-Southwest, North, and North-West wind flow, according to the wind rise diagrams. The whole wind speed spectrum in a year was dominated by winds of 0 to 18 knots.

104. Due to climatic fluctuations brought on by the monsoons, wind direction fluctuates in the project region. Beginning in the middle of March and lasting until near the end of September is the south-westerly monsoon. Monsoon winds blow continuously from the south from March to October; in January, winds come from the west and northwest. The month of February is uneventful, with gloomy mornings in particular. Figure below shows the seasonal monthly maximum wind speed direction rose plot from 2012 to 2021 duration.

Figure 28: Seasonal Variation of Wind Rose in Dhaka during the Years of 2012-2021



Source: Dhaka Meteorological Station. Bangladesh Meteorological Department. 2022

F. Acoustic Environment

105. **Ambient Noise Level.** To establish the baseline noise levels in the vicinity of the subproject locations, monitoring of noise levels was carried out during the period 25 January – 4 February 2023. These measurements were taken from various wards of the NCC area and may not be necessarily within the immediate vicinities of the subproject sites. However, with the observed ground conditions, noise level may not deviate significantly from one location to another within the city. Further validation of site-specific baseline noise level will be undertaken prior to construction activities. Assuming these high level of noise are confirmed during the design phase/pre-construction phase, there is a need for integration of noise protection measures during construction, especially in and around the settlements. The locations of monitoring are in Figure 29 and Table 24 below, and corresponding results are presented in Table 25 below. Based on results, there is generally a high level of noise for both daytime and nighttime on either working days or non-working days as compared to the standards. Copies of laboratory analysis results are in **Appendix 5**.

Figure 29: Map Showing Noise Level Measurement Locations

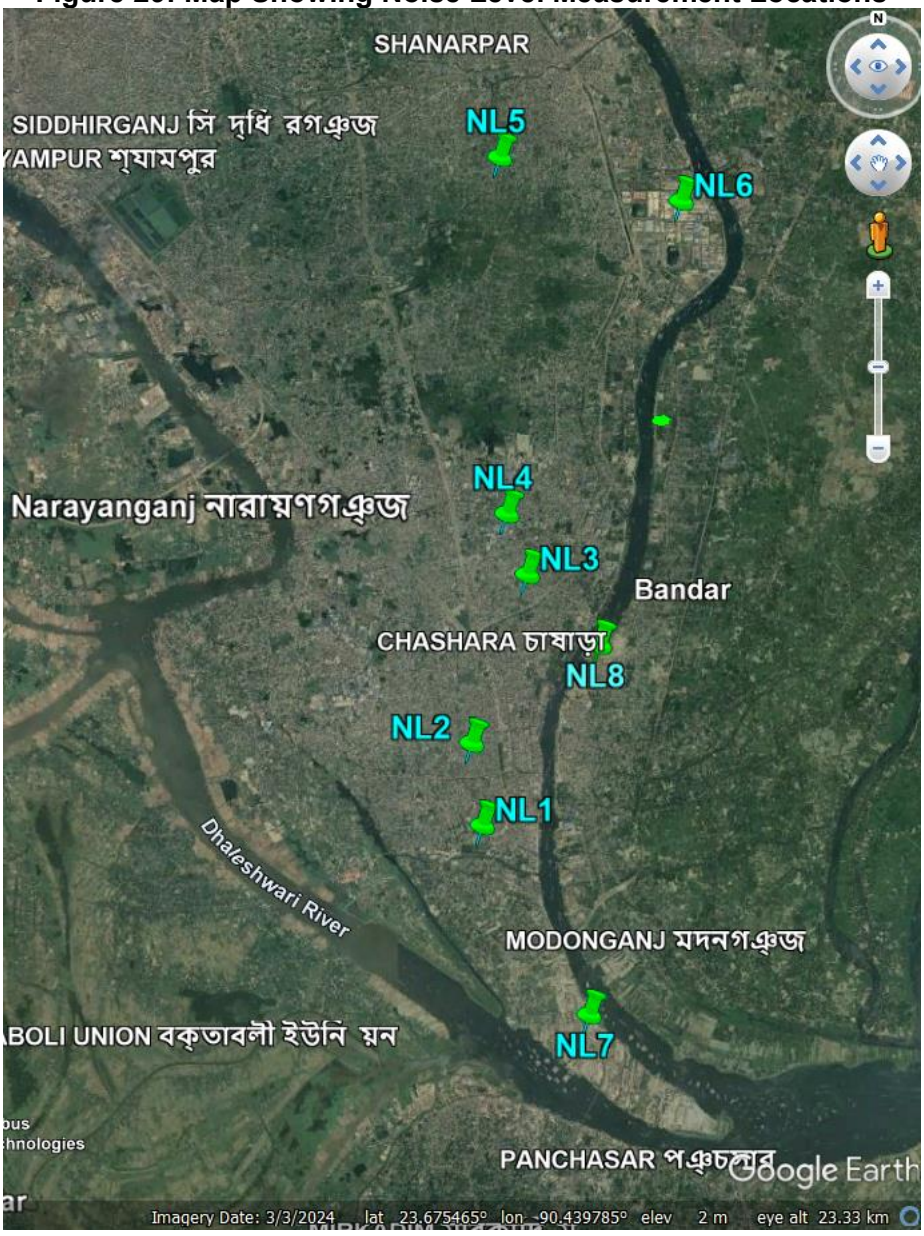


Table 23: Noise Level Measurement Dates and Location Details

Location Code	Location Name	Sampling Location	Monitoring date
Working Day			
NL1	Ranada Prasad Saha University, 12 Sahed Bappi Sharoni, Narayanganj	23°36'5.48"N 90°29'50.01"E	25 Jan.2023
NL2	Bara Dewbhog, 1 Mobarak Shah Rd, Narayanganj	23°36'41.67"N 90°29'44.81"E	25 Jan 2023
NL3	Shirin Selina Home, Narayanganj	23°37'55.85"N 90°30'11.56"E	26 Jan 2023
NL4	Fakir Knitwear Ltd., Fakir Rd, Fatullah	23°38'22.57"N 90°30'1.75"E	26 Jan 2023
Non- Working Day			
NL1	Ranada Prasad Saha University, 12 Sahed Bappi Sharoni, Narayanganj	23°36'5.48"N 90°29'50.01"E	27 Jan 2023
NL2	Bara Dewbhog, 1 Mobarak Shah Rd, Narayanganj	23°36'41.67"N 90°29'44.81"E	27 Jan 2023
NL3	Shirin Selina Home, Narayanganj	23°37'55.85"N 90°30'11.56"E	28 Jan 2023
NL4	Fakir Knitwear Ltd., Fakir Rd, Fatullah	23°38'22.57"N 90°30'1.75"E	28 Jan 2023
Working Day			
NL5	Chairman Bari, Siddhirganj	23°40'59.39"N 90°29'58.41"E	01 Feb 2023
NL6	Adamjee EPZ Road, Siddhirganj	23°40'40.09"N 90°31'25.46"E	01 Feb 2023
NL7	Crown Cement Factory Ltd. Road, Muktarpur, Narayanganj	23°34'42.2"N 90°30'41.3"E	02 Feb 2023
Non- Working Day			
NL5	Chairman Bari, Siddhirganj	23°40'59.39"N 90°29'58.41"E	03 Feb 2023
NL6	Adamjee EPZ Road, Siddhirganj	23°40'40.09"N 90°31'25.46"E	03 Feb 2023
NL7	Crown Cement Factory Ltd. Road, Muktarpur, Narayanganj	23°34'42.2"N 90°30'41.3"E	04 Feb 2023

Table 24: Primary Baseline Noise Level Measurements Within NCC

SL. No	Ward No	Leq_{day}	Leq_{night}	L_{max}	L_{min}	Standard	
						Day(dB)	Night(dB)
NL1-WD	Ward-18	67.74	60.41	92.5	45.6	**50**	**40**
NL1-NWD		66.41	59.96	89.6	32.1		
NL2-WD	Ward-16	59.29	56.95	80.0	30.8	**60**	**50**
NL2-NWD		63.56	55.21	90.8	37.8		
NL3-WD	Ward-12	64.68	58.76	85.1	30.8	**55**	**45**
NL3-NWD		63.28	57.87	90.2	41.0		
NL5-WD	Ward-2	62.89	56.89	90.0	30.8	**55**	**45**
NL5-NWD		62.97	55.22	86.4	32.1		
NL6-WD	Ward-6	78.99	68.88	103.2	42.3	**75**	**70**
NL6-NWD		74.99	68.70	93.6	32.1		
NL7-WD	-	73.39	57.16	97.9	40.8	**75**	**70**
NL7-NWD		77.78	68.93	95.9	40.8		
Standard (ECR'1997) & Noise Pollution (Control) Rules 2006							
Silent area						50	40
Residential area						55	45
Mixed area						60	50
Commercial Area						70	60
Industrial area						75	70

SL. No	Ward No	Leq_{day}	Leq_{night}	L_{max}	L_{min}	Standard	
						Day(dB)	Night(dB)
World Bank/IFC Standard							
Residential; Institutional; Educational						55	45
Industrial						70	70

G. Ecological Environment

1. Terrestrial Environment

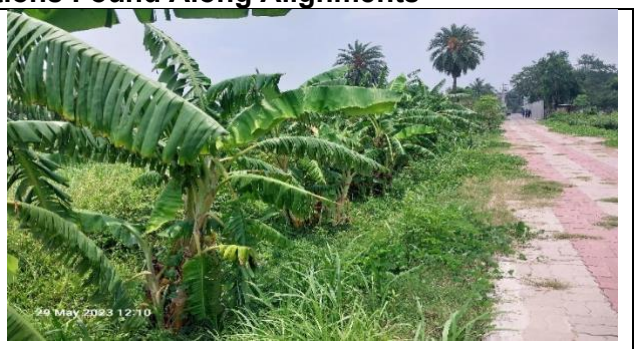
106. **Flora**. Generally, the terrestrial environment of NCC comprises the different natural and man-made resources. Natural resources include roadside trees and vegetation, homestead trees, woody plants, herbs, shrubs, climbers and other plants on cultivated lands. None of these species is considered endangered or critically endangered or of national significance. Being considered a developed and built-up area with modified urban setting, NCC is mostly surrounded now by a combination of residential, commercial and institutional establishments. There are no natural habitats or forests that will be encroached or affected by the subproject. No protected species per IUCN Red List was observed during field visits within the 100 – 200-meter radius and immediate surroundings of the subproject sites. The table and figure below show the typical flora species found in the NCC area.

Table 25: Flora Species Found in NCC Area

Bangla Name	English Name	Scientific Name	Uses
Aam	Mango	*Mangifera indica*	Fruit tree
Neem	Neem	*Azadirachta indica*	Medicinal
Meheguni	Mahogoni	*Swietenia macrophylla*	Timber
Sojne		*Moringa oleifera*	Medicinal
Kathal	*Jacjfruit*	*Artocarpus heterophyllus*	Fruit tree
Narikel	Coconut	*Cocos nucifera*	Fruit tree
Taal	Plum	Borassus flabellifer	Fruit tree
Jaam	Black Barry	Syzygium jambolanum	Fruit tree
Kola	Banana	Musa acuminata	Fruit tree
Koroi		Albizia procera	Medicinal

Figure 30: Typical Vegetations Found Along Alignments

Zone-1



Zone -2

	
Zone-3	Zone-4

107. **Fauna**. Common animals found in the NCC area are the domesticated animals like dogs and cats. Other species include reptiles such as snake, house lizard, soft-shell, turtle, toad, frog, squirrel, fruit bat, field and house mice, and flying box. Some of these species also thrive in inlad water boides in the area such as the ponds or canals. There are also some avian species that can be found in the NCC area. The commonly spotted birds include kingfishers, house crow, house sparrow, little fern, etc. but little occurrences. None of these species is considered endangered or critically endangered or of national significance.

2. Aquatic Environment

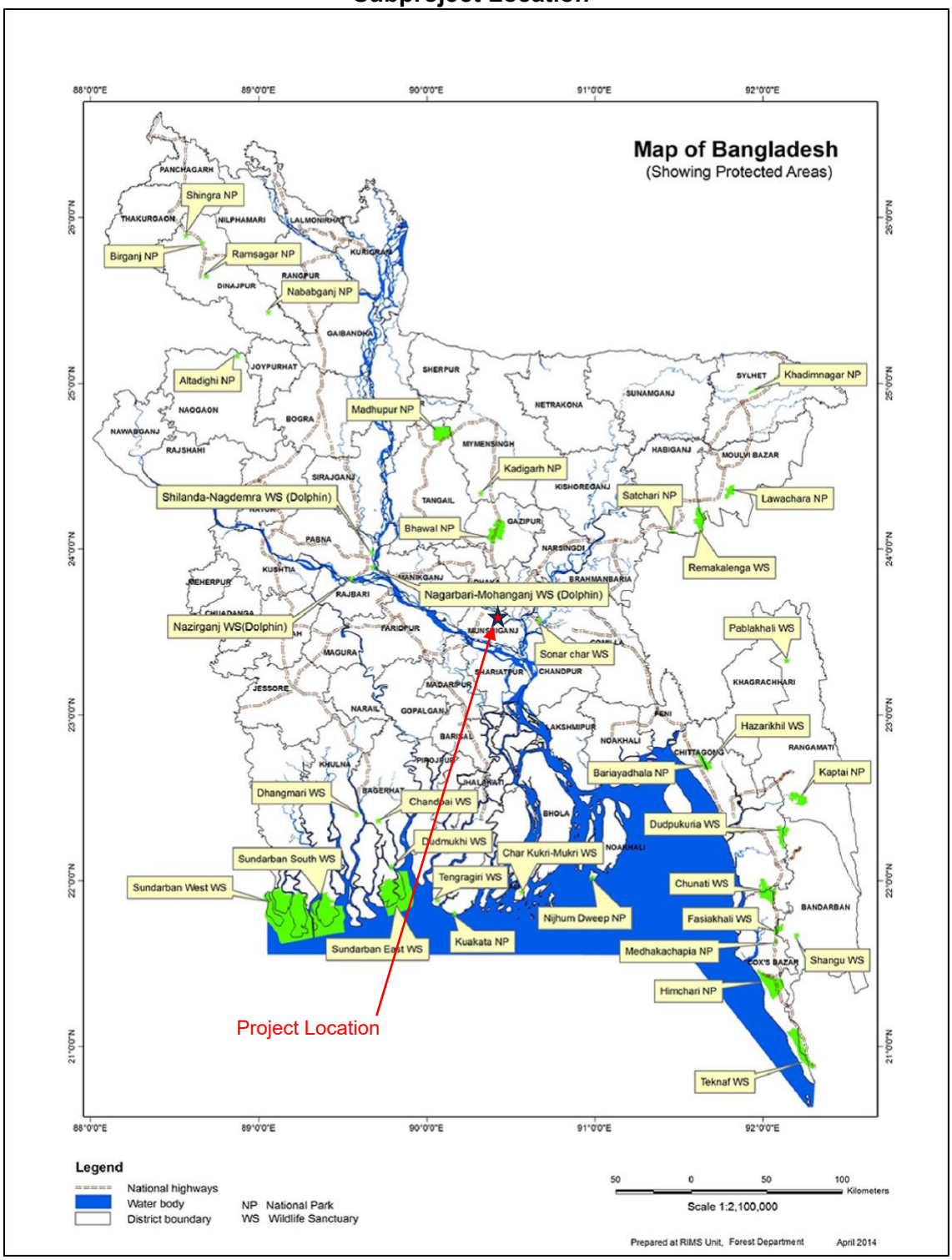
108. The quality of water in the Shitalakhya river that traverses NCC area has continued to deteriorate in the past two decades due to rapid urbanization and poor sewerage and sanitation in the city, including pollution load contribution from upstream municipalities and cities. Nevertheless, monitoring of the quality of this river reveals the presence of dissolved oxygen which may indicate the survival of microscopic aquatic species such as phytoplankton and other species that could adapt to polluted waters. However, no known species of commercial value and appropriate for human consumption has been observed in this river. Based on site visits and consultations with locals, there are no fishing grounds that exist along this river from upstream down to the confluence point with Daleshwari river. All along in the past two decades, Shitalakhya river has only been used as a navigational route for industrial, commercial and local ferries.

109. Although Shitalakhya river is not used as a fishing ground, other inland ponds, ditches and swamps in the NCC area are used for fishing or fish production. Fishes include catfishes (magur and shing), major carps (katla, rui, and mrigal), minor carps (puti), and others (tengra, boal, mola, shol). Native waterfowl and migratory birds, freshwater turtles and other reptiles and amphibians depend on these inland water bodies. No species considered endangered or critically endangered or of national significance is present in the area. Most of the waterbodies like the canal and ditches are covered with water hyacinths.

3. Protected Areas

110. There are no protected areas within or around the subproject sites. Per screening conducted, the closest Protected Area is Bhawal National Park which is already about 50km away. Further research with Bangladesh Forest Department revealed that there is also a wildlife sanctuary (Sonar Char Wildlife Sanctuary) close to NCC, but this is likewise about 50km away. The following map shows the location of NCC relative to various protected areas in Bangladesh.

Figure 31: Map Showing Protected Areas of Bangladesh and Their Proximity to Subproject Location[a]



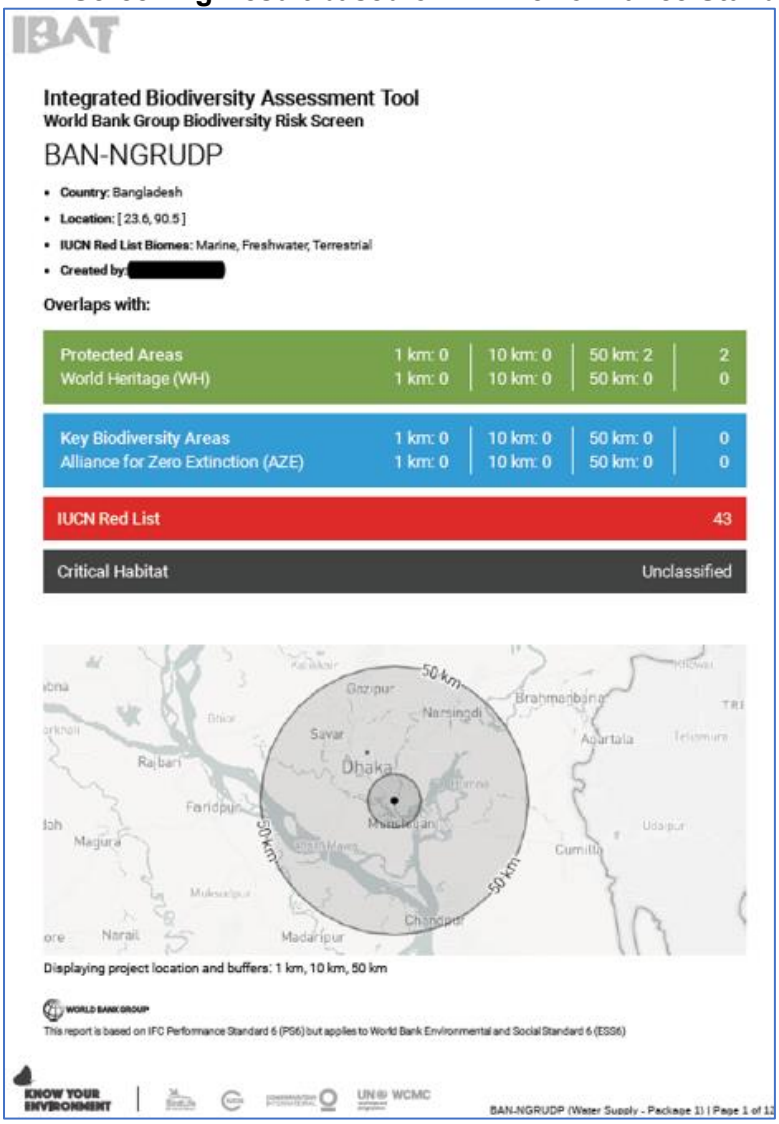
Source: Management Effectiveness Assessment of Protected Areas of Bangladesh. Bangladesh Forest Department. 2016

[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

4. Critical Habitat

111. Despite being located in a built-up and developed urban area, the subproject sites have been assessed in terms of critical habitat status. A screening using the Integrated Biodiversity Assessment Tool (IBAT) was undertaken to screen and assess potential risks on sensitive areas or critical habitat that may exist around the subproject sites (default area of analysis of 50 km radius). IBAT screening results confirmed that there are no protected areas or key biodiversity areas around the vicinities of the project sites, and the closest protected area is Bhawal National Park which about 50km away. The IBAT screening also shows biodiversity species potentially to occur within the default 50-km radius. However, the subproject sites are already a built-up area and the probability of these species being found at the sites is very low. Site visits have also been conducted which confirmed that none of these species are found or sighted at the subproject sites. Snapshot of the summary of the screening results is shown in figure below and the full set of results is in Appendix 6.

Figure 32: IBAT Screening Result based on IFC Performance Standard 6 (PS6)



H. Socio-Economic Environment

112. The NCC is a city corporation in the Narayanganj Sadar Upazila of Narayanganj District. The NCC was established through the merging of three former independent municipalities, namely: Narayanganj Pourashava, Siddhirganj Pourashava, and Kadam Rasul Pourashava. As a result, NCC is composed of 27 wards from these three municipalities or pourashavas. Relative to the Shitalakhya river, Narayanganj and Siddhirganj Pourashavas are situated on the western side while Kadam Rasul Pourashavacon the eastern side. As a result, NCC jurisdiction now covers areas on both sides of Shitalakhya river.

1. Demography

113. NCC's total area is 72.43 square kilometers with estimated population of 709,381 as of 2011.[24] Numbers of households are 60,290 in Siddhirganj Pourashava, 66,045 in Narayanganj Pourashava, and 39,302 in Kadam Rashul Pourashava. The average household size is higher in Narayanganj Pourashava than the other two pourashavas. Likewise, the sex ratio was higher in Narayaganj Pourashava than the other two pourashavas. Literacy rate of women was lower than of men in all three pourashavas. (footnote 18). Table below provides a summary of the demographic data in NCC.

Table 26: Household Data, Literacy Rate and Sex Ratio in the Study Area (NCC)

Ward/Union	Total Households	Average Household Size	Literacy Rate %		Sex Ratio
			Male	Female	
Siddhirganj Pourashava					
Ward-01	8,623	4.2	73.7	69.1	108
Ward-02	5,739	4.4	69.9	65.6	106
Ward-03	8,044	4.4	78.6	74.0	111
Ward-04	5,655	4.1	64.3	61.0	110
Ward-05	4,278	4.3	66.2	61.3	103
Ward-06	5,845	4.3	55.7	49.9	105
Ward-07	5,196	4.2	69.7	66.0	104
Ward-08	10,568	4.0	68.6	60.4	108
Ward-09	6,342	4.3	68.0	61.6	104
	60,290				
Narayanganj Pourashava					
Ward-01	5,094	4.0	74.8	63.9	109
Ward-02	5,843	4.2	70.6	62.9	109
Ward-03	9,565	4.2	74.1	66.4	108
Ward-04	10,004	4.6	76.4	69.7	108
Ward-05	6,552	4.5	77.7	72.3	109
Ward-06	5,453	4.4	72.3	65.9	112
Ward-07	7,920	4.4	68.2	63.9	105
Ward-08	8,198	4.3	70.3	65.3	104
Ward-09	7,416	4.1	60.2	57.6	105
	66,045				
Kadam Rasul Pourashava					
Ward-01	2,723	4.3	58.8	53.4	102
Ward-02	4,109	4.3	60.2	55.8	98
Ward-03	5,039	4.3	67.0	59.9	105
Ward-04	7,289	4.2	70.7	65.6	104

[24] Adjusted Population 2011. Statistical Yearbook of Bangladesh 2022. Bangladesh Bureau of Statistics. June 2023.

Ward/Union	Total Households	Average Household Size	Literacy Rate %		Sex Ratio
			Male	Female	
Ward-05	7,114	4.3	57.5	51.9	104
Ward-06	5,028	4.0	65.1	60.7	98
Ward-07	2,954	4.3	64.6	59.2	104
Ward-08	1,655	4.1	71.6	61.3	103
Ward-09	3,391	4.0	70.3	62.0	108
	39,302				
Total	**165,637**				

Source: Population & Housing Census-2011. Community Report: Narayanganj

2. Economy and Employment

114. NCC has a hoary history of development of industries and commerce of the country. Industrial use occupies 5.04% of the areas mostly along Shitalakhya river. Very limited agricultural practice can be seen in Bandar and Shiddirganj region. Narayanganj has become the center of apparel industry in Bangladesh. There was once a time that all sorts of products such as jute and oilseed were exported through the Narayanganj port. The first ever jute mill of the country Bawa Jute Mills, is situated in the Kadam Rasul Pourashava. Sonargaon, which is an important place in Narayanganj, was also very popular for garment products. Narayanganj, as a prime river port, became the center for collection and export of various raw materials due to its direct linkages with Chittagong. Thus, Narayanganj was declared as a port under Sea Custom Act, 1878.

115. Economic growth of NCC has been increasing tremendously for the last decade. A large increase of population became apparent mainly due to in-migration brought about by employment opportunities provided by the expansion of commercial and industrial activities in the NCC and Narayanganj Sadar Upazila. There are many industries and manufacturing companies established in and around the NCC and Narayanganj Sadar Upazila. These companies include textile mills, garments and other type of industries. Most of the employed population of the project area are involved in the services sector, then followed by employment in the industrial and agricultural sectors. Employment in agriculture includes direct farming, sharecropping, and agricultural labor. Table below shows the distribution of employment in NCC.

Table 27: Occupation of People in the Study Area (NCC)

Ward/Union	Population Aged 7+ years and Above Not Attending School but Employed		Field activities/ Occupation					
			Agriculture		Industry		Service	
	Male	Female	Male	Female	Male	Female	Male	Female
Siddhirganj Pourashava								
Ward-01	1,663	612	115	4	344	329	1,204	279
Ward-02	1,372	331	75	6	387	160	910	165
Ward-03	1,573	606	51	3	493	312	1,029	291
Ward-04	1,868	792	96	7	700	393	1,072	392
Ward-05	1,198	475	21	4	283	213	894	258
Ward-06	2,491	702	14	2	572	446	1,905	254
Ward-07	1,137	386	58	-	413	302	666	84
Ward-08	2,745	1,464	59	7	916	689	1,770	768
Ward-09	1,869	563	322	11	311	131	1,236	421
	15,916	5,931	811	44	4,419	2,975	10,686	2,912

Ward/Union	Population Aged 7+ years and Above Not Attending School but Employed		Field activities/ Occupation					
			Agriculture		Industry		Service	
	Male	Female	Male	Female	Male	Female	Male	Female
Narayanganj Pourashava								
Ward-01	1,037	702	9	-	537	511	491	191
Ward-02	1,312	630	19	-	315	228	978	402
Ward-03	2,339	1,474	25	6	1,057	682	1,257	786
Ward-04	1,794	1,131	57	17	724	415	1,013	699
Ward-05	1,589	406	94	15	763	192	732	199
Ward-06	1,771	860	13	6	1,287	585	471	269
Ward-07	2,121	698	16	-	730	259	1,375	439
Ward-08	1,992	547	19	-	530	159	1,443	388
Ward-09	3,216	979	39	5	1,188	360	1,989	614
	17,171	7,427	291	49	7,131	3,391	9,749	3,987
Kadam Rasul Pourashava								
Ward-01	922	232	161	76	337	83	424	73
Ward-02	1,261	307	59	8	501	182	701	117
Ward-03	1,683	576	27	10	553	332	1,103	234
Ward-04	2,212	699	23	3	322	236	1,867	460
Ward-05	2,859	1,146	100	36	1,029	547	1,730	563
Ward-06	1,117	354	43	4	263	201	811	149
Ward-07	635	304	78	2	355	243	202	59
Ward-08	374	183	30	2	161	120	183	61
Ward-09	843	290	51	5	378	209	414	76
	11,906	4,091	572	146	3,899	2,153	7,435	1,792
Total	**44,993**	**17,449**	**1,674**	**239**	**15,449**	**8,519**	**27,870**	**8,691**

Source: Population & Housing Census-2011, Community Report: Narayanganj

3. Educational Institution

116. As per survey under the Narayaganj City Corporation Area Action Plan, there are 977 educational structures in NCC area among which, 54.48% pucca (permanent solid), 31.63% semi-pucca and 16.45% katcha or kutcha (made of various light temporary materials such as timber/ wood/ corrugated iron sheet) structures. A total of 153 primary schools, 79 kindergartens and 30 informal and non-formal educational institutes, 83 high schools, 31 colleges, 15 madrasas and 2 universities are located in NCC area.

4. Religion

117. Majority of the population of all Wards are Muslims followed by Hindus, Christians, Buddhists, and others. Table below shows a complete picture of the population by religious affiliation in NCC.

Table 28: Population by Religion in the Study Area

Ward	Total Population	Muslim	%	Hindu	%	Christian	%	Buddhist	%	Others	%
Siddhirganj Pourashava											
Ward-01	36,592	36,080	99	482	1	11	0	12	0	7	0
Ward-02	25,585	25,184	98	399	2	2	0	-	-	-	-
Ward-03	35,947	35,422	99	471	1	30	0	21	0	3	0
Ward-04	23,385	23,042	99	303	1	21	0	1	0	18	0
Ward-05	18,421	17,902	97	503	3	15	1	1	0	-	-
Ward-06	25,100	24,898	99	199	1	3	0	-	-	-	-
Ward-07	21,888	21,706	99	139	1	11	1	28	0	4	0
Ward-08	42,704	41,629	98	1,050	3	17	0	8	0	-	-
Ward-09	27,138	26,931	99	205	1	2	0	-	-	-	-
	256,760	252,794		3,751		112		71		32	
Narayanganj Pourashava											
Ward-01	20,489	17,736	87	2,731	13	17	0	5	0	-	-
Ward-02	24,550	22,252	91	2,273	9	18	0	7	0	-	-
Ward-03	40,187	36,758	91	3,397	8	26	0	6	0	-	-
Ward-04	47,079	38,786	82	8,231	17	43	0	16	0	3	0
Ward-05	29,431	16,371	56	13,057	44	3	0	-	-	-	-
Ward-06	24,096	13,399	56	10,687	44	9	0	1	0	-	-
Ward-07	34,496	33,498	97	976	3	10	0	5	0	7	0
Ward-08	35,518	33,812	95	1,705	5	1	-	-	-	-	-
Ward-09	30,484	25,511	84	4,960	16	7	0	6	0	-	-
	286,330	238,123		48,017		134		46		10	
Kadam Rasul Pourashava											
Ward-01	11,822	11,628	98	190	2	-	-	4	0	-	-
Ward-02	17,694	17,556	99	137	1	-	-	-	-	1	0
Ward-03	22,176	20,053	90	2,111	10	-	-	11	0	1	0
Ward-04	30,728	26,432	86	4,282	14	8	0	6	0	-	-
Ward-05	30,572	28,708	93	1,856	6	7	0	-	-	1	-
Ward-06	20,308	20,077	99	230	1	1	0	-	-	-	-
Ward-07	12,636	12,305	97	325	3	6	0	-	-	-	-
Ward-08	6,812	6,158	90	645	9	1	0	-	-	8	0
Ward-09	13,543	13,256	98	238	2	46	0	3	0	-	-
	166,291	156,173		10,014		69		24		11	
Total	**709,381**	**647,090**		**61,782**		**315**		**141**		**53**	

Source: Population & Housing Census-2011, Community Report: Narayanganj

5. Health Facilities and Other Community Facilities

118. There are health facilities in NCC, which include 37 different types of government and private hospitals and 44 clinics. There is only one tertiary hospital in NCC area which is the Narayanganj 200 Beds Hospital in Khanpur.

119. There are community facilities in NCC which include mosques, temples, churches, community centers, auditoriums, mazars, etc. There are a total of 524 mosques, 61 temples, 5 pagodas and 1 church in the study area. In addition, there are cinema halls, stadium, swimming pools, theme parks, etc. that serve as recreational facilities for city dwellers.

6. Settlement and Housing

120. The predominant housing structures in the study area are in Ward-08 in Kadam Rasul Pourashava, with 59.7% made of katcha or kutcha (made of various light temporary materials such as timber/ wood/ corrugated iron sheet); in Ward-05 of Kadam Rasul Pourashava, with 59.8% made of semi-pucca; in Ward-04 of Narayanganj Pourashava, with 66.1% made of pucca; and in Ward-03 of Narayanganj Pourashava, with 6.7% made of *Jhupri* (hut). Table below shows the summary of the type of structures of dwellings in NCC.

Table 29: Type of Structures of Houses in the Study Area (NCC)

Ward/ Union	Number of Households	Percentage of Type of Housing Structures			
		Pucca	Semi pucca	Kutcha	Jhupri
Siddhirganj Pourashava (Municipality)					
Ward-01	8,623	39	47	14	0
Ward-02	5,739	38	40	22	0
Ward-03	8,044	39	56	6	-
Ward-04	5,655	30	45	23	2
Ward-05	4,278	34	36	30	-
Ward-06	5,845	21	27	51	1
Ward-07	5,196	23	53	21	2
Ward-08	10,568	16	40	44	0
Ward-09	6,342	27	29	44	0
	60,290				
Narayanganj Pourashava (Municipality)					
Ward-01	5,094	26	38	37	0
Ward-02	5,843	32	40	27	1
Ward-03	9,565	47	33	13	7
Ward-04	10,004	66	26	8	1
Ward-05	6,552	59	34	7	1
Ward-06	5,453	64	25	7	4
Ward-07	7,920	50	36	9	6
Ward-08	8,198	55	34	11	1
Ward-09	7,416	35	39	24	2
	66,045				
Kadam Rasul Pourashava (Municipality)(Bandar Upazila)					
Ward-01	2,723	14	38	47	1
Ward-02	4,109	21	30	47	2
Ward-03	5,039	21	47	32	0
Ward-04	7,289	38	44	17	0
Ward-05	7,114	18	60	22	1
Ward-06	5,028	20	44	36	0
Ward-07	2,954	14	49	35	2
Ward-08	1,655	8	32	60	0
Ward-09	3,391	11	35	54	-
	39,302				
Total	**165,637**				

Source: Population & Housing Census-2011, Community Report: Narayanganj

7. Water Supply and Electricity

121. The sources of drinking water supply in NCC include piped/tap water and tube wells. Table below shows the data as to the sources of drinking water in the different wards of the three

pourashavas of NCC. It can be gleaned that a large number of households of the NCC area uses tube wells because these do not have access to piped water supply.

122. As of 2011, ward-wise electricity connection is in the range of 96.2 – 99.7%. Table below also shows the extent of access to electricity in the different wards of NCC.

Table 30: Drinking Water Sources and Electricity Facilities in Study Area (NCC)

Ward / Union	Number of Households	Source of Drinking Water in (%)			Electricity Connection in (%)
		Tap water	Tube well	Other	
Siddhirganj Pourashava					
Ward-01	8,623	90.6	8.5	0.9	99.5
Ward-02	5,739	91.7	7.3	0.9	99.3
Ward-03	8,044	6.1	93.5	3.5	99.4
Ward-04	5,655	2.2	94.3	0.1	96.9
Ward-05	4,278	5.8	32.2	62.1	99.1
Ward-06	5,845	38.6	35.8	25.6	99.5
Ward-07	5,196	22.1	75.4	2.5	98.3
Ward-08	10,568	46.7	51.1	2.1	98.9
Ward-09	6,342	5.0	90.3	4.8	97.6
	60,290				
Narayanganj Pourashava					
Ward-01	5,094	87.6	12.0	0.4	99.2
Ward-02	5,843	90.4	9.3	0.3	99.6
Ward-03	9,565	69.8	28.8	1.3	96.2
Ward-04	10,004	71.3	26.2	2.5	99.4
Ward-05	6,552	85.7	12.5	1.8	99.7
Ward-06	5,453	73.9	22.4	3.7	99.4
Ward-07	7,920	57.5	40.7	1.8	99.3
Ward-08	8,198	63.7	35.6	0.8	99.7
Ward-09	7,416	42.5	52.9	4.6	99.0
	66,045				
Kadam Rasul Pourashava					
Ward-01	2,723	9.5	88.2	2.3	98.7
Ward-02	4,109	53.7	45.0	1.4	96.3
Ward-03	5,039	60.5	37.2	2.2	99.0
Ward-04	7,289	56.2	41.6	2.2	98.8
Ward-05	7,114	19.3	79.1	1.6	98.5
Ward-06	5,028	77.3	19.5	3.2	98.1
Ward-07	2,954	39.7	52.9	7.4	98.7
Ward-08	1,655	11.6	86.7	1.7	97.6
Ward-09	3,391	0.1	82.3	17.6	97.7
	39,302				
Total	**165,637**				

Source: Population & Housing Census-2011, Community Report: Narayanganj

8. Sanitation

123. Generally, most of the households in NCC have sanitary facilities. The difference only lies on whether these are water-sealed or not. However, in poorer areas in the outskirts of the city, there is evidence that significant number of households do not have access to hygienic latrine facilities. Accordingly and with the lesser population density in these areas, some residents defecate in open spaces. Table below shows the result of a census on sanitation facilities in NCC.

Table 31: Sanitation Coverage in Study Area (NCC)

Ward/Union	Number of Households	Percentage of Toilet Facility			
		Sanitary (with water-seal)	Sanitary (no water-seal)	Non-Sanitary	None
Siddhirganj Pourashava					
Ward-01	8,623	62.9	35.8	1.3	0.0
Ward-02	5,739	45.2	47.2	7.6	0.1
Ward-03	8,044	65.6	33.0	1.4	0.0
Ward-04	5,655	34.1	57.4	8.2	0.3
Ward-05	4,278	26.3	49.1	24.5	0.0
Ward-06	5,845	27.2	62.2	10.6	0.1
Ward-07	5,196	36.2	58.7	5.0	0.1
Ward-08	10,568	12.9	53.0	33.9	0.3
Ward-09	6,342	21.8	62.4	15.7	0.1
	60,290				
Narayanganj Pourashava					
Ward-01	5,094	31.7	61.3	6.8	0.2
Ward-02	5,843	38.7	53.5	7.8	0.0
Ward-03	9,565	52.4	36.3	11.0	0.3
Ward-04	10,004	57.5	38.0	4.0	0.5
Ward-05	6,552	40.8	55.7	3.5	0.0
Ward-06	5,453	54.4	39.6	5.6	0.3
Ward-07	7,920	63.2	28.0	5.2	3.6
Ward-08	8,198	72.1	22.7	5.2	0.0
Ward-09	7,416	6.8	81.2	10.2	1.8
	66,045				
Kadam Rasul Pourashava					
Ward-01	2,723	34.3	57.2	7.5	1.0
Ward-02	4,109	18.0	39.6	41.3	1.2
Ward-03	5,039	29.9	33.1	36.9	0.2
Ward-04	7,289	47.8	39.8	12.4	0.0
Ward-05	7,114	33.2	61.8	4.5	0.5
Ward-06	5,028	38.0	52.9	8.7	0.4
Ward-07	2,954	32.2	44.2	22.7	0.9
Ward-08	1,655	13.2	67.9	18.7	0.2
Ward-09	3,391	5.0	75.5	19.2	0.4
	39,302				
Total	**165,637**				

Source: Population & Housing Census-2011, Community Report: Narayanganj

124. Currently, NCC does not have an organized sewerage and sewage collection and treatment. Inspection of the alignments of drains and canals suggests that both grey water (kitchen water, domestic cleaning and washing) and black water (sewage overflows from septic tanks or direct discharge of sewage) from these establishments are discharged into stormwater drainage channels. The drainage system conveys combined storm water and discharges from both residential and commercial/industrial establishments in NCC. This scenario brings about a drainage system being the conduit of wastewaters with varying pollution load.

9. Solid Waste Management

125. An estimation of solid waste generation by NCC in 2017 reveals around 898.60 tons per day, with characteristics of which is about 70% organic, 14% textiles, and 11% plastics. There is no efficient and organized waste segregation in the city. Some recyclable materials are collected

by private collectors for recycling by their own or exported to retailers or to neighboring countries.[25] Generally, wastes are collected, transported and disposed in existing dumpsites. However, coverage of this waste management is limited due to lack of resources, both manpower and equipment. Thus, much of the solid wastes are dumped in many open spaces and low-lying areas, resulting to clogging of natural and man-made drains in many part of the city. Dumpsites are also operating beyond capacity. The Jalkuri Sanitary Landfill Site that is planned to be used by the project (NGRUDP) is likewise approaching its full capacity. Nevertheless, even with limited resources, NCC continuous to adopt responsible management of wastes through the promotion of the 3-R (reduce, reuse, recycle) strategy of the national government.

126. The Jalkuri Sanitary Landfill Site is one landfill that is currently being utilized by NCC. This disposal site is about 4.5 km away from the NCC city center. Wide and 2-way city roads connect the city to this disposal site. There is no potential access issue exists to this disposal site. Figures below shows an aerial view of this site.

Figure 33: Aerial Visual of Jalkuri Sanitary Landfill Site

10. Roads and Transport

127. According to Narayanganj City Corporation Action Area Plan, 2016, the total road length in NCC area is about 609 km, of which katcha road is 211 km, semi-pucca road is 82 km and

[25] Feasibility Study On Solid Waste Management System For Narayanganj City. JICA. June 2019.

pucca road is 316 km. NCC is connected with Dhaka through three roads, meter-gauge rail line, and rivers (through Buriganga and Shitalakhya rivers).

I. Physical Cultural Resources

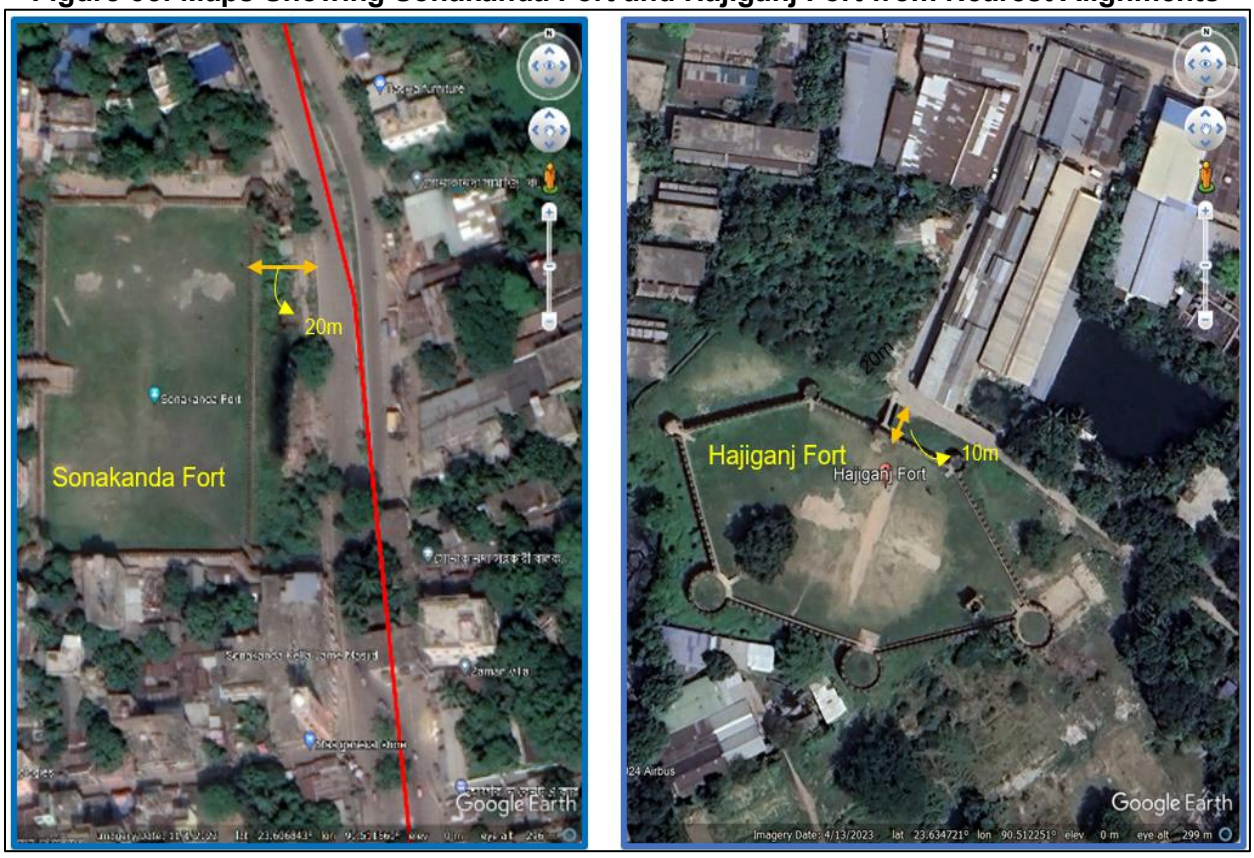
128. Narayanganj has historical importance for its relics of settlements of 12 Bhuiyan such as the Hajiganj Fort or Khizpur and Sonakanda Fort. These two forts are listed as protected monuments and are under the management of the Department of Archaeology. Protection and management of these heritage sites are covered under the Antiquities Act, 1968 and Antiquities Preservation Rules, 1986. These Act and Rules prohibit the destruction or damage to antiquities in the country, which include the Hajiganj Fort and Sonakanda Fort. While these prohibitions and restrictions pertain to activities within the boundaries of the heritage sites, there are no explicit rules pertaining to development activities outside the boundaries of said sites. However, as a precautionary measure, it is important for the subproject to inform the Department of Archaeology of the excavation activities it will undertake along the roads near these two heritage sites, including the chance finds protocol that will be adopted during construction activities.

129. On site assessment specific to these two widely known heritage structures of Hajiganj Fort and Sonakanda Fort, it was found out that their distances to the alignments are at around 10m and 20m, respectively. Figures below show ground level photos and maps relative to the locations of these two heritage structures.

Figure 34: Photos of Widely Known Heritage Structures in Narayanganj

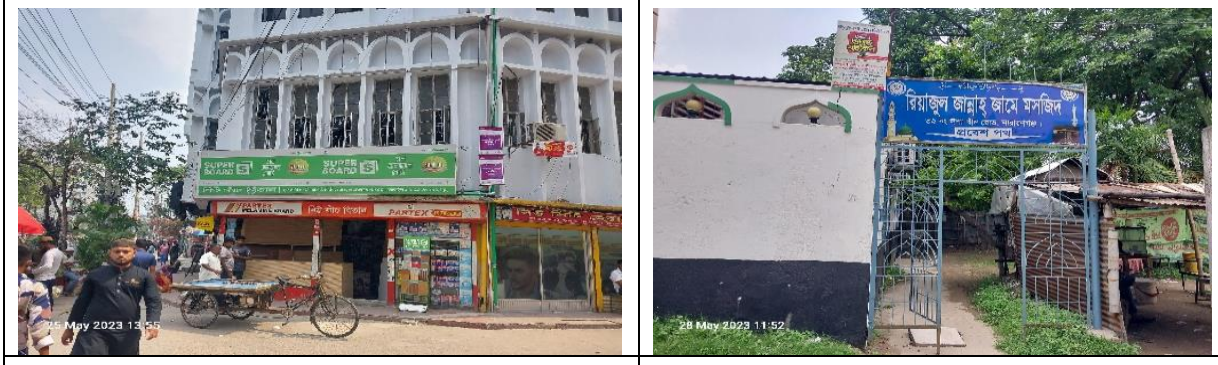
	
Sonakanda Fort	**Hajiganj Fort**

Figure 35: Maps Showing Sonakanda Fort and Hajiganj Fort from Nearest Alignments

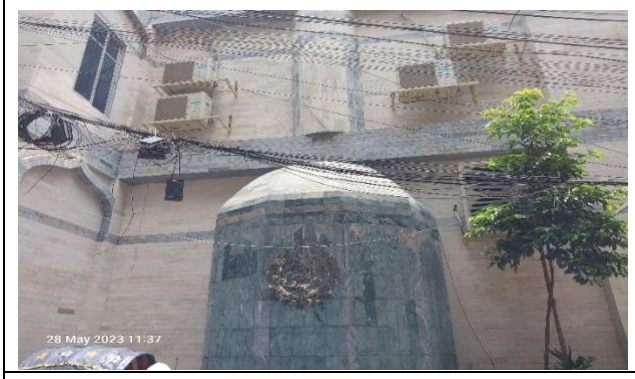


130. In addition, there are 524 mosques, 61 temples, 5 pagodas and 1 church in the NCC area. Easements and rights of way separate the boundaries of these physical cultural resources (PCRs) from the roads where civil works will be undertaken. These easements and rights of way have varying widths (1 – 20 meters), which are deemed enough to ensure pipelaying during construction phase will not impact the PCRs. Typical and inherent in community setting in Bangladesh are properties or structures, such as mosques or eidgahs, built very near the boundaries of roads. For works in these relatively constricted or congested areas, the excavation protocol provided in this IEE report (see Chapter V Section C) will be followed to ensure no impact occurs to the PCRs. Sample PCRs that is very near the roads is in Figure below.

Figure 36: Samples of Religious Structures Located Along Drain Alignments



Zone-1	Zone -3

	
Zone-3	**Zone-4**

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Introduction

131. Environmental impact assessment is the systematic identification and evaluation of the potential impacts (effects) of proposed projects, plans, programs, or legislative actions relative to the physical, chemical, biological, cultural, and socioeconomic components of the total environment. The primary purpose of this assessment process is to encourage the consideration of the environmental issues in planning and decision making and to ultimately arrive at actions that are more environmentally compatible.[26]

132. Impact assessment must take account of the nature, scale and duration of effects on the environment, whether such effects are positive (beneficial) or negative (detrimental). It is also imperative that each issue/impact is assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimization of an impact is noted. The environmental impact assessment is focused on the following phases of the project namely: (i) pre-construction; (ii) construction phase; and (ii) operation phase. As the subproject entails development of water supply infrastructures, which will be permanent, decommissioning is not applicable to this specific subproject.

133. The subproject area will require extensive site preparation for all the components. Environmental clearance from the DOE to start the construction works is also necessary. The proposed major activities will involve earth filling, construction of labor camps, site preparation, transportation of machinery and ancillaries, storage of equipment and materials for construction, erection of all equipment and machineries, etc. The subproject activities will have diversified impacts on the environment and socio-economic conditions of the local people. Among the impacts from the proposed activities, some are temporary in nature and limited to pre-construction and construction period, and others are continuous until the operation phase.

134. Most of the possible impacts are largely construction-related and can be addressed through adoption of good engineering practices, good housekeeping, better construction materials management at site, observing health and safety for workers and community people during subproject implementation. A number of activities with possible impacts on existing

[26] Environmental Impact Assessment by Larry W. Canter. McGraw-Hill Publications. 1996.

environmental settings were identified and their individual mitigation measures to be addressed during construction were indicated. Some of the impacts will be minimized within permissible limits by following site-specific mitigation measures as required. Causing disturbances, dust generation and other nuisance during the busy working hours of the day, clearing of vegetations during site preparation and labor camp induced sanitation and social stress are the most significant impacts of the construction works.

B. Impact Assessment

1. Methodology

135. Potential environmental and social impacts were identified on the basis of the review and analysis of the primary and secondary data or information and stakeholder consultations, and several field visits to the sites. In order to sketch out the potential impacts posed by the subproject interventions, it was necessary to single out every activity under the subproject; thereafter a detail understanding of the existing environmental and socio-economic settings of the subproject area was made. The significance of potential impacts was assessed using the criteria and methodology given below.

136. **Impact Magnitude.** Interventions associated with this subproject involves traditional construction activities in linear works for the drainage construction and rehabilitation works along the ROWs of existing roads. Allied works include excavation, dredging, and concreting for the drainage system. Depending on the types of activities, potential impacts of the subproject has been categorized as major, moderate, minor or negligible based on consideration of the parameters such as: (i) duration of the impact; (ii) spatial extent of the impact; (iii) reversibility; (iv) likelihood; and (v) legal standards and established professional criteria. These magnitude categories are defined in the below Table.

Table 32: Parameters for Determining Magnitude

Parameter	Major	Medium/Moderate	Minor	Negligible
Duration of potential impact	Long term (more than 15 years)	Medium Term Lifespan of the project (5 to 15 years)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of the potential impact	Widespread far beyond project boundaries	Beyond immediate Project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impacts	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	Baseline requires a year or so with some interventions to return to baseline	Baseline returns naturally or with limited intervention within a few months	Baseline remains constant

Parameter	Major	Medium/Moderate	Minor	Negligible
Legal standards and established professional criteria	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but breaches international lender guidelines in one or more parameters	Meets minimum national standard limits or international guidelines	Not applicable
Likelihood of potential impacts occurring	Occurs under typical operating or construction conditions (Certain)	Occurs under worst case (negative impact) or best case (positive impact) operating conditions (Likely)	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to occur

137. **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 subproject's potential impacts are outlined in the following Table.

Table 33: 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

138. **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 34: 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

139. The above methodology is also used to assess the residual impact after all the mitigation measures proposed have been applied. Normally, when the significance of residual impact is rated as either low or negligible, it means the mitigation measures are effective to address the impacts. However, when the significance of residual impact results to a rating in the range of

moderate to high or critical, it means the mitigation measures are not effective enough to address the issues. In this case, either change in design or compensatory/offset measure is necessary.

1. Summary of Impacts

140. The subproject'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.

Table 35: Summary of the Potential Impacts of the Project

Potential Impacts	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Design/Pre-Construction Phase								
Natural Hazards	Long term	Local	No	Certain	Medium	Mild	Moderate	Negligible
Disruption of existing utilities and services	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Health hazard from asbestos-containing materials	Long term	Local	Yes	Occasional	Medium	Mild	Moderate	Negligible
Spoil Disposal Planning	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Physical Cultural Resources	Long term	Global (due to potential Outstanding Universal Value or OUV)	No	Occasional	Medium	Mild	Moderate	Negligible
Consents, Permits, NOCs, Clearances etc.	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Contractor Mobilization	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Construction camps / workers' accommodation	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Updating of IEE and Preparation of SEMP	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Community awareness	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
EMP Implementation Training	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Construction Phase								
Sources of Materials	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to Topography and Aesthetics	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to Structures Due to Excavation Works	Short term	Local	No	Likely	Medium	Mild	Moderate	Negligible
Impact to Surface Water	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible

Potential Impacts	Duration of Impact	Spatial Extent	Reversible or not	Likelihood	Magnitude	Sensitivity	Significance Prior to Mitigation	Significance after Mitigation
Impact to Groundwater Quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to Ambient Air Quality	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to Noise and Vibration Level	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact to Underground PCRs (Relics)	Long term	Global (due to potential OUV)	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact to Community Health and Safety	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact to Occupational Health and Safety	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact on Local Festivals and Cultural Practices	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact to Terrestrial Flora and Fauna Resources	Short term	Local	Yes	Occasional	Medium	Mild	Moderate	Negligible
Impact o Socio-economic Resources	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Impact on Employment	Short term	Local	Yes	Certain	Minor	Mild	Positive	Positive
Post-construction Waste Management, Disposal and Site Restoration	Short term	Local	Yes	Certain	Medium	Mild	Moderate	Negligible
Operation and Maintenance Phase								
Impact due to drainage maintenance	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact to Community Health and Safety	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible
Impact to Occupational Health and Safety	Short term	Local	Yes	Likely	Medium	Mild	Moderate	Negligible

C. Anticipated Impacts and Mitigation Measures During Design Phase and Pre-Construction Phase

1. Natural Hazards

141. **Impact.** The seismicity map of Bangladesh shows that Narayanganj lies in Zone-2 which shows intermediate level of seismic activity (see **Figure 16** in Chapter IV hereof). While the subproject area did not experience significant seismic events in years, there is a likelihood that the site will be impacted by one. Apart from this potential seismic event, other extreme natural events such as unprecedented flooding could also potentially disturb the land within the NCC area. All these events cause damage to any infrastructures that will be built over the lands, including land subsidence or landslides in areas bordering water bodies. Damage to the drainage system is also likely, which may result to severe flooding and aggravated water logging in the city.

142. **Mitigation.** Mitigation measures include the following:

(i) Ensure design is based on the basic hydraulic principles of designing a storm drainage system, taking into consideration the impact of climate change over the long term. This includes proper estimation of volumetric flows during various seasons, sizing of inlet structures in drains, cross sectional area of drain that will accommodate the expected throughput, and other hydrologic and hydraulic design requirements;
(ii) Use of construction materials that could withstand potential stresses during extreme events, temperatures, pressures, etc.; and
(iii) The structural designs of the drainage infrastructures shall comply with relevant guidance such as Bangladesh National Building Code, etc. to ensure the structures can withstand possible seismic events in Seismic Zone 2 areas, including climate-induced events that may happen in the future.

2. Disruption of existing utilities and services

143. **Impacts.** All alignments of the subproject linear works will pass through roads in the different parts of NCC. There is high likelihood that these will cross, intercept and/or align with existing utilities and services, such as underground and overground cables, electricity posts, etc., already installed in these areas. Any damage to these utilities will disrupt the daily lives and livelihood activities of the people affected. The potential impacts arising from disruption and damage to public utilities are summarized in following table.

Table 36: Potential Impacts of Disruption to Public Utilities

Disrupted or Damaged Utility	Potential Impacts
Electricity Posts and Cables[a]	Interruption of electric supply
	Personal injury due to electrocution
	Cost of Repair/Delay to Works
Water Pipelines[b]	Interruption of water supply
	Cost of Repair/Delay to Works
Telephone and/or Internet Cables[c]	Interruption of communication system
	Cost of Repair/Delay to Works

[a] Owned by Bangladesh Power Development Board
[b] Owned by NCC
[c] Various telecom companies in Bangladesh, depending on location

144. **Mitigation Measures.** Recorded drawings of underground utility services are not always accurate, and the Contractor shall accurately locate all services, by trial pits, if necessary, before work commences in any given area. Nevertheless, accidents could occur where small diameter water pipelines and low voltage power cables are unrecorded or where an excavator operator carelessly swings an extended boom into overhead cables. All such incidents shall be reported to the engineer, and the Contractor shall be responsible for the expeditious repair of accidental damage.

145. Damage to any utility at a defined site shall be made good to the satisfaction of the responsible agency at the Contractor's cost. Damage to utilities not defined prior to construction, despite the Contractor having undertaken all reasonable liaisons with the responsible agencies, shall not be the responsibility of the Contractor. It shall be the responsibility of NCC to ensure the utilities agencies respond in time to the Contractor's requests for information.

146. Contractor shall liaise with each of the agencies (e.g. Roads and Highway Department, Dhaka Power Distribution Company, and Telecom Companies) responsible for the maintenance of utilities that are to be crossed, temporarily diverted or otherwise affected by the works as to the timing and nature of any disruption of service. Where required, the responsible agency shall be requested by NCC to carry out the necessary works at the time required and at NCC cost. The tender documents shall contain sufficient information on utilities at the sites to permit the Contractor to include the cost of the works for which it is responsible in the bid.

3. Risk of health hazard from asbestos-containing materials (ACMs)

147. **Impacts**. With the assessment of the existing drinking water distribution network in the entire NCC area, it was determined that aggregate of 10.2 km of the network is made of asbestos cement (AC) pipe. Thus, during the drainage works (either for new drains or rehabilitation of new drains) there may be instances particularly in narrower lanes that AC pipes might still be accidentally encountered and/or damaged during construction phase or even during the operation phase.

148. Handling asbestos cement pipes may result to the generation of asbestos dust and fibers, which could go airborne and harm the workers and the public. When inhaled, asbestos fibers may cause long term health issues such as asbestosis and other lung inflammation and diseases including cancer.

149. **Mitigation Measures**. While the water supply subproject under the overall project will not touch or disturb the AC pipes, it is important for the drainage subproject to also be able to implement appropriate measures in case of unintended encounter of AC pipes. The following mitigation measures are only put in place as precaution during implementation. There are two levels of managing health risks related to asbestos – during design stage and finalization of bidding and contract documents, and during pre-construction phase by the winning Contractor.

Design, and Bidding and Contract Document Preparation Stage.

(i) The bidding and contract documents need to recognize the likely presence of asbestos-containing materials (ACM) such as asbestos cement (AC) pipes along the drainage alignments, including their extent such as length or volume, as may be available.
(ii) If sufficient information is not available from the Employer (NCC) or PMU, the bidding and contract documents need to emphasize the need to conduct field

survey together with the winning bidder to identify the alignments having AC pipes or infrastructures having ACMs prior to any mobilization;

(iii) All costs related to the development and implementation of ACM Management Plan (AMP) shall be borne by the Contractor. Appropriation or budgeting should include, among others, the following:
   a. Training of workers about the health hazards of asbestos to themselves and their families;
   b. Work clothing or PPEs required when handling ACMs;
   c. Double changing rooms and wash facilities to prevent dust from going home on street clothes; and
   d. Periodic medical examinations of workers.

Pre-construction Phase by the Contractor.

(i) Develop and implement an asbestos-containing materials (ACM) Management Plan (AMP) that includes identification of hazards, the use of proper safety gear, and handling and disposal methods. The AMP should be able to provide all explanations that are understandable to ordinary laborers or employees of the Contractor. The Contractor may refer to ADB's Good Practice Guidance for the Management and Control of Asbestos (Protecting Workplaces and Communities from Asbestos Exposure Risks).[27] A sample AMP is in **Appendix 7**, which was developed under an ADB technical assistance that supported a similar type of ADB-funded project in the water sector in South Asia. In summary, the AMP should include the best practices in handling and disposal of ACM, such as, among others, the following:

Working Safely at Sites:

   a. When working with ACMs such as AC pipes, wear the appropriate PPEs including respirator or dust mask;
   b. Make sure the mask has two straps to hold it firmly in place. Don't use masks that only have one;
   c. Also wear a hard hat, gloves, disposable coveralls with a hood, and safety glasses or goggles to protect eyes;
   d. Do not eat, drink or smoke in the work area as the dust may be inhaled or eaten. Wash hands and face with soap and water before meal breaks and when finished work for the day;
   e. Do not use power tools. Asbestos fibers can be released if power tools are used for anything other than for the removal of screws;
   f. Do not water blast or scrub with a stiff broom or brush. If the material has been accidentally water blasted or has suddenly deteriorated in some way, call a licensed asbestos removal contractor;
   g. Wet gently with water when removing asbestos cement pipes, use a pump spray to lightly dampen the pipes and keep the dust down. Remember not to water blast ACMs;
   h. Avoid drilling and cutting into asbestos products. Do not drill holes through and never cut. Instead remove the entire product and replace it with a non-asbestos product;
   i. Do not drop fiber pipes to minimize breakage. Remove them carefully. Lower them to the ground;

[27] https://www.adb.org/publications/good-practice-management-control-asbestos

j. Lay plastic sheeting under the work area to prevent any dust contaminating the ground. Use 200 micron thick plastic sheeting or bags; these must not be made from recycled materials or re-used for any other purpose;
k. The work area has to be barricaded and there should be no unauthorized person allowed. Only trained ACM expert or workers should be allowed to handle the ACM along with the EHS Expert of Contractor.
l. When working near houses, advise residents to close windows and doors and seal vents to stop dust getting into the houses;
m. All the broken AC pipes have to collected and stacked properly with 200 micron plastic wrapping with winning signage;
n. Do not leave plastic sheet lying about where they may be further broken or crushed by people or traffic;
o. Remove all ACM by the trained handler; and
p. During dry climatic conditions, due care must be taken to see that no waste broken pipes or fittings are left loose and outside the confined area and may be dampened as required.

Disposal of AMC:

q. Due care has to be taken to collect the dampened waste in a permissible standard bags with proper warning signage's.
r. The plastic bags must have legible note:
   Waste Type:
   - ❑ Date of packing:
   - ❑ Qty/Numbers:
   - ❑ Packed by:
   - ❑ Warning Signage:
   - ❑ Disposal:

s. The wastages packed have to be disposed off to Treatment, Storage or Disposal Facility(TSDF).

(ii) The AMP shall be submitted to PMU for approval;
(iii) Ensure all its personnel and laborers are trained to enable them understand health risks associated with asbestos from AC pipes, how to identify AC pipes, and how to properly handle AC pipes based on the AMP it developed for the subproject;
(iv) With support from the PMU and prior to mobilization, conduct reconnaissance of alignments believed to be where AC pipes are laid and undertake determination or sampling following related protocol in the AMP;
(v) Based on the reconnaissance, establish a recording system that will note the locations of AC pipes. This record shall be maintained and updated during construction phase should there be other additional AC pipe alignments identified or encountered during pipelaying works; and
(vi) Submit to PMU updated records of AC pipe alignments encountered, if any, as part of its regular monitoring reports to PMU.

4. Disposal Sites

150. **Impact.** The subproject is expected to generate significant amounts of spoils during construction phase due to excavation activities along new drainage alignments, and to desilting and re-excavation of existing drainages in the city. Huge volume of municipal solid wastes will likely be recovered from these existing drainages and canals during the rehabilitation and construction works. Assuming no other uses for excess spoils, their indiscriminate or unmanaged disposal will negatively impact the environment, such as siltation and clogging of canals, damage

to paved roads, and safety to pedestrians and community as a whole. The same fate could happen to the municipal solid wastes if not managed properly at the sites.

151. **Mitigation**. Prior to award of contract, NCC will identify a location for the disposal of excess spoils that will be generated during the construction phase. The disposal location will need to obtain clearance from relevant government agencies having jurisdiction over such location. No award of the contract shall be made until disposal location and relevant clearance are obtained. The Jalkuri Sanitary Landfill is an indicative choice, however, necessary assessment is needed on whether or not the landfill will be able to accommodate the spoils, and that necessary clearance from the operator of the landfill will be required. Jalkuri site is about 4.5 km from the NCC area.

5. Physical Cultural Resources

152. **Impact**. The alignments of the drainage network may pass through near or adjacent locally important cultural heritage monuments. Damage to these physical cultural resources (PCRs) could create conflict with the local people and the government as a whole.

153. **Mitigation**. . Ensure that the bidding and contract document has the condition for Contractor to undertake specific steps on how to avoid impacts to these PCRs, such as the following:

(i) Mandatory visit to all alignments to identify all possible PCRs that may be affected by the construction and rehabilitation works, such as mosques, eidgahs (prayer areas), heritage sites, and other locally important monuments. Results should be recorded and put to the attention of the engineers in charge during construction phase;
(ii) Strictly follow methodologies and protocols developed for all types of excavation works as discussed in this IEE; and
(iii) Develop other mitigation measures that will be used during subproject implementation that may not be available in the methodologies and protocols discussed in this IEE. However, these mitigation measures shall be consistent or aligned with the established methodologies and protocols, with the intent to protect any PCRs found at the subproject sites.

6. Consents, Permits and Clearances

154. **Impacts.** Without permission, the subproject cannot be implemented. Failure to obtain necessary consents, permits, and other appropriate regulatory clearances can result to design revisions and work stoppage.

155. **Mitigation.** All of the necessary consents, permits, and clearances shall be obtained before the start of civil works and acknowledged in writing and provide report on compliance all obtained permits, clearance, NOCs, etc. Permissions and clearances are required from the following government agencies and departments:

(i) Department of Environment;
(ii) BIWTA;
(iii) NCC; and
(iv) Other agencies as may be determined during the pre-construction phase.

7. Contractor Mobilization.

156. **Impact**. Contractor's fielding of equipment and manpower to the sites will likely impact baseline site conditions and potentially damage private properties and public properties, including cultural heritage sites. Safety of both workers and the community will also be likely affected due to movements of both workers and construction equipment.

157. **Mitigation**. Immediately after award of its contract, the Contractor shall undertake all pre-mobilization works and plans in order to ensure impacts are avoided on natural environment and man-made structures specific to different subproject sites, including any disturbance to existing customs, movements and way of life of local people in these locations. No mobilization and civil works shall be undertaken unless the following have been complied with by the Contractor:

(i) Developed the required site-specific EMPs (SEMPs) and these are approved by PMU with support from MDSC;
(ii) Developed a Traffic Management Plan covering all subproject sites and their vicinities, in coordination with local traffic police. Contractor shall have traffic management plan in place prior to the excavation. Sample outline for Traffic Management Plan is in **Appendix 8**;
(iii) Developed a Spoil Management Plan and Waste Management Plan that will include information on the government-approved disposal site and the route from subproject locations to the said site. Sample outlines for the Spoil Management Plan and Waste Management Plan are in **Appendix 9** and **Appendix 10**, respectively. The Soil Management Plan, in particular, should provide all the necessary steps to handle and dispose using practical approaches and environmentally sound manner the expected volume of dredged materials from drainage rehabilitation works, including the disposal site as discussed above;
(iv) Established environmentally sound sewage facilities for all offsite facilities and offices, including construction camps to ensure no pollutive discharge to Shitalakhya river or any other water bodies. Design considerations for sewage facilities are in **Appendix 11**; and
(v) Developed a Health and Safety Plan approved by PMU with support from MDSC. The plan will include specific steps to manage potential spread of infectious diseases. Sample outline for Health and Safety Plan is in **Appendix 12**.

8. Construction Camps or Workers' Accommodation

158. **Impact**. There may be instances that workers will need to stay within or near the construction sites. Contractors would normally provide construction camps or accommodation at these sites. However, the haphazard construction of these camps without basic amenities could result in social stress and eventual degradation of the local environment.

159. **Mitigation**. The Contractor will need to ensure that the camps or accommodations be provided with sanitary amenities at designated areas. In addition to any local regulations, Contractor will need to follow the standards for workers accommodation pertaining to *"Workers' accommodation: processes and standards. A guidance note by IFC and the EBRD" 2009*.[28] This shall include the development of a Sewage Management Plan to manage effluents from construction camps and Contractor's offices, which should be incorporated in the facility designs. This shall include environmentally sound sewage facilities to manage septage/sewage from

[28] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

construction camps and Contractor's offices, which should be incorporated in the facility designs. Construction notes for environmentally sound sewage facilities are in **Appendix 11**.

9. Updating of IEE and Preparation of SEMP

160. PMU will update IEE based on final detailed designs to reflect any changes, and submit to ADB for review, clearance, and disclosure prior to bidding. The cleared updated IEE shall be attached to the bidding and contract documents. After the award of contract, Contractor shall be responsible for preparing the SEMPs. The SEMPs shall be based on the EMP in the updated IEE report, with details on staff, implementation schedules, monitoring procedures, and resources, including costs for implementing measures against infectious diseases that may arise during subproject implementation. The SEMPs shall also include detailed health and safety plan with monitoring and reporting procedures consistent with national guidelines and internationally recognized standards or guidelines such as the WHO guidelines. Contractor will submit its SEMPs to PMU, and PMU will review and approve accordingly. The approved SEMPs will be the basis for monitoring by PMU and MDSC. The SEMPs will allow PMU, construction supervision engineer to focus on what are specific items expected from the Contractor regarding environmental safeguards on a day-to-day basis. With the SEMPs, PMU can easily verify the associated environmental requirements each time the Contractor will request approval for work schedules.

10. Community Awareness

161. Consultations have been undertaken during the subproject preparation and during the approval stage of the overall project. However, before the start of subproject implementation, the local population should be well aware of the final schedule. There should be regular interaction with the local population and make them understand the subproject activities. Without proper interaction with local communities and/or with stakeholders may lead to confusion and agitation and non-cooperation of local people. Important information needed to be disseminated to the people are, among others, the following:

(i) Refresher on the overview and objectives of the subproject;
(ii) Preliminary and/or final detailed design of subproject components;
(iii) Schedule of implementation;
(iv) Potential environmental and social impacts (positive and negative) of the subproject, and the proposed mitigation measures for the perceived negative impacts; and
(v) Grievance redress mechanism and contact details of the subproject.

11. EMP Implementation Training

162. Often lack of proper training to implement the EMP stipulated in the bid document leads to mismanaged environmental safeguards. Therefore, EMP training for the Contractor, workers and implementing agency is necessary before construction goes on-board. MDSC will provide the training needs before construction starts. This training will aim to ensure all involved parties (Contractor, workers and representatives from NCC through the PMU) understand the nature and purpose of EMP implementation, including spoils management, standard operating procedures for construction works; community and occupational health and safety, core labor standards and laws, applicable environmental laws, etc.

D. Anticipated Impacts and Mitigation Measures During Construction Phase

1. Sources of Materials

163. **Impacts.** Extraction of construction materials that will be used for the subproject (cement, sand, aggregates) can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.

164. **Mitigation.** PMU, with support from MDSC, will guide the subproject Contractor in minimizing the use of non-renewable resources and rock-based materials. The Contractor will be responsible for:

(i) Sourcing construction materials, including aggregates, etc., from legitimate suppliers authorized by the government; and
(ii) Maintain a construction material register at the site.

2. Impact to Topography and Aesthetics

165. Excavation and other construction works for the subproject will affect the topography and aesthetics at the sites due to accumulation of unmanaged spoils and construction debris.

166. **Mitigation**. Contractor to implement the Spoil Management Plan, and in addition, the following measures (if not specifically included in the Spoil Management Plan):

(i) Avoid storing spoils at the vicinity of excavation or construction sites for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites following the Spoil Management Plan;
(ii) Dispose only in the designated disposal areas identified under the subproject;
(iii) Ensure adequate compaction, and drainage system around the disposal areas;
(iv) Ensure disposal areas are utilized up to their capacity limit only and in accordance with the required sloping and leveling/grading specification approved under the subproject; and
(v) If disposal area reaches the limit, utilize another designated disposal area approved under the subproject.

3. Impact to Structures During Excavation

167. Some alignments also pass through various roads (including many narrow roads) with old and fragile residential and commercial buildings on both sides. The foundation of these structures could be damaged due to vibration, or collapse of excavated trench.

Figure 37: Typical Roads in Narayanganj City Corporation

Widest Road

4-lane Road with Vendors

Typical Alley/Road in a Residential Area

Typical Road in a Residential Area

Typical Road in Commercial Area

Narrow Alley in a Residential Area

169. **Mitigation**. Excavation shall be avoided during rainy days and seasons all throughout the subproject area. For excavation of more than 1m depth or depending on site condition, shoring shall be applied to avoid any sort of collapse and maintaining safety of lives and property. Proper barricade and signage boards shall be installed during excavation to avoid unauthorized person entering into the construction site. Shoring shall be in place in each excavated trench along the alignment. Excavated materials shall be handled properly; which shall be loaded to dump truck and shall be taken to temporary storage area (spoils to be used for backfilling or reinstatement works) or disposal site (for the excess spoils). The excavated material shall not be stored along the excavated trench. Table below provides some methodologies that need to be followed by the Contractor.

Table 37: Excavation Methods By Area Type[a]

Excavation in all areas:

- Materials from excavated trench will be transported and stacked to the nearest open space to be decided by the Engineer-in-Charge (or equivalent) or the place allocated by Contractor. For loading and unloading, small tippers will be used. This excavated material shall be brought back to the site of work for filling the trench. Shoring sheeting and bracing will be carried out accordingly depending on depth of excavation and nearness to structures.
- In case the presence of water is likely to create unstable soil conditions, a well point system erected on both sides of the trench shall be employed to drain the immediate area of the trench prior to excavation operation. A well point system consists of a series of perforated pipes driven into the water bearing strata on both sides of a trench and connected with a header pipe and vacuum pump. If excavation is deeper than necessary, the same shall be fitted and stabilized before laying the pipes.
- The proposed excavation at any one time shall be limited to such lengths, which does not cause inconvenience to surrounding inhabitants and road traffic. All excavations left unattended shall be adequately protected with approved fencing and barricades and with flashing lights where required.
- Bypass way of at least 1 m for people will be provided with proper barricades and placing chequered plates supported on channels.
- Any archaeological artifacts identified during trench excavation will follow the chance finds procedure.

Industrial zone, wide streets

- The excavation of trenches for drainage shall be done mechanically using appropriate equipment and some portions manually.
- The excavation of trench will be carried out for every 15 to 25 m, or practical segment length that could avoid or minimize disruption of activities in the area.
- Excavation will be carried out during the night time as far as possible.
- Vibration limit of 50 mm/sec Peak Particle Velocity. Frequency limit of not less than 10Hz.
- Any archaeological artifacts identified during trench excavation will follow the chance finds procedure.

Residential areas, narrow lanes.

- The excavation of trenches for drainage shall be done half mechanically and half manually using appropriate equipment.
- Small equipment and vehicle will be used especially small JCBs for excavation, small tipper trucks, compactor vibration machine, etc.
- Hand ramming is proposed for compaction and small vibration machine is allowed in these areas but must not exceed vibration limits.
- Vibration limit of 10 mm/sec Peak Particle Velocity. Frequency limit of not less than 10Hz.
- The excavation of trench will be carried out for every 8 to 25 m, or where at least one pipe can be installed.
- Excavation will be carried out during the night time as far as possible, or depending on the extent of use of the road lanes during day time. If the road lane is not a busy area during the day, excavation will be carried out during the day to avoid disturbance to sleeping residents during night time.

Areas with fragile buildings or structures

- The excavation of trenches for drainages shall be done full manually using appropriate equipment.
- Hand ramming or small vibration machine where unavoidable is allowed in these areas, and must not exceed vibration limits.
- Vibration limit of 5 mm/sec Peak Particle Velocity . Frequency limit of not less than 10Hz.
- The excavation of trench will be carried out for every 8 to 10 m, or where at least one pipe can be installed.
- Excavation will be carried out only during day to more easily identify chance finds. Pipe installation and site reinstatement may proceed at night time if required.
- Equipment and heavy machines will not be used for trench excavation or compaction if works are adjacent cultural heritage structures.

● Excavation work will be carried out in piece meal approach.

[a] Adopted from a result of expert study and recommendations for excavation activities within or near heritage sites, busy areas, residential areas, narrow lanes with sensitive or fragile structures, etc. ADB-funded NEP-Kathmandu Valley Wastewater Management Project. 2020. This was modified accordingly to refer drainage-related works.

4. Impact to Surface Water Quality

170. The locations of the subproject components are near Shitalakhya river and other smaller canals in the city. Excavation and construction activities may result to accidental spills of chemicals and siltation that could threaten or further deteriorate the quality of these receiving bodies of water.

Figure 38: Sample Alignment Near Shitalakhya River

171. **Mitigation**. Contractor will need to implement the following measures:

(i) Dispose excess spoils only in the designated disposal areas identified under the subproject;
(ii) Avoid storing spoils at the vicinity of site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area;
(iii) To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas;
(iv) Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer;
(v) Silt traps to be provided at construction area near receiving bodies of water;
(vi) No equipment or machinery shall be operated outside the work areas;

(vii) Avoid spillage of fuels, chemicals and lubricants. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume;
(viii) Ensure that drains are not blocked with excavated soil;
(ix) Locate stockyards away from canals or receiving bodies of water;
(x) Ensure construction camps, and Contractor's offices are provided with sanitary amenities at designated areas. In addition to any local regulations, Contractor will need to follow the standards for workers accommodation pertaining to *"Workers' accommodation: processes and standards. A guidance note by IFC and the EBRD" 2009*.[29];
(xi) Clean up of the area after the completion and prior to the onset of monsoon season; and
(xii) Avoid scheduling of excavation work during the monsoon season. Earthworks should be undertaken during dry season.

5. Impact to Groundwater Quality

172. The subproject is planned to be implemented in 4 years. With this kind of undertaking, contractors normally establish their site offices, storage sites and workers' camps. Operational activities and use of these facilities during the construction period could potentially contaminate groundwater resource due to seepage of liquid wastes and chemicals from the sites.

173. **Mitigation**. In addition to the mitigation measures described to prevent impact to surface waters, Contractor will need to implement the following measures:

(i) Store fuel, oil and other chemicals in secure, managed areas with lined impervious floors and bunded with 110% by volume;
(ii) Ensure refueling area has lining to avoid seepage of unavoidable spills during refueling. Ensure to clean up spills immediately and all used cleaning materials are disposed properly;
(iii) Ensure to provide portable toilets in all construction camps to discourage injecting septic wastes on land;
(iv) Avoid cutting of trees or vegetations within and around the construction camps and sites; and
(v) Conduct ground water quality monitoring, particularly at sites near fuel depot or refueling site and construction camps. Ensure to conduct at least one sampling every six months. Important parameters to test are Oil and Grease, and Fecal Coliform.

6. Impact to Ambient Air Quality

174. Excavation and construction activities will result to generation of dust that could remain airborne within and around the subproject sites. Operation of construction heavy equipment and vehicles will also result to release of emissions. The dust and emissions are significant factors that could degrade the ambient air quality in the area, which in turn affect the general wellbeing of the residents in households or establishments nearby.

[29] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

175. **Mitigation**. Contractor will need to implement the following measures:

(i) Conventional dust control measures such as use of water sprays and minimizing hauling and vehicle movements during windy times of the day or night;
(ii) Proper covering (e.g. tarpaulin) of hauling equipment such as dump trucks during transport of materials or spoils;
(iii) Provide temporary barriers or covers around active site excavation areas;
(iv) Limit vehicles speed at work site enough to not cause vigorous suspension of dust;
(v) Prohibit idling of heavy equipment or vehicles for a long time;
(vi) Regular maintenance of heavy equipment and vehicles to ensure compliance with national vehicle emissions standards;
(vii) Prohibit burning of any liquid or solid wastes;
(viii) Conduct regular visual inspections to identify and address other potential sources of dust emissions; and
(ix) Conduct ambient air quality monitoring at strategic locations at least once every six months. Ensure that sampling locations are based on the wind and dust/smoke dispersion direction at the site.

7. Impact to Noise and Vibration Level

176. Excavation and construction activities will result to generation of noise that could disturb the construction workers, staff, and community people. Use of machinery for excavation and compaction will also result to vibration that could damage sensitive and old structures at the subproject sites.

177. **Mitigation**. Contractor will need to implement the following measures:

(i) Provide prior information of the scheduled works to nearby residents;
(ii) Use silencers for all equipment;
(iii) Avoid delivery of raw construction materials during night time;
(iv) Avoid noise-intensive activities at night time;
(v) Horns should not be used unless it is necessary to warn others or animals of the vehicle's approach and prevent any potential accident;
(vi) Minimize drop heights during delivery and stacking of raw construction materials;
(vii) Use sound barriers to lessen the noise from sites;
(viii) Maintain maximum of noise level of 45 dB(A) at the nearest residence relative to the specific worksites;
(ix) Conduct noise level monitoring. Ensure to conduct at least one sampling every six months and when construction activities are at peak. Important areas to test are at locations nearest the community residents and construction camps;
(x) Use pumping equipment with low level noise generation;
(xi) If using generators, ensure generator set complies with the noise standards;
(xii) Ensure generator set has acoustic enclosure and silencer (if necessary) in the exhaust muffler; and
(xiii) Depending on site, strictly comply with vibration limits as indicated in Table 37 when using excavation and compacting equipment.

8. Impact to Underground Physical Cultural Resources

178. **Impacts.** Bangladesh is home to many old and ancient structures. Narayanganj city is one area with a number of historical sites. Although the alignments will not encroach areas or boundaries of overground historical structures, there is a possibility that chance finds such as underground relics or structures considered as physical cultural resource (PCR) will be encountered and impacted during excavation along the drainage alignments.

179. **Mitigation.** As a precautionary approach, the Contractor will need to implement measures, including the excavation methods (see Table 37). In the event of chance finds, the Contractor will need to strictly implement the following chance finds protocol:

(i) Require the Contractor to coordinate immediately with PMU and Bangladesh Department of Archaeology (or its local office in Narayanganj, if any) for any suspicion of chance finds during excavation works;
(ii) Stop work immediately to allow further investigation if any finds are suspected; and
(iii) Request authorized person from the Bangladesh Department of Archaeology to observe when excavation resumes for the identification of the potential chance finds, and comply with further instructions.

9. Community Health and Safety

180. **Impacts.** Numerous threats could be encountered in the vicinity of the subprojects, including storage camps or yards and workers' camps. Easy access by pedestrians, animals, and other community people to the sites could expose them to these threats, such as the dangers due to moving heavy equipment or electrocution at the sites. There may also be risk of accidental fall of these community people or animals in excavated areas.

181. In case of communicable diseases such as COVID19, there is a serious threat of spreading the virus in the communities surrounding the subproject sites due to interaction of Contractor's staff and construction workers with the locals. This can lead to possible loss of human lives.

182. **Mitigation.** Contractor will need to implement the following measures:

(i) Appoint full time EHS officer per contract requirement;
(ii) Install warning signs, warning tapes, hard barricades, and notices around the work site perimeter to avoid unauthorized entry. For excavated sections that cannot be isolated or enclosed due to access issues for the community or residents, ensure to cover these with steel planks or durable wood planks during off-work hours. If during work hours that these excavated sections, especially the deep trenches, cannot be covered entirely, provide steel planks or durable wood planks with handrails that can be used by pedestrians;
(iii) Install sturdy fence around storage camps or yards and workers' camps;
(iv) Assign guards around the subproject sites, including storage camps or yards and workers' camps, on a 24/7 basis;
(v) Provide lighting all around the subproject site, including storage camps or yards and workers' camps, to ensure the perimeter is well-lit at nighttime;
(vi) Follow a code of conduct for workers, which should include restricting workers in designated areas, no open defecation, no littering, no firewood collection, no setting of fire except when needed but in designated places, no trespassing, no unauthorized overstaying at construction sites, and no obligation to undertake

potentially dangerous work without the use of proper personal protective equipment, among others;

(vii) Follow international best practices on community health and safety such as those in Section 4.3 of World Bank EHS Guidelines on Construction and Decommissioning Activities;[30] The community health and safety plan shall ensure the following:

a. implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning;
b. restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community;
c. removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; and
d. implement measure to prevent proliferation of vectors of diseases at work sites;
e. adequate space and lighting, temporary fences, shining barriers and signage at active work sites;
f. contractor's preparedness in emergency response;
g. adequate dissemination of GRM and contractor's observance and implementation of GRM; and
h. upon availability, local people should be given an opportunity for work in the subproject activities;

(viii) Follow international best practices on traffic safety such as those in Section 3.4 of the World Bank Environmental Health and Safety (EHS) Guidelines on Community Health and Safety;[31] The community health and safety plan should include the following:

a. Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. Measures should include:
   - Emphasizing safety aspects among drivers;
   - Improving driving skills and requiring licensing of drivers;
   - Adopting limits for trip duration and arranging driver rosters to avoid overtiredness;
   - Avoiding dangerous routes and times of day to reduce the risk of accidents;
   - Use of speed control devices (governors) on trucks, and remote monitoring of driver actions;
b. Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.

[30] IFC World Bank Group. 2007. https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-construction-and-decommissioning-en.pdf

[31] IFC World Bank Group. 2007. https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-community-health-and-safety-en.pdf

Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, recommended measures include:

a. Minimizing pedestrian interaction with construction vehicles;
b. Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns);
c. Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents;
d. Using locally sourced materials, whenever possible, to minimize transport distances. Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic; and
e. Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions.

(ix) Follow the established community and occupational health and safety protocol on emerging infectious diseases such as COVID-19;
(x) Maintain a complaint logbook at the site and take action promptly of complaints;
(xi) Schedule transport and hauling activities by avoiding peak traffic periods;
(xii) Clean wheels and undercarriage of haul trucks prior to leaving construction sites;
(xiii) Educate drivers and advice to limit speed between 20-25 km/h while traversing settlement areas and avoid use of horn unless necessary to prevent accidents; and
(xiv) Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement.

10. Occupational Health and Safety

183. **Impacts.** Health risks and safety problems for workers are concerns in all construction projects. Safety risks and health issues arise from storage, handling and transport of hazardous construction material. Health hazard is also significant due to exposure of workers to drainage silts or soils that could be contaminated with hazardous elements such as heavy metals and pathogens. Construction workers are also at risk of accidents due to moving vehicles, and other construction related activities. Workers are also exposed to high level of pollution from dust, exhaust of vehicles and machinery, and noise. Further, extended working hours of workers could lead to risk of accidents due to fatigue.

184. Given the experience with COVID-19 pandemic, concern is high for the site workers' safety and health. Clustering and gathering of workers can easily trigger spread of diseases. Such a situation is dangerous and could potentially lead to loss of human lives. The health risk is also very high within the construction camps due to possibility of high density and unhygienic living conditions.

185. **Mitigation.** The Contractor will need to implement its health and safety protocols approved by PMU or MDSC. This will contain normal internationally accepted procedures in relation to the risks imposed by the nature of the work to be undertaken, including risks associated with emerging infectious diseases. The Contractor shall ensure all authorized persons present on all sites, be they Contractor staff, representatives of the implementing agency or the construction manager,

or other visitors, are aware of any site-specific safety requirements and are supplied with hard hats and other protective clothing appropriate for the work being undertaken, including other precautionary measures against airborne diseases.

186. In particular, the Contractor shall implement the following mitigation measures:

(i) Appoint full time EHS officer per contract requirement;
(ii) All relevant provisions of the Bangladesh Labour Act, 2006 (and 2013 amendment) and relevant WHO guidelines will be adhered to, concerning the provision of adequate measures to avoid contracting and/or spreading diseases during construction phase;
(iii) Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities,[32] which include the following elements, whichever are applicable:

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

b. Physical Hazards
   i. Use of personal protective equipment (PPE) by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, including specific use of appropriate gumboots, gloves and other PPEs when handling and transporting silts and soils excavated from canals, and ensure these are used properly;
   ii. Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear;
   iii. Use of bracing or trench shoring on deep excavation works;
   iv. Adequate lighting in dark working areas and areas with night works;
   v. Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only;

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

vi. Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and
vii. Use of air pollution source equipment and vehicles that are well maintained and with valid permits;

c. General Facility Design and Operation
i. Regular checking of integrity of workplace structures to avoid collapse or failure;
ii. Ensuring workplace can withstand severe weather conditions;
iii. Enough work spaces available for workers, including exit routes during emergencies;
iv. Fire precautions and firefighting equipment installed;
v. First aid stations and kits are available. Trained personnel should always be available who can provide first aid measures to victims of accidents;
vi. Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only;
vii. Good working environment temperature maintained;
viii. Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and
ix. Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur.

(iv) Follow established occupational health and safety protocol on emerging infectious diseases;
(v) Provide regular health check-ups, sanitation and hygiene, health care, and control of diseases for the workforce;
(vi) Provide at cost all labor and materials and construct/install and maintain site safety, hard barricading, flexible green net, signboards, and lightings throughout the construction site;
(vii) Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards;
(viii) Make available ambulance facility at the construction site and camp site, if any;
(ix) Compensation for the loss of life (a zero tolerance to loss of life policy should be developed and implemented) or for any type of injuries; and
(x) Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.

11. Impact on Local Festivals and Cultural Practices

187. Alignments of the drainage network may pass through near or adjacent locally important cultural and religious sites such as mosques, eidgah, etc. where religious or local festivities are celebrated. Construction activities may have the potential to disrupt the smooth transition of these celebrations.

188. **Mitigation**. Contractor shall follow religious and city festival calendar to avoid impact upon local celebrations. Construction works need to be avoided or minimized during the festivals. If

excavation works or construction works have been done but remain unrestored approaching a certain festivity, alternative access to mosques and other important sites must be considered or set up.

12. Impact to Terrestrial Flora and Fauna Resources

189. While the critical habitat screening and results of site visits show no likely presence of endangered and critically endangered species per IUCN Red List, the construction phase of the subproject may pose impact to other flora and fauna resources in the immediate vicinity of the sites. Typical vegetations found along the alignments are presented in the Chapter 4 Section B of this IEE report. These vegetations were determined to be common and abundant species found elsewhere in Bangladesh.

190. **Mitigation**. The Contractor will ensure that awareness training on environmental safeguards is provided to all construction workers, which will include the following reminders that need to be observed and complied with during the construction period:

(i) Avoid any cutting of trees and shrubs at the construction site. The spaces are wide enough for any activities without cutting any of the trees or locally important plants, if any;
(ii) Prohibit use of wood as fuel at construction camp sites, if any;
(iii) Provide LPG/kerosene to workforce staying at the construction camp sites; and
(iv) Prohibit the harvest and trade of any plants or poaching of animals found in the area.

13. Impacts on Socioeconomic Resources

191. Construction works may result in temporary loss of livelihoods and interruption of social and economic activities in some alignments. In areas where there are shops or other commercial activities, these could lose some business if access is difficult for customers.

192. **Mitigation.** The Contractor will ensure the following:
(i) Adopt the GRM of the project, and respond to grievances;
(ii) The construction works do not interfere with the convenience of the public or access to, use, and occupation of public or private roads, or any other access to properties, whether public or private.
(iii) Temporary access to properties adjacent to the construction site will be provided through the construction of ramps with concrete slabs for use of pedestrians and light vehicles. Handrails may be provided to ramps or planks depending on the width of excavations;
(iv) In critical areas such as institutions, operating hours are factored into work schedules and workforce is increased for speedy completion;
(v) Advance information on works to be undertaken including appropriate signage is provided; and
(vi) The diversion is done in coordination with the traffic police division for necessary rerouting of traffic and traffic management.

14. Impact on Job Opportunities

193. Primarily a positive impact, the subproject will create significant temporary employment for construction workers, equipment maintenance and support staff. While a small number of

senior project managers may come from overseas and other specialists from elsewhere in Bangladesh, the majority of project staffs and laborers are expected to be recruited locally from within the native/local workforce.

E. Anticipated Impacts and Mitigation Measures During Post-Construction Phase

194. **Impact**. The activities of the subproject will result to sorts of construction wastes and traces of excess spoils, and dredged materials after the construction period. Indiscriminate disposal or ignoring their proper disposal could be dangerous to the environment and the people in the vicinity of the subproject sites.

195. **Mitigation**, Immediately within one week after construction phase, the Contractor shall collect all the wastes at the different sites, and implement the following. Contractor may opt to outsource this to qualified entities in NCC, provided that Contractor's EHS personnel strictly supervise the cradle-to-grave management of all these wastes. All costs related to management of these wastes shall be borne by the Contractor, or as per agreement in the contract documents.

(i) Segregate or sort all wastes according to nature (recyclable, non-recyclable, hazardous, non-hazardous or any combination);
(ii) Ensure to handover (or sell as the case may be) recyclable wastes to authorized recycling entities in Bangladesh. Contractor shall coordinate this action with NCC through the PMU;
(iii) Ensure to dispose non-recyclable and non-hazardous wastes to appropriate disposal sites. These may be collected, transported and disposed similar to how solid wastes in the city is managed. Thus, Contractor shall coordinate with NCC through the PMU in this regard;
(iv) Ensure to transport and dispose hazardous wastes using authorized hazardous waste transporters and treaters in Bangladesh. Contractor shall coordinate all actions for these wastes with NCC through the PMU; and
(v) Ensure the sites are cleared with all wastes disposed accordingly, and compliance with this measure shall be included as one of the conditions for payment to the Contractor.

F. Anticipated Impacts and Mitigation Measures During Operation Phase

196. Anticipated impacts of subproject during operation and maintenance (O&M) will be related to the maintenance works for the drainage system. These are likely to be not significant, as proper design would have been made during the design and construction phases. However, any repair works may still create impacts to both environment and the people, such as those related to increase of noise level in repair sites, and risks of accidents to community people and workers during repairs. NCC, as the ultimate management entity for the drainage system, will employ all measures in its O&M works to ensure no significant environmental impact will occur.

1. General Drainage Maintenance

197. **Impact**. Without proper maintenance, benefits of the drainage system will not be sustained. The drainage system may clog if no proper operation and maintenance is in place. Also during maintenance works, drainage system will generate wastes such as solid wastes and silts, which may also cause pollution to the immediate environment and deteriorate aesthetics in the areas affected.

198. **Mitigation**. NCC to ensure that:

(i) A program is established for the regular visual inspection of the drainage alignments to identify problems early, before they become critical (breakage, plugging, etc.);
(ii) When issues are encountered, remedial action is implemented promptly, including clearing sediment and other material that could cause blockage, and conducting any required physical repairs to the drains to prevent leaks;
(iii) A waste management plan is prepared and implemented in handling and disposing wastes generated during maintenance activities. This includes management on the disposal of solid wastes generated at the site such as the solid wastes and silts. The waste management plan should comply with all the relevant government rules and regulations, including clearances on the use of disposal sites where these wastes will be disposed. The Spoil Disposal Plan and Waste Management Plan utilized during the construction phase may be adopted, but may also be modified accordingly to fit activities during drainage maintenance works only; and
(iv) Budget a permanent allocation for undertaking the above maintenance works and allied activities for the drainage system.

2. Community Health and Safety

199. **Impact**. During maintenance works at any of the drainage alignments, neighboring community is likely to be temporarily disrupted due to various hazards such as noise, dust, disturbance to access to residential/commercial establishments, etc.

200. **Mitigation**. NCC will develop and implement an O&M Manual that will include mitigation measures, such as, among others, the following:

(i) Follow international best practices on community health and safety such as those in World Bank EHS Guidelines on Water and Sanitation;
(ii) For any re-excavation or desilting works related to the maintenance activities, the methodologies and protocols developed for the construction phase (see Table 37) shall be strictly followed; and
(iii) Noise abatement measures developed for the construction phase shall be strictly followed.

3. Occupational Health and Safety

201. **Impact**. Occupational health and safety issues in drainage management may also arise during the maintenance phase. Staff and workers are also at risk of accidents due to moving vehicles, and other hazards during maintenance works, such as exposure to high level of pollution from exhaust of vehicles and machinery, and noise. Further, extended working hours of these personnel could lead to risk of accidents due to fatigue.

202. Similarly, with the experience during the COVID19 pandemic, clustering and gathering of workers can easily trigger spread of diseases. Such a situation is dangerous and could potentially lead to loss of human lives.

203. **Mitigation.** NCC will develop and implement and O&M Manual that will include mitigation measures, such as, among others, the following:

(i) All relevant provisions of the Bangladesh Labour Act, 2006 (and its 2013 amendment) and any of its amendments, and relevant WHO guidelines;

(ii) Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Water and Sanitation,[33] which include the following elements, whichever are applicable:

a. Accidents and Injuries

i Use personal flotation device when working near bodies of water such as the Shitaklakhya river;

ii Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance;

iii Use fall protection equipment when working at heights;

iv Maintain work areas to minimize slipping and tripping hazards;

v Implement fire and explosion prevention measures in accordance with internationally accepted standards;

vi When installing or repairing components adjacent to roadways, implement procedures and traffic controls, such as:

- Establishment of work zones so as to separate workers from traffic and from equipment as much as possible;
- Reduction of allowed vehicle speeds in work zones;
- Use of high-visibility safety apparel for workers in the vicinity of traffic;
- For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing vehicles; and

vii Locate all underground utilities before digging.

b. Chemical Exposure and Hazardous Atmospheres

i Implement a training program for the workers who are exposed to various types of hazardous and toxic solid wastes from the drains, on safe handling practices and emergency response procedures;

ii Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance;

iii Prepare escape plans from areas where there might be a gaseous emissions;

iv Use personal gas detection equipment while working in confined space;

v Continuously monitor air quality in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency);

vi Periodically sample air quality in work areas for hazardous chemicals, particularly in enclosed spaces. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to

[33] IFC World Bank Group. 2007. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines/watersanitation_firstconsultation

limit worker exposure, for example collection and treatment of off-gases from air stripping;

vii Prohibit eating, smoking, and drinking except in designated areas; and

viii Rotate personnel during lengthy work activities to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials.

(ii) Follow established occupational health and safety protocol on infectious diseases such as COVID-19; and

(iii) Provide regular health check-ups, sanitation and hygiene, health care, and control of diseases for the workforce.

4. Impact Due to Continuing Discharge of Wastewater into Drains and Canals

204. During the operation phase, it is expected that the new drainage system will convey combined storm water and discharges from both residential and commercial/industrial establishments in NCC. This scenario brings about a drainage system being the conduit of wastewaters with varying pollution load. The city does not have any infrastructure or facility that cater to the effective collection and treatment of wastewater. While the subproject is envisaged to improve the drainage system and eliminate the occurrence of persistent flooding/waterlogging in low lying areas of NCC, the NCC management is keen on implementing a medium to long term plan where future investments on wastewater and sewage collection and treatment will likewise be put as a priority. Accordingly, budget constraints hinder the undertaking of all these sanitation facilities and services at the same time. Once the drainage infrastructures are improved and rehabilitated, construction of sewerage facilities will come as next priority. NCC's next plan to establish a sewerage collection and treatment system will ensure that all household discharges will be collected in a separate sewer system and conveyed to centralized wastewater or sewage treatment plants. Concept of wastewater and sewage collection and treatment is included in the drainage master plan (see Appendix 2).

205. The infrastructures for wastewater and sewage collection and treatment may be realized after the drainage subproject is completed through another government funding and/or ADB loan in the future. By the meantime until this sewerage and sanitation plan is implemented, NCC will work towards limiting pollution to the drainages and Shitalakhya river. Under its mandate and through any of its sanitation-related programs, NCC shall take more specific and measurable actions to stop sewage (black water or septage) discharge into drains by encouraging the people to construct properly design septic tanks for both households and community toilet facilities. For industrial effluents, NCC will work towards strict enforcement of pollution laws and regulations along with the Department of Environment, Ministry of Industries and local industry associations in Narayanganj city.

206. The people of NCC will be the major beneficiaries of the improved drainage system, as they will be ensured with uninterrupted flow of stormwater run-off from the many parts of the city, thus preventing waterlogging and flooding in these areas. This will improve the overall health condition of the people as water borne diseases will be reduced, so people would spend less on healthcare and lose fewer working days due to illness, thus improving their overall health, economic status, and better quality of life. This will also improve the environmental condition in these areas.

G. Cumulative Impact

207. The subproject activities, including excavation activities for linear works, would take place in existing road rights-of-way and on segmentation approach. Works will happen at certain locations at a given time that may affect small or localized areas only. The likely main impacts assessed that may have cumulative effects with the impacts of other development works in the city, would be the potential additional contribution of dust emissions and potential traffic disruption. However, the subproject excavation activities are too small in nature and will involve mitigation measures to reduce dust pollution. Linear works will happen on segmentation approach to limit the potential impact area, together with other mitigation measures to avoid traffic congestion particularly in the busy areas. As such, no impacts that have cumulative effects is envisaged.

VI. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

A. Consultation and Information Disclosure

208. Meaningful stakeholder consultation and participation is part of the subproject preparation and implementation strategy. Consultation and participation will ensure information is provided and feedback is obtained and considered on the implementation of the subproject. Affected persons will be consulted at various stages of subproject preparation to ensure: (i) incorporation of views/concerns of affected persons, particularly the vulnerable, on environmental impacts and mitigation measures; (ii) identification of any help required by affected persons during rehabilitation; and (iii) avoidance of potential conflicts for smooth subproject implementation.

209. Meaningful consultation will also provide adequate opportunities for participation of all stakeholders and inclusion of the vulnerable in subproject process. This is also the avenue where relevant information on any major changes to the subproject will be shared with beneficiaries, affected persons, vulnerable groups, and other stakeholders.

1. Objective and Purpose

210. The objectives of the consultations are to inform the project-affected people about the subproject, the present status of environmental, social and ecological condition in the area, potential impacts of the proposed subproject, suggested measures to mitigate these impacts, and at the same time to seek other possible solutions to these impacts from them. The consultations are also an avenue to reduce conflict through the early identification of controversial issues about the subproject and work with the stakeholders to find acceptable solutions; increase public confidence about the proponent, reviewers and decision makers, and develop a proposal which is truly sustainable which will be integrated into the subproject design.

2. Identification of Stakeholder

211. Consultations were organized both formally and informally at different levels including focus group discussions at the ward and community settlement level. During the field survey, significant efforts were made to identify the possible categories of stakeholders and their stakes. The stakeholders identified during field visits were the ward officials, community-based groups, professional groups (teachers, medical practitioners), labor groups (fishermen, hawkers, drivers), representatives from the Bangladesh Inland Waterways and Transport Authority, and ward residents.. All those stakeholders had different types of stakes according to their professions.

3. Summary Public Consultation Meetings

212. **Consultation Methodology.** The consultation methods adopted for these public meetings were a combination of short introductory speeches, presentation of overall project and subproject details utilizing photos and maps, and two-way discussions. The use of visual aids and materials enabled the participants to comprehend the issues easily, encouraging them to participate in the discussions more effectively and provide informed comments and opinions.

213. 27 focus group discussions (FGD) have been conducted in various wards of the city. These were participated in by different stakeholders, with each FGD had target group. FGD participants were from different professional groups: Ward Councilors, Local Businessmen, Day laborers, Local Elites, Businessmen, Landowner, Female participants, and general people of the area. These participants are aware of the present drainage situation/condition of their local areas, and that they are interested in understanding the plan being proposed by NCC for the drainage network system of the city. Minutes of meetings are in Appendix 13. A total of 332 people participated in these consultation activities, consisting of 311 males and 21 females.

214. Overall, participants were supportive and thankful of the subproject. They expressed their understanding that the project will be very important as part of improving their social life and wellbeing. Concerns related to compensations are addressed in related social safeguard documents under the subproject. Summary of the findings that are relevant to environmental safeguards is as follows:

(i) Participants reported that they learned of the government's plans for a new drainage network. They heard it from different angles, mainly from NCC officials, public representatives etc.;
(ii) They also said that there are many waterlogged drains and inadequate drains which NCC should take proper care of;
(iii) According to the responses of the participants, there are many reasons for waterlogging in the drains, such as when people dumping construction materials and garbage into the drains causing blockages;
(iv) Participants also commented that during monsoons, some drains do not function properly due to being filled with garbage or other things, and that they should be cleaned regularly;
(v) They also added that their houses are always flooded during rains because drains are not functional to allow rainwater to flow;
(vi) Most of the participants expressed their opinion that the drainage networks in their area are not fully functional due to siltation, inappropriate sizes and not covered;
(vii) Most of the participants urged NCC to construct new drains in their roads so that rain water can flow faster;
(viii) Drains that are not covered cause many health and safety issues – the participants were anxious about regarding this;
(ix) Participants supported NCC's plan to remedy the waterlogging and inadequate drains issues, and understand that the project will give them better drainage system, improve their families' health and reduce health costs, get rid of waterborne diseases and develop livelihoods. Thus, they will benefit economically from this project; and
(x) After presenting all project details, potential impacts and mitigation measures to be adopted, the participants received the information well with no negative reactions or feedbacks. This implied that the proposed environmental management and mitigation measures are acceptable to the participants. The

participants thanked the Government and NCC for taking realistic plans to ensure fully functional drains and adequate drains in every ward through the project.

4. Information Disclosure

215. Preliminary subproject information was disclosed through the different consultations done. Once the detailed designs of the various components are finalized, the same will be disseminated again, including more formally by making written documents and other materials available in form and at locations which can be easily accessed by stakeholders, such as the NCC, PMU and ward community offices. This will also include providing summary reports in the local language and posted at public locations in the wards and community settlement area. The aim is to provide wider reach and means for the receipt of comments from the general public. Subsequently, all documents will be disclosed on ADB and NCC websites. A copy of this IEE report will also be disclosed on the ADB and NCC websites.

B. Future Consultations and Communication Plan

216. Meaningful consultations with stakeholders will continue throughout subproject implementation as necessary to address issues related to environmental assessment. The consultation process will be continued and expanded during the subproject implementation to ensure stakeholders participate fully in subproject execution, as well as to implement a comprehensive information, education, and communication plan.

217. For the benefit of the community, the IEE report will be made available at (i) offices of executing and implementing agencies, (ii) ward offices; and (iii) Contractor's offices at the subproject sites. It will be ensured that the hard copies of IEE report are kept at places which are conveniently accessible to people, as a means to disclose the document and at the same time creating wider public awareness. An electronic version of the IEE report will be placed in the official website of executing and implementing agencies and the ADB website after clearance of the IEE by ADB. Moreover, all semi-annual environmental monitoring reports during subproject implementation will be available at both NCC and ADB websites.

218. Future consultation and disclosure activities shall include the following:

1. Consultations During Construction Phase

(i) Public meetings with affected communities to present the final detailed design, discuss and plan work programs and allow issues to be raised, if there still any, and addressed once construction has started; and

(ii) Smaller-scale meetings to discuss and plan construction work with individual communities to reduce disturbance and other impacts, and to provide a mechanism through which stakeholders can participate in subproject monitoring and evaluation.

2. Information Disclosure

(i) Public information campaigns (via newspaper, flyers, and media) to explain the subproject's final detailed design to the wider population of the subproject area and prepare them for disruptions they may experience once construction is underway;

(ii) 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;
(iii) Formal disclosure of completed subproject reports by making copies available at convenient locations in the subproject area, and informing the public of their availability; and
(iv) Providing a mechanism through which comments can be made.

Table 38: Indicative Communication Plan for the Subproject

Responsible Entity	Target Stakeholders	Key Concerns	Communication Method	Frequency / Schedule	Key Messages
Project Preparation					
NCC Management	Relevant government agencies - Ministry of Finance - Department of Environment	Progress of project approval by the government - financial - environmental clearance	- Meetings - Presentations - Written communications	As needed during project preparation	Agreements and solutions to getting approval
Detailed Design					
NCC / PMU /	Ward Officials Media Nongovernment Organizations Community-Based Organizations Women's Groups NCC Residents	All aspects of environmental impacts expected from the subproject / project.	- Community consultation meetings - Focus group discussions - Emails or written communications - Press Conferences	At least once in every target area during the detailed design phase	Update on Environmental Management Plan and Mitigation Measures
Construction Phase					
NCC / PMU / Contractors / Civil Works Contractors	Media Nongovernment Organizations Community-Based Organizations	- On-target project implementation - Delays of project implementation - Other public concerns	- Press Conferences - Emails or written communications - NCC website - Disclosed Semi-Annual Environmental Monitoring Reports (SEMRs) on ADB and NCC websites	At least once every semester	- Progress of project implementation - Information on project implementation delays
	Ward Officials Women's Groups Ward Residents	- Disruptions due to construction works - Community health and safety issues - Community	- Community consultation meetings - Focus group discussions - One-on-one consultations - NCC website	- Once prior to starting construction works in a particular area - As	- Scheduling of works - Community health and safety measures to be in place during

Responsible Entity	Target Stakeholders	Key Concerns	Communication Method	Frequency / Schedule	Key Messages
		residents' concerns	- Disclosed SEMRs on ADB and NCC websites	needed during construction period in a particular area	construction works
Operation Phase					
NCC / PMU / Contractors	All stakeholders	- Operation and maintenance issues on the drainage system, including other future plans to achieve the objectives of the NCC Drainage Masterplan.	- Press conferences - Press releases (print or broadcast media) - NCC Website - Social media platforms	As needed	- Solutions to O&M issues and target dates to resolve issues - Mitigation measures to address / or offset measures to temporary impacts of O&M issues.

VII. GRIEVANCE REDRESS MECHANISM

219. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of affected persons' concerns, complaints, and grievances about the social and environmental performance at the level of the overall project, including the subproject. The GRM will aim to provide a time-bound and transparent mechanism to voice out and resolve social and environmental concerns associated with the project.

220. The common GRM will provide an accessible and trusted platform for receiving and facilitating the resolution of affected persons' grievances related to the project. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.

221. The project area-wide public awareness campaigns will ensure that knowledge of the grievance redress procedures is generated. The PMU will conduct awareness campaigns to ensure that all affected persons and vulnerable households are made aware of grievance redress procedures and entitlements.

222. Affected persons will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes to be installed by PMU. Grievances can be sent by post, or by writing in a complaints register in the PMU office. The option of registering complaints on the NCC website can be explored, as this option is not available currently. Careful documentation 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 will be undertaken. The PMU social and environmental officers will have the overall responsibility for timely grievance redress on environmental and social safeguards issues and for registration of grievances, related disclosure, and communication with the aggrieved party. A copy of a proposed outline of a grievance registration form is given in

(**Appendix 14**). All the documents made available to the public will include information on the contact number, address and contact person for registering grievances, and will be disseminated throughout the project area by the PMU.

A. Existing NCC Grievance Mechanism

223. The current methods of registering complaints include complaint registration at the Office of the Executive Engineer at Godenail Water Treatment Plant, complaint registration through the concerned elected representatives (ward councilors and the Mayor). Complaints are currently conveyed through emails, phone calls, WhatsApp messages etc. The complaint receiving person channels the grievance to the concerned officer/department of NCC for resolution. Larger issues are resolved in consultation with the Mayor of NCC. The existing grievance redress process is currently not formalized.

B. Proposed Narayanganj Green and Resilient Urban Development (NGRUD) Project Grievance Mechanism

224. The existing NCC grievance redress processes will be integrated into the proposed project specific grievance redress mechanism which will be established for the project. In case of grievances that are immediate and urgent in the perception of the complainant, the Assistant Engineer/ Contractor safeguard personnel – Social and Environment / Social and Environment Officer from PMU will provide the most easily accessible or first level of contact for the quick resolution of grievances. Contact phone numbers and names of the concerned staff and Contractor, will be posted at all construction sites in visible locations. A representative of affected persons from each settlement will be a special invitee when grievances of a particular settlement are being discussed by the GRC.[34] Given below is the proposed grievance redress mechanism for the project.

(i) **Local level**: The on-site contractors Safeguards (social and environment) Officer/ Assistant Engineer of the PMU/ Social and Environment Officer, NCC will receive and record the complaint at the subproject site. Alternatively, the complaint can be registered by phone call, message, email, or on the NCC website and this will be reverted to the onsite personnel for 1st level resolution. The complaint will be reviewed by local level GRC comprising of: (i) Deputy Project Director, NCC, who will be the Convener; other members include Social and Environment officer, NCC; (iii) Councilor- reserved seat; (iv) Councilor- concerned ward; (v) GRM Focal (Chief Social Welfare Officer) (vi) Assistant Engineer NCC (designated as member secretary) (iv) Contractors' safeguards personnel- social and environment (v) Resettlement/ Environment Specialist of the MDSC. The first level or the local level officers/ GRC will try to resolve the issue on-site in consultation with the aggrieved party. This will be done within 7 days of receipt of a complaint/ grievance;

(ii) **Project level**: All grievances that cannot be redressed within 7 days at the local level will be brought to the notice of the Project GRC, comprising of Project Director who will be the Convener; other members include Deputy Project Director (sectoral); Social Safeguards Officer (PMU); Environment Safeguards Officer (PMU); Team Leader, MDSC (designated as member secretary) and Social and

[34] Any travel expenses incurred by affected persons and their representatives (special invitees) to attend the GRC meetings shall be covered under the budgetary provision made for GRC.

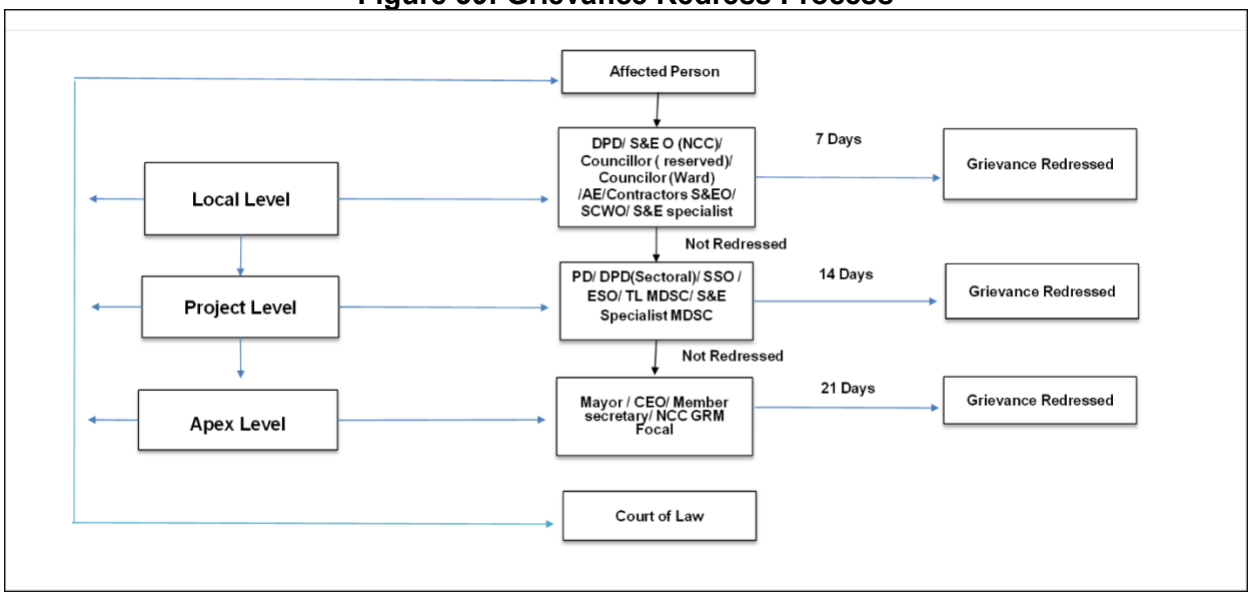
Environment Specialist, MDSC. The Project level GRC will resolve the grievance within 14 days of receipt of a complaint/ grievance; and

(iii) **Apex level**: If the grievance is not resolved at the Project level, the grievance will be referred to the Apex level, headed by the Honorable Mayor. Chief Executive Officer will support the grievance process. Other members include the Project Director who will be the Member secretary; and NCC GRM focal officer. The grievance at this level will be resolved within 21 days of its receipt.

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

226. **ADB's Accountability Mechanism.** In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism through directly contacting (in writing) the Complaint Receiving Officer at ADB headquarters or the ADB Bangladesh Resident Mission. People who are, or may in the future be, adversely affected by the project may submit complaints to ADB's Accountability Mechanism. The Accountability Mechanism provides an independent forum and process whereby people adversely affected by ADB-assisted projects can voice, and seek a resolution of their problems, as well as report alleged violations of ADB's operational policies and procedures. Before submitting a complaint to the Accountability Mechanism, affected people should make an effort in good faith to solve their problems by working with the concerned ADB operations department. Only after doing that, and if they are still dissatisfied, should they approach the Accountability Mechanism.[35]

Figure 39: Grievance Redress Process



AE= Assistant Engineer; CEO= Chief Executive Officer; CSWO= Chief Social Welfare Officer; DPD= Deputy Project Director; ESO = Environmental Safeguards Officer; GRM = Grievance Redress Mechanism; MDSC= Management Design and Supervision Consultant; NCC = Narayanganj City Corporation; PD = Project Director; S&E = social and environment; S&EO= Social and Environment Officer; SSO = Social Safeguards Officer; TL = Team Leader.

[35] https://www.adb.org/who-we-are/accountability-mechanism/main

227. **Record-keeping.** The PMU will keep records of grievances received, including contact details of the complainant, the date the complaint was received, the nature of the grievance, agreed corrective actions and the date these were affected and the outcome. The number of grievances recorded and resolved and the outcomes will be available in the PMU office, as well as reported in monitoring reports submitted to ADB on a semi-annual basis. All resolutions shall be communicated to the aggrieved party/complainant(s).

228. **Periodic review and documentation of lessons learned**. The PMU will periodically review the functioning of the GRM and record information on the effectiveness of the mechanism, especially on the program's ability to prevent and address grievances.

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

VIII. ENVIRONMENTAL MANAGEMENT PLAN

A. Introduction

230. The purpose of this EMP is to provide a framework that outlines how NCC and any contractor appointed will manage and where practicable, minimize negative environmental effects during the design, construction and operation of the subproject. Construction is considered to include all site preparation, preparatory works, demolition, materials delivery, materials and waste removal, construction activities and associated engineering works.
231.
232. This EMP identifies the minimum requirements regarding the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout design, construction and operation periods of the subproject. Compliance with this EMP does not absolve the Contractor or its subcontractors (during construction phase) and/or the subproject operators (during operation phase) from compliance with all legislation and bylaws relating to construction phase and operation phase activities, respectively.

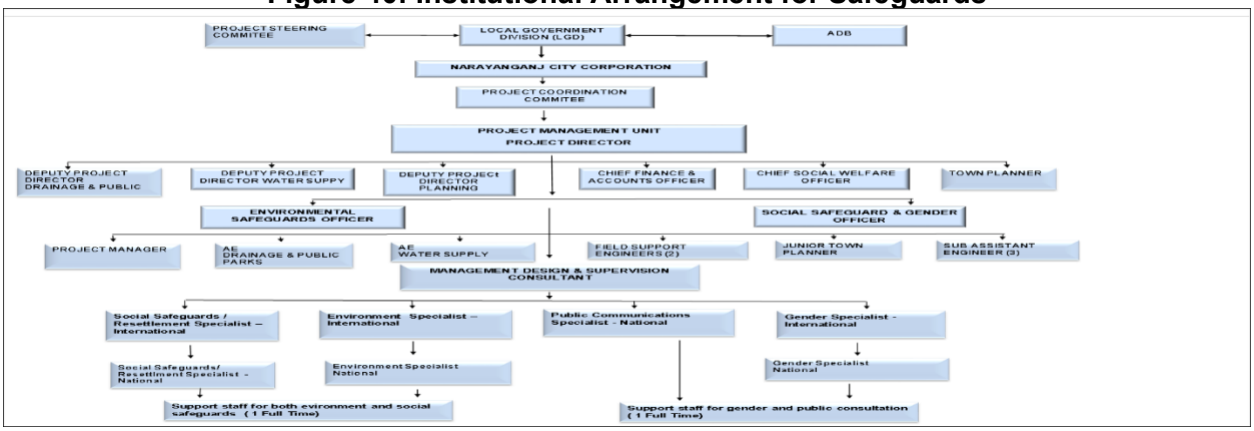
233. This EMP provides a framework to:
- (i) Describe the subproject for environmental management during design, construction and operation phases;
- (ii) Implement those monitoring and mitigation measures identified in this IEE;
- (iii) Outline the principles and minimum standards required of the Contractor during the development of its SEMPs;
- (iv) Identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- (v) Outline the procedures for communicating and reporting on environmental aspects of the subproject throughout all phases of subproject implementation.

B. Institutional Arrangement

234. The Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC) will be the executing agency and NCC will be the implementing agency for the overall project. A Project Coordination Committee (PCC) will be formed within the NCC to engage with policymakers, obtain guidance on key policy issues and oversee overall project implementation.

235. A Project Management Unit (PMU) will be created under the overall supervision of PCC. The PMU will ensure that the subproject will be implemented in accordance with the ADB SPS and relevant government laws, rules and regulations, including the recently Environmental Conservation rules, 2023, among others. The PMU will be supported by a Management, Design and Supervision Consultant (MDSC) team, comprising individual consultants that will provide all necessary management and supervision expertise in implementing the overall project. The management and supervision will come at varying degrees during design phase and pre-construction phase, construction phase, and operation phase. Figure below outlines the institutional arrangement for the project in terms of safeguards supervision and implementation.

Figure 40: Institutional Arrangement for Safeguards



236. **Project Management Unit.** The PMU established within NCC, headed by a Project Director, will continue to implement the project and will be responsible for overall planning, management, coordination, supervision, and progress monitoring of the project. The PMU will be staffed with at least one (1) environmental safeguards officer who will lead the efficient overall implementation of environmental safeguards. The environmental safeguards officer will be supported by environment specialist and other consultants of MDSC in implementing and/or monitoring environmental safeguards compliance under the project, including in the conduct of capacity development and training. The responsibilities of the environmental safeguards officer are:

(i) Ensure that IEE reports are included in the bidding and contract documents;
(ii) Ensure availability of budget for safeguard activities in the bidding and contract documents;
(iii) Ensure 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 subproject site;
(iv) Review and confirm draft IEE reports are finalized based on final detailed designs;
(v) Ensure that no civil works shall commence until corresponding final IEE report is cleared by ADB;
(vi) Review and provide recommendations on the approval of site-specific EMPs (SEMPs), including other required work plans, of the contractors;

(vii) Provide oversight on environmental management aspects of the project, and ensure the EMPs, SEMPs and other required work plans are implemented by the contractors;
(viii) Establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMPs;
(ix) Facilitate and confirm overall compliance with all government rules and regulations regarding site and environmental clearances as well as any other environmental requirements as relevant;
(x) Review, monitor and evaluate effectiveness with which the EMPs and SEMPs are implemented, and recommend necessary corrective actions to be taken;
(xi) Undertake field monitoring to validate compliance with the EMPs, SEMPs and other required work plans;
(xii) With support from MDSC, consolidate monthly environmental monitoring reports from the contractors. Based on these monthly reports and on results of PMU's own field monitoring and validation activities, prepare and submit semi-annual environmental monitoring reports (SEMRs) to ADB;
(xiii) Ensure timely disclosure of final IEE reports, SEMRs and other safeguard documents in project website and in a form accessible to the public;
(xiv) Address any grievances brought about through the grievance redress mechanism (GRM) in a timely manner per the IEEs (GRM is discussed in Section VI hereof);
(xv) Undertake regular review of safeguards-related loan covenants, and the compliance during project implementation; and
(xvi) With support from MDSC, organize periodic capacity building and training programs on safeguards for project stakeholders, including PMU personnel and contractors.

237. **Management, Design and Supervision Consultant (MDSC)**. The MDSC team will have one International Environment Specialist Consultant and one National Environment Specialist Consultant who will assist PMU in the review and updating of all necessary environmental safeguard documentation as required by ADB SPS and national laws, regulations, policies and guidelines applicable to the project; and in fulfilling all other tasks necessary to ensure the project complies with all environmental safeguard requirements. Specific tasks of the Environment Specialist Consultants are the following:

(i) Support the PMU in fulfilling all responsibilities as enumerated in the preceding paragraph;
(ii) Update/Finalize the initial environmental examination (IEE) report including environmental management plans (EMP) based on final detailed design of the subprojects and in accordance with ADB SPS and national laws, regulations, policies and guidelines;
(iii) Conduct due diligence of associated facilities and/or audit of existing facilities, if any, during the detailed design phase, as defined in ADB SPS;
(iv) Conduct of meaningful consultations and ensure issues/concerns/suggestions raised are incorporated in the design and updated/final IEE reports;
(v) Ensure relevant provisions from the updated/final IEE reports and EMPs are incorporated in the bid and contract documents;
(vi) Support in implementing the grievance redress mechanism and ensure members of the grievance committee have the necessary capacity to resolve project-related issues/concerns;
(vii) Together with the social safeguards experts, conduct safeguards capacity building to ensure PMU and contractors have the capacity to implement, monitor, and

report on implementation of EMPs, resettlement plans and indigenous peoples plans (if any); and

(viii) Monitor implementation of EMPs at all work sites, including all potential safeguard issues identified in the safeguard documentation mentioned above;

(ix) Monitor any unanticipated environmental risks or impacts that arise during construction, implementation or operation of the subprojects that were not considered in the IEE reports and EMPs. Prepare corrective action plans and ensure that these are implemented by the contractors and reported accordingly in environmental monitoring reports to ADB; and

(x) Undertake all other tasks to ensure the project complies with ADB SPS and national environmental laws, rules, and regulations.

238. **Contractor (and subcontractor/s, if any)**. The IEE reports with EMPs will form part of bidding and contract documents and verified by PMU. The Contractor will be required to designate their respective environment, health and safety officers (or equivalent) to ensure effective implementation of EMP and SEMPs, including other specific work plans, during civil works. Contractor is to carry out all environmental mitigation and monitoring measures outlined in its contract and this IEE report. The Contractor will be required to submit to PMU, for review and approval, corresponding SEMP and other required work plans per this IEE report. These plans should be able to provide information on (i) proposed sites/locations for construction work camps, storage areas, hauling roads, lay down areas, disposal areas for solid and hazardous wastes; (ii) specific mitigation measures following the approved EMP; (iii) monitoring program per EMP; and (iv) budget for SEMP and EMP implementation, among others. No works can commence until corresponding SEMPs and required work plans are approved by PMU.

239. Specifically, the Contractor will have the following responsibilities, among others, that will be included in the bid and contract documents:

(i) Ensure that the infrastructure development works are carried out in an environmentally friendly manner, minimizing environmental impacts while ensuring the health and safety of all its workers and the minimizing disturbance to the surrounding environment and communities;

(ii) Consideration of ADB SPS, national regulations and the EMP during bid preparation and cost estimation;

(iii) Hire or designate a full time Environment, Health and Safety Officer (or equivalent) responsible for compliance to ADB SPS requirements, national regulations and the EMP/SEMP and other required work plans. The officer/staff must have a clear terms of reference and responsibilities to ensure that all environmental concerns are properly managed;

(iv) Ensure regular reporting to the PMU on work progress and alert management on any potential issues or delays;

(v) Strictly follow health and safety measures at the subproject sites;

(vi) Obtain the necessary permits and clearances, if any is required for the Contractor, to implement the subproject;

(vii) Ensure that all worker recruitment and OHS requirements are complied;

(viii) Take necessary corrective action to rectify any non-conformance, including actions related to grievances;

(ix) Institute an emergency plan for natural calamities/disasters and accidents at the site;

(x) Follow chance finds procedures to discovery of any physical cultural artifact;

(xi) Ensure any sub-contractors/suppliers who are utilized within the context of the contract comply with the environmental requirements of the EMP. The contractor will be held responsible for non-compliance on their behalf; and

(xii) Supply method statements for all activities requiring special attention as specified and/or requested by the MDSC environment specialist for the duration of the contract.

240. A copy of the EMP/approved SEMP will be kept on-site during the construction period at all times. Non-compliance with, or any deviation from, the conditions set out in the EMP/SEMP constitutes a failure in compliance and will require corrective actions.

C. Environmental Management Plan Matrix

241. Consistent with Section V, the following tables summarize the impacts and mitigation measures relative to the subproject.

Table 39: Environmental Impacts and Mitigation Measures

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
1. Design and Pre-Construction Phase				
1.1 Natural Hazards	Likelihood of seismic events and other extreme events such as flooding, landslides, etc. due to climate change	• Ensure design is based on the basic hydraulic principles of designing a storm drainage system, taking into consideration the impact of climate change over the long term. This includes proper estimation of volumetric flows during various seasons, sizing of inlet structures in drains, cross sectional area of drain that will accommodate the expected throughput, and other hydrologic and hydraulic design requirements; • Use of construction materials that could withstand potential stresses during extreme events, temperatures, pressures, etc.; and • The structural designs of the drainage infrastructures shall comply with relevant guidance such as Bangladesh National Building Code, etc. to ensure the structures can withstand earthquakes and climate-induced events in the future.	PMU/MDSC	PMU
1.2 Disruption of Public Utilities/services	Utility lines within or in the vicinities of the subproject sites may need to be moved. Otherwise, these may be damaged disrupting or interrupting services to consumers.	• Provision in the design and budget for the relocation of the existing utility infrastructures, wherever required; • Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction phase; • Require Contractor to prepare a contingency plan to include actions to be taken in case of unintentional interruption of services; • Utilities will only be removed and relocated with proper agency approvals and permission; and • Reconnection of utilities will be completed at the shortest practicable time before construction commences.	PMU/MDSC	PMU
1.3 Risk of health hazard from asbestos-containing materials (ACMs)	There is a potential for encounter of asbestos cement (AC) pipes during construction phase. Damage to asbestos cement pipes may result to the generation of asbestos dust and fibers, which could go airborne and harm the workers and the public. When inhaled, asbestos fibers may	<u>During Design, and Bidding and Contract Document Preparation Stage.</u> • The bidding and contract documents need to recognize the likely presence of asbestos-containing materials (ACM) such as asbestos cement (AC) pipes along the drainage alignments, including their extent such as length or volume, as may be available; • If sufficient information is not available from the Employer (NCC) or PMU, the bidding and contract documents need to emphasize the need to conduct field survey together with the winning bidder to identify the alignments having AC pipes or infrastructures having ACMs prior to any mobilization; • Bidding and contract document to include line items for all costs related to the development and implementation of ACM Management Plan (AMP) shall be		

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	cause long term health issues such as asbestosis and other lung inflammation and diseases including cancer.	borne by the Contractor. Appropriation or budgeting should include, among others, the following: o Training of workers about the health hazards of asbestos to themselves and their families; o Work clothing or PPEs required when handling ACMs; o Double changing rooms and wash facilities to prevent dust from going home on street clothes; and o Periodic medical examinations of workers. <u>Pre-construction Phase by the Contractor.</u> • Develop and implement an asbestos-containing materials (ACM) Management Plan (AMP) that includes identification of hazards, the use of proper safety gear, and handling and disposal methods. The AMP should be able to provide all explanations that are understandable to ordinary laborers or employees of the Contractor. The Contractor may refer to ADB's Good Practice Guidance for the Management and Control of Asbestos (Protecting Workplaces and Communities from Asbestos Exposure Risks).[36] The AMP should include the best practices in handling and disposal of ACM, such as, among others, those enumerated in Chapter V Section B of this IEE report. • The AMP shall be submitted to PMU for approval; • Ensure all its personnel and laborers are trained to enable them understand health risks associated with asbestos from AC pipes, how to identify AC pipes, and how to properly handle AC pipes based on the AMP it developed for the subproject; • With support from the PMU and prior to mobilization, conduct reconnaissance of alignments believed to be where AC pipes are laid and undertake determination or sampling following related protocol in the AMP; • Based on the reconnaissance, establish a recording system that will note the locations of AC pipes. This record shall be maintained and updated during		

[36] https://www.adb.org/publications/good-practice-management-control-asbestos

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		construction phase should there be other additional AC pipe alignments identified or encountered during pipelaying works; and Submit to PMU updated records of AC pipe alignments encountered, if any, as part of its regular monitoring reports to PMU.		
1.4 Disposal Site	Linear works excavation normally generates excess spoils. Indiscriminate and unmanaged disposal of this will result to negative environmental impacts (siltation and clogging of canals, damage to roads, safety to community) and other nuisance to communities.	• Prior to award of contract, NCC will identify a location for the disposal of excess spoils that will be generated during the construction phase. • The disposal location will need to obtain clearance from relevant government agencies having jurisdiction over such location, including clearance from the disposal facility (e.g. Jalkuri Landfill). • No award of the contract shall be made until disposal location and relevant clearance are obtained.	PMU/MDSC	PMU
1.5 Physical Cultural Resources	Excavation works may have the potential to damage cultural heritage monuments and other PCRs.	Include in bidding and contract document the condition for Contractor to undertake the following steps in order to avoid impacts to PCRs: • Mandatory visit to all alignments to identify all possible PCRs that may be affected by the construction and rehabilitation works, such as mosques, eidgahs, heritage sites, and other locally important monuments; • Strictly follow methodologies and protocols developed for all types of excavation works as discussed in this IEE; and • Develop other mitigation measures that will be used during subproject implementation that may not be available in the methodologies and protocols discussed in this IEE. However, these mitigation measures shall be consistent or aligned with the established methodologies and protocols, with the intent to protect any PCRs found at the subproject sites.	PMU/MDSC	PMU
1.6 Consents, Permits, NOCs, Clearances, etc.	Failure to obtain necessary consents, permits, and other appropriate regulatory clearances can result to design revisions and work stoppage.	• Obtain all of the necessary consents, permits, and clearances before the start of civil works. • Acknowledge in writing and provide report on compliance all obtained permits, clearance, NOCs, etc. • Include in detailed design drawings and documents all conditions and provisions if necessary.	MDSC	PMU

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
1.7 Contractor Mobilization	Fielding of equipment and manpower to the sites will likely impact baseline site conditions and potentially damage private properties and public properties, including cultural heritage sites. Safety of both workers and the community will also be likely affected due to movements of both workers and construction equipment	Contractor to ensure the following are complied prior to mobilization: • Developed the required SEMPs and these are approved by PMU with support from MDSC; • Developed a Traffic Management Plan covering all subproject sites and their vicinities, in coordination with local traffic police. Contractor shall have traffic management plan in place prior to the excavation; • Developed a Spoil or Waste Management Plan that will include information on the government-approved disposal site and the route from subproject locations to the said site; • Established environmentally sound sewage facilities for all offsite facilities and offices, including construction camps to ensure no pollutive discharge to Shitalakhya river or any other water bodies; and • Developed a Health and Safety Plan approved by PMU with support from MDSC. The plan will include specific steps to manage potential spread of COVID-19 and other emerging infectious diseases.	Contractor,	PMU MDSC
1.8 Construction Camps or Workers' Accommodation	When camps or accommodation are constructed, there is a likelihood that these are built without amenities resulting to social stress and degradation of the local environment	• Ensure that the camps or accommodations be provided with sanitary amenities at designated areas. In addition to any local regulations, Contractor will need to follow the standards for workers accommodation pertaining to "Workers' accommodation: processes and standards. A guidance note by IFC and the EBRD" 2009.[37]	Contractor	PMU, MDSC
1.9 Updating of IEE and SEMP Preparation	Without updated IEE and SEMP, works will not commence resulting to delay in the project implementation.	• Ensure IEEs are updated based on final detailed designs, and submitted to ADB for final review, clearance and disclosure. • Ensure SEMPs are prepared and submitted to PMU for approval.	MDSC/PMU (Updating of IEE) Contractor (Preparation of SEMP)	PMU

[37] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_gpn_workersaccommodation

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
1.10 Community Awareness	Consultations will be needed prior to civil works construction to enable communities around the subproject sites understand of the final schedule. Without proper interaction with local communities and or with stakeholders may lead to confusion and agitation and non-cooperation of local people.	Undertake another round of consultation to inform the people of the following: • Refresher on the overview and objectives of the subproject; • Preliminary and/or final detailed design of subproject components; • Schedule of implementation; • Potential environmental and social impacts (positive and negative) of the subproject, and the proposed mitigation measures for the perceived negative impacts; and • Grievance redress mechanism and contact details of the subproject.	PMU, MDSC, Contractor	PMU
1.11 EMP Implementation Training	Lack of proper training to implement the EMP leads to mismanaged environmental safeguards.	• Ensure to provide EMP training to Contractor, workers and representatives from NCC.	MDSC	PMU
2. During Construction Phase				
2.1 Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	• Sourcing construction materials, including aggregates, etc., from legitimate suppliers authorized by the government; and • Maintain a construction material register at the site.	Contractor	MDSC, PMU
2.2 Topography and Aesthetics	Excavation and other construction works for the subproject will affect the topography and aesthetics at the sites due to accumulation of unmanaged spoils	Implement the Spoil Management Plan, and in addition, the following measures (if not specifically included in the Spoil Management Plan): • Avoid storing spoils at the vicinity of construction sites for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites; • Dispose only in the designated disposal areas identified under the subproject; • Ensure adequate compaction, and drainage system around the disposal areas;	Contractor	MDSC, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
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	and construction debris.	• Ensure disposal areas are utilized up to their capacity limit only and in accordance with the required sloping and leveling/grading specification approved under the subproject; and • If disposal area reaches the limit, utilize another designated disposal area approved under the subproject.		
2.3 Excavation for Linear Works	Some alignments pass through various roads with varying widths, excavation activities may pose damage to structures due to vibration or collapse of excavated trenches.	Institute excavation methods based on the type of areas affected. Some methodologies below, which should be considered by the Contractor. *Excavation in all areas:* • Materials from excavated trench will be transported and stacked to the nearest open space to be decided by the Engineer-in-Charge (or equivalent) or the place allocated by Contractor. For loading and unloading, small tippers will be used. This excavated material shall be brought back to the site of work for filling the trench. Shoring sheeting and bracing will be carried out accordingly depending on depth of excavation and nearness to structures. • In case the presence of water is likely to create unstable soil conditions, a well point system erected on both sides of the trench shall be employed to drain the immediate area of the trench prior to excavation operation. A well point system consists of a series of perforated pipes driven into the water bearing strata on both sides of a trench and connected with a header pipe and vacuum pump. If excavation is deeper than necessary, the same shall be fitted and stabilized before laying the pipes. • The proposed excavation at any one time shall be limited to such lengths, which does not cause inconvenience to surrounding inhabitants and road traffic. All excavations left unattended shall be adequately protected with approved fencing and barricades and with flashing lights where required. • Bypass way of at least 1 m for people will be provided with proper barricades and placing chequered plates supported on channels. • Any archaeological artifacts identified during trench excavation will follow the chance finds procedure. *Areas with fragile buildings or structures:* • The excavation of trenches for drainages shall be done full manually using appropriate equipment. • Hand ramming or small vibration machine where unavoidable is allowed in these areas, and must not exceed vibration limits. • Vibration limit of 5 mm/sec Peak Particle Velocity . Frequency limit of not less than 10Hz. • The excavation of trench will be carried out for every 8 to 10 m, or where at least one pipe can be installed. • Excavation will be carried out only during day to more easily identify chance finds. Pipe installation and site reinstatement may proceed at night time if required. • Equipment and heavy machines will not be used for trench excavation or compaction if works are adjacent cultural heritage structures.	Contractor	PMU MDSC

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Excavation work will be carried out in piece meal approach. *Residential areas, narrow lanes:* • The excavation of trenches for drainages shall be done half mechanically and half manually using appropriate equipment. • Small equipment and vehicle will be used especially small JCBs for excavation, small tipper trucks, compactor vibration machine, etc. • Hand ramming is proposed for compaction and small vibration machine is allowed in these areas but must not exceed vibration limits. • Vibration limit of 10 mm/sec Peak Particle Velocity. Frequency limit of not less than 10Hz. • The excavation of trench will be carried out for every 8 to 25 m, or where at least one pipe can be installed. • Excavation will be carried out during the night time as far as possible, or depending on the extent of use of the road lanes during day time. If the road lane is not a busy area during the day, excavation will be carried out during the day to avoid disturbance to sleeping residents during night time. *Industrial zone, wide streets:* • The excavation of trenches for drainages shall be done mechanically using appropriate equipment and some portions manually. • The excavation of trench will be carried out for every 15 to 25 m, or where at least two pipes can be installed. • Excavation will be carried out during the night time as far as possible. • Vibration limit of 50 mm/sec Peak Particle Velocity. Frequency limit of not less than 10Hz. • Any archaeological artifacts identified during trench excavation will follow the chance finds procedure.		
2.4 Surface Water Quality	Some alignments are near Shitalakhya river. Excavation and construction activities may result to numerous impacts such as siltation of Shitalakhya river.	• Dispose excess spoils only in the designated disposal areas identified under the subproject; • Avoid storing spoils at the vicinity of site for a long period of time. Haul spoils on a regular basis to ensure more efficient handling and management at the disposal sites. Use temporary storage sites for spoils that will be used for backfilling, but location should be away from sites so as not to create any negative impact on aesthetics in the area; • To minimize excess spoils for disposal, use some for beneficial purposes such as in any other construction activities, or to raise the level of low-lying areas; • Ensure proper compaction of refilled soil and there shall not be any loose soil particles on the top; the material shall be refilled in layers and compacted properly layer by layer; • Silt traps to be provided at construction area near receiving bodies of water; • No equipment or machinery shall be operated outside the work areas; • Avoid spillage of fuels, chemicals and lubricants. Fuel and other petroleum products stored at storage areas away from water drainage and protected by impermeable lining and bunded 110% by volume;	Contractor	MDSC, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		• Ensure that drains are not blocked with excavated soil; • Locate stockyards away from canals or receiving bodies of water; • For effluents from construction camps and Contractor's offices, provide treatment arrangements such as retention ponds and septic tanks which should be incorporated in the facility designs. A sewage management plan has to be prepared by the Contractor and agreed with PMU; • Clean up of the area after the completion and prior to the onset of monsoon season; and • Avoid scheduling of excavation work during the monsoon season. Earthworks should be undertaken during dry season.		
2.5 Groundwater Quality	Construction activities could potentially contaminate groundwater resource due to seepage of liquid wastes and chemicals from construction sites and construction camp sites.	Ensure to implement the following: • Store fuel, oil and other chemicals in secure, managed areas with lined impervious floors and bunded with 110% by volume; • Ensure refueling area has lining to avoid seepage of unavoidable spills during refueling. Ensure to clean up spills immediately and all used cleaning materials are disposed properly; • Ensure to provide portable toilets in all construction camps to discourage injecting septic wastes on land; and • Conduct ground water quality monitoring, particularly at sites near fuel depot or refueling site and construction camps. Ensure to conduct at least one sampling every six months. Important parameters to test are Oil and Grease, and Fecal Coliform.	Contractor	MDSC, PMU
2.6 Ambient Air Quality	Construction activities could result to generation of dust that could remain airborne within and around the subproject sites, and degrade the ambient air quality in the area. This could affect the general wellbeing of residents in the area.	Ensure to implement the following: • Conventional dust control measures such as use of water sprays and minimizing hauling and vehicle movements during windy times of the day or night; • Proper covering (e.g. tarpaulin) of hauling equipment such as dump trucks during transport of materials or spoils; • Provide temporary barriers or covers around active site grading areas; • Limit vehicles speed at work site enough to not cause vigorous suspension of dust; • Prohibit idling of heavy equipment or vehicles for a long time; • Regular maintenance of heavy equipment and vehicles to ensure compliance with national vehicle emissions standards; • Prohibit burning of any liquid or solid wastes; • Conduct regular visual inspections to identify and address other potential sources of dust emissions; and • Conduct ambient air quality monitoring at strategic locations at least once every six months. Ensure that sampling locations are based on the wind and dust/smoke dispersion direction at the sites.	Contractor	MDSC, PMU
2.7 Noise Level	Excavation and construction activities will result to	Ensure to implement the following: • Provide prior information of the scheduled works to nearby residents; • Use silencers for all equipment;	Contractor	MDSC, PMU

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	generation of noise that could disturb the construction workers, staff, and community people.	• Avoid delivery of raw construction materials during night time; • Avoid noise-intensive activities at night time; • Horns should not be used unless it is necessary to warn others or animals of the vehicle's approach and prevent any potential accident; • Minimize drop heights during delivery and stacking of raw construction materials; • Use sound barriers to lessen the noise from sites; • Maintain maximum of noise level of 45 dB(A) at the nearest residence relative to the specific worksites; • Conduct noise level monitoring. Ensure to conduct at least one sampling every six months and when construction activities are at peak. Important areas to test are at locations nearest the community residents and construction camps; • Use pumping equipment with low level noise generation; • If using generators, ensure generator set complies with the noise standards; • Ensure generator set has acoustic enclosure and silencer (if necessary) in the exhaust muffler; and • Depending on site, strictly comply with vibration limits as indicated in Table 37 of this IEE report when using excavation and compacting equipment.		
2.8 Underground Physical Cultural Resources	There is a possibility of chance finds. Excavation activities could damage potential underground heritage assets.	Ensure to implement the following protocol: • strictly follow the protocol which would require the Contractor to coordinate immediately with PMU, and Bangladesh Department of Archaeology for any suspicion of chance finds during excavation works; • stop work immediately to allow further investigation if any finds are suspected; and • request authorized person from the Bangladesh Department of Archaeology to observe when excavation resumes for the identification of the potential chance find, and comply with further instructions.	Contractor	MDSC, PMU
2.9 Community Health and Safety	The construction sites and construction activities could pose danger to pedestrians, animals and other community people due to moving heavy equipment, electrocution, or excavated areas. Spread or outbreak of diseases could be a threat as well.	Ensure to implement the following: • Install warning signs, warning tapes, hard barricades, and notices around the site perimeter to avoid unauthorized entry; • Assign guards around the subproject sites on a 24/7 basis; • Provide lighting all around the subproject site to ensure the perimeter is well-lit at nighttime; • Follow a code of conduct for workers, which should include restricting workers in designated areas, no open defecation, no littering, no firewood collection, no setting of fire except when needed but in designated places, no trespassing, no unauthorized overstaying at construction sites, and no obligation to undertake potentially dangerous work without the use of proper personal protective equipment, among others; • Follow International best practices on community health and safety such as those in Section 4.3 of World Bank Environmental Health and Safety (EHS) Guidelines	Contractor	MDSC, PMU

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
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		on Construction and Decommissioning Activities;[38] The community health and safety plan shall ensure the following: ○ implement risk management strategies to protect the community from physical, chemical, or other hazards associated with sites under construction and decommissioning; ○ restricting access to the site, through a combination of institutional and administrative controls, with a focus on high risk structures or areas depending on site-specific situations, including fencing, signage, and communication of risks to the local community; ○ removing hazardous conditions on construction sites that cannot be controlled affectively with site access restrictions, such as covering openings to small confined spaces, ensuring means of escape for larger openings such as trenches or excavations, or locked storage of hazardous materials; ○ implement measure to prevent proliferation of vectors of diseases at work sites; ○ adequate space and lighting, temporary fences, shining barriers and signage at active work sites; ○ contractor's preparedness in emergency response; ○ adequate dissemination of GRM and contractor's observance and implementation of GRM; and ○ upon availability, local people should be given an opportunity for work in the subproject activities; • Follow international best practices on traffic safety such as those in Section 3.4 of the World Bank Environmental Health and Safety (EHS) Guidelines on Community Health and Safety;[39] The community health and safety plan should include: ○ Adoption of best transport safety practices across all aspects of project operations with the goal of preventing traffic accidents and minimizing injuries suffered by project personnel and the public. Measures should include: ▪ Emphasizing safety aspects among drivers; ▪ Improving driving skills and requiring licensing of drivers; ▪ Adopting limits for trip duration and arranging driver rosters to avoid overtiredness; ▪ Avoiding dangerous routes and times of day to reduce the risk of accidents; ▪ Use of speed control devices (governors) on trucks, and remote monitoring of driver actions; ○ Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.		

[38] IFC World Bank Group. 2007. https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-construction-and-decommissioning-en.pdf
[39] IFC World Bank Group. 2007. https://www.ifc.org/content/dam/ifc/doc/2000/2007-general-ehs-guidelines-community-health-and-safety-en.pdf

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
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		Where the project may contribute to a significant increase in traffic along existing roads, or where road transport is a significant component of a project, recommended measures include: ○ Minimizing pedestrian interaction with construction vehicles; ○ Collaboration with local communities and responsible authorities to improve signage, visibility and overall safety of roads, particularly along stretches located near schools or other locations where children may be present. Collaborating with local communities on education about traffic and pedestrian safety (e.g. school education campaigns); ○ Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents; ○ Using locally sourced materials, whenever possible, to minimize transport distances. Locating associated facilities such as worker camps close to project sites and arranging worker bus transport to minimizing external traffic; and ○ Employing safe traffic control measures, including road signs and flag persons to warn of dangerous conditions. • Follow the established community and occupational health and safety protocol on emerging infectious diseases such as COVID-19; • Maintain a complaint logbook at the site and take action promptly of complaints; • Schedule transport and hauling activities by avoiding peak traffic periods; • Clean wheels and undercarriage of haul trucks prior to leaving construction site; • Educate drivers: limit speed between 20-25 km/h while traversing settlement areas and avoid use of horn unless necessary to prevent accidents; and Earmark parking place for construction equipment and vehicles when idling; no parking shall be allowed on the roads, that may disturb the traffic movement.		
2.10 Occupational Health and Safety	Health hazard is significant due to exposure of workers to drainage silts or soils that could be contaminated with hazardous elements such as heavy metals and pathogens. Construction workers are also at risk of accidents due to various hazards (moving vehicles, high level of pollution from dust, exhaust of	Ensure to implement the following: • All relevant provisions of the Bangladesh labor Law, 2006, other national regulations related to occupational health and safety as tabulated in Chapter II of this IEE report, and relevant WHO guidelines will be adhered to, concerning the provision of adequate measures to avoid contracting and/or spreading diseases during construction phase; • Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Construction and Decommissioning Activities,[40] which include the following elements, whichever are applicable: ○ Communication and Training ▪ Training of all workers on occupational health and safety prior to construction works; ▪ Conduct of orientation to visitors on health and safety procedures at work site;	Contractor	MDSC, PMU

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

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
	vehicles and machinery and noise). Further, extended working hours of workers could lead to risk of accidents due to fatigue. Construction workers are also exposed to possible disease outbreak at the work sites or construction camps.	▪ Signages strategically installed to identify all areas at work site, including hazard or danger areas; ▪ Proper labeling of equipment and containers at construction and storage sites; and ▪ Suitable arrangements to cater for emergencies, including: first aid equipment; personnel trained to administer first aid; communication with, and transport to, the nearest hospital with an accident / emergency department; monitoring equipment; rescue equipment; firefighting equipment; and ▪ communication with nearest fire brigade station; o Physical Hazards ▪ Use of personal protective equipment (PPE) by all workers such as earplugs, safety shoes, hard hats, masks, goggles, etc. as applicable, including specific use of appropriate gumboots, gloves and other PPEs when handling and transporting silts and soils excavated from canals, and ensure these are used properly; ▪ Avoidance of slips and falls through good house-keeping practices, such as the sorting and placing loose construction materials or demolition debris in established areas away from foot paths, cleaning up excessive waste debris and liquid spills regularly, locating electrical cords and ropes in common areas and marked corridors, and use of slip retardant footwear; ▪ Use of bracing or trench shoring on deep excavation works; ▪ Adequate lighting in dark working areas and areas with night works; ▪ Rotating and moving equipment inspected and tested prior to use during construction works. These shall be parked at designated areas and operated by qualified and trained operators only; ▪ Specific site traffic rules and routes in place and known to all personnel, workers, drivers, and equipment operators; and ▪ Use of air pollution source equipment and vehicles that are well maintained and with valid permits; o General Facility Design and Operation ▪ Regular checking of integrity of workplace structures to avoid collapse or failure; ▪ Ensuring workplace can withstand severe weather conditions; ▪ Enough work spaces available for workers, including exit routes during emergencies; ▪ Fire precautions and firefighting equipment installed; ▪ First aid stations and kits are available. Trained personnel should always be available who can provide first aid measures to victims of accidents;		

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
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		▪ Secured storage areas for chemicals and other hazardous and flammable substances are installed and ensure access is limited to authorized personnel only; ▪ Good working environment temperature maintained; ▪ Worker camps and work sites provided with housekeeping facilities, such as separate toilets for male and female workers, drinking water supply, wash and bathing water, rest areas, and other lavatory and worker welfare facilities; and ▪ Maintain records and make reports concerning health, safety and welfare of persons, and damage to property. Take remedial action to prevent a recurrence of any accidents that may occur. • Follow established occupational health and safety protocol on emerging infectious diseases such as the COVID19; • Provide regular health check-ups, sanitation and hygiene, health care, and control of diseases for the workforce; • Provide at cost all labor and materials and construct/install and maintain site safety, hard barricading, flexible green net, signboards, and lightings throughout the construction site; • Launch awareness programs concerning human trafficking and the possibility of spread of sexually transmitted diseases (STDs) and HIV/AIDS using brochures, posters, and signboards; • Make available ambulance facility at the construction site and camp site, if any; • Compensation for the loss of life (a zero tolerance to loss of life policy should be developed and implemented) or for any type of injuries; and • Provide insurance to the workers. Health and safety training for all site personnel is very important and must be mandatory.		
2.11 Local Festivals and Cultural Practices	Construction activities may disrupt religious or local festivities.	• Contractor shall follow religious and city festival calendar to avoid impact upon local celebrations. • Construction works need to be avoided or minimized during the festivals. • If excavation works or construction works have been done but remain unrestored approaching a certain festivity, alternative access to mosques and other important sites must be considered or set up.	Contractor	MDSC, PMU
2.12 Terrestrial Flora and Fauna Resources	Construction phase activities may pose impact to other flora and fauna resources in the immediate vicinity of the sites.	Contractor need to observe and comply with the following: • Avoid any cutting of trees and shrubs at the construction site. The spaces are wide enough for any activities without cutting any of the trees or locally important plants, if any; • Prohibit use of wood as fuel at construction camp sites, if any; • Provide LPG/kerosene to workforce staying at the construction camp sites; and • Prohibit the harvest and trade of any plants or poaching of animals found in the area.	Contractor	MDSC, PMU
2.13 Socioeconomic Resources	Construction works may result in temporary loss of	Ensure to implement the following: • Adopt the GRM of the project, and respond to grievances;	Contractor	MDSC, PMU

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	livelihoods and interruption of social and economic activities in some alignments. In areas where there are shops or other commercial activities, these could lose some business if access is difficult for customers.	• The construction works do not interfere with the convenience of the public or access to, use, and occupation of public or private roads, or any other access to properties, whether public or private. • Temporary access to properties adjacent to the construction site will be provided through the construction of ramps with concrete slabs for use of pedestrians and light vehicles. Handrails may provided to ramps or planks depending on the width of excavations; • In critical areas such as institutions, operating hours are factored into work schedules and workforce is increased for speedy completion; • Advance information on works to be undertaken including appropriate signage is provided; and • The diversion is done in coordination with the traffic police division for necessary rerouting of traffic and traffic management.		
2.14 Job Opportunities	(Positive Impact) Subproject activities will create significant temporary employment for construction workers, equipment maintenance and support staff.	(Intensification or enhancement measure) As much as possible when expertise is available, Contractor to recruit from local workforce.	Contractor	MDSC, PMU
Construction waste management and site restoration	The activities of the subproject will result to sorts of construction wastes and traces of excess spoils, and dredged materials after the construction period. Indiscriminate disposal or ignoring their proper disposal could be dangerous to the environment and the people in the vicinity of the subproject sites.	mmediately within one week after construction phase, the Contractor shall collect all the wastes at the different sites, and implement the following. Contractor may opt to outsource this to qualified entities in NCC, provided that Contractor's EHS personnel strictly supervise the cradle-to-grave management of all these wastes. All costs related to management of these wastes shall be borne by the Contractor, or as per agreement in the contract documents. • Segregate or sort all wastes according to nature (recyclable, non-recyclable, hazardous, non-hazardous or any combination); • Ensure to handover (or sell as the case may be) recyclable wastes to authorized recycling entities in Bangladesh. Contractor shall coordinate this action with NCC through the PMU; • Ensure to dispose non-recyclable and non-hazardous wastes to appropriate disposal sites. These may be collected, transported and disposed similar to how solid wastes in the city is managed. Thus, Contractor shall coordinate with NCC through the PMU in this regard;		

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
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		• Ensure to transport and dispose hazardous wastes using authorized hazardous waste transporters and treaters in Bangladesh. Contractor shall coordinate all actions for these wastes with NCC through the PMU; and Ensure the sites are cleared with all wastes disposed accordingly, and compliance with this measure shall be included as one of the conditions for payment to the Contractor.		
4. Operation and Maintenance (O&M) Phase				
4.1 General Drainage Maintenance	Without proper maintenance, benefits of the drainage system will not be sustained. The drainage system may clog if no proper operation and maintenance is in place. Also during maintenance works, drainage system will generate wastes such as solid wastes and silts, which may also cause pollution to the immediate environment and deteriorate aesthetics in the areas affected.	NCC to ensure that: • A program is established for the regular visual inspection of the drainage alignments to identify problems early, before they become critical (breakage, plugging, etc.); • When issues are encountered, remedial action is implemented promptly, including clearing sediment and other material that could cause blockage, and conducting any required physical repairs to the drains to prevent leaks; • A waste management plan is prepared and implemented in handling and disposing wastes generated during maintenance activities. This includes management on the disposal of solid wastes generated at the site such as the solid wastes and silts. The waste management plan should comply with all the relevant government rules and regulations, including clearances on the use of disposal sites where these wastes will be disposed. The Spoil Disposal Plan and Waste Management Plan utilized during the construction phase may be adopted, but may also be modified accordingly to fit activities during drainage maintenance works only; and • Budget a permanent allocation for undertaking the above maintenance works and allied activities for the drainage system.	NCC	NCC
4.2 Community Health and Safety	During maintenance works at any of the drainage alignments, neighboring community is likely to be temporarily disrupted due to various hazards such as noise, dust, disturbance to access to residential/commercial establishments, etc.	NCC will develop and implement an O&M Manual that will include mitigation measures, such as, among others, the following: • Follow international best practices on community health and safety such as those in World Bank EHS Guidelines on Water and Sanitation; • For any re-excavation or desilting works related to the maintenance activities, the methodologies and protocols developed for the construction phase shall be strictly followed; and • Noise abatement measures developed for the construction phase shall be strictly followed.	NCC	NCC
4.3 Occupational	Occupational health and safety issues in	NCC will develop and implement an O&M Manual that will include mitigation measures, such as, among others, the following:	NCC	NCC

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
Health and Safety	drainage management may also arise during the maintenance phase. Staff and workers are also at risk of accidents due to moving vehicles, and other hazards during maintenance works, such as exposure to high level of pollution from exhaust of vehicles and machinery, and noise. Further, extended working hours of these personnel could lead to risk of accidents due to fatigue. With the experience during the COVID19 pandemic, clustering and gathering of workers can easily trigger spread of diseases. Such a situation is dangerous and could potentially lead to loss of human lives.	• All relevant provisions of the Bangladesh Labour Act, 2006 (and its 2013 amendment) and any of its amendments, and relevant WHO guidelines; • Follow international best practices on occupational health and safety such as those in Section 4.2 of World Bank EHS Guidelines on Water and Sanitation,41 which include the following elements, whichever are applicable: ○ Accidents and Injuries ▪ Use personal flotation device when working near bodies of water such as the Shitaklakhya river; ▪ Implement a confined spaces entry program that is consistent with applicable national requirements and internationally accepted standards. Valves to process tanks should be locked to prevent accidental flooding during maintenance; ▪ Use fall protection equipment when working at heights; ▪ Maintain work areas to minimize slipping and tripping hazards; ▪ Implement fire and explosion prevention measures in accordance with internationally accepted standards; ▪ When installing or repairing components adjacent to roadways, implement procedures and traffic controls, such as: • Establishment of work zones so as to separate workers from traffic and from equipment as much as possible; • Reduction of allowed vehicle speeds in work zones; • Use of high-visibility safety apparel for workers in the vicinity of traffic; • For night work, provision of proper illumination for the work space, while controlling glare so as not to blind workers and passing vehicles; and ▪ Locate all underground utilities before digging. ○ Chemical Exposure and Hazardous Atmospheres ▪ Implement a training program for the workers who are exposed to various types of hazardous and toxic solid wastes from the drains, on safe handling practices and emergency response procedures; ▪ Provide appropriate personal protective equipment (including, for example, self-contained breathing apparatus) and training on its proper use and maintenance; ▪ Prepare escape plans from areas where there might be a gaseous emissions; ▪ Use personal gas detection equipment while working in confined space; ▪ Continuously monitor air quality in work areas for hazardous conditions (e.g. explosive atmosphere, oxygen deficiency);		

[41] IFC World Bank Group. 2007. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines/watersanitation_firstconsultation

Project Activity/ Field	Impacts	Mitigation Measures	Responsibility	
			Implementation	Monitoring
		▪ Periodically sample air quality in work areas for hazardous chemicals, particularly in enclosed spaces. If needed to meet applicable occupational health national requirements or internationally accepted standards, install engineering controls to limit worker exposure, for example collection and treatment of off-gases from air stripping; ▪ Prohibit eating, smoking, and drinking except in designated areas; and ▪ Rotate personnel during lengthy work activities to reduce inhalation of air-stripped chemicals, aerosols, and other potentially hazardous materials. • Follow established occupational health and safety protocol on infectious diseases such as COVID-19; and • Provide regular health check-ups, sanitation and hygiene, health care, and control of diseases for the workforce.		

D. Capacity Building

242. In order to ensure smooth implementation and monitoring of the EMP, it is important that all key implementation stakeholders have the necessary capacity and knowledge about the requirements of ADB SPS and relevant government environmental laws, rules and regulations. The MDSC Environmental Specialist will train and assist key stakeholders, particularly NCC and PMU, in developing the capacity. An indicative training program outlined below will be utilized by the MDSC Environment Specialist in the conduct of training.

243. The proposed capacity building program will include:

(i) sensitization of NCC and PMU staff and stakeholders on environmental management, including on the ADB, and Government of Bangladesh requirements on environment;
(ii) capacity building programs to improve the capability of environment staff at all levels in carrying out/monitoring and implementing environmental management measures for the subproject; and
(iii) capacity building programs on environmental issues including quality monitoring.

244. The MDSC Environmental Specialist will provide the basic training required for environmental awareness followed by specific aspects of infrastructure improvement projects along with environmental implications for projects. Specific modules customized for the available skills set will be devised after assessing the capabilities of the members of the Training Program and the requirements of the subproject. The entire training would cover basic principles of environmental assessment and management mitigation plans and programs, implementation techniques, monitoring methods and tools. The proposed training program along with the frequency of sessions is presented in table below.

Table 40: Training Modules for Environmental Management

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
Introduction and sensitization to environment issues	Sensitization on environmental concerns Environmental impacts of water supply projects, drainage projects, and urban developments such as green space and parks improvements. Environmental regulations of the Government and ADB SPS Coordination between departments for	NCC engineers / management team, officials responsible for implementing the overall project and subprojects, and other NCC Officials and PMU Environmental Safeguards Officer Contractors (both DBO contractors; and civil works contractors)	Workshop	One-day workshop during construction	MDSC Environment Specialist

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
	implementation of environmental issues.				
Training on hazards, health, safety and environmental issues pertaining to the overall project and subprojects.	Sensitization and training for engineering and management professionals, to be involved in on-site execution and operation of the overall project and subprojects. Special training on handling and disposal of asbestos-containing materials such as asbestos cement pipes. Special training on testing, handling and disposal of sludge from WTP operations.	NCC engineers/ Management Team, PMU Environmental Safeguards Officer Contractors (both DBO contractors and civil works contractors)	Workshops, site visits	Two days before and during construction	MDSC Environment Specialist and Health and Safety Specialist Asbestos Expert (may be hired by MDSC as resource person during the training) Hazardous Materials Management Expert (may be hired by MDSC as resource person during the training)
EMP implementation	Implementation of EMP Identification of environment impacts Monitoring and reporting for EMP Public interactions and consultations Coordination for consents with various departments	NCC engineers, officials responsible for implementing the overall project and subprojects, and other NCC Staff, PMU Environmental Safeguards Officer Contractors (both DBO contractors and civil works contractors)	Lectures and field visit	Two-day session at construction stage	MDSC Environment Specialist

Program	Description	Participants	Form of Training	Duration	Trainer /Agency
	Monitoring formats, filling and review of impacts				

IX. MONITORING AND REPORTING

245. NCC through the PMU will monitor the progress of EMP implementation. The PMU, with support from MDSC, will undertake site inspections and document review to verify compliance with the EMP and progress toward the final outcome. The Contractor will conduct day to day implementation of the SEMPs.

246. The Contractor will submit monthly reports to the PMU. The monthly reports will include compilation of copies of monitoring sheets accomplished and duly signed by the Contractor's EHS manager (or equivalent) on a daily basis. A sample daily monitoring sheet which can be used by the Contractor is in **Appendix 15**. This monitoring sheet is indicative which can be further enhanced depending on the actual situations at construction sites.

247. PMU, with support from MDSC, shall also conduct its own monitoring activities consistent with the indicators in the EMP to confirm that all environmental safeguard measures are properly implemented at the subproject site, including in the surrounding communities. A sample monitoring sheet which can be used by PMU or MDSC is in **Appendix 16**. Similarly, this monitoring sheet is indicative which can be further enhanced depending on the actual situations and other needs of information during the implementation phase.

248. PMU, with support from MDSC, shall consolidated its own findings with the reports from the contractors. Based on consolidated information, PMU shall accomplish semi-annual environmental monitoring reports (SEMRs), which shall be submitted to ADB for review and disclosure on ADB website. Submission of SEMR will continue until ADB issues a Project Completion Report. The template for the SEMR is available in the Project Administration Manual.

249. ADB will carry out the following monitoring actions to supervise the subproject:

(i) On a need basis, conduct visits when potential adverse environmental or social impact exists;
(ii) Conduct supervision missions with detailed review by ADB's environment/social safeguard specialists and/or officers and/or consultants for components with adverse environmental and social impacts;
(iii) Review the SEMRs submitted by PMU to ensure that adverse impacts and risks are mitigated as planned in the EMP;

(iv) Work with PMU to rectify to the extent possible any failures to comply with its environmental safeguard commitments, as covenanted in the loan agreement and elaborated in all environmental safeguard documents; and formulate and implement a corrective action plan to re-establish compliance as appropriate; and

(v) Prepare a project completion report that assesses whether the objective and desired outcomes of the safeguard plans have been achieved, taking into account the baseline conditions and the results of monitoring.

250. ADB's monitoring and supervision activities are carried out on an on-going basis until a project completion report is issued. ADB issues completion report within 1-2 years after the project is physically completed and in operation.

Table 41: Environmental Quality Monitoring Plan[a]

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
1. Design / Pre-Construction Phases							
1.1	Air Quality Sampling	PM2.5, PM10, SOx, NOx, CO	Subproject sites (active construction areas)	At least once	National Ambient Air Quality Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
1.2	Noise Level Measurement	Noise levels at daytime and night time in dBA	Subproject sites and vicinities (relative to active construction areas)	At least once	National Noise Level Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
1.3	Groundwater quality (for construction and drinking purposes)	Groundwater level, pH, TDS, TSS, hardness, oil and grease, and coliform	Groundwater source at the subproject sites (if any) (active construction areas)	At least once	National Standard for Drinking water	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
1.4	Surface Water Quality (Shitalakhya river)	BOD, TSS, oil and grease, fecal coliform	Upstream and downstream of Shitalakhya river relative to the locations of the subproject sites	At least once	National Standard for Inland Surface water	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
1.5	Soil Quality	Heavy metals), pH, fecal coliform,	17 major canals and strategic locations for existing drainage (residential, commercial, industrial)	Once during the pre-construction phase	Soil standards	Contractor	PMU, MDSC
2. Construction Phase							
2.1	Air Quality Sampling	PM2.5, PM10, SOx, NOx, CO	Subproject sites (active construction areas)	At least once every six months throughout the construction period.	National Ambient Air Quality Standards	Contractor or through a nationally recognized	NCC, MDSC

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
						laboratory sourced by Contractor	
2.2	Noise Level Measurement	Noise levels at daytime and night time in dBA	Subproject sites and vicinities (relative to active construction areas)	At least once every six months with daytime and night time readings, throughout the construction period.	National Noise Level Standards	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
2.3	Groundwater quality (for construction and drinking purposes)	Groundwater level, pH, TDS, TSS, hardness, oil and grease, and coliform	Groundwater source at the subproject sites (if any) (active construction areas)	At least once every six months throughout the construction period	National Standard for Drinking water	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
2.4	Surface Water Quality (Shitalakhya river)	BOD, TSS, oil and grease, fecal coliform	Upstream and downstream of Shitalakhya river relative to the locations of the subproject sites	At least once in six months	National Standard for Inland Surface water	Contractor or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC

[a] All environmental quality sampling should follow methodologies and sampling periods per relevant rules and/or guidelines (ambient air quality, noise level, and water quality)

Table 42: EMP Implementation Monitoring Plan

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
1. Design / Pre-Construction Phases							
1.1	Design measures addressing risks of climate change	Design elements included to ensure infrastructure can withstand seismic events, flooding, landslides, etc. On DTWs, siting and depths considered climate change.	PMU / MDSC Office	Once after final detailed design is completed	Bangladesh National Building Code	MDSC	PMU

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
1.2	Disruption of Public Utilities/services	Ensure that the respective authority of utility service providers and consumers are informed in time; and Inspect that utilities are being relocated at the designated site maintaining proper safety measures	Subproject sites	Monthly - prior to start of construction	Utility relocation plan	NCC/Contractor (together with relevant utility authority)	PMU, MDSC
1.3	Planning for ACMs	ACM Planning requirement is included in the bidding and contract documents	PMU / MDSC Office,	On ongoing basis prior to floating of bidding documents Once prior to contract award	Bidding Documents Contract Documents	MDSC	PMU
1.4	Spoil disposal site identification	Spoil disposal site identified and corresponding clearance (or equivalent) is obtained.	PMU / MDSC Office,	On ongoing basis prior to contract award	Written confirmation of disposal site location. Clearance (or equivalent) issued.	MDSC	PMU
1.5	Physical cultural resources	Condition for Contractor to follow the chance finds protocol as discussed in the EMP/IEE are included in the bidding and contract documents.	PMU / MDSC Office,	On ongoing basis prior to floating of bidding documents On ongoing basis prior to contract award	Bidding Documents Contract Documents	MDSC	PMU
1.6	Tree Removal	Check whether trees were preserved at the sites	For all the subproject areas	On an ongoing basis from start of mobilization to construction phase.	IEE requirement (avoidance of cutting of trees)	Contractor	PMU, MDSC
1.7	Consents, Permits, NOCs, Clearances, etc.	All valid permits, clearances and NOCs, are in place during the detailed design or pre-construction phase at the latest.	PMU / MDSC Offices, Contractor office or site office	Ongoing basis; prior to start of construction	Copies of permits, clearances and NOCs.	PMU, MDSC, Contractor	PMU, MDSC

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
1.8	Construction camps or workers' accommodation	Construction camps are established or built following standard requirements and recommendations in the EMP/IEE.	Construction camp sites	At least weekly or may be needed	EMP (including standards per IFC and EBRD; and Sewage Facility Design)	Contractor	PMU, MDSC
1.9	Preparation of SEMPs and all pre-construction sub-plans	SEMP and all sub-plans per EMP/IEE requirements have been prepared by Contractor and approved by PMU/MDSC	Contractor Office	On ongoing basis during pre-construction phase	Updated IEE report Approved SEMP Approved sub-plans	Contractor	PMU/ MDSC
1.10	Community awareness	Continuing consultations done per EMP requirements	Contractor Office	On ongoing basis during pre-construction phase	Reports of consultations done	Contractor	PMU/ MDSC
1.11	EMP Implementation Training	EMP implementation training to Contractor, workers and NCC personnel has been conducted prior to construction works.	MSDC Office	On ongoing basis during detailed design phase/pre-construction phase	Reports of training done	MDSC	PMU
2. Construction Phase							
2.1	Construction camps or workers' accommodation	Construction camps are maintained based on the EMP/IEE requirements.	Construction camp sites	At least weekly or may be needed	EMP (including standards per IFC and EBRD; and Sewage Facility Design)	Contractor	PMU, MDSC
2.2	Sources of Materials	Legitimacy of sources of materials to be used for construction	Storage areas at the different subproject sites	At least once every 6 months for MDSC throughout the construction period.	Materials register or record of purchase by Contractor	MDSC, Contractor	NCC, MDSC
2.3	Drilling, excavation and other construction activities	Potential impacts per EMP: - Land topography and aesthetics - Terrestrial flora and fauna resources - Surface water quality - Groundwater quality	Construction camps, work sites (active construction areas)	Daily by Contractor throughout the construction period. At least once every 6 months for MDSC throughout the construction period.	Subproject plans, EMP; Complaints from Community	MDSC, Contractor	NCC, MDSC

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
		- Ambient air quality - Noise level at site and vicinity - Chance finds - Community and occupation health and safety - Grievances/ complaints					
2.4	Waste Management	Check storage, transportation, disposal, handling of hazardous waste (e.g., used engine oil, engine filters, etc.); Waste and effluents to be collected and disposed safely from construction camp; Waste and garbage from construction site to be disposed safely.	Construction camp, Subproject sites (active construction areas)	At least weekly (for Contractor) At least once in six months (for MDSC)	Contract provisions; EMP; No complaints	MDSC, Contractor	NCC, MDSC
2.5	Socioeconomic benefit	Local labor employment, income level status	Subproject sites	At least once in six months during the construction period.	Primary survey and consultations	MDSC (to be led by the Social Safeguard Officer)	NCC, MDSC
2.6	Community Health and Safety	Potential health and safety impacts to community people as enumerated and defined in the EMP.	Throughout the subproject areas and surrounding communities (active construction areas)	Daily (by Contractor) At least once in six months (by MDSC) throughout the construction period.	Contract provisions; EMP; Zero accident record; No complaints.	Contractor, MDSC	NCC, MDSC
2.7	Occupational Health and Safety	Potential health and safety impacts to workers as enumerated and defined in the EMP.	Subproject sites, construction camp	Daily (by Contractor) At least once in six months (by MDSC)	Contract provisions; EMP; Zero accident record; No complaints.	Contractor, MDSC	NCC, MDSC

Sl. No.	Monitoring Attributes	Parameters to be Monitored	Location	Frequency	Standards	Responsibility	
						Implementation	Monitoring
				throughout the construction period.			
2.8	Community awareness and consultation	Progress of continuing community awareness and consultation	At the community areas and/or subproject sites (active construction areas)	At least once every six months	Minutes of meetings Record of attendees list Photolog	Contractor, MDSC	NCC, MDSC
3. Post-Construction Phase							
3.1	Post-construction site clean up	All post-construction site clean up activities per EMP requirements have been done effectively	All subproject sites	At least once after construction phase but prior to final payment related to construction activities completed.	Contractor monthly reports Related Contractor activity reports	Contractor	PMU, MDSC
4. Operation Phase							
4.1	General Drainage Maintenance	Conditions of drainage system	Drainage alignments and all active sites with repair and maintenance works, NCC office	On an ongoing basis	Monitoring Program for Drainage Maintenance works Monitoring reports Budget	NCC or through a nationally recognized laboratory sourced by Contractor	NCC, MDSC
4.2	Community and Occupational Health and Safety	Complaints, Accident/Incident Records	Drainage alignments and all active sites with repair and maintenance works.	On an ongoing basis.	Zero accident record; No complaints.	NCC	NCC

E. Environmental Budget

251. Costs for implementing the EMP in this IEE report include monitoring costs during construction and capacity building costs on environmental management, which are absorbed into the Contractor's work contract. The costs for training proposed include the costs incurred toward site visits, travel to the training program by participants, printing of training materials, and other logistic arrangements. The costs involved towards preparation of training material and training are covered in the consultancy budget for the MDSC. These costs are presented in table below.

252. The cost estimates mentioned in table below are indicative amounts. These shall be reviewed by the Contractor, and assessed if enough for implementing the EMP. Any budget shortfall, including other necessary measures identified during the implementation phase, shall be supplemented from the provisional sum of the Contractor's contract.

253. As such, these costs must be included in the Contract documents along with a copy of IEE. The EMP implementation shall be integrated into the Project Administration Manual (PAM).

Table 43: Cost Estimates to Implement the EMP[a]

Particulars	Stage	Unit	Total number	Rate (BDT)	Cost (BDT)	Costs covered by
Mitigation Measures						
Environmental mitigation / enhancement measures integrated into the designs and costs included as part of civil works, including OHS measures[b]	Pre-construction / Construction	year	4	1,085,000	4,340,000	Contractor
Sub-Total (A)					4,340,000	
Monitoring Measures						
Air Quality monitoring	Pre-Construction Phase	Lump sum	-	-	200,000	Contractor
Air Quality monitoring	Construction Phase	Lump sum	-	-	1,000,000	Contractor
Noise level	Pre-Construction Phase	Lump sum	-	-	10,000	Contractor
Noise level	Construction Phase	Lump sum	-	-	100,000	Contractor
Water Quality monitoring	Pre-Construction Phase	Per location	2	15,000	30,000	Contractor
Water Quality monitoring	Construction Phase	Per location	40	15,000	600,000	Contractor

Particulars	Stage	Unit	Total number	Rate (BDT)	Cost (BDT)	Costs covered by
Soil Testing	Pre-Construction Phase	Per location	20	15,000	300,000	Contractor
Various Monitoring (Adequacy of solid waste management system, chemical and waste disposal, implementation of community and occupational health and safety measures)[c]	Construction, Post construction and operation	Lump sum	-	-	200,000	Contractor / NCC
Sub-Total (B)					2,140,000	
Capacity Building						
Introduction and sensitization to environmental issue	Preconstruction	Lump sum	-	-	50,000.00	MDSC
Training on hazards, health, safety, and environmental issues	Preconstruction	Lump sum	-	-	100,000.00	MDSC
EMP implementation	Construction	Lump sum	-	-	100,000.00	MDSC
Sub-Total (C)					250,000.00	
Total (A+B+C)					**BDT 6,780,000** **BDT 250,000**	Contractor MDSC
Total (in $) @ BDT109.63 per $					**$ 61,844.38** **$ 2,280.40**	Contractor MDSC

[a] Assuming implementation period by the Contractor is 10 years from 2024 – 2034.

[b] This line item should include OHS-related costs as applicable: (i) PPEs for general construction works, (ii) PPEs for excavation works and works at heights and confined spaces, (iii) barricading, (iv) related training, (v) audits, (vi) emergency handling and specialized equipment, (vii) installation and maintenance of welfare facilities, (viii) equipment inspection and tagging, (ix) medical fitness of personnel and workers, and (x) human resources on EHS/OHS (e.g. EHS Supervisor or equivalent). Indicative list that Contractor should consider is in **Appendix 15**.

[c] NCC may utilize general checklists developed for monitoring Contractor's activities, such as implementation of EMP, including OHS measures. See **Appendix 16**.

X. CONCLUSIONS AND RECOMMENDATIONS

254. It is envisaged that the proposed subproject will contribute to providing reliable, sustainable, and inclusive urban services in NCC, the fourth most populated city in Bangladesh and one of the major growth engines of the country being adjacent to Dhaka and a vital transport hub. Once implemented, the subproject will have direct benefits to the people of NCC with a

reliable drainage system that could abate the persistent flooding and waterlogging issues in many parts of the city.

255. This IEE has been prepared based on preliminary design of the subproject. The baseline environmental conditions have been gathered with respect to the subproject locations and NCC as a whole, and all potential impacts to the environment as a result of implementing the subproject have been identified. Based on these impacts, corresponding mitigation measures have been developed and compiled in the EMP. There are no environmentally sensitive areas that will be affected by the subproject. Consultations with the stakeholders have been conducted and the subproject received very wide acceptance

256. Overall, the full IEE process confirms that the subproject is unlikely to cause significant adverse impacts considered as diverse, irreversible and unprecedented. The construction phase will only involve straightforward civil works and operation phase will only involve common or traditional maintenance works for the drainage system, so impacts will be mainly localized. These impacts can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures in the EMP and O&M manual. On a positive note, the IEE process also confirms the beneficial impacts of the subproject over the long term.

257. This IEE needs to be updated based on the final detailed design to reflect any changes and ensuring the compliance with the design measures suggested in this document. The updated IEE shall be submitted to ADB for review, clearance and disclosure prior to bidding. The cleared updated IEE shall be treated as the final IEE. No bidding can commence until the final IEE is cleared by ADB and attached as part of the bidding documents. If circumstances would require, the IEE will be further updated for ADB's review during the implementation period. In the event of unanticipated impact and/or any design change and/or non-compliance during subproject implementation period, the IEE shall be updated to include (i) assessment of the unanticipated impact and corresponding mitigation measures; and/or (ii) information on the design change and assessment of associated environmental impacts, if any; and/or (iii) corrective actions, associated cost and schedule; respectively. Further, the PMU shall:

(i) Obtain all statutory clearances and ensure relevant conditions or requirements are incorporated in the detailed design;
(ii) Conduct safeguards induction to the Contractor after award of contract;
(iii) Ensure Contractor appoints qualified environment, health and safety (EHS) officer prior to start of works;
(iv) Disclose information and establishment of GRM in a timely manner;
(v) Strictly supervise EMP implementation;
(vi) Continue consultations with stakeholders; and
(vii) Monitor and report status of implementation of the EMP on a regular basis as indicated in the IEE.

258. During the pre-construction phase, the Contractor shall prepare its SEMP, including other work plans, and submit to NCC, through the PMU or MDSC, for approval. No works shall commence until the SEMP and any relevant or required work plan is approved.

(i) Traffic Management Plan;
(ii) Spoil Management Plan;
(iii) Waste Management Plan; and
(iv) Health and Safety Plan (Community and Occupational).

259. This IEE report has been prepared in accordance with ADB SPS's requirements for projects classified as Category B for environment. With the above premises considered, the classification of Category B for environment is confirmed. Separately, per ECA, 1995 and ECR, 2023 of Bangladesh, the overall project or NGRUDP is classified under "Red" category. Hence, preparation of an environmental impact assessment (EIA) based on DOE approved terms of reference is mandatory. Upon approval of the submitted EIA, ECC must be obtained from the DOE prior to award of contracts.

Appendix 1: Rapid Environmental Assessment (REA) Checklist (Urban Development)

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Safeguards Division (SDSS) for endorsement by the Director, SDSS and for approval by the Chief Compliance Officer.
(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's: (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Bangladesh/Narayanganj Green and Resilient Urban Development Project/ Drainage Subproject

Sector Division: Water and Urban Development Sector Office, Sector Group

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area…			
Densely populated?	✓		Narayanganj City it the fourth most populated city in Bangladesh with population density of more than 100,000 per square kilometer.
Heavy with development activities?	✓		Narayanganj City Corporation (NCC) has a combination of commercial and industrial establishments.
Adjacent to or within any environmentally sensitive areas?			
• Cultural heritage site	✓		NCC is one city in Bangladesh that has several cultural heritage sites. In particular, the popular Hajiganj Fort and Sonakanda Fort are in NCC.
• Protected Area		✓	No protected area within or near the subproject sites.
• Wetland		✓	No wetlands within or near the subproject sites.
• Mangrove		✓	No mangroves within or near the subproject sites.
• Estuarine		✓	No estuarines within or near the subproject sites.
• Buffer zone of protected area		✓	No buffer zone of a protected area within or near the subproject sites.
• Special area for protecting biodiversity		✓	No special area for protecting biodiversity within or near the subproject sites.
• Bay		✓	NCC is far from the coastal area.
B. Potential Environmental Impacts Will the Project cause…			

Screening Questions	Yes	No	Remarks
impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.		✓	The subproject will not have any adverse impact. Rather, the subproject will reinforce the sustainability of sanitation and solid waste disposal system of NCC. Rehabilitation of the drainage system will improve the flow of stormwater and prevent the persistent flooding and waterlogging issues currently being experienced in NCC. Thus overall, the subproject will improve the sanitation condition in the city.
deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed?		✓	Not applicable.
degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)?		✓	The subproject will not degrade the land and any other ecosystems.
dislocation or involuntary resettlement of people?		✓	No physical displacements anticipated. Subproject sites and alignments are in government-owned lands with existing rights of way. Temporary impacts to businesses may occur during pipelaying or rehabilitation works for the distribution network component and are to be addressed through specific measures in the EMP.
disproportionate impacts on the poor, women and children, Indigenous Peoples, or other vulnerable group?		✓	Not anticipated. The subproject is a pro-poor and gender-inclusive undertaking as it aims to provide improved drainage system for NCC. The subproject provides a positive impact.
degradation of cultural property, and loss of cultural heritage and tourism revenues?	✓		Some alignments of the drainages to be rehabilitated are near or adjacent some cultural heritage sites. There is a potential that these will be impacted by the construction and rehabilitation activities, either permanent or temporary. However, these impacts have been assessed and mitigation measures are included in the EMP.
occupation of low-lying lands, floodplains, and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries?		✓	Not applicable.
water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality, and pollution of receiving waters?		✓	The subproject will instead aim to improve the conditions of surface water with the improvement of the drainage system.
air pollution due to urban emissions?		✓	Not applicable.

Screening Questions	Yes	No	Remarks
▪ risks and vulnerabilities related to occupational health and safety due to physical, chemical, and biological hazards during project construction and operation?	✓		The implementation of the subproject will involve activities where the health and safety of workers will be put at risk. However, measures to mitigate impacts to occupational health and safety are included in the EMP.
road blocking and temporary flooding due to land excavation during rainy season?	✓		Construction activities during rainy season will have the potential to cause road blocks and flooding. However, mitigation measures to prevent these impacts are in the EMP.
noise and dust from construction activities?	✓		Construction activities will have the potential to generate noise and dust. However, mitigation measures to prevent these impacts are in the EMP.
traffic disturbances due to construction material transport and wastes?	✓		Construction activities and transport of materials and wastes will have the potential to disturb traffic in the vicinity particularly during busy hours. However, mitigation measures to prevent this impact are in the EMP.
temporary silt runoff due to construction?	✓		Excavation and other construction activities will have the potential to cause silt runoff. However, mitigation measures to prevent this impact are included in the EMP.
hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation?		✓	Not applicable.
water depletion and/or degradation?		✓	Not applicable.
overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization?		✓	Not applicable.
contamination of surface and ground waters due to improper waste disposal?	✓		Rehabilitation of drains and canals will generate wastes, including the recovery of solid wastes from drains and canals. Improper disposal of these wastes will have the potential to contaminate surface and groundwater in the area. However, measures to prevent this impact are included in the EMP.
pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems?	✓		Rehabilitation of drains and canals will generate wastes, including the recovery of solid wastes from drains and canals. Improper disposal of these wastes will have the potential to contaminate surface and groundwater in the area. However, measures to prevent this impact are included in the EMP.
large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	The subproject will not require significant number of people who will move into NCC. Engaging local labor will be a priority under the subproject.
social conflicts if workers from other regions or countries are hired?		✓	The subproject will not require significant number of people who will move into NCC. Engaging local labor will be a priority under the subproject.

Screening Questions	Yes	No	Remarks
risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction?	✓		Fuel and other chemicals will be used during construction phase. Potential impact of fuel or chemical spill or mishandling during construction phase will be managed through measures included in the EMP..
community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation, and decommissioning?	✓		Anticipated during construction phase. But work areas will be clearly demarcated with signages and safety barriers, and access will be controlled. Only workers and subproject concerned members will be allowed to visit the operational sites.

Appendix 2: NCC Drainage Master Plan

(The Drainage Master Plan is a 165-page document. To reduce the file size of the IEE report, only the cover page of the master plan is reflected below for reference. A complete and free copy of the document can be requested from the ADB Project Officer and/or NCC PMU).

Narayanganj City Corporation

Urban Infrastructure Improvement Preparatory Facility (ADB Funded – NCC Component)

Consultant Services for Preparatory Studies and Procurement Support (PSPS)

Contract No. : UIIPF/NCC/S-01 Project Readiness Financing (TA Loan)

DRAINAGE MASTERPLAN

June 2023

PADECO PEGLOBAL NJS BCL dpm

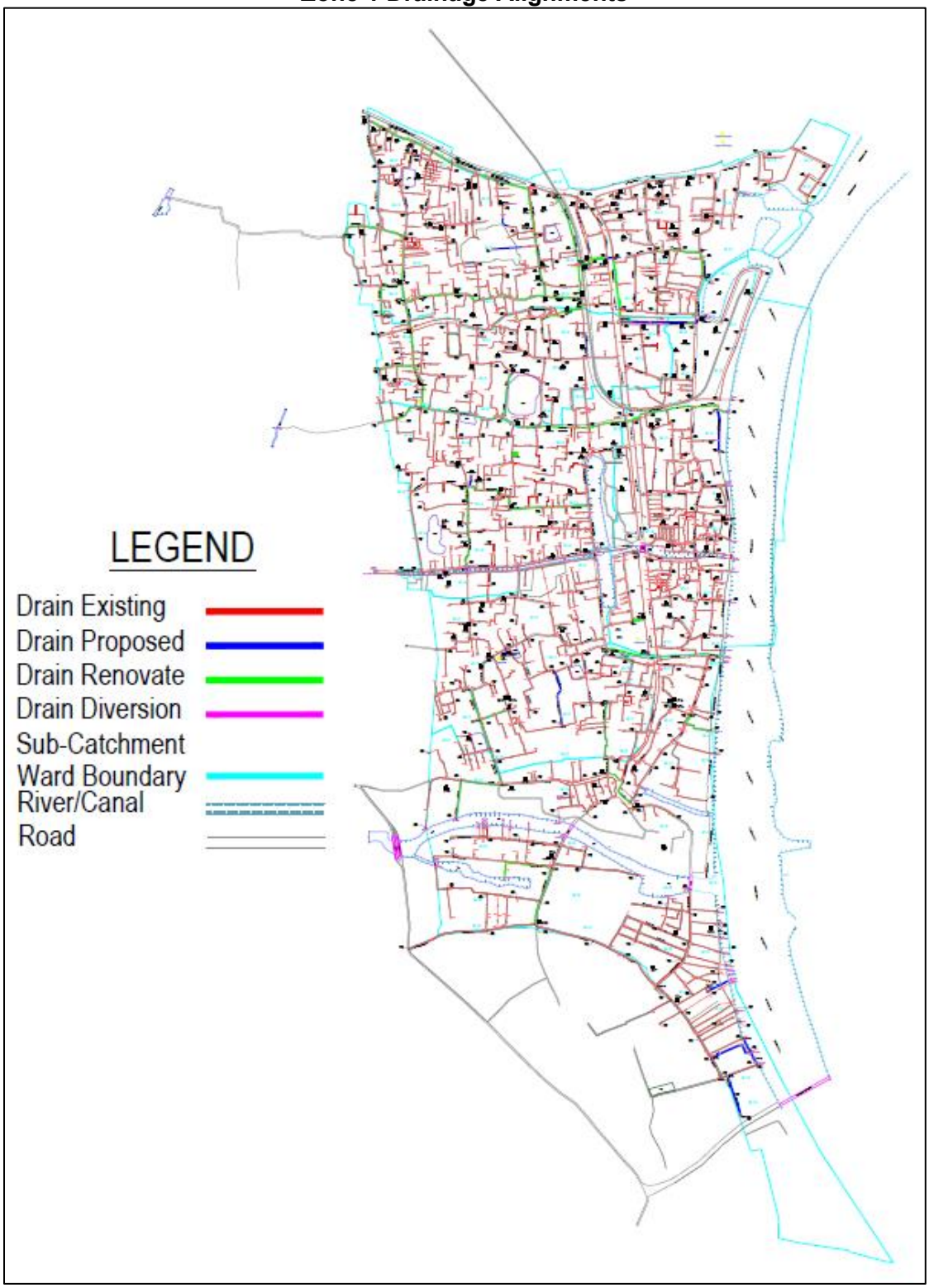
Adobe Acrobat
Document

(please double click the PDF icon to see the NCC Drainage Master Plan)

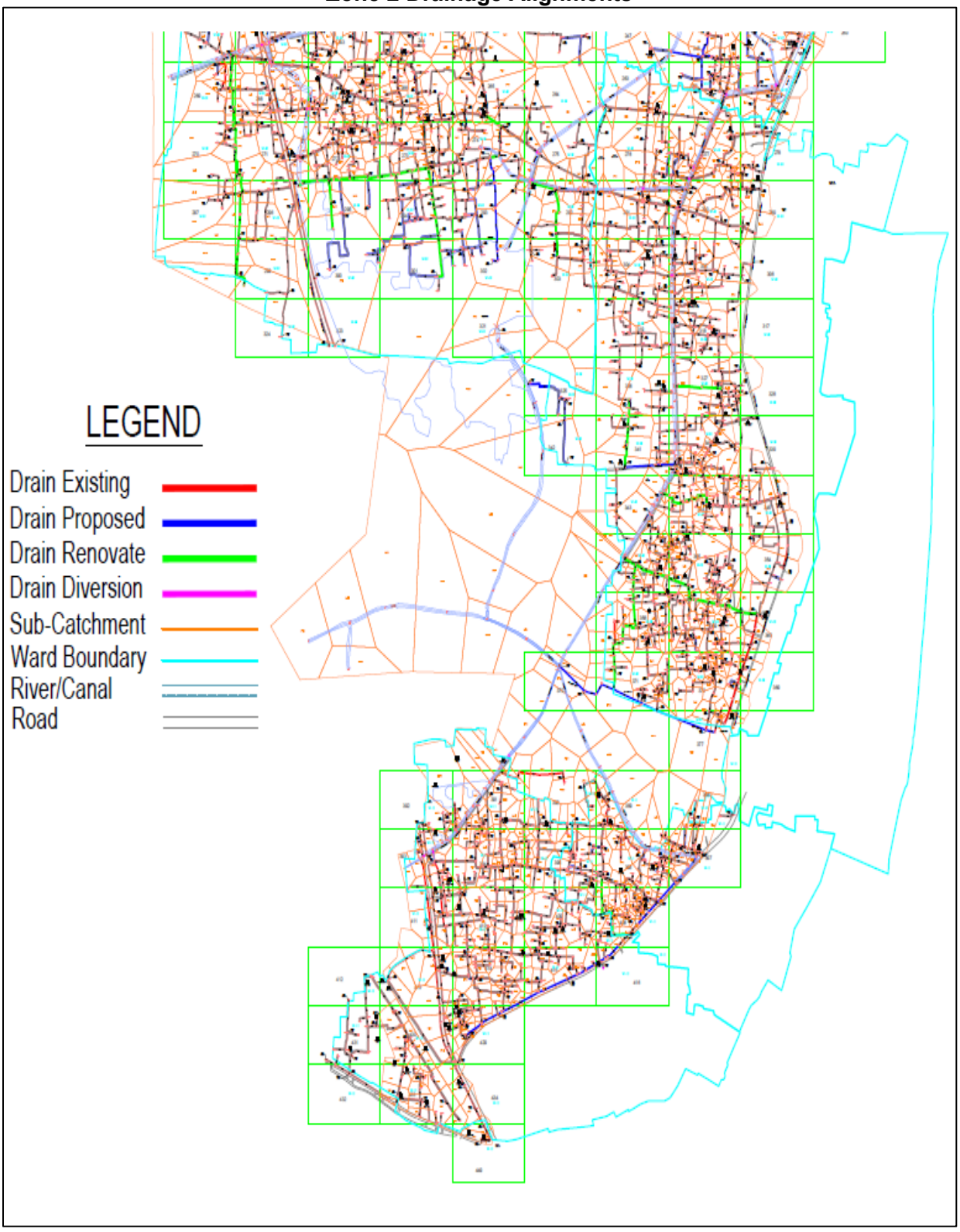
Appendix 3: Drainage Alignments on Zone-Wise Basis

(Zoomable drawings that can show better detail are available using AutoCAD software. This can be requested from the NCC PMU).

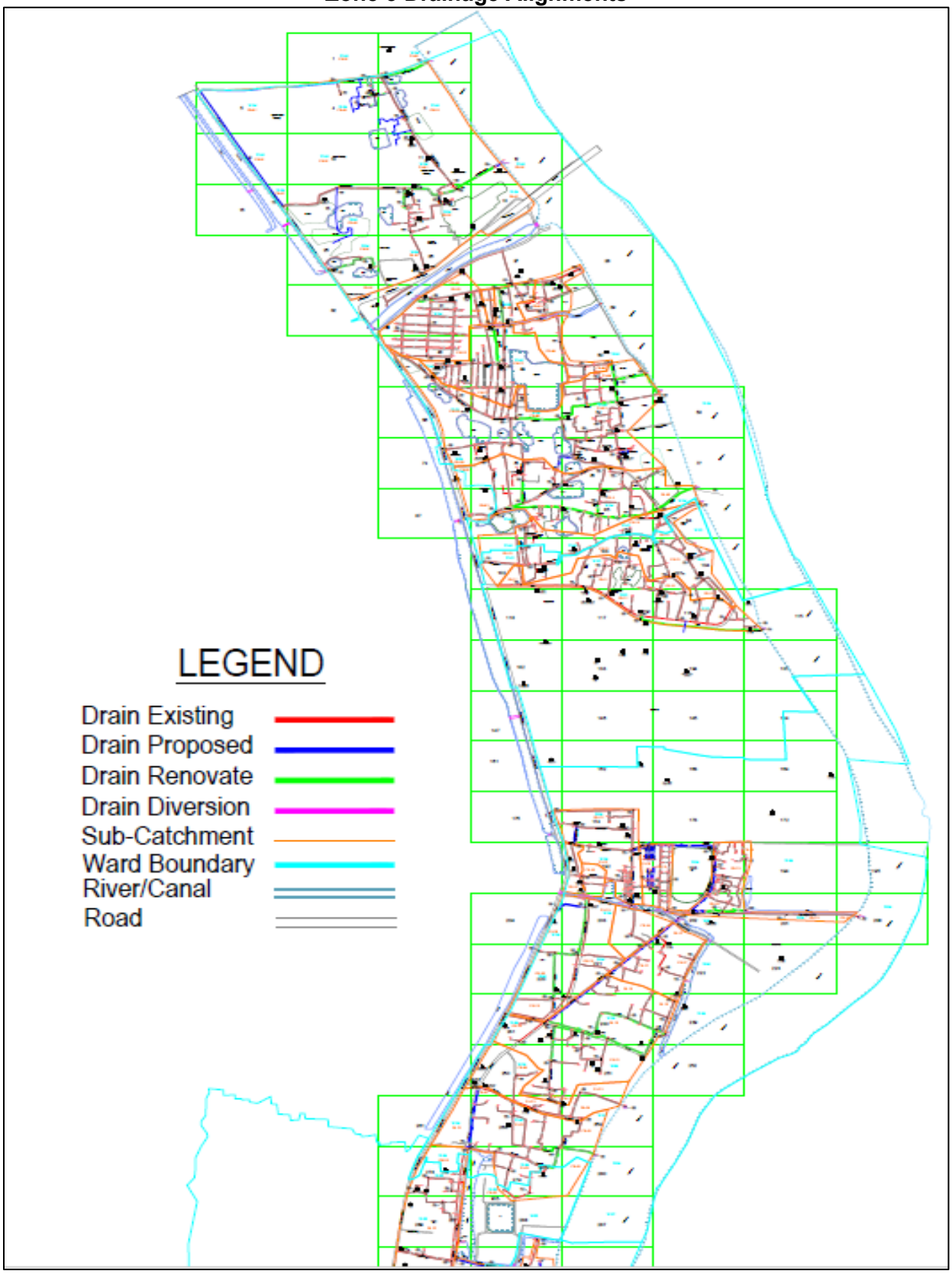
Zone 1 Drainage Alignments



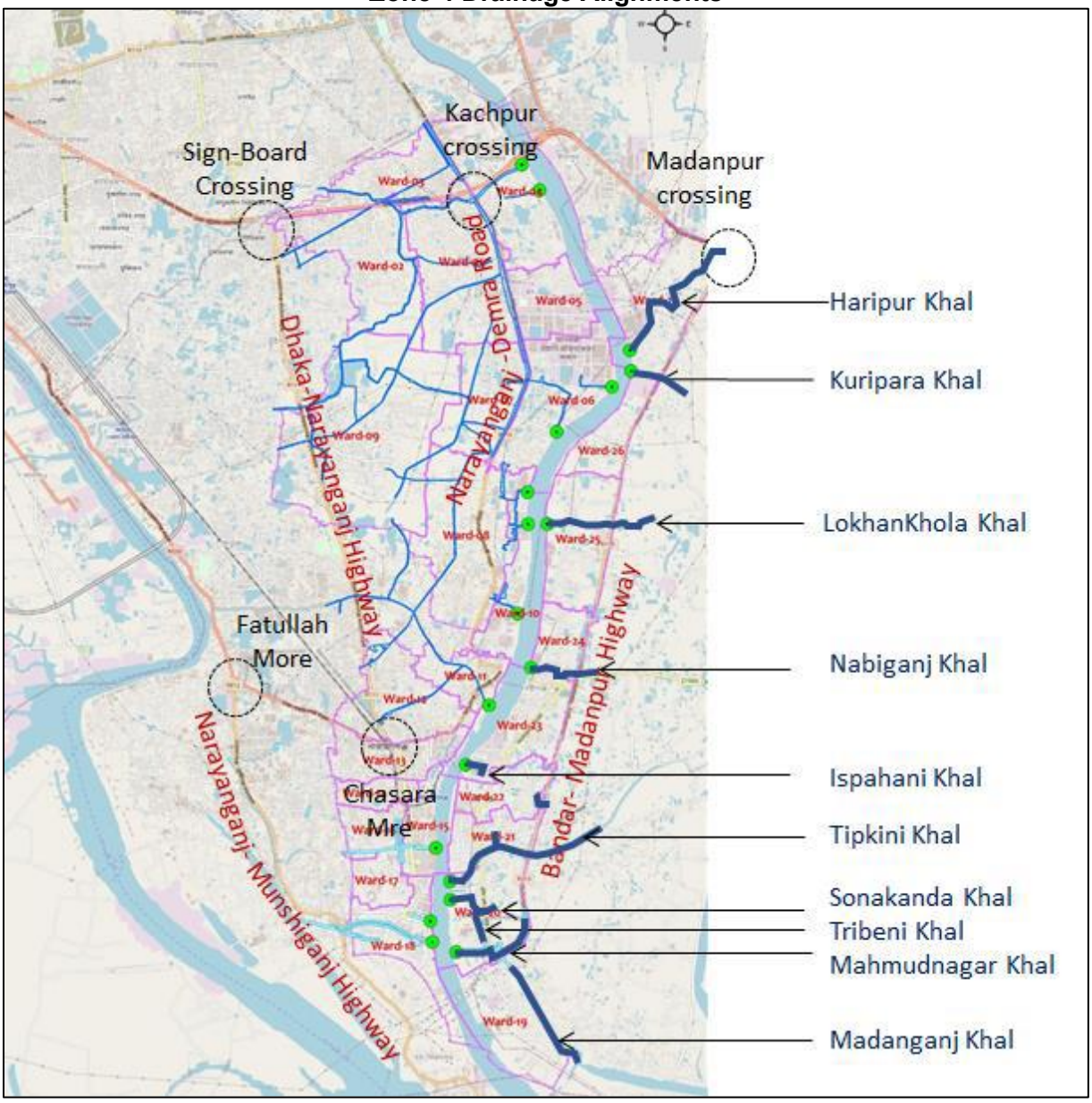
Zone 2 Drainage Alignments



Zone 3 Drainage Alignments



Zone 4 Drainage Alignments



[a] Disclaimer: Boundaries, colors, denominations or any other information shown on this map do not imply, on the part of ADB, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

Appendix 4: Copies of Laboratory Analysis Results on Ambient Air Quality

Ref: EQMS/Air Quality/ 20230205227

EQMS ENVIRONMENTAL LABORATORY

Monitoring Results of Ambient Air Quality

Project Name : Urban Infrastructure Improvement Preparatory Facility (UIIPF)

Monitoring Activity : Ambient Air Quality (Working Day)

Monitoring Personnel : EQMS Inspection Team

Monitoring Location :

SL. No	GPS Coordinate	Location Name
1	23°36'5.46"N 90°29'50.01"E	Ranada Prasad Saha University, 12 Sahed Bappi Sharoni, Narayanganj
2	23°36'41.67"N 90°29'44.81"E	Bara Dewbhog, 1 Mobarak Shah Rd, Narayanganj
3	23°37'55.85"N 90°30'11.56"E	Shirin Selina Home, Narayanganj
4	-	-
5	23°40'59.39"N 90°29'58.41"E	Chairman Bari, Siddhirganj
6	23°40'40.09"N 90°31'25.46"E	Adamjee EPZ Road, Siddhirganj
7	23°34'42.21"N 90°30'41.3"E	Crown Cement Factory Ltd. Road, Muktarpur, Narayanganj
8	23°37'24.88"N 90°30'46.23"E	AKIJ Flour Mills Limited, Nabigonj, Narayanganj

Monitoring Date : 25.01.2022 - 04.02.2023

Reporting Date : 14.02.2023

P.T.O

Head Office: H # 53, F # 04, B # C, Banani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bolshakhi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amot Street, Scarborough Ontario, M1K4B5 Canada

EQMS

Ref: EQMS/Air Quality/ 20230205227

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants' Concentration in µg/m³							CO mg/m³
		PM_{10}	$PM_{2.5}$	SO_2	NO_2	Pb	NH3	O_3	
AQ1	25.01.2023	353.87	177.43	30.25	61.79	0.031	2.48	41.39	2.33
AQ2	25.01.2023	133.28	101.35	30.19	33.98	BDL	0.00	21.71	0.15
AQ3	26.01.2023	182.85	122.97	27.68	52.24	0.070	0.00	13.02	0.20
AQ4	-	-	-	-	-	-	-	-	-
AQ5	01.02.2023	108.18	68.33	14.49	22.18	0.068	0.00	42.90	0.31
AQ6	01.02.2023	190.75	98.89	105.67	75.63	0.059	6.04	29.11	1.80
AQ7	02.02.2023	205.97	94.61	43.24	47.88	0.034	6.04	29.12	1.80
AQ8	02.02.2023	93.78	59.89	16.07	19.66	BDL	0.00	18.44	0.14
Durations		24	24	24	24	24	24	8	8
Air Pollution (Control) Rules, 2022		150	65	80	80	0.50	400	100	05
Method of Analysis		Light Scattering Nephelometer	Light Scattering Nephelometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	Mixed Method Oxide	High Sensitivity Electrochemical

*Note: * Air Pollution (Control) Rules, 2022, Legend: PM_{10} -Particulate Matter of a diameter of 10 microns or less. $PM_{2.5}$-Particulate Matter of a diameter of 2.5 microns or less, SO_2=Sulphur Dioxide; NO_2=Nitrogen Dioxide; NH3 (ammonia); O_3 =Ozone; CO =Carbon Monoxide, BDL = Below detection limit*

Weather Condition:

Code	Wind Speed (km/h)	Wind Direction	Relative Humidity (%)	Remarks/ Comments
AQ1	1.06	215.44 (South South West)	50	Sunny Day
AQ2	3.1	253.56 (West South West))	53	Sunny Day
AQ3	4.25	136.50 (South East)	60	Sunny Day
AQ4	-	-	-	-
AQ5	6.59	218.31 (South South West)	63	Sunny Day
AQ6	4.14	140.51 (South East)	57	Sunny Day
AQ7	4.57	140.68 (South East)	49	Sunny Day
AQ8	8.32	176.45 (South South West)	43	Sunny Day

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Lab Office: Flat # F1, House # Ta-134/A, Bokhalkhi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amat Street, Scarborough Ontario, M1K4B5 Canada

Ref: EQMS/Air Quality/ 20230205227

Received By:	Analyzed By:	Checked By:
Shihabuddin Ahmed Consultant EQMS Consulting Limited	Ahmed Jubaer Technical Manager EQMS Consulting Limited	Md. Jahidul Islam Quality Manager EQMS Consulting Limited

Head Office: H # 53, F # 04, B # C, Barani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bokhakhi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amot Street, Scarborough Ontario, M1K4B5 Canada

Ref: EQMS/Air Quality/ 20230205228

EQMS ENVIRONMENTAL LABORATORY

Monitoring Results of Ambient Air Quality

Project Name : Urban Infrastructure Improvement Preparatory Facility (UIPF)

Monitoring Activity : Ambient Air Quality (Non-Working Day)

Monitoring Personnel : EQMS Inspection Team

Monitoring Location :

SL. No	GPS Coordinate	Location Name
1	23°36'5.46"N 90°29'50.01"E	Ranada Prasad Saha University, 12 Sahed Bappi Sharoni, Narayanganj
2	23°36'41.67"N 90°29'44.81"E	Bara Dewbhog, 1 Mobarak Shah Rd, Narayanganj
3	23°37'55.85"N 90°30'11.56"E	Shirin Selina Home, Narayanganj
4	-	-
5	23°40'59.39"N 90°29'58.41"E	Chairman Bari, Siddhirganj
6	23°40'40.09"N 90°31'25.46"E	Adamjee EPZ Road, Siddhirganj
7	23°34'42.2"N 90°30'41.3"E	Crown Cement Factory Ltd. Road, Muktarpur, Narayanganj
8	23°37'24.88"N 90°30'46.23"E	AKIJ Flour Mills Limited, Nabigonj, Narayanganj

Monitoring Date : 25.01.2022 - 04.02.2023

Reporting Date : 14.02.2023

P.I.O

Head Office: H # 53, R # 04, B # C, Barani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bolshahi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amal Street, Scarborough Ontario, M1X4B5 Canada

Ref: EQMS/Air Quality/ 20230205228

Description of Analysis:

Location	Sampling Date	Ambient Air Pollutants' Concentration in µg/m³							CO mg/m³
		PM_{10}	$PM_{2.5}$	SO_2	NO_2	Pb	NH3	O_3	
AQ1	25.01.2023	256.59	159.58	66.24	39.65	0.032	4.39	38.93	1.19
AQ2	25.01.2023	128.72	96.72	27.20	45.67	BDL	0.00	14.36	0.20
AQ3	26.01.2023	147.53	106.85	20.81	24.15	0.021	0.00	51.97	0.17
AQ4	-	-	-	-	-	-	-	-	-
AQ5	01.02.2023	113.99	82.42	26.67	13.21	0.065	0.00	37.78	0.18
AQ6	01.02.2023	226.16	133.19	89.03	73.79	0.060	5.27	33.06	2.03
AQ7	02.02.2023	335.70	131.59	59.84	66.04	0.052	4.85	42.28	1.61
AQ8	02.02.2023	116.76	84.29	37.99	26.67	BDL	0.00	9.15	0.21
Durations		24	24	24	24	24	24	8	8
Air Pollution (Control) Rules, 2022		150	65	80	80	0.50	400	100	05
Method of Analysis		Light Scattering Nephalometer	Light Scattering Nephalometer	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	High Sensitivity Electrochemical	Mixed Metal Oxide	High Sensitivity Electrochemical

*Note: * Air Pollution (Control) Rules, 2022, Legend: PM_{10}-Particulate Matter of a diameter of 10 microns or less. $PM_{2.5}$-Particulate Matter of a diameter of 2.5 microns or less, SO_2 =Sulphur Dioxide; NO_2 =Nitrogen Dioxide; NH3 (ammonia); O_3 =Ozone; CO =Carbon Monoxide, BDL = Below detection limit*

Weather Condition:

Code	Wind Speed (km/h)	Wind Direction	Relative Humidity (%)	Remarks/ Comments
AQ1	5.33	127.69(East South East)	53	Sunny Day
AQ2	10.73	262.50(West South West)	65	Sunny Day
AQ3	8.03	166.83 (South)	61	Sunny Day
AQ4	-	-	-	-
AQ5	7.78	196.88(South)	60	Sunny Day
AQ6	4.39	177.08(South South East)	47	Sunny Day
AQ7	3.10	120.21(East South East)	49	Sunny Day
AQ8	8.50	121.50 (East South East)	54	Sunny Day

Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bokhakhi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Arnot Street, Scarborough Ontario, M1K4B5 Canada

Ref: EQMS/Air Quality/ 20230205228

Received By:	Analyzed By:	Checked By:
Shihabuddin Ahmed Consultant EQMS Consulting Limited	Ahmed Jubaer Technical Manager EQMS Consulting Limited	Md. Jahidul Islam Quality Manager EQMS Consulting Limited

Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh
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Toronto Office: 7 Amat Street, Scarborough Ontario, M1K4B5 Canada

Appendix 5: Copies of Laboratory Analysis Results on Noise Level Measurements

Ref: EQMS/Noise Level/ 20230205229

EQMS Environmental Laboratory
Test Results of Noise Level

Project Name : Urban Infrastructure Improvement Preparatory Facility (UIIPF)
Description of Sample : Noise Level Measurement
Sample Collector : EQMS Inspection Team
Sampling Location : NL1 to NL8
Sampling Date : 25.01.2022-28.01.2022 & 01.02.2023-04.02.2023
Reporting Date : 13.02.2023
Monitoring Locations:

SL. No	GPS Coordinate	Location Name
1	23°36'5.48"N 90°29'50.01"E	Ranada Prasad Saha University, 12 Sahed Bappi Sharoni, Narayanganj
2	23°36'41.67"N 90°29'44.81"E	Bara Dewbhog, 1 Mobarak Shah Rd, Narayanganj
3	23°37'55.85"N 90°30'11.56"E	Shirin Selina Home, Narayanganj
4	-	-
5	23°40'59.39"N 90°29'58.41"E	Chairman Bari, Siddhirganj
6	23°40'40.09"N 90°31'25.46"E	Adamjee EPZ Road, Siddhirganj
7	23°34'42.2"N 90°30'41.3"E	Crown Cement Factory Ltd. Road, Muktarpur, Narayanganj
8	23°37'24.88"N 90°30'46.23"E	AKIJ Flour Mills Limited, Nabigonj, Narayanganj

P.T.O

Head Office: H # 53, R # 04, B # C, Banani, Dhaka -1213, Bangladesh
Lab Office: Flat # F1, House # Ta-134/A, Bokhakhi Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amat Street, Scarborough Ontario, M1K4B5 Canada

Ref: EQMS/Noise Level/ 20230205229

Description of Analysis:

SL No	Leq_{day}	Leq_{night}	L_{max}	L_{min}	Standard Day(dB)	Standard Night(dB)
NL1-WD	67.74	60.41	92.5	45.6	50	40
NL1-NWD	66.41	59.96	89.6	32.1		
NL2-WD	59.29	56.95	80.0	30.8	60	50
NL2-NWD	63.56	55.21	90.8	37.8		
NL3-WD	64.68	58.76	85.1	30.8	55	45
NL3-NWD	63.28	57.87	90.2	41.0		
NL4-WD	-	-	-	-	75	70
NL4-NWD	-	-	-	-		
NL5-WD	62.89	56.89	90.0	30.8	55	45
NL5-NWD	62.97	55.22	86.4	32.1		
NL6-WD	78.99	68.88	103.2	42.3	75	70
NL6-NWD	74.99	68.70	93.6	32.1		
NL7-WD	73.39	57.16	97.9	40.8	75	70
NL7-NWD	77.78	68.93	95.9	40.8		
NL8-WD	74.42	66.99	97.3	40.6	75	70
NL8-NWD	70.62	59.97	92.5	44.3		
Standard (ECR'1997) & Noise Pollution (Control) Rules 2006						
Silent area					50	40
Residential area					55	45
Mixed area					60	50
Commercial Area					70	60
Industrial area					75	70
World Bank/IFC Standard						
Residential; Institutional; Educational					55	45
Industrial					70	70

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Lab Office: Flat # F1, House # Ta-134/A, Bokhakhli Sarani, Gulshan-Badda Link Road, Dhaka – 1212
Toronto Office: 7 Amat Street, Scarborough Ontario, M1X4B5 Canada

Ref: EQMS/Noise Level/ 20230205229

Received by:	Analyzed by:	Checked by:
Shihabuddin Ahmed Consultant EQMS Consulting Limited	Ahmed Jubaer Technical Manager EQMS Consulting Limited	Md. Jahidul Islam Quality Manager EQMS Consulting Limited

Appendix 6: IBAT Screening Results

IBAT

Integrated Biodiversity Assessment Tool

World Bank Group Biodiversity Risk Screen

BAN-NGRUDP

- **Country:** Bangladesh
- **Location:** [23.6, 90.5]
- **IUCN Red List Biomes:** Marine, Freshwater, Terrestrial
- **Created by:** [redacted]

Overlaps with:

Protected Areas	1 km: 0	10 km: 0	50 km: 2	2
World Heritage (WH)	1 km: 0	10 km: 0	50 km: 0	0
Key Biodiversity Areas	1 km: 0	10 km: 0	50 km: 0	0
Alliance for Zero Extinction (AZE)	1 km: 0	10 km: 0	50 km: 0	0
IUCN Red List				43
Critical Habitat				Unclassified

Displaying project location and buffers: 1 km, 10 km, 50 km

WORLD BANK GROUP

This report is based on IFC Performance Standard 6 (PS6) but applies to World Bank Environmental and Social Standard 6 (ESS6)

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About this report

The recommendations stated alongside any Protected Areas and Key Biodiversity Areas identified in this report are determined by the following:

Protected Areas:

- 'Highest risk. Seek expert help' is stated if the report identifies a designation that includes either 'natural' or 'mixed world heritage site'.
- 'Assess for Critical Habitat' is stated if the report identifies a Strict Nature Reserve, Wilderness Area or National Park as coded by IUCN protected area categories Ia, Ib and II.
- 'Assess for biodiversity risk' is stated if the report identifies any other type of protected area.

Key Biodiversity Areas:

- 'Highest risk. Seek expert help' is stated if the report identifies an Alliance for Zero Extinction site.
- 'Assess for Critical Habitat' is stated if the report identifies Critically Endangered or Endangered species OR species with restricted ranges OR congregatory species as coded in the IUCN Red List of Threatened Species.
- 'Assess for biodiversity risk' is stated if the report identifies any other type of Key Biodiversity Area.

IBAT provides initial screening for Critical Habitat values. Performance Standard 6 (PS6) defines these values for Critical Habitat (PS6: para. 16) and legally protected and internationally recognized areas (PS6: para. 20). PS6 will be triggered when IFC client activities are located in modified habitats containing "significant biodiversity value," natural habitats, Critical Habitats, legally protected areas, or areas that are internationally recognized for biodiversity. References to PS6 and Guidance Note 6 (GN6) are provided to guide further assessment and detailed definitions where necessary. Please see https://www.ifc.org/ps6 for full details on PS6 and GN6.

This report identifies restricted range species according to the KBA Standard definition (hyperlink KBA Standard https://portals.iucn.org/library/sites/library/files/documents/2016-048.pdf):

Species having a global range size less than or equal to the 25th percentile of range-size distribution in a taxonomic group within which all species have been mapped globally, up to a maximum of 50,000 km2. If all species in a taxonomic group have not been mapped globally, or if the 25th percentile of range-size distribution for a taxonomic group falls below 10,000 km2, restricted range should be defined as having a global range size less than or equal to 10,000 km2. For coastal, riverine and other species with linear distributions that do not exceed 200 km width at any point, restricted range is defined as having a global range less than or 15 equal to 500 km linear geographic span (i.e. the distance between occupied locations furthest apart).

Note, sites supporting restricted range species can qualify as KBAs under criterion B2. These are sites that hold a significant proportion of the global population size of multiple restricted-range species, and so contribute significantly to the global persistence of biodiversity at the genetic and species level.

The report screens for known risks within a standard 50km buffer of the coordinates used for analysis. This buffer is not intended to indicate the area of impact. The report can be used to:

- Scope risks to include within an assessment of risks and impacts

- Identify gaps within an existing assessment of risks and impacts
- Prioritize between sites in a portfolio for further assessment of risks and impacts
- Inform a preliminary determination of Critical Habitat
- Assess the need for engaging a biodiversity specialist
- Identify additional conservation experts or organizations to inform further assessment or planning

WARNING: IBAT aims to provide the most up-to-date and accurate information available at the time of analysis. There is however a possibility of incomplete, incorrect or out-of-date information. All findings in this report must be supported by further desktop review, consultation with experts and/or on-the-ground field assessment as described in PS6 and GN6. Please consult IBAT for any additional disclaimers or recommendations applicable to the information used to generate this report.

Please note, sensitive species data are currently not included in IBAT reports in line with the Sensitive Data Access Restrictions Policy for the IUCN Red List. This relates to sensitive Threatened species and KBAs triggered by sensitive species.

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Priority Species

Habitat of significant importance to priority species will trigger Critical Habitat status (See PS6: para 16). IBAT provides a preliminary list of priority species that could occur within the 50km buffer. This list is drawn from the IUCN Red List of Threatened Species (IUCN RL). This list should be used to guide any further assessment, with the aim of confirming knownor likely occurrence of these species within the project area. It is also possible that further assessment may confirm occurrence of additional priority species not listed here. It is strongly encouraged that any new species information collected by the project be shared with species experts and/or IUCN wherever possible in order to improve IUCN datasets.

IUCN Red List of Threatened Species - CR & EN

The following species are potentially found within 50km of the area of interest.
For the full IUCN Red List please refer to the associated csv in the report folder.

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Batagur dhongoka	Three-striped Roofed Turtle	REPTILIA	CR	Decreasing	Terrestrial, Freshwater
Sphyrna lewini	Scalloped Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
Sphyrna mokarran	Great Hammerhead	CHONDRICHTHYES	CR	Decreasing	Marine
Sonneratia griffithii		MAGNOLIOPSIDA	CR	Decreasing	Terrestrial, Marine
Aythya baeri	Baer's Pochard	AVES	CR	Decreasing	Freshwater
Houbaropsis bengalensis	Bengal Florican	AVES	CR	Decreasing	Terrestrial
Batagur baska	Northern River Terrapin	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater
Pelochelys cantorii	Asian Giant Softshell Turtle	REPTILIA	CR	Decreasing	Terrestrial, Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Geoclemys hamiltonii	Spotted Pond Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Hardella thurjii	Crowned River Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Morenia petersi	Indian Eyed Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Orcaella brevirostris	Irrawaddy Dolphin	MAMMALIA	EN	Decreasing	Marine, Freshwater
Panthera tigris	Tiger	MAMMALIA	EN	Decreasing	Terrestrial
Rhincodon typus	Whale Shark	CHONDRICHTHYES	EN	Decreasing	Marine
Varanus flavescens	Yellow Monitor	REPTILIA	EN	Decreasing	Terrestrial
Nilssonia gangetica	Indian Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Nilssonia hurum	Indian Peacock Softshell Turtle	REPTILIA	EN	Decreasing	Terrestrial, Freshwater
Nycticebus bengalensis	Bengal Slow Loris	MAMMALIA	EN	Decreasing	Terrestrial
Hoolock hoolock	Western Hoolock Gibbon	MAMMALIA	EN	Decreasing	Terrestrial
Platanista gangetica	Ganges River Dolphin	MAMMALIA	EN	Decreasing	Freshwater
Eusphyra blochii	Winghead Shark	CHONDRICHTHYES	EN	Decreasing	Marine

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Mobula eregoodoo	Longhorned Pygmy Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Stegostoma tigrinum	Zebra Shark	CHONDRICHTHYES	EN	Decreasing	Marine
Mobula tarapacana	Sicklefin Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Mobula thurstoni	Bentfin Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Acropora rudis		ANTHOZOA	EN	Decreasing	Marine
Trachypithecus phayrei ssp. phayrei		MAMMALIA	EN	Decreasing	Terrestrial
Alopias pelagicus	Pelagic Thresher	CHONDRICHTHYES	EN	Decreasing	Marine
Heritiera fomes		MAGNOLIOPSIDA	EN	Decreasing	Terrestrial, Marine, Freshwater
Holothuria scabra	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Holothuria lessoni	Golden Sandfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Thelenota ananas	Prickly Redfish	HOLOTHUROIDEA	EN	Decreasing	Marine
Urogymnus polylepis	Giant Freshwater Whipray	CHONDRICHTHYES	EN	Decreasing	Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Mobula birostris	Oceanic Manta Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Rynchops albicollis	Indian Skimmer	AVES	EN	Decreasing	Terrestrial, Freshwater
Sterna acuticauda	Black-bellied Tern	AVES	EN	Decreasing	Terrestrial, Freshwater
Haliaeetus leucoryphus	Pallas's Fish-eagle	AVES	EN	Decreasing	Terrestrial, Freshwater
Aquila nipalensis	Steppe Eagle	AVES	EN	Decreasing	Terrestrial
Leptoptilos dubius	Greater Adjutant	AVES	EN	Decreasing	Terrestrial, Freshwater
Laticilla cinerascens	Swamp Grass-babbler	AVES	EN	Decreasing	Terrestrial, Freshwater
Mobula mobular	Spinetail Devil Ray	CHONDRICHTHYES	EN	Decreasing	Marine
Trachypithecus phayrei	Phayre's Leaf-monkey	MAMMALIA	EN	Decreasing	Terrestrial
Trachypithecus pileatus ssp. pileatus	Blond-bellied Langur	MAMMALIA	EN	Decreasing	Terrestrial

Restricted Range Species

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Ophisternon bengalense	Bengal Mud Eel	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater

Species Name	Common Name	Taxonomic Group	IUCN Category	Population Trend	Biome
Bengala elanga	Bengala Barb	ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Xenentodon cancila		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Batasio batasio		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oreichthys cosuatis		ACTINOPTERYGII	LC OR LR/LC	Unknown	Freshwater
Oryzias dancena	Indian Ricefish	ACTINOPTERYGII	LC OR LR/LC	Stable	Marine, Freshwater
Pseudosphromenus cupanus	Spiketail Paradise Fish	ACTINOPTERYGII	LC OR LR/LC	Stable	Freshwater
Oryzias carnaticus	Spotted Ricefish	ACTINOPTERYGII	LC OR LR/LC	Unknown	Marine, Freshwater
Macrobrachium scabriculum		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Macrobrachium rude		MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Macrobrachium rosenbergii	Giant River Prawn	MALACOSTRACA	LC OR LR/LC	Unknown	Freshwater
Fregetta tropica	Black-bellied Storm-petrel	AVES	LC OR LR/LC	Decreasing	Terrestrial, Marine
Nangra bucculenta		ACTINOPTERYGII	DD	Unknown	Freshwater

IBAT

Biodiversity features which are likely to trigger Critical Habitat

Protected Areas

The following protected areas are found within 1 km and 10 km and 50 km of the area of interest.
For further details please refer to the associated csv file in the report folder.

Area name	Distance	IUCN Category	Status	Designation	Recommendation
Bhawal	50 km	IV	Designated	National Park	Assess for biodiversity risk
Mirpur Botanic Garden	50 km	Not Reported	Proposed	National Botanic Garden	Assess for biodiversity risk

Key Biodiversity Areas

There are no key biodiversity areas to show for this report.

Species with potential to occur

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
REPTILIA	100	18	3	6	9	3	77	2
CHONDRICHTHYES	25	19	2	10	7	2	3	1
MAGNOLIOPSIDA	88	4	1	1	2	3	76	5
AVES	330	17	2	6	9	21	292	0
MAMMALIA	69	19	0	8	11	4	46	0
ANTHOZOA	8	2	0	1	1	2	3	1

Area Taxonomic group	Total assessed species	Total (CR, EN & VU)	CR	EN	VU	NT	LC	DD
HOLOTHUROIDEA	30	5	0	3	2	0	14	11
ACTINOPTERYGII	516	8	0	0	8	9	461	38
INSECTA	103	1	0	0	1	0	100	2
LILIOPSIDA	57	1	0	0	1	1	53	2
MALACOSTRACA	27	0	0	0	0	1	19	7
AMPHIBIA	17	0	0	0	0	0	17	0
HYDROZOA	2	0	0	0	0	0	2	0
GASTROPODA	114	0	0	0	0	0	109	5
POLYPODIOPSIDA	4	0	0	0	0	0	4	0
BIVALVIA	35	0	0	0	0	0	32	3
ARACHNIDA	3	0	0	0	0	0	3	0

Recommended citation

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Recommended Experts and Organizations

For projects located in Critical Habitat, clients must ensure that external experts with regional expertise are involved in further assessment (GN6: GN22). Clients are encouraged to develop partnerships with recognized and credible conservation organizations and/or academic institutes, especially with respect to potential developments in natural or Critical Habitat (GN6: GN23). Where Critical Habitats are triggered by priority species, species specialists must be involved. IBAT provides data originally collected by a large network of national partners, while species information is sourced via the IUCN Red List and affiliated Species Specialist Groups. These experts and organizations are listed below. **Please note that this is not intended as a comprehensive list of organizations and experts. These organizations and experts are under no obligation to support any further assessment and do so entirely at their discretion and under their terms. Any views expressed or recommendations made by these stakeholders should not be attributed to the IFC or IBAT for IFC partners.**

Birdlife Partners

URL: https://www.birdlife.org/worldwide/partnership/birdlife-partners

Directory for Species Survival Commission (SSC) Specialist Groups and Red List Authorities

URL: https://www.iucn.org/commissions/ssc-groups

Appendix 7: Sample Asbestos-Containing Materials Management Plan

Adobe Acrobat
Document

(please double click the PDF icon to see the document)

Appendix 8: Sample Outline of Traffic Management Plan

Introduction

This Traffic Management Plan (TMP) provides the traffic management procedures to be followed by the vehicle users of Contractors' while implementing the construction/reconstruction works of the project (or subproject). The vehicle operators should be careful that, road users are not limited to motorists. There are also the pedestrians, such as school children, people with disabilities, cyclists and animals using or traversing these roads.

Traffic Management Objectives and Strategies

The objectives of the TMP are to:

i. Provide for a safe environment for all road users;

ii. Provide protection to Contractors' operators and the general public from traffic hazards that may arise as a result of the driving of vehicles;

iii. Minimize the disruption, congestion and delays to all road users;

iv. Ensure access to adjacent private/commercial premises is maintained at all times.

To achieve the above objectives, the Traffic Management Plan will:

i. Ensure whenever possible, that a sufficient number of traffic lanes to accommodate vehicle traffic volumes are provided.

ii. Ensure that delays and traffic congestion are kept to a minimum and within acceptable levels.

iii. Ensure that appropriate/sufficient warning and information signs are installed and that adequate guidance is provided to delineate the travel paths to bypass or cross the construction site.

iv. Ensure that the roads are free of hazards and that all road users are adequately protected from activities of road users.

v. Ensure that all needs of road users, motorists, pedestrians, cyclists, public transport passengers and people with disabilities are accommodated around the construction site.

A Traffic Management Plan is a key workplace document that has legal standing. As such it is critical that the structure and content of the Plan is sufficient to explain the potential hazards, the assessed risks and the proposed treatments for the proposed work activities and work site. The TMP should include all of the following. Where any of the following sections are not applicable, the TMP should indicate this accordingly.

<u>Introduction</u>

i. Purpose and Scope,

ii. Objectives and Strategies.

Project Overview

i. Project Location,

ii. Project Details and Site Constraints/Impacts

Project Representatives (Principal for the Works; Principal Contractor)

Safety Plan

i. Occupational Safety and Health;

ii. Competencies;

iii. Responsibilities- Role, responsibility and authority of key personnel, management hierarchy including site representatives and contact details of the responsible personnel;

iv. Communicating TMP requirements;

v. Prior approvals (if any) granted by the governing local government agencies with relevant reference number.

Trip Hazards & Environmental Conditions

i. Weather;

ii. Vegetation;

iii. Existing signage;

iv. Structures.

Worksite Access

i. Pedestrians;

ii. Cyclists;

iii. Works vehicles;

iv. Emergency vehicles;

v. Public Transport;

vi. Property Access;

vii. School crossings;

viii. Impact on adjoining Road Network;

ix. Heavy and Oversized Vehicles and Loads;

x. Legal and Other Requirements.

Emergency Arrangements and Contingencies

i. Emergency Services;

ii. Dangerous Goods;

iii. Damage/Failure to Services (Traffic signals, street lighting, power, gas);

iv. Contingency Planning (Road crash or vehicle breakdown, serious injury or fatality);

v. Emergency Contacts.

Appendix 9: Sample Outline of Spoil Management Plan

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

Objectives of Spoil Management Plan: The objectives of SMP are:

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

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

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

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

Spoil volumes, Characteristics and Minimization

Spoil volume calculations: Estimate the volumes of spoils produced from each of the construction sites.

Characterization of spoil: Based on the type of spoil; characterization is done (sand stone, mud mix materials, reusable materials

Adopt Spoil Reduce, Reuse Opportunities: An overview of the assessment methodology to be used is mentioned below.

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

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

Storage and stock piling Transportation and haulage route

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

Summary of Key Issues and Remedial Actions

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

Appendix 10: Sample Outline of Waste Management Plan

Sample Waste Management Plan Outline

(Note: This was lifted from and patterned after the "Suggested Pre-incident All-hazards Waste Management Plan Outline of US Environmental Protection Agency". Minor edits were made for consistency with specific country setting.)

Recommended Plan Contents:	Considerations:
I. Plan Overview 1. Scope *Description of scenario, entity, and geographical area covered* 2. Planning assumptions 3. List of officials who should be notified in the case of an incident and contact information 4. Roles and responsibilities for waste management activities *Include specialized resources (e.g., subject matter experts for consultation, emergency response teams)* 5. Regulatory requirements List necessary permits as they are obtained 6. Documentation of plan development process *Include all internal departments and external entities* 7. Record of plan approvals, reviews, and updates to include any changes made	This section should be updated as needed during an incident with the situational overview. Scenarios may be based on site- and community-specific threats, hazards, and vulnerabilities.[3] Describe general terrain types, land use, and accessibility for the areas that would most likely be impacted by the incident and how these characteristics may affect waste management activities. Also, identify critical infrastructure and areas that may impact response priorities or present cleanup challenges. Include relevant national, local, tribal, and territorial (including neighboring countries, as appropriate) environmental/public health regulatory and legal requirements that impact waste management and material reuse. Also, include the impact that a government emergency or major disaster declaration might have on the implementation of applicable laws. Keep in mind that local government requirements may be more stringent than national government requirements and may include additional waste streams not covered under national laws. Establish roles and responsibilities for all waste management activities, including who will monitor contractors and waste management sites.
II. Materials and Waste Streams . List of anticipated waste streams . Description of each waste stream *Include regulatory status (national and local), associated hazards, if any, agent-specific (e.g., chemical, biological) information, fact sheets, if any, contact information for waste-specific subject matter experts, and packaging, labeling, handling, and transportation requirements, as well as identify decontamination and reuse, recycling, treatment, and disposal*	This section should be updated as needed during an incident with the actual waste streams generated by the incident. Consider these and other potential waste streams: • Aqueous Waste (e.g., water from decontamination activities) • Asbestos-containing Material • Ash • Asphalt • Building Contents • Chemically-contaminated Waste • Commingled Debris • Construction and Demolition Debris

options appropriate to that waste stream	• Cylinders and Tanks • Electronics Waste • Food Waste • Hazardous Waste • Lead-based Paint • Metals • Mixed Waste • Municipal Solid Waste (MSW) • Scrap Tires • Soils, Sediments, and Sandbags • Solid Waste from Response Activities (e.g., personal protective equipment (PPE), waste from law enforcement activities) • Used Oil and Oil-contaminated Waste • Vegetative Debris Consider all other potential sources of wastes from construction activities.
III. Waste Quantities 1. Forecast quantity of each type of anticipated waste 2. Method for estimating actual waste quantities during/after an incident *(e.g., GIS, windshield assessment, manned and unmanned aerial surveillance)*	This section should be updated as needed during an incident with waste estimates based on the specifics of the incident. **Recommended Tools:** Incident Waste Decision Support Tool (I-WASTE DST) (registration is required to use this tool) http://www2.ergweb.com/bdrtool/login.asp FEMA's Hazards U.S.-Multi-Hazard (Hazus-MH) (for estimating potential losses from earthquakes, floods, and hurricanes) http://www.fema.gov/hazus (ArcGIS software is required to use Hazus-MH) EPA's Waste Estimation Support Tool (WEST) (for estimating the type and amount of waste generated from cleanup after a radiological incident) https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEnt ryId=288802
IV. Waste Characterization Sampling and Analysis *(for each waste stream)* 1. Sampling *Estimate number of samples, identify type of analysis needed for each waste/material type, potential approaches to combine/composite samples, and address Health and Safety issues, such as appropriate PPE for sampling activities*	Two different types of sampling may be needed to meet waste acceptance criteria at waste management facilities and to allay community concerns: 1) sampling to classify and determine compliance with national, local, or tribal regulatory criteria, and 2) sampling to ensure that waste/materials have been effectively decontaminated.

AND *Identify any requirements for transporting the samples to laboratories for testing* 2. Analysis *Identify data quality objectives, labs which can conduct the analyses, as well as methodologies for the analyses, what items are needed for sampling (e.g., swabs, sample bottles), sampling methodologies (e.g., composite sampling procedures), and the required techniques* 3. Quality assurance *Identify methods to ensure the quality of the data, analysis, and results*	
V. Waste Management Strategies/ Options 1. Procedures and approaches *By activity* a. Minimization *Actions to minimize waste generation, toxicity, and physical size* b. Collection *Methods; health and safety requirements* c. Segregation d. Decontamination (equipment, people, waste/ materials) *Health and safety requirements* e. Accumulation/Storage *Site location selection criteria; documentation; health and safety requirements* f. Monitoring of Waste Management Activities 2. Pre-selected waste management sites *Site-specific information*	This section should be updated as needed during an incident (e.g., with sites that are used or may be used to manage waste during the incident). Relevant legal and regulatory requirements should be considered, including whether waste management activities may trigger compliance with environmental and historic preservation laws, rules, and regulations. Describe how compliance will be attained. Required permits may include waste processing and recycling operations permits, temporary land-use permits, land-use variances, traffic circulation strategies, air quality permits, water quality permits, coastal commission land-use permits, HHW permits, fire department permits, and burn permits. Reuse, recycling, and composting are generally preferred options, where appropriate. Consider adding a list of possible materials that can be reused, recycled, or composted. Having advance information on the local and regional markets, capacity, and local and regional recyclers can be important. Consider the impact of potential decontamination approaches on quantities and characteristics of waste and the impact of waste management constraints on potential decontamination approaches.

a. Waste staging and storage (short-term and long term) locations b. Equipment staging and storage (short-term and long-term) locations c. Decontamination and treatment stations	Define the priorities during both the response and recovery phase operations, including for facilities that may be impacted. Describe the coordination process with other entities responsible for managing waste. Consider difficulties and issues regarding removing waste from waterways and sensitive habitats (e.g., shorelines, wetlands, marshes) and their impacts on collection and removal activities. Describe the circumstances under which waste will be removed from private property. Identify the laws that allow government to intercede in private property matters, the process to obtain permissions to enter onto private property, and the process for recouping costs (such as insurance proceeds). Account for impacts from adverse weather, such as flooding and wind damage. Identify multiple sites/locations to choose from during an incident, if possible. However, designating specific sites/locations in advance of an incident may not be possible. In this case, develop guidelines that could be used to designate sites during an incident. Whether specifying sites/locations or developing guidelines, consider: • Benefits of on-site vs. off-site management • Potential impact of having to transport the waste • Speed with which waste needs to be managed • Facility requirements and capacity • Permitting and land-use variance requirements • Cost of various options • Community concerns • Site security • Resources needed, including private sources of equipment • Proximity to anticipated waste generation points • Ease of access • Ease of containment of wastes/materials • Ownership of sites • Need for buffers and setbacks • Proximity to environmentally sensitive/protected areas (e.g., wetlands, floodplains, critical habitats, surface water, storm drains and sanitary sewer drains

	that may lead to waterways, drinking water wells, septic tanks with leach fields) • Proximity to historically significant areas like historic districts and archeologically sensitive areas • Environmental and human health concerns of specific waste streams • Ability to sort waste streams by category to facilitate recycling • Ability to properly contain radioactive or other highly hazardous waste streams Consider the possible need for long-term groundwater, air, and other environmental monitoring at on-site burial sites and other waste management facilities or sites. Consider the nature of the waste or material being managed. In some cases, long-term storage may be required.
VI. Waste Management Facilities 1. Anticipated types of waste management facilities needed *Identify all facility types needed to manage anticipated waste streams and quantities* 2. Specific facilities identified *Provide detailed information on each potential site to aid in selection at time of the incident, including some or all of the following: facility name, type, contact information for site manager and support staff, location information (including latitude/longitude), permit status and compliance history, types of waste accepted, pre-negotiated contracts, if any, waste capacity, waste acceptance criteria, financial status, distance from anticipated waste generation points, costs, community concerns*	This section should be updated as needed during an incident with facilities that are used or may be used to manage waste during the incident. Communicating with facilities before an incident occurs can help to determine the facilities' waste acceptance criteria, which may be more stringent than what is legally required (e.g., in order to help determine sampling and analysis needs, size requirements). Identify multiple waste management facilities to choose from in case an incident occurs. Waste from wide area incidents may exceed the capacity of local facilities, or facilities may refuse to accept the waste. Out-of-country facilities may be necessary, in which case permissions may be required and different regulations and requirements may apply. In the event that existing waste management facilities do not have the capacity or capability to manage all generated wastes, including those in other communities that are accessible by rail, barge, or truck, planners should consider storing waste long-term, reopening a closed facility, or constructing a new facility. Consider pre-identifying sites for potential new facilities or developing criteria for siting new facilities. Proximity to transportation is an important consideration when selecting a waste management facility, as well as proximity to waste management sites (e.g., whether heavy

	equipment can access the site to load the large quantities of waste onto barges or railcars for transport to facilities).
VII. Transportation 1. Logistical options 2. Routes (including maps) 3. Hauler information *Provide detailed information on each potential hauler to aid in selection at time of the incident, including some or all of the following: hauler's name, type, contact information, wastes they are permitted to handle, community concerns, security and legal requirements, decontamination needs, insurance requirements, PPE requirements, any special documentation requirements, spill response plan, and prenegotiated contracts, if applicable*	Consult with transportation officials on alternate routes, damaged infrastructure, and other matters impacting transport of waste. Prior to transportation, hazardous material must be classified according to the risks it presents and packaged, marked, labeled, and described on a shipping paper, as required by relevant local laws and regulations. Consider all modes of transportation. , including aircraft, vessel and rail, as well as possible differences in restrictions for highways and local roads. Keep in mind packaging, labeling, permitting, security (e.g., for certain waste streams, escorts and computerized, real-time tracking systems may be required), and other transportation permit requirements. National or local government permission may be required, which may include obtaining a permit. Expedited permit procedures may be appropriate. Highway weight restrictions may vary based on time of year. Consider including a pre-scripted outline or fact sheet of hauler responsibilities, including health and safety requirements. Drivers may be considered emergency workers and subject to applicable exposure limits. Drivers and personnel who prepare hazardous materials for transportation may be considered hazmat employees and be subject to training requirements.
VIII. Waste and Material Tracking and Reporting System 1. General principles 2. Databases or other tracking software to be used 3. Waste tracking report templates *Indicate information to be tracked*	Tracking the waste from cradle to grave helps increase transparency and aids in allaying community concerns. Keep in mind security concerns regarding sensitive information. Use of portable measurement and digital tracking devices should be considered. Haulers, government entities, and receiving facilities may use different surveying equipment and units of measurement, which should be adjusted as needed to maintain consistency.
IX. Community Communications/ Outreach Plan	It is important to ensure that the community, including its residents, receive accurate and timely information about

1. Strategy 2. Contact information for key stakeholder groups *(e.g., community groups, media, government officials)* 3. Pre-scripted information for waste management activities involving the public *(e.g., fact sheets, public service announcements (PSAs), frequently asked questions (FAQs))* 4. Information to aid in establishing a response website once an incident occurs and/or contribute to an incident response website created by the Incident Command or other entity *(e.g., hosting information, format, potential contents)*	the parameters, rules, and guidelines for waste management activities. Community outreach may include detailing special training, required PPE, and safety information, especially during a chemical, biological, or radiological incident, for facility personnel, people who choose not to evacuate their homes and, thus, are living with contamination in their homes, and responders, including volunteers who are helping to clean up the waste. Develop outreach and training materials for stakeholders and the public in multiple languages, as applicable to the target populations. Also consider the use of social media and the need for interpreters/translators.
X. Health and Safety for Waste Management Activities *(for emergency workers and the public)*	While a general health and safety plan for the incident will be developed, specific waste management activities may require additional guidance and should be addressed. Waste handling at all stages may require environmental monitoring and additional measures to detect and prevent releases to the environment, which may result in harmful exposures to workers or the public (e.g., For potential exposure to fibers from friable asbestos, an Asbestos Management Plan may be necessary). Include specific details on safety rules and procedures to protect workers and the public and specific measures for adherence to safety rules and procedures. Ensure that the overall incident health and safety plan includes information related to waste management activities.
XI. Resource Summary *Gathered from all previous sections* 1. Resource needs *(e.g., equipment, staff, packaging materials, PPE)* 2. Resource sources	Resources may be available in-house, from contracts, or through agreements. For any contracting need, possible contractors should be identified and prequalified. Identify the types of work that will be performed with contracted resources. Describe the process and procedure for acquiring competitively procured contracted services, provide specific contract requirements, and explain how contractor qualifications are established.

a. Mutual Aid Agreements b. Pre-negotiated contracts c. Specialized experts 3. Specialized technical assistance contacts 4. Contracting a. Emergency procurement procedures b. Contract oversight plan 5. Cost accounting/financial management	Consider that the availability of resources may be impacted by the incident itself (e.g., contamination, physical damage), lack of access (e.g., road damage), adverse weather conditions, competing needs from other jurisdictions or responses, etc.
XII. Oversight Activities and Exit Strategy *Describe the process for transitioning each waste management activity back to its pre-incident state, including the scale-down/close-out of each waste management response activity (e.g., waste collection and staging, air monitoring of staging areas) and each waste management oversight activity performed (e.g., site visits/inspections of waste management facilities and sites, sampling and analysis of waste streams), the transition of roles and responsibilities, and the frequency of each activity*	This section should be developed and added at the time of an incident. It is important to note that there may be some waste management activities that extend beyond the end of the response that should be addressed in the exit strategy (e.g., long-term monitoring).

RECOMMENDED APPENDICES

- Job descriptions for waste management staff positions
- List of training classes available for different waste management roles
- Pre-written waste management emergency ordinances, orders, directives, declarations, designations, permits, etc.
- Maps of waste management facilities and sites, transportation routes, critical waste management infrastructure, and key resources
- Links to health and safety information
- Glossary and list of acronyms

Appendix 11: Environmentally Sound Design Considerations for Sewage Facilities at Construction Camps or Temporary Work Sites

Pit Privy

Outdoor pit privies must:

- be maintained in a clean and sanitary condition and in good working order;
- be protected so that insects, rodents or other animals do not have access to the contents;
- be constructed so as to prevent the entry of either rain or surface water into the pit;
- be located more than 7.5 meters from a well or camp facilities (e.g. residence, kitchen, etc.);
- be located more than 30 meters from any river, stream, creek, lake, spring or other body of surface water;
- be located as far as possible but at least 15 meters from a water well or other supply. A 30 meters setback is recommended for water supplies other than a properly constructed drilled water well;
- include a 1.5 meter separation from the bottom of the pit to a water table if the soil is clay or 7.6 meter separation if the soil is sand;
- have setbacks to other features and structures so as to not create a health hazard; and
- only be used for human waste.

Privy Vaults

Outdoor privy vaults must:

- be maintained in a clean and sanitary condition and in good working order;
- utilize a sewage holding tank or portion of a holding tank conforming to septic tank standards;
- be protected so that insects, rodents or other animals do not have access to the contents;
- be pumped and the sewage hauled to an appropriate disposal location by a licensed sewage hauler;
- be located more than 7.5 meters from a well or camp facilities (e.g. residence, kitchen, etc.);
- be located as far as possible but at least 7.5 meters from any river, stream, creek, lake, spring or other body of surface water;
- be located as far as possible but at least 7.5 meters from a properly constructed drilled water well or any other type of water well or water supply;
- have appropriate setbacks to other features and structures should be considered when constructing a privy vault; and
- be constructed so as to prevent the entry of either rain or surface water into the vault.

Seepage Pits

A seepage pit is a pit that has been excavated in the soil. A seepage pit is not intended to be a permanent structure.

The seepage pit should:

- be maintained in a clean and sanitary condition and in good working order;
- be protected so that insects, rodents or other animals do not have access to the contents;

- be located more than 30 meters from any river, stream, creek, lake, spring or other body of surface water;
- be located more than 30 meters from a properly constructed drilled water well or any other type of water well or water supply;
- include a 1.5 meter separation from the bottom of the seepage pit to a water table if the soil is clay or 7.6 meters separation if the soil is sand;
- be located such that individuals do not walk through sewage during the performance of duties;
- be located so as to contain sewage within the seepage pit;
- Be located such that surface runoff and overland flooding does not enter the seepage pit;
- be covered with a cover capable of holding the weight of an adult male (103 kg); and
- be constructed and located to as not pose a physical hazard. Seepage pits should be filled in with native soil when the contents reach to within 0.6 m (2 ft of the ground surface) or the pit will no longer be used.

Appendix 12: Sample Outline of Health and Safety Plan

Adobe Acrobat
Document

(please double click the PDF icon to see the document)

Appendix 13: Summary of Minutes of Consultation Meetings
(Complete copies of minutes of meetings is more than 150 pages. For detailed information on the minutes of meetings, copies may be requested from NCC)

Narayanganj City Corporation

Preparatory Studies and Procurement Support (PSPS)

Focus Group Discussions

FGD Report

Drainage Network

Dated: 14th November, 2022

Conducted by:

ARRA Research & Consultancy

Focus Group Discussion (FGD) Report

Category of Participants for these FGD:

FGD participants were of different professional groups. With the Ward Councilors, there were Local Businessmen, Day labor, Local Elites, Businessmen, Landowner, Female participants, and general people of the area who were aware of the present drainage situation/condition of their local area as well as the waterlogged drainage areas and inadequate drains were present, and help to make a full drainage network system of NCC.

Drainage Network – NCC - Ward 01 to Ward 27

Ward wise Location of the FGDs:

Sl. no.	FGD no.	Place Description	No of Participants	Date	Participants Group
1	01	Councilor Office, Ward 01	17	1st November, 2022	Mixed Group From all corners of the Ward
2	02	Councilor Office, Ward 02	13	2nd November, 2022	Mixed Group From all corners of the Ward
3	03	Councilor Office, Ward 03	13	1st November, 2022	Mixed Group From all corners of the Ward
4	04	Councilor Office, Ward 04	16	1st November, 2022	Mixed Group From all corners of the Ward
5	05	Councilor Office, Ward 05	13	1st November, 2022	Mixed Group From all corners of the Ward
6	06	Councilor Office, Ward 06	17	2nd November, 2022	Mixed Group From all corners of the Ward
7	07	Councilor Office, Ward 07	11	2nd November, 2022	Mixed Group From all corners of the Ward
8	08	Councilor Office, Ward 08	10	2nd November, 2022	Mixed Group From all corners of the Ward
9	09	85/181, Monowara Khatun Mansion Building, Ward-9	14	3rd November, 2022	Mixed Group From all corners of the Ward
10	10	217/1, Godnail Road, Arambag, Ward 10	17	2nd November, 2022	Mixed Group From all corners of the Ward

11	11	Nagar Khanpur, Sadar, Narayanganj, Ward 11	16	1st November, 2022	Mixed Group From all corners of the Ward
12	12	Khanpur Etimkhana More, Infront of Etimkhana, Ward 12	10	3rd November, 2022	Mixed Group From all corners of the Ward
13	13	Councilor Office, Ward 13	10	3rd November, 2022	Mixed Group From all corners of the Ward
14	14	Councilor Office, Ward 14	12	3rd November, 2022	Mixed Group From all corners of the Ward
15	15	Councilor Office, Ward 15	11	3rd November, 2022	Mixed Group From all corners of the Ward
16	16	Councilor Office, Ward 16	14	3rd November, 2022	Mixed Group From all corners of the Ward
17	17	Councilor Office, Ward 17	12	2nd November, 2022	Mixed Group From all corners of the Ward
18	18	Councilor Office, Ward 18	09	4th November, 2022	Mixed Group From all corners of the Ward
19	19	Councilor Office, Ward 19	14	3rd November, 2022	Mixed Group From all corners of the Ward
20	20	Councilor Office, Ward 20	16	3rd November, 2022	Mixed Group From all corners of the Ward
21	21	Councilor Office, Ward 21	15	3rd November, 2022	Mixed Group From all corners of the Ward
22	22	Councilor Office, Ward 22	12	3rd November, 2022	Mixed Group From all corners of the Ward
23	23	Councilor Office, Ward 23	13	4th November, 2022	Mixed Group From all corners of the Ward
24	24	Councilor Office, Ward 24	08	4th November, 2022	Mixed Group From all corners of the Ward
25	25	Councilor Office, Ward 25	09	4th November, 2022	Mixed Group From all corners of the Ward
26	26	Dhakeshori Bagpaa, Bandar, Narayanganj, Ward 26	12	4th November, 2022	Mixed Group From all corners of the Ward
27	27	Kuripara, Bandar, Narayanganj, Ward 27	13	4th November, 2022	Mixed Group From all corners of the Ward

FGD Findings and Recommendations:

In this Socio-economic & Inventory of Loss Survey for Drainage Network, 27 FGDs have been carried out and the findings and recommendations those were received from the sessions have been briefly stated below.

- Participants reported that they had heard of the government's plans for a new drainage network. They heard it from different angles, mainly from NCC officials, public representatives etc.
- They also said that there are many waterlogged drains and inadequate drains which NCC should take proper care of.
- According to the responses of the participants, there are many reasons for waterlogging in their drains such as people not being aware of construction materials cause drains being blocked, dumping garbage in drains, not cleaning regularly, height problem of drains, waterlogged areas, inadequate drains with no space for rain water etc.
- Most of the participants expressed their opinion that their income has decreased due to waterlogged drains in their areas and for the waterlogged areas, they are suffering from many health and economic problems due to inadequate drains.
- Participants also commented that during monsoons, some drains do not function properly due to being filled with garbage or other things. They should be cleaned regularly.
- They also added that their house always flooded when any rain occurs as because drains not functional and blocked by technical fault.
- Participants involved in business in the hut or market were very worried about their business due to waterlogged drains. They are facing economic losses.
- Most of the participants expressed their opinion that the drainage networks in their area are not fully functional due to low, thin and not covered.
- Maximum participants urged for new drain in their roads as surface water can move faster.
- Drain not covered and it causes many health & safety issues – the participants were anxious about regarding this.
- FGD participants supported NCC's any kind of plan regarding the waterlogged and inadequate drains and said those projects will give them better drainage system, improve family health and reduce health costs, get rid of waterborne diseases and develop livelihoods. Economically they will benefit.
- The participants thanked the Government and NCC for taking realistic plans to ensure fully functional drains and adequate drains in every ward through this FGDs.

Appendix 14: Sample Grievance Registration Form

The _____Project 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 use 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 Officials Reviewing Grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

Appendix 15: Sample Daily Monitoring Sheet for Contractor

(Note: This checklist is indicative which can be further enhanced depending on the project circumstances.)

[NAME OF ADB PROJECT]
Contractor Monitoring Sheet

Name of Subproject: _____
Location: _____
Contractor: _____
Contractor EHS Supervisor (or equivalent): _____
Date of monitoring: _____

Summary of Findings

Monitoring Item	Status	Remarks
1. Compliance with Local Permit Requirements	**(Obtained / Application Submitted / Not Applicable)**	
Location/zoning permits		
Permit to construct		
Building permit		
Transport / hauling permits		
2. Compliance with IEE Requirements	**(Approved / Under Preparation / Submitted to PMU for Approval / Not Applicable)**	
Site-specific EMP (SEMP)		
Corrective Action Plan, if any		
3. Compliance with SEMP		
Construction Site	**(Satisfactory / Needs Improvement / Not Implemented/Not Applicable)**	
- Conduct of toolbox talk		
- Use of PPE		
- Rest areas for male and female workers		
- Toilets for male and female workers		
- Medical kits		
- Drinking water supply		
- Dust control		
- Noise control		
- Solid waste management		
- Wastewater management		
- Chemicals storage (fuel, oil, etc.)		
- Siltation or erosion control		
- Heavy equipment staging / parking area		
- Barricades around excavation sites		
- Access to residential houses/shops/businesses		
- Traffic routing signages		
- Lightings at night		

Monitoring Item	Status	Remarks
- Trench shoring / landslide protection		
Construction Workers' Camp Site	**(Available / Needs Improvement / Not Available / Not Applicable)**	
- Quarters for male and female workers		
- Sleeping utilities (e.g. beds, pillows, blankets, mosquito nets, etc.)		
- Power/Electricity supply		
- Drinking water supply		
- Toilets for male and female workers		
- General purpose water supply (cooking, washing, bathing)		
- Cooking facilities and areas		
- Solid waste management		
- Wastewater management		
- Pest control		
4. Implementation of GRM	**(Yes / No or None / Under Resolution)**	
Complaints		
Complaints resolution		
5. Environmental Quality Measurement	**(Passed / Failed / Not Applicable)**	
Ambient air quality sampling		
Noise level measurement		
Receiving water quality sampling		

Other Issues: _____

_____

_____

_____

Attachments:
1. Copies of new permits obtained, if any.
2. Photos taken at worksites, if any.
(photos attached in previous monitoring sheets should not be used again).
3. Laboratory results of environmental quality measurements, if any.

Prepared by: _____
Name, Designation and Signature

Appendix 16: Sample Inspection Checklist for Project Management Unit

(Note: This checklist is indicative which can be further enhanced depending on the project circumstances.)

[NAME OF ADB PROJECT]
SITE INSPECTION CHECKLIST

Subproject / Location:_____ Date: _____

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
1.	Supervision and Management On-Site	Yes	No	NA	
	a. Is an EHS supervisor available?				
	b. Is a copy of the SEMP available?				
	c. Are daily toolbox talks conducted on site?				
2.	The Facilities	Yes	No	NA	
	a. Are there a medical and first aid kits on site?				
	b. Are emergency contact details available on-site?				
	c. Are there PPEs available? What are they?				
	d. Are the PPEs in good condition?				
	e. Are there firefighting equipment on site?				
	f. Are there separate sanitary facilities for male and female workers?				
	g. Is drinking water supply available for workers?				
	h. Is there a rest area for workers?				
	i. Are storage areas for chemicals available and with protection? in safe locations?				
3.	Occupational Health and Safety	Yes	No	NA	
	a. Are the PPEs being used by workers?				
	b. Are excavation trenches provided with shores or protection from landslide?				
	c. Is breaktime for workers provided?				
	d. How many for each type of collection vehicle is in current use?				
4.	Community Safety	Yes	No	NA	
	a) Are excavation areas provided with barricades around them?				
	b) Are safety signages posted around the sites?				
	c) Are temporary and safe walkways for pedestrians available near work sites?				
	d) Is there a record of treated wastewater quality testing/measurement?				
5.	Solid Waste Management	Yes	No	NA	
	a. Are excavated materials placed sufficiently away from watercourses?				
	b. Is solid waste segregation and management in place?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
	c. Is there a regular collection of solid wastes from work sites?				
6.	Wastewater Management	Yes	No	NA	
	a) Are there separate sanitary facilities for various types of use (septic tanks, urination, washing, etc.)?				
	b) Is any wastewater discharged to storm drains?				
	c) Is any wastewater being treated prior to discharge?				
	d) Are measures in place to avoid siltation of nearby drainage or receiving bodies of water?				
	e) Are silt traps or sedimentation ponds installed for surface runoff regularly cleaned and freed of silts or sediments?				
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 at construction sites?				
	d. Are stockpiles of sand, cement and other construction materials covered to avoid being airborne?				
	e. Are construction vehicles carrying soils and other spoils 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 7 am and 7 pm, week days?				
	b) Do generators operate with doors closed or provided with sound barrier around them?				
	c) Is idle equipment turned off or throttled down?				
	d) Are there noise mitigation measures adopted at construction sites?				
	e) Are neighboring residents notified in advance of any noisy 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 signages sufficient to guide motorists?				

MONITORING/INSPECTION QUESTIONS		FINDINGS			COMMENTS / CLARIFICATIONS
	c) Are the excavation sites along roads provided with barricades with reflectors?				
	d) Are the excavation sites provided with sufficient lighting at night?				
10.	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 compiled?				
	c) Are laboratory results of environmental sampling conducted since the commencement of construction activities properly compiled?				
	d) Are these records readily available at the site and to the inspection team?				

Other Issues: _____

_____

_____

_____

Prepared by: _____

Name, Designation and Signature