Draft Initial Environmental Examination

October 2013

BAN: Coastal Towns Infrastructure Improvement Project – Pirojpur Drainage

Prepared by the Local Government Engineering Department, Government of Bangladesh for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 10 October 2013)

Currency unit	–	Taka (Tk)
BDT.1.00	=	$.01287
$1.00	=	Tk 77.69

ABRREVIATIONS

ADB	–	Asian Development Bank
AP	–	affected person
DoE	–	Department of Environment
DPHE	–	Department of Public Health Engineering
EARF	–	environmental assessment and review framework
ECA	–	Environmental Conservation Act
ECC	–	environmental clearance certificate
ECR	–	Environmental Conservation Rules
EIA	–	environmental impact assessment
EMP	–	environmental management plan
ETP	–	effluent treatment plant
GRC	–	grievance redressal committee
GRM	–	grievance redress Mechanism
IEE	–	initial environmental examination
LCC	–	location clearance certificate
LGED	–	Local Government Engineering Department
MLGRDC	–	Ministry of Local Government, Rural Development, and Cooperatives
O&M	–	operations and maintenance
PMU	–	project management unit
PPTA	–	project preparatory technical assistance
REA	–	rapid environmental assessment
RP	–	resettlement plan
SPS	–	Safeguard Policy Statement
ToR	–	terms of reference

GLOSSARY OF BANGLADESHI TERMS

crore	–	10 million (= 100 lakh)
ghat	–	boat landing station
khal	–	drainage ditch/canal
khas, khash	–	belongs to government (e.g. land)
katcha	–	poor quality, poorly built
lakh, lac	–	100,000
madrasha	–	Islamic college
mahalla	–	community area
mouza	–	government-recognized land area
parashad	–	authority (pourashava)
pourashava	–	municipality
pucca	–	good quality, well built, solid
thana	–	police station
upazila	–	subdistrict

WEIGHTS AND MEASURES

ha	–	hectare
km	–	kilometer
m	–	meter
mm	–	millimeter

NOTES

(i) In this report, "$" refers to US dollars.
(ii) —BDT. refers to Bangladeshi Taka

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EXECUTIVE SUMMARY

1. The Coastal Towns Infrastructure Improvement Project (the project) is a key infrastructure initiative of the Government of Bangladesh. The project is located in the coastal area of Bangladesh, and is designed to improve and expand municipal infrastructure and related services in selected pourashavas (municipalities) incorporating climate chance resilience measures. The project consists of four components (i) improved climate-resilient municipal infrastructure, (ii) strengthened governance and institutional capacity, (iii) enhanced public awareness, behavior change, and community-based climate adaptation, and (iv) project management support. The impact of the project will be improved climate change resilience and natural disaster preparedness in coastal towns. The outcome of the project will be improved access to climate-disaster resilient municipal services, including (i) municipal infrastructure such as drainage, cyclone shelters, urban roads, bridges, culverts, solid waste management, bus terminals, slum improvements, boat landings, and markets, (ii) water supply, and (iii) sanitation. The project is to be implemented in 6 years from 2014 to 2020.

2. The project is a project lending modality using a sector approach for selection of subprojects. The release of project funds to the pourashavas will be administered under a 2-stage process known as Performance Criteria Mechanism, whereby the project pourashavas have to meet certain institutional capacity and governance criteria to receive funding. Infrastructure subprojects are therefore divided between Stage I funding and Stage II funding.

3. Pirojpur drainage subproject is one of the subprojects proposed under Performance Criteria Stage I which is considered critical for drainage and flood control. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS, 2009).

4. **Categorization.** An environmental assessment using ADB's Rapid Environmental Assessment (REA) checklist for drainage and flood control (Appendix 1) was conducted and results of the assessment show that the subproject is unlikely to cause significant adverse impacts. Pirojpur drainage subproject is classified as Environmental Category B as per the SPS as no significant impacts are envisioned. This initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects and provides mitigation and monitoring measures to ensure no significant impacts as a result of the subproject.

5. Per Government of Bangladesh Environment Conservation Act, 1995 (ECA, 1995) and Environment Conservation Rules (ECR, 1997), the subproject is categorized as "Orange-B" and Location Clearance Certificate (LCC) and Environmental Clearance Certificate (ECC) must be obtained from the DoE.

6. **Subproject Scope.** The subproject is formulated under this project to provide more accessible, reliable and climate-resilient municipal services in a holistic and integrated manner. Investments under this subproject include rehabilitation and construction of 25.3 kilometers (km) of drainage and flood control structures such as (i) 16.92 km earthen channel; (ii) 1.53 km concrete cement block lined channel; (iii) 3.4 km reinforced concrete cement (RCC) covered drain; and (iv) 3.45 km RCC open drain.

7. **Implementation Arrangements.** Local Government Engineering Department (LGED) is the executing agency (EA), and Department of Public Health Engineering (DPHE) is co-

executing agency.[1] LGED is responsible for providing support and guidance to pourashavas concerning performance criteria and pourashava development planning. Implementation activities will be overseen by a separate program management unit (PMU). The participating pourashavas are the implementing agencies (IA), with a project implementation unit (PIU) within the pourashava structure. Local LGED and DPHE offices will be involved in the functioning of the PIUs to provide technical support. Consultant teams[2] are responsible for (i) detailed engineering design, contract documents preparation and safeguards facilitation; (ii) project management and administration support; (iii) assistance in supervising construction; (iii) strengthening of local governance, conducting studies/surveys on flood inundation and climate change impacts, facilitating disaster risk management capacity building and community level adaptation through locally managed climate resilience funds; and (iv) community-based climate adaptation and disaster preparedness, awareness raising on behavioural change in water, sanitation and hygiene (WASH) activities and facilitating resettlement procedures.

8. **Description of the Environment.** Subproject components are located in Pirojpur urban area or in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at these sites. The subproject sites are located in existing right of ways (ROWs) and government-owned land. There are no protected areas, wetlands, mangroves, or estuaries in or near the subproject location. There are no forest areas within or near Pirojpur.

9. **Environmental Management.** An environmental management plan (EMP) is included as part of this IEE, which includes (i) mitigation measures for environmental impacts during implementation; (ii) an environmental monitoring program, and the responsible entities for mitigating, monitoring, and reporting; (iii) public consultation and information disclosure; and (iv) a grievance redress mechanism. A number of impacts and their significance have already been reduced by amending the designs. The EMP will be included in civil work bidding and contract documents.

10. Locations and siting of the proposed infrastructures were considered to further reduce impacts. The concepts considered in design of the Pirojpur drainage and flood control subproject are: (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people; (ii) prioritizing rehabilitation over new construction, using vacant government land and right of way (ROW), and taking all possible measures in design and selection of site or alignment to avoid resettlement impacts; (iii) avoiding where possible locations that will result in destruction/disturbance to historical and cultural places/values; (iv) avoiding tree-cutting where possible; (v) ensuring all planning and design interventions and decisions are made in consultation with local communities and reflecting inputs from public consultation and disclosure for site selection. As a result, some measures have already been included in the subproject designs. This means that the impacts and their significance have already been reduced.

11. During the construction phase, impacts mainly arise from (i) disturbance of residents, businesses, and traffic; (ii) need to manage excess construction materials and spoils; (iii) community and workers health and safety. These are common impacts of construction in urban areas, and there are well developed methods for their mitigation. Measures such as conducting

[1] LGED is responsible for (i) roads, (ii) bridges, (iii) solid waste management, (iv) cyclone shelters, and (v) drainage and flood control. DPHE is responsible for (i) water supply, and (ii) sanitation.

[2] Consultant teams are composed of project design advance (PDA) detailed design consultants, project management and supervision consultants (PMSC), institutional strengthening and awareness building consultants (ISABC), and non-government organization.

work in lean season and minimizing inconvenience by best construction methods will be employed. Traffic management will be necessary during excavation works on busy roads. In the operational phase, all facilities and infrastructure will operate with routine maintenance, which should not affect the environment. Facilities will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only.

12. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

13. **Consultation, Disclosure and Grievance Redress.** The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB, LGED, and DPHE websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

14. **Monitoring and Reporting.** The PMU and project management and supervision consultants (PMSC) will be responsible for monitoring. The PMSC will submit monthly monitoring reports to PMU, and the PMU will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

15. **Conclusions and Recommendations.** The citizens of Pirojpur will be the major beneficiaries of this subproject. With the improved drainage and flood control structures, they will be provided with reliable and climate-resilient municipal services. In addition to improved environmental conditions, the subproject will reduce occurrence of water-related diseases and exposure to climate extremes. People would spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health. Therefore the proposed subproject is unlikely to cause significant adverse impacts and net environmental benefits to citizens of Pirojpur will be positive. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures.

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

I. INTRODUCTION

1. The Coastal Towns Infrastructure Improvement Project (the project) is a key infrastructure initiative of the Government of Bangladesh. The project is located in the coastal area of Bangladesh, and is designed to improve and expand municipal infrastructure and related services in selected pourashavas (municipalities) incorporating climate chance resilience measures. The project consists of four components (i) improved climate-resilient municipal infrastructure, (ii) strengthened governance and institutional capacity, (iii) enhanced public awareness, behavior change, and community-based climate adaptation, and (iv) project management support. The impact of the project will be improved climate change resilience and natural disaster preparedness in coastal towns. The outcome of the project will be improved access to climate-disaster resilient municipal services, including (i) municipal infrastructure such as drainage, cyclone shelters, urban roads, bridges, culverts, solid waste management, bus terminals, slum improvements, boat landings, and markets, (ii) water supply, and (iii) sanitation. The project is to be implemented in 6 years from 2014 to 2020.

2. The project is a project lending modality using a sector approach for selection of subprojects. The release of project funds to the pourashavas will be administered under a 2-stage process known as Performance Criteria Mechanism, whereby the project pourashavas have to meet certain institutional capacity and governance criteria to receive funding. Infrastructure subprojects are therefore divided between Stage I funding and Stage II funding.

3. Pirojpur drainage subproject is one of the subprojects proposed under Performance Criteria Stage I which is considered critical for drainage and flood control. ADB requires the consideration of environmental issues in all aspects of the Bank's operations, and the requirements for environmental assessment are described in ADB's Safeguard Policy Statement (SPS, 2009). An environmental assessment using ADB's Rapid Environmental Assessment (REA) Checklist for Drainage was conducted, and results of the assessment show that the project is unlikely to cause significant adverse impacts. Thus, this initial environmental examination (IEE) has been prepared in accordance with ADB SPS's requirements for environment category B projects.

II. POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK

A. ADB Policy

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

5. **Screening and categorization.** The nature of the environmental assessment required for a project depends on the significance of its environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures. Projects are screened for their expected environmental impacts, and are assigned to one of the following four categories:

(i) **Category A.** Projects could have significant adverse environmental impacts. An EIA is required to address significant impacts.

(ii) **Category B.** Projects could have some adverse environmental impacts, but of lesser degree or significance than those in category A. An IEE is required to determine whether significant environmental impacts warranting an EIA are likely. If an EIA is not needed, the IEE is regarded as the final environmental assessment report.
(iii) **Category C.** Projects are unlikely to have adverse environmental impacts. No EIA or IEE is required, although environmental implications are reviewed.
(iv) **Category FI.** Projects involve a credit line through a financial intermediary or an equity investment in a financial intermediary. The financial intermediary must apply an environmental management system, unless all projects will result in insignificant impacts.

6. **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 project's impact and risks.

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

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

B. National Laws

8. Implementation of all subprojects will be governed by the environmental acts, rules, policies, and regulations of the Government of Bangladesh. These regulations impose restrictions on the activities to minimize/mitigate likely impacts on the environment. Many of these are cross-sectoral and several of them are directly related to environmental issues. The most important of these are the Environment Conservation Act, 1995 (ECA, 1995), and the Environment Conservation Rules (ECR, 1997).

9. In addition to the Environmental Conservation Act and Rules, there are a number of other policies, plans and strategies which deal with the water sector, coastal areas, and climate change. These are the Forest Act 1927 (last modified 30th April 2000); National Water Policy, 1999; Coastal Zone Policy, 2005; Coastal Development Strategy, 2006; Bangladesh Climate Change Strategy and Action Plan, 2009; and National Safe Drinking Water Supply and Sanitation Policy of 1998. Appendix 2 provides salient features and applicability of the legislations and Table 1 presents specific requirements for the project. Appendix 3 provides the environmental standards for air, surface water, groundwater, drinking water, emissions, noise and vehicular exhaust.

Table 1: Applicable Government of Bangladesh Environmental Legislations

	Legislation	Requirements for the Project
1.	Environmental Conservation Act of 1995 and amendments in 2000, 2002 and 2010 [1]	- Restriction on operation and process, which can be continued or cannot be initiated in the ecologically critical areas - Regulation on vehicles emitting smoke harmful to the environment - Remedial measures for injuries to ecosystems - Standards for quality of air, water, noise and soil for different areas for various purposes and limits for discharging and emitting waste - Environmental guidelines
2.	Environmental Conservation Rules of 1997 and amendments in 2002 and 2003	- Environmental clearances - Compliance to environmental quality standards
3.	Forest Act of 1927 and amendments (2000)	- Clearance for any felling, extraction, and transport of forest produce
4.	Bangladesh Climate Change Strategy and Action Plan of 2009	- Ensure 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 with the likely impacts of climate change. - enhance the capacity government ministries, civil society and private sector to meet the challenge of climate change
5.	National Water Policy of1999	- EIA for water development projects and increase surface water flow - Pre-screening of IEEs/EIAs for water sector projects by WARPO, in advance of submission to DOE for final clearance. - Augmentation for dry season water flow - Awareness-raising in consumptive use of surface and groundwater for irrigation - Structural and non-structural mitigation (early warning and flood proofing)
6.	National Safe Drinking Water Supply and Sanitation Policy of 1998	- Pourasavhas and WASAs will take actions to prevent wastage of water. In addition they will take necessary steps to increase public awareness to prevent misuse of water. - Sanitation systems shall be self- sufficient and self- sustaining. - Pourasavhas shall be responsible for solid waste collection, disposal and their management. DOE shall be consulted on solid waste management. - Where WASAs exists, they shall be responsible for sewerage and storm water drainage systems.
7.	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

C. Government of Bangladesh Environmental Assessment Procedures

10. Under the ECR 1997 industrial units and projects are classified into four categories according to “their site and impact on the environment”, and each category (green, orange-A, orange-B and red) requires a different level of environmental assessment as a prerequisite for granting the ECC that allows the project to proceed. The ECA indicates that all industrial units or projects must obtain a Location Clearance Certificate (LCC) and Environmental Clearance Certificate (ECC) from the Department of Environment (DoE).

11. Schedule 1 of the law provides a classification for industrial projects and types of development that are common in Bangladesh. Table 2 indicates that the proposed subproject

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

components are likely to be classified as red category.

Table 2: Likely Government of Bangladesh Classification of Pirojpur Drainage Subproject

	Subproject	Component	Equivalent in Schedule I of ECR 1997	DoE Classification
1.	Drainage and flood control	Primary network (includes domestic connections or primary drains)	Engineering works (up to 10 hundred thousand Taka capital)	Red Per preliminary quantity and cost estimate, Pirojpur drainage and flood control structures 297.69 million Taka
		Secondary network (includes secondary drains)		
		Tertiary network (includes main drains and drainage outfalls)		

12. Rule 7 of the ECR indicates that the application for ECC must be made to the relevant DoE Divisional Officer, and the application for red category projects will include the following:

(i) Completed application for ECC, and the appropriate fee;
(ii) Report on the feasibility of the project;
(iii) Report on the IEE for the project, and terms of reference (TOR) for the EIA; or EIA report prepared on the basis of TOR previously approved by DoE;
(iv) Report on the environmental management plan (EMP);
(v) No objection certificate from the local authority;
(vi) Emergency plan relating to adverse environmental impact and plan for mitigation of the effect of pollution; and
(vii) Outline of the relocation and rehabilitation plan (where applicable).

13. Under the ECR DoE has 60 days to respond to receipt of the ECC application for a red category project.

III. DESCRIPTION OF THE PROJECT

A. The Study Area

14. Pirojpur pourashava consists of 9 wards, 30 *mahallas* and 23 *mouzas*. It is located between 22°23' and 22°42' north and between 89°52' and 90°03' east. It has an area of 29.46 km^2 within the center of Pirojpur upazila (district) which occupies an area of 166.81 km^2. The town is about 72 km from the sea; and bordered on the west side by Baleshwar River and to the east and south by Kocha River.

15. The ground elevation in Pirojpur pourashava varies from 0.4 to 4.4 meters (m) above mean sea level. Subproject components are located in Pirojpur urban area or in its immediate surroundings which were converted into urban use for many years ago, and there is no natural habitat left at these sites. The subproject sites are located in existing right of ways (RoWs) and government-owned land. There are no protected areas, wetlands, mangroves, or estuaries in or near the subproject location. There are no forest areas within or near Pirojpur. The location map is shown as Figure 1.

B. Existing Condition and Need for the Project

16. Damudar *khal* (canal), the major drainage backbone of Pirojpur connecting Baleshwar and Kocha rivers, runs almost along the center of the town. All other drainage network including small and big canals joins the Damudar khal, some of which are Chila, Varani, Shasan Ghat, Madhyama Mashimpur, Dhup Pasha, and Ranipur *khals*. Almost 90% of these drains are of the primary category. The secondary and tertiary drains are about 4% and 6%, respectively. The primary canals, specifically Damudar and Varani *khals*, are silted up and encroached thus have lost their original capacities.

17. The urban drainage model (UDM) developed in TA 7890-BAN: Strengthening the Resilience of the Urban Water Supply, Drainage, and Sanitation to Climate Change in Coastal Towns[2] has been applied to simulate design and climate change scenarios. A summary of the major conclusions of the study shows (i) drainage systems in Pirojpur are as yet unplanned and under developed. Mostly the drainage network consists of set of natural *khals* that were part of the extensive coastal river system around which habitation developed; and (ii) various sections of these natural canals in Pirojpur are overtopped for design storm conditions due to extensive encroachment, restricted outflows, blockage due to dumping of solid waste and progressive siltation over many years mainly due to embankments that interrupt natural tidal flows.

18. Focus group discussion (FGDs) conducted in May 2012 under TA 7890-BAN identified climatic vulnerabilities and impacts of poor drainage and flood control structures on local stakeholders and residents. Due to lack of embankment, people in Pirojpur are vulnerable to flood during heavy rainfall and frequent tidal surges. Ward No. 3 and 9 are fully affected by flooding from the Kocha River and Ward 6 is fully affected by Baleshwar River. In Wards 3 and 9 the depth of water ranges from 0.4 to 0.6 m for about 2 to 3 hours after heavy rains. 80% of Ward 5 and 30% of Ward 4 is affected by flooding from the Baleshwar River. 50% of Ward 7 is vulnerable to Damodar and Varani khals, which has silted up. The stagnant wastewater in the drains and ditches provides an ideal habitat for mosquitoes and create unhygienic conditions due to stagnation. People have lost agricultural production, homesteads, immovable and movable assets due to cyclones, floods, tidal surges and river erosion. There is frequent displacement of households, damage to sanitation infrastructure, increase in poverty level, financial crisis and increase in food prices. These impacts lead to forced migration particularly the male earners of households, increased incidence of water borne diseases and fishing community losses of their fishing equipment.

C. Proposed Components

19. The drainage system needs to be improved to meet the needs of adequate reduction of

[2] A Strategic Program for Climate Resilience (SPCR) prepared by Bangladesh was approved under the Pilot Programme for Climate Resilience (PPCR) in November 2010. The Coastal Towns Infrastructure Improvement Project (CTIIP) identified by the SPCR and mentioned in the ADB's 2011-2013 country operations business plan for Bangladesh has great relevance. TA 7890-BAN: Strengthening the Resilience of the Urban Water Supply, Drainage, and Sanitation to Climate Change in Coastal Towns taken up within the CTIIP initiative is an ADB Capacity Development Technical Assistance (CDTA) project for strengthening capacity to develop climate-resilient urban water supply, drainage, and sanitation projects in coastal towns. Scope of TA 7890-BAN included assessment of climate change scenarios in selected coastal towns; assessment of impacts on the water, drainage and sanitation sector caused by climate change; identification of structural and other options to strengthen climate resilience; and strengthen the capacity and awareness of key stakeholders regarding climate change. Its results were used to guide the linked project preparatory technical assistance (PPTA) to prepare a feasibility study incorporating preliminary engineering designs that would further help the Project Design Advance (PDA) team to make detailed designs for implementation of urban infrastructure projects.

flooding and inundation; and changes in climatic conditions, such as increasing rain intensities and more extreme weather events, such as thunderstorms, which will most likely aggravate these problems. The priority of the canals and drains was determined through participatory approaches during the workshop held on April 12, 2013 in the presence of Pirojpur mayor, councilors, engineers, PPTA consultants and other officials of relevant government agencies.

20. Preliminary designs have been made considering climate change resilience and adaptation. The proposed interventions include items like raising up of canal banks and re-excavation to protect flooding and to improve capacities of drains. Investments under this subproject include rehabilitation and construction of 25. 3 kilometers (km) of drainage and flood control structures such as (i) 16.92 km earthen channel; (ii) 1.53 km concrete cement block lined channel; (iii) 3.4 km reinforced concrete cement (RCC) covered drain; and (iv) 3.45 km RCC open drain. The inventory and proposed interventions on drainage and flood control structures are listed in Table 3.

Table 3: Components of Proposed Pirojpur Drainage Subproject

	Drain/ Structure ID No.	Ward No.	Existing Condition			Proposed Intervention			
			Location and Length	Section and Structure Type	Existing Condition	Section	Proposed Structure Type	Length	Scope of works / Remarks
1.	PD 01	W4,5,7, 2,3,8,9	Damudar *khal*, from Baleshwar river, (up to Borokhalish akhali Bridge) L = 4,000 m	T - 17.71 m B - 6.5 m D - 1.7 m Earthen Canal	Bed silted up: settlement of bank	T - 20.00m B - 7.50m D - 3.5 m	Earthen Canal	3,800 m	Re-excavation of canal
							Concrete cement (CC) block lined channel	200 m	
2.	SD 02	W5,6,7, 8	2(a) Pirojpur parerhat varani *khal*, from Damuder *khal* to parerhat *khal* near Barapul, L = 2,600 m	T - 7.00 m B - 2.00 m C -1.25 m Earthen Canal	Bed silted up: settlement of bank	T - 8.00 m B - 3.50 m D - 1.75 m	Earthen Canal	2,470 m	Re-excavation of canal
							CC block lined channel	130 m	
			2(b) Malaria pule to primary school (Mashid bari)	T - 5.00 m B - 2.00 m D - 1.25 m	Bed silted up: settlement of bank	T - 5.00 m B - 2.00 m	Earthen Canal	450 m	Re-excavation of canal
							CC block lined channel	50 m	
3.	SD 03	W4	Pal para khal, from Damuder khal to Mr. Kabil house, L = 1,500 m	T - 4.25 m B - 1.50 m D - 1.00 m Earthen Canal	Bed silted up: settlement of bank	T - 1.25 m D - 1.50 m	Reinforced cement concrete (RCC) covered U-channel	1,500 m	Adjacent road to be widened
4.	PD 02	W5	Chan Mari khal, from Baleshwar	T - 4.55 m B - 2.00 m D -1.30 m	Bed silted up: settlement	04	Earthen Canal	1,422 m	Adjacent road to be widened
							CC block	158 m	

	Drain/ Structure ID No.	Ward No.	Existing Condition			Proposed Intervention			
			Location and Length	Section and Structure Type	Existing Condition	Section	Proposed Structure Type	Length	Scope of works / Remarks
			River to Sarder bari field, L = 1,580 m	Earthen Canal	of bank		lined channel		
5.	SD 04	W7	Gazi bari khal from Damuder khal (near barring gate) to S.K. Jalil mia`s house, L = 1,736 m	T - 4.80 m B - 2.00 m D - 1.20 m Earthen Canal	Bed silted up: settlement of bank	B - 4.00 m D - 1.50 m	RCC covered U-channel	1,736 m	Re-excavation of canal
6.	SD 06	W5	Modda Rasta Katcha drain from Chan mari khal to Maddo rasta via Mr. Farruk sarder house, L = m	B - 2.00 m D - 1.50 m	Bed silted up: settlement of bank	B - 2.00 m D - 1.5 m	RCC open channel	500 m	Re-excavation of canal
7.	SD 07	W5	Primary Education Office Drain from existing RCC drain to Mr. Delower house, L = m	B - 1.50 m D - 1.25 m	Bed silted up: settlement of bank	B - 1.5 m D - 1.25 m	RCC open channel	250 m	Re-excavation of canal
8.	SD 08	W4	West Sikarpur katcha drain from Chilla khal to cfitala near Mr. Abu mia house, via babo Dulal Ghoos,	B - 2.00 m D - 1.50 m	Bed silted up: settlement of bank	B - 2.00 m D - 1.50 m	RCC open channel	600 m	Re-excavation of canal
9.	SD 09	W7	Damuder khal to Mr. Haque Mias house, side of S.P house,	B - 2.00 m D - 1.50 m	Bed silted up: settlement of bank	B - 2.00 m D - 1.50 m	RCC open channel	500 m	Re-excavation of canal
10.	SD 10	W7	Pirojpur – Paraerhat Varani khal to Maddo Mushid house north	B - 1.50 m D - 2.50 m	Bed silted up: settlement of bank	T - 6.00 m B - 1.75 m D - 1.50 m	RCC open channel	1,736 m	Re-excavation of canal

	Drain/ Structure ID No.	Ward No.	Existing Condition			Proposed Intervention			
			Location and Length	Section and Structure Type	Existing Condition	Section	Proposed Structure Type	Length	Scope of works / Remarks
			side of bypass						
11.	SD 11	W5	Adorshapara drain from Baleshwar river to east side of sultan mia`s house,	New	Bed silted up: settlement of bank	B - 2.00 m D - 1.5 m	RCC open channel	500 m	Re-excavation of canal
12.	PD 12	W7	Murshid bari khal from Pirojpur – parerhat varani khal to Mr. Alom house,	New	Bed silted up: settlement of bank	B - 1.50 m D - 2.00 m	RCC open channel	500 m	Re-excavation of canal
13.	SD 13		Khumuria Asrom bari road side drain to Baleshwar river,	New	Bed silted up: settlement of bank	B - 2.00 m D - 1.50 m	RCC open channel	600 m	Re-excavation of canal
14.	SD 04	W4	14(a) Sikarpur khal from Damuder khal to water supply compound , L = 1,000 m	T - 5.68 m B - 2.00 m D - 1.25 m Earthen Canal	Bed silted up: settlement of bank	T - 6.50 m B - 3.00 m	Earthen Canal	900 m	Re-excavation of canal
							CC block lined channel	100 m	
		W4	14(b)Sikder bari to Sheikh bari , L = 2,500 m	T - 5.00 m B - 2.00 m D - 1.25 m	Bed silted up: settlement of bank	T - 5.00 m B - 2.00 m D - 1.25 m	Earthen Canal	440 m	Re-excavation of canal
							CC block lined channel	60 m	
		W4	14(c) Sikder bari Culvart to Huque driver house	T - 5.00 m B - 2.00 m D - 1.25 m	Bed silted up: settlement of bank	T - 6.50 m B - 3.00 m	Earthen Canal	450 m	Re-excavation of canal
							RCC open channel	600 m	
15.	SD 05	W8	Fire service khal(Machempur Kisnagur) from Damuder khal to Stadium compound, L = 1,522 m	B - 2.00 m D - 1.50 m Earthen Canal	Bed silted up: settlement of bank	T - 5.00 m B - 2.00 m D - 1.25 m	Earthen Canal	1,369.8 m	Re-excavation of canal
							CC block lined channel	152.2 m	
16.	SD 06	W2,4	Side of Primary Teacher's	T - 10.10 m B - 3.00 m D - 1.30 m	Bed silted up: settlement	T - 6.00 m B - 1.75 m	Earthen Canal	1,350 m	Re-excavation of canal
							CC block	150 m	

	Drain/ Structure ID No.	Ward No.	Existing Condition			Proposed Intervention			
			Location and Length	Section and Structure Type	Existing Condition	Section	Proposed Structure Type	Length	Scope of works / Remarks
			Training Institute khal,from Damuder khal to Police line, L = 1,736 m	Earthen Canal	of bank		lined channel		
17.	SD 07	W8,9	Dhup pasa khal,fromDamuder khal to Krisna Nagur Field, L = 1,275 m	T - 9.23 m B - 3.5 m D - 1.5 m Earthen Canal	Bed silted up: settlement of bank	D - 1.50 m T - 9.23 m	Earthen Canal CC block lined channel	2,700 m 300 m	Re-excavation of canal
18.	SD 08	W4	HBN Bricks to East side of Mr. Muklasur Rahman house, via Madu Mia`s Mill khal, L = 3,000 m	T - 4.80 m B - 2.00 m D - 1.20 m Earthen Canal	Bed silted up: settlement of bank		Earthen Canal CC block lined channel	1,562.4 m 173.6 m	Re-excavation of canal

D. Implementation Schedule

21. The subproject is to be implemented over a period of 6 years. The detailed design stage is expected to commence in 2013, and the construction period will cover 24 months.

Figure 1: Location Map

★ **Study town**

IV. DESCRIPTION OF THE ENVIRONMENT

A. Methodology Used for the Baseline Study

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

(i) subproject details, reports, maps, and other documents available with the ADB CDTA and PPTA consultants, LGED, and Pirojpur pourashava;
(ii) relevant acts and extraordinary gazettes, and guidelines issued by Government of Bangladesh agencies; and
(iv) literature on land use, soil, geology, hydrology, climate, socioeconomic profiles, and environmental planning documents collected from Government of Bangladesh agencies and websites.

23. Several visits to the subproject sites were made during the CDTA and PPTA stages to assess the existing environment (physical, biological, and socioeconomic) and gather information with regard to the proposed sites and scale of the proposed subproject. A separate socioeconomic study was conducted to determine the demographic information, archeological and religious places, densely populated pockets, and settlements.

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

B. Physical Characteristics

25. **Topography, landforms, geology and soils.** Pirojpur pourashava, with an area of 29.46 km^2. A topographic and physical feature survey of the pourashava was undertaken by Sheltech consultants in 2010 to 2011. According to that survey, the lowest spot height is 0.4 m and the highest is 4.00 m with an average ground level of 1.86 m. The physical feature survey showed that there are about 16.3 hectares of roads. There are 189 bridges, 181 box culverts and 20 pipe culverts. Approximately 11% of the Pourashava area is ponds, ditches and *khals*.

26. **Climatic conditions.** Pirojpur has a tropical monsoon-type climate. January is the coolest month with temperatures averaging near 26 ºC (78 ºF) and April the warmest with temperatures from 33 to 36 ºC (91 to 96 ºF). The climate is one of the wettest in the world. Most places receive more than 1,525 mm of rain a year. Most rains occur during the monsoon (June-September) and little in winter (November-February). Pirojpur is subject to devastating cyclones, originating over the Bay of Bengal, in the periods of April to May and September to November. Often accompanied by surging waves, these storms can cause great damage and loss of life.

27. **Water quality.** The town is bordered on the west side by the Baleshwar River and to the east and south by the Kocha River.

28. **Air quality.** As there are no major air pollution sources, the air quality of Pirojpur pourashava, in general, is within acceptable limits. Currently, no air quality monitoring stations are in operation within the pourashava limit.

29. **Acoustic environment.** Subproject components are in the built-up part of Pirojpur, with residential, commercial, and institutional establishments. The volume of traffic that passes

through these sections is not significant and traffic jams are not frequent. However vehicular movement can be considered as major cause of noise pollution.

C. Biological Characteristics

30. **Flora and fauna.** Subproject components are located in Pirojpur urban area or in its immediate surroundings which were converted into urban use for years ago, and there is no natural habitat left at these sites. Animals and plants in the subproject area are those commonly found in urban and built-up areas. No endangered/protected species of either flora or fauna are found in the pourashava or its immediate surroundings.

31. **Protected areas.** There are no forest areas, wetlands, mangroves, or estuaries in or near the subproject sites. No natural forest exists in the subproject sites or in the surrounding areas.

D. Socioeconomic Characteristics

32. Area and population. lies within the centre of Pirojpur Upazila which occupies an area of 166.81 km2. Information about the total number of households, with average size, and population of Pirojpur pourashava is presented in Table 4.

Table 4: Population of Pirojpur Pourashava

	Area (km^2)	Households (nos.)	Population			Average Household Size	Density (per km^2)
			Total	Male	Female		
Pirojpur	**29.46**	**13,646**	**60,056**	**30,048**	**30,008**	**4.40**	**2,038**
Ward No - 01	4.5	1,311	5,707	2,802	2,905	4.35	1,268
Ward No - 02	2.62	1,369	6,455	3,157	3,302	4.72	2,463
Ward No - 03	4.70	1,023	4,717	2,358	2,359	4.61	1,003
Ward No - 04	1.81	2,548	10,421	5,199	5,222	4.08	5,757
Ward No - 05	2.31	1,687	7,528	3,979	3,549	4.46	3,258
Ward No - 06	3.60	1,330	6,143	3,170	2,973	4.61	1,706
Ward No - 07	1.01	1,665	7,112	3,376	3,736	4.27	7,041
Ward No - 08	2.85	1,490	6,474	3,214	3,260	4.34	2,271
Ward No - 09	6.06	1,223	5,495	2,793	2,702	4.49	906

Source: Bangladesh Bureau of Statistics Community Report, Zilla: Pirojpur, 2011.

33. **Land use.** A land use survey was undertaken by Sheltech Consultants in 2009. The results show that there is predominance of agricultural land use (42%) followed by residential land use (30%) and the rest as commercial, industrial, administrative, educational, places of worship, health, recreational, restricted, transportation, miscellaneous, mixed uses, graveyard, open spaces, and water bodies. The survey clearly shows that the land use pattern reveals significant urbanized land uses. Approximately 11% of the pourashava area is ponds, ditches and khals.

34. **Type of community spread.** Pirojpur is composed of 79.01% Muslim, 20.91% Hindu and 0.08% others. Average literacy is 55.8%.

35. **Existing provisions for pedestrians and other forms of transport.** Pirojpur roads generally fall into two categories: *katcha* (earthen) construction and *pukka* (formed) roads. Formed roads are mainly BT asphalt roads with CC roads in a few places for main roads, while minor roads may also be brick-on-edge soling, known locally as HBB. Nearly all roads are built above the existing ground level, not only to avoid inundation during storms, but as the silty loam

and alluvial soils typical of the area compact easily, roads need a supporting base layer that is often built up to around one meter above ground level. There are about 16.3 ha of roads, 189 bridges, 181 box culverts and 20 pipe culverts in Pirojpur. Management survey results reveal that there is no public or private bus service available for internal movement of passengers at Pirojpur. At present, there is no designated authority for the management of traffic at Pirojpur pourashava, the owners of the transport agencies decide about their routes and manage their traffic.

36. **Socio-economic status.** Main occupations are agriculture (35.3%), agricultural laborer (17.05%), wage laborer (5.71%), commerce (16.2%), service (7.25%), fishing (2.68%), transport (1.64%), construction (1.28%), and others (12.89%). Main crops are paddy, wheat, sugarcane, and betel leaf.

37. **Other existing amenities for community welfare.** Educational institutions in the pourashava include 4 government colleges, 18 non-government colleges, 5 government high schools, 185 non-government high schools, 12 junior schools, 485 government primary schools, 282 non-government primary schools, 188 *madrashas* (any type of religious school or college for the study of the Islamic religion, though this may not be the only subject studied), 4 kindergarten schools, 1 poly technique institute and 7 satellite schools. Health facilities include 2 hospitals, 6 *upazila* health complexes, 42 union health and family planning centre, 1 maternity and child welfare centre, 12 satellite clinics and 53 palli health services clinic.

E. Historical, Cultural and Archaeological Characteristics

38. **Physical and cultural heritage.** There historical places in Pirojpur are the marks of war of liberation, 2 mass killing sites, 1 mass grave and 1 memorial. The archaeological heritage and relics sites are Kumarkhali Kali Mandir, Rayerkati Zamindarbari and Shiva Mandir, two domed mosque (Nesarabad), remnants of Kaurikhara Zamindarbari. Kumarkhali Kali Mandir, Rayerkati Zamindarbari and Shiva Mandir, two domed mosque (Nesarabad), remnants of Kaurikhara Zamindarbari. The subproject components are not located in or near and excavation works will not be conducted in the vicinities of these sites.

V. ASSESSMENT OF ENVIRONMENTAL IMPACTS AND SAFEGUARDS

A. Methodology

39. Issues for consideration have been raised by the following means: (i) input from interested and affected parties; (ii) desktop research of information relevant to the proposed subproject; (iii) site visits; and (iv) evaluation of proposed design scope and potential impacts. Categorization of the subproject and formulation of mitigation measures have been guided by ADB's REA Checklist for Drainage and Flood Control (Appendix 1) and ADB SPS 2009.

B. Screening Out Areas of No Significant Impact

40. From the preliminary design and results of the rapid environmental assessment, it is clear that implementation of Pirojpur drainage and flood control subproject will not have major negative impacts because activities will be localized/site-specific and short in duration, corridors of impact of will be on existing public ROWs, and construction will be conducted within a relatively small area. Because of these there are several aspects of the environment that are not expected to be affected by the subproject (Table 5) thus can be screened out of the assessment at this stage but will be assessed again during detailed design stage and before implementation.

Table 5: Fields in Which the Subproject Is Not Expected to have Significant Impacts

Field	Rationale
A. Physical Characteristics	
Topography, landforms, geology and soils	Required amount of materials will not cause alteration of topography, landforms, geology and soils. Erosion hazard is insignificant as trenching and excavation works will be conducted only during construction stage (short-term) and specific to sites along public ROWs.
Climatic conditions	Short-term production of dust is the only effect on atmosphere. However, impact is short-term, site-specific and within a relatively small area. There are well developed methods for mitigation.
Water quality	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. However, impact is short-term, site-specific and within a relatively small area. There are well developed methods for mitigation.
Air quality	Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants (such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. However, impact is short-term, site-specific and within a relatively small area. There are well developed methods for mitigation.
Acoustic environment	Construction activities will be on settlements, along and near schools, and areas with small-scale businesses. Temporary increase in noise level and vibrations may be caused by excavation equipment, and the transportation of equipment, materials, and people. However, the proposed subproject will follow existing ROW alignment and impact is short-term, site-specific and within a relatively small area. There are well developed methods for mitigation.
B. Biological Characteristics	
Biodiversity	Activities being located in the built-up area of Pirojpur pourashava will not cause direct impact on biodiversity values. Based on preliminary design construction activities do not anticipate any cutting of trees (to be reassessed during detailed design stage).
C. Socioeconomic Characteristics	
Land use	No alteration on land use. Rehabilitation of existing drainage and flood control structures is prioritized over new construction, using vacant government land and right of way (ROW).
Type of community spread	No alteration on type of community spread.
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Hauling of construction materials and operation of equipment on-site can cause traffic problems. However, the proposed subproject will follow existing ROW alignment and impact is short-term, site-specific and within a relatively small area. There are well developed methods for mitigation.
Socio-economic status	Subproject components will be located in government land and existing ROWs thus there is no requirement for land acquisition or any resettlements. Manpower will be required during the 24-month construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term.
Other existing amenities for community welfare	Although construction of subproject components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject sites being in built-up areas of Pirojpur pourashava where there are a variety of human activities, will result to impacts to the sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are temporary and for short duration.
D. Historical, Cultural, and Archaeological Characteristics	

Field	Rationale
Physical and cultural heritage	There are no scheduled or unscheduled historical, archaeological, paleontological, or architectural sites of heritage significance listed by local and/or national authority and/or internationally (UNESCO) within or adjacent to subproject sites.

C. Anticipated Impacts and Mitigation Measures – Planning and Design Phase

41. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible. Locations and siting of the proposed infrastructures were considered to further reduce impacts. The subproject will be in properties held by the pourashava and access to the subproject sites is thru public ROW and existing roads hence, land acquisition and encroachment on private property will not occur.

42. The concepts considered in design of the Pirojpur drainage and flood control subproject are: (i) locating facilities on government-owned land to avoid the need for land acquisition and relocation of people; (ii) prioritizing rehabilitation over new construction, using vacant government land and right of way (ROW), and taking all possible measures in design and selection of site or alignment to avoid resettlement impacts; (iii) avoiding where possible locations that will result in destruction/disturbance to historical and cultural places/values; (iv) avoiding tree-cutting where possible; (v) ensuring all planning and design interventions and decisions are made in consultation with local communities and reflecting inputs from public consultation and disclosure for site selection.

43. Possible actions to mitigate against the main projected effects of climate change on drainage and flood control infrastructure and service are described in Table 6. Possible actions to mitigate against other factors that will affect drainage and flood control infrastructure and climate resilience are described in Table 7. Preliminary designs integrate a number of measures, both structural and non-structural, to mainstream climate resilience into the Pirojpur drainage subproject, including: (i) existing drains rehabilitated and capacities enhanced to 2050 projections - dredging, re-profiling, lining, etc., as appropriate; (ii) new drains constructed to same capacity, including reinstating and enhancing natural drainage channels, etc., wherever feasible; (iii) runoff detention capacity introduced wherever feasible; and (iv) materials selected and construction quality monitored for increased durability, because of longer inundation periods, wastewater risks, etc. As a result, some measures have already been included in the subproject designs. This means that the impacts and their significance have already been reduced.

Table 6: Possible Actions to Mitigate against Projected Effects of Climate Change on Drainage and Flood Control Infrastructure and Improve Climate Resilience

	Climate Change Effect	Mitigation Measures
1.	Increased rainfall quantity and runoff	- Increase infrastructure capacity, e.g. channels, bridges, culverts, regulating structures, outfall vents, etc. (levels to take account of sea level rise) - Create capacity to detain runoff as necessary, e.g. ponds, open spaces, channels, khals, etc. - Isolate/protect vulnerable catchments and sub-catchments, to reduce flooding from adjacent catchments, especially if large in area and volume and impacts are less serious, e.g. agricultural land - Actively managing runoff and discharges, according to needs, adverse impacts, etc. - Improve O&M, organizational capacity, resource allocation, etc. - Work with relevant stakeholders to manage water use and flood discharges more effectively

	Climate Change Effect	Mitigation Measures
		- Improve collection and disposal of solid waste - Control encroachments - Improve public behavior through active and prolonged information, education and communication campaigns to reduce uncontrolled solid waste disposal, encroachments, damage to infrastructure, unregulated development in key areas, etc., supported by enforcement.
2.	Sea level rise (SLR)	- Raise existing flood defenses to requisite levels and building new flood defenses on unprotected tidal channels and *khals* - Improve drainage infrastructure and detention capacity as required (see (1)) - Improve O&M, organizational capacity, resource allocation, etc. - Work with relevant stakeholders, e.g. BWDB, landowners, water user groups, farmers associations, etc., to ensure their actions contribute as required.
3.	Increased frequency of severe cyclones	- Enhance flood defense levels and strengthen to the requisite levels according to location, etc., e.g. urban areas should have higher and stronger levels of protection than rural areas - Improve infrastructure and detention capacity and protecting/isolating catchments as appropriate (see (1)) - Improve O&M of defenses and drainage, organizational capacity, resource allocation, etc., - Work with relevant stakeholders, e.g. BWDB, etc., to ensure their actions contribute as best possible.

Source: PPTA Consultant.

Table 7: Possible Actions to Mitigate against Other Factors that may affect Drainage/Flood Control Infrastructure and Climate Resilience

	Impact Factor	Mitigating action
1.	Construction materials' quality	- Choose most durable materials possible, even if higher cost, e.g. concrete, high quality bricks. - Monitor and control construction quality
2.	Flat topography	- Shorten drainage routes - Avoid downstream constrictions, etc. - Retain and upgrade existing natural drainage routes and channels. - Maximize runoff and water-level regulation, and detention capacity; regulate land development as required. - Consider short to medium-term pumping, using mobile/emergency pumps wherever appropriate.
3.	Rising temperatures	- Execute works during most favorable times of year and day. - Monitor and control preparing, placing and curing concrete and mortar, to ensure placement, etc., during most favorable times. - Use plain high-quality un-rendered brickwork and high quality cement mortar in preference to rendered low-grade bricks - Use sulphate resisting cement in vulnerable locations (higher heat gain during curing) or cement containing fly-ash (less heat gain, so preferred).
4.	Runoff	- Require separate arrangements for disposal of fecal-contaminated wastewater. - Use trapezoidal section drains with small low-flow section (cunette) for low flows - Line drains to achieve higher discharge velocities without increasing risk of scour, etc.
5.	Flooding	- Choose durable materials, preferably concrete or high quality bricks - Ensure high quality construction - Consider short to medium-term pumping (mobile/emergency pumps) - Check and design against possible floating in various operating scenarios (hydrostatic pressure).

Source: PPTA Consultant.

D. Anticipated Impacts and Mitigation Measures – Construction Phase

44. In the case of this subproject (i) most of the individual elements are relatively small and

involve straightforward construction, so impacts will be mainly localized and not greatly significant; (ii) most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving excavation and earth movements; and (iii) being located in the built-up area of the pourashavas, will not cause direct impact on biodiversity values.

45. **Construction method.** Trenches will be dug by backhoe digger, supplemented by manual digging where necessary. Excavated soil will be placed nearby, and the materials (brought to site on trucks and stored on unused land nearby) will be placed in the trench by crane or using a small rig. The infrastructures will be constructed manually according to design specifications. Any excavated road will be reinstated.

46. There is sufficient space for a staging area, construction equipment, and stockpiling of materials. However, the contractor will need to remove all construction and demolition wastes on a daily basis.

47. Although construction of these project components involves quite simple techniques of civil work, the invasive nature of excavation and the project sites in built-up areas of Pirojpur where there are a variety of human activities, will result to impacts to the environment and sensitive receptors such as residents, businesses, and the community in general. These anticipated impacts are short-term, site-specific and within a relatively small area. There are no impacts that are significant or complex in nature, or that need an in-depth study to assess the impact. Thus, Pirojpur drainage subproject is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with construction activities can be mitigated to acceptable levels with the following mitigation measures (Table 8).

Table 8: Anticipated Impacts and Mitigation Measures – Construction Phase

Field	Impacts	Mitigation Measures
A. Physical Characteristics		
Topography, landforms, geology and soils	Significant amount of gravel, sand, and cement will be required for this subproject. Extraction of construction materials may cause localized changes in topography and landforms. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Utilize readily available sources of materials. If contractor procures materials from existing burrow pits and quarries, ensure these conform to all relevant regulatory requirements. - Borrow areas and quarries (If these are being opened up exclusively for the subproject) must comply to environmental requirements, as applicable. No activity will be allowed until formal agreement is signed between PIU, landowner and contractor.
Water quality	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Prepare and implement a spoils management plan (Appendix 4). - Prioritize re-use of excess spoils and materials in construction activities. If spoils will be disposed, consult with Pirojpur local authority on designated disposal areas. - All earthworks must to be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. - Location for stockyards for construction materials shall be identified at least 300m away from watercourses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. - Take all precautions to minimize the wastage of water in the construction activities.

Field	Impacts	Mitigation Measures
		- Take all precautions to prevent entering of wastewater into streams, watercourses, or irrigation system. Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies. - Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas. - While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and cross drainage channels. - Monitor water quality according to the environmental management plan.
Air quality	Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants (such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Damp down exposed soil and any sand stockpiled on site by spraying with water when necessary during dry weather; - Use tarpaulins to cover soils, sand and other loose material when transported by trucks. - Unpaved surfaces used for haulage of materials within settlements shall be maintained dust-free. - Arrangements to control dust through provision of windscreens, water sprinklers, and dust extraction systems shall be provided at all hot-mix plants, batching plants and crushers (if these establishments are being set up exclusively for the subproject). - Monitor air quality.
Acoustic environment	Construction activities will be on settlements, along and near schools, and areas with small-scale businesses. Temporary increase in noise level and vibrations may be caused by excavation equipment, and the transportation of equipment, materials, and people. However, the proposed subproject will follow existing ROW alignment and impact is short-term, site-specific and within a relatively small area. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Involve the community in planning the work program so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times. - Plan activities in consultation with Pirojpur local authority so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. - Use of high noise generating equipment shall be stopped during night time. - Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; - Utilize modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensure that these are maintained to manufacturers' specifications at all times. - All vehicles and equipment used in construction shall be fitted with exhaust silencers. Use silent-type generators (if required). - Monitor noise levels. Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. - If it is not practicable to reduce noise levels to or below noise exposure limits, the contractor must post warning signs in the noise hazard areas. Workers in a posted noise hazard area must wear hearing protection. - Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.
Aesthetics	Based on preliminary design construction activities do not anticipate any cutting of trees (to be reassessed during detailed design) but will produce excess	- Prepare the Debris Disposal Plan - Remove all construction and demolition wastes on a daily basis. - Coordinate with Pirojpur local authority for beneficial uses of excess excavated soils or immediately dispose to designated

Field	Impacts	Mitigation Measures
	excavated earth (spoils), excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	areas Avoid stockpiling of any excess spoils - Suitably dispose of collected materials from drainages, unutilized materials and debris either through filling up of pits/wasteland or at pre-designated disposal locations. - All vehicles delivering fine materials to the site and carrying waste debris for disposal shall be covered to avoid spillage of materials. All existing roads used by vehicles of the contractor, shall be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. - Lighting on construction sites shall be pointed downwards and away from oncoming traffic and nearby houses. - In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening. This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction. - The site must be kept clean to minimize the visual impact of the site. Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;
B. Biological Characteristics		
Biodiversity	Activities being located in the built-up area of Pirojpur pourashava. There are no protected areas in or around subproject sites, and no known areas of ecological interest. Based on preliminary design there are no trees at the site that need to be removed (to be reassessed during detailed design stage).	- Check if tree-cutting will be required during detailed design stage. No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission of the environment management specialist. - All efforts shall be made to preserve trees by evaluation of minor design adjustments/ alternatives (as applicable) to save trees. - Special attention shall be given for protecting giant trees and locally-important trees (with religious importance) during implementation. - Prevent workers or any other person from removing and damaging any flora (plant/vegetation) and fauna (animal) including fishing in any water body in the subproject vicinity. - Prohibit employees from poaching wildlife and cutting of trees for firewood.
C. Socioeconomic Characteristics		
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Hauling of construction materials and operation of equipment on-site can cause traffic problems. However, the proposed subproject will follow existing ROW alignment. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Prepare and implement a Traffic Management Plan (Appendix 5) - Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. - Maintain safe passage for vehicles and pedestrians throughout the construction period. - Schedule truck deliveries of construction materials during periods of low traffic volume. - Erect and maintain barricades, including signs, markings, flags and flagmen informing diversions and alternative routes when required. - Notify affected sensitive receptors by providing sign boards informing nature and duration of construction activities and contact numbers for concerns/complaints. - Leave spaces for access between mounds of soil. - Provide walkways and metal sheets where required to maintain access across for people and vehicles. - Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. - Consult businesses and institutions regarding operating hours and factoring this in work schedules. Ensure there is provision of alternate access to businesses and institutions

Field	Impacts	Mitigation Measures
		during construction activities, so that there is no closure of these shops or any loss of clientage. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.
Socio-economic status	Subproject components will be located in government land and existing ROWs thus there is no requirement for land acquisition or any resettlements. Manpower will be required during the 24-month construction stage. This can result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term.	- Employ at least 50% of labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problems from workers housed in poorly serviced camp accommodation. - Secure construction materials from local market.
Other existing amenities for community welfare	Although construction of subproject components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject sites being in built-up areas of Pirojpur pourashava where there are a variety of human activities, will result to impacts to the sensitive receptors such as residents, businesses, and the community in general. Excavation may also damage existing infrastructure (such as water distribution pipes, electricity pylons, etc) located alongside the roads. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Obtain details from pourashava nature and location of all existing infrastructure, and plan excavation carefully to avoid any such sites to maximum extent possible; - Integrate construction of the various infrastructure subprojects to be conducted in Pirojpur (roads, water supply, etc.) so that different infrastructure is located on opposite sides of the road where feasible and roads and inhabitants are not subjected to repeated disturbance by construction in the same area at different times for different purposes. - Consult with local community to inform them of the nature, duration and likely effects of the construction work, and to identify any local concerns so that these can be addressed. - Existing infrastructure (such as water distribution pipes, electricity pylons, etc.) shall be relocated before construction starts at the subproject sites. - Prior permission shall be obtained from respective local authority for use of water for construction. Use of water for construction works shall not disturb local water users. - If construction work is expected to disrupt users of community water bodies, notice to the affected community shall be served 7 days in advance and again 1 day prior to start of construction. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.
Community health and safety	Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Contractor's activities and movement of staff will be restricted to designated construction areas. - Locations of hot-mix plants, batching plants and crushers (if these establishments are being set up exclusively for the subproject) shall be shall be located at least 100 m away from the nearest dwelling preferably in the downwind direction. - Consult with Pirojpur local authority on the designated areas for stockpiling of, soils, gravel, and other construction materials. - If the contractor chooses to locate the work camp/storage area on private land, he must get prior permission from the environment management specialist and landowner. - Use small mechanical excavators to attain faster trenching progress. For rock and concrete breaking, use non-explosive blasting chemicals, silent rock cracking chemicals, and concrete breaking chemicals.[5] - Under no circumstances may open areas or the surrounding bushes be used as a toilet facility.

[5] These products come in powder forms, and once mixed with water (being the catalyst) simply expand, and crack the rock from hole to hole. This product is environmentally friendly and can be washed away after it has been used.

Field	Impacts	Mitigation Measures
		- Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. - A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii) prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); (iv) no fires permitted on site except if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. - Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action as per environment management specialist's instruction. - The contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the environment management specialist within 48 hours of receipt of such complaint/grievance.
Workers health and safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures.	- Comply with requirements of Government of Bangladesh Labor Law of 2006 and all applicable laws and standards on workers H&S. - Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. - Produce and implement a site health and safety (H&S) plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing (H&S) training[6] for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. - Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances - Maintain necessary living accommodation and ancillary facilities in functional and hygienic manner in work camps. Ensure (i) uncontaminated water for drinking, cooking and

[6] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

Field	Impacts	Mitigation Measures
		washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; and (iii) sanitation facilities are available at all times. - Provide medical insurance coverage for workers; - Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; - Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; - Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; - Ensure moving equipment is outfitted with audible back-up alarms; - Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate; and - Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
D. Historical, Cultural, and Archaeological Characteristics		
Physical and cultural heritage	Pirojpur pourashava was established in 1885. However, construction works will be on existing drainages and built-up areas of Pirojpur thus risk for chance finds is low.	- All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. - Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. - Stop work immediately to allow further investigation if any finds are suspected.

E. Anticipated Impacts and Mitigation Measures – Operations and Maintenance Phase

48. In the operations and maintenance (O&M) phase, the drainages and flood control structures will operate with routine maintenance, which should not affect the environment. The infrastructures will need to be repaired from time to time, but environmental impacts will be much less than those of the construction period as the work will be infrequent, affecting small areas only. O&M will be the responsibility of Pirojpur local authority, which will be given training by this project.

49. Routine repairs and unblocking of drains will be very small in scale, to conducted manually by small teams of men with simple equipment (shovels, wheelbarrows, etc.) and works will be very short in duration thus will not cause significant physical impacts. Traffic may be interrupted temporarily but this work will be very small in scale, infrequent, and short in duration, so there will be no economic or other implications. To maintain the safety of workers and road-users, such work should be coordinated with the local police department so that adequate warning signs and traffic diversions can be set up when necessary. Debris/sediments from drainages need to be collected and disposed at a designated site such as the landfill. It is important that the designated disposal site's base is of a non-permeable membrane in order to

prevent leachate that can contaminate the soil and groundwater. The potential adverse impacts that are associated with O&M activities can be mitigated to acceptable levels with the following mitigation measures (Table 9).

Table 9: Anticipated Impacts and Mitigation Measures – O&M Phase

Field	Impacts	Mitigation Measures
A. Physical Characteristics		
Water quality	Run-off from stockpiled debris/sediments from drainages which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Take all precautions to prevent entering of run-off into streams, watercourses, or irrigation system. Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies. - Remove all debris/sediments immediately. - Dispose debris/sediments at a designated site such as landfill. It is important that the designated disposal site's base is of a non-permeable membrane in order to prevent leachate that can contaminate the soil and groundwater.
Air quality	Moving debris/sediments from drainages may create dusts during dry season. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Use tarpaulins to cover soils, sand and other loose material.
Acoustic environment	Temporary increase in noise level and vibrations. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Plan activities in consultation with Pirojpur local authority so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. - Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.
B. Biological Characteristics		
Biodiversity	Activities in the built-up area of Pirojpur pourashava. There are no protected areas in or around subproject sites, and no known areas of ecological interest.	- No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission. - Prevent workers or any other person from removing and damaging any flora (plant/vegetation) and fauna (animal).
C. Socioeconomic Characteristics		
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Traffic may be interrupted temporarily. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Maintain safe passage for vehicles and pedestrians during maintenance activities. - Erect and maintain barricades, including signs, markings, flags and flagmen informing diversions and alternative routes when required. - Notify affected sensitive receptors by providing sign boards informing nature and duration of maintenance activities and contact numbers for concerns/complaints. - Leave spaces for access between mounds of soil. - Provide walkways and metal sheets where required to maintain access across for people and vehicles. - Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. - Consult businesses and institutions regarding operating hours and factoring this in work schedules. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.
Workers health and safety	Workers need to be mindful of the occupational hazards working in confined spaces such	- Comply with requirements of Government of Bangladesh Labor Law of 2006 and all applicable laws and standards on workers H&S.

Field	Impacts	Mitigation Measures
	as closed drains. Potential impacts are negative and long-term but reversible by mitigation measures.	- Ensure that all site personnel have a basic level of H&S training. - Produce and implement a O&M health and safety (H&S) plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing (H&S) training[7] for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. - Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances - Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; - Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; - Mark and provide sign boards. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. - Disallow worker exposure to noise level greater than 85 dBA for a duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.
D. Historical, Cultural, and Archaeological Characteristics		
Physical and cultural heritage	Pirojpur pourashava was established in 1885. However, construction works will be on existing drainages and built-up areas of Pirojpur thus risk for chance finds is low.	- All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. - Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. - Stop work immediately to allow further investigation if any finds are suspected.

F. Cumulative Impact Assessment

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

[7] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

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

51. The project has identified the valued components as water quality, air quality, acoustic environment, socioeconomic and socio-community components, and human health and safety. There are no foreseeable projects that will overlap with the subproject. The spatial boundary of the subproject is the area along alignment of the drainage and flood control structures. The temporal boundary can be considered as the whole Pirojpur pourashava.

52. **Water quality.** PPTA findings show that intensity of tropical cyclones will increase with the rise of sea surface temperature. As a result the probability of higher category cyclones would increase in year 2040-2050. Increased and more intensive rainfall will cause more floods inundating roads and yards, market places and other important areas. Larger, steeper or lined drains will be required to discharge excess storm water. However Pirojpur topography and land availability do not lend itself to steeper drainage with complex pumping or water management arrangements. It is recommended that the infrastructures be (i) designed to the current best practice standard and in line with the current LGED guidelines[8] for a 25-year design period; (ii) designed as (i) but taking into account of the projected climate change impacts up to 2050;[9] (iii) built that the floods do not damage them; and (iv) drains are to be kept free from wastes and siltation. Short-term negative impacts are the same but with increased demand for construction materials and time to complete the works. Potential long-term environmental impacts are positive; including: (i) mainstreaming climate risk reduction into infrastructure development ensures subprojects infrastructure are less vulnerable to floods, storm surge, landslides and impacts of other extreme weather events. (ii) improved climate change data management and availability resulting to improved risk assessment; (iii) improved environmental planning guidelines and procedures will be improved, and (iv) evidence-based decision making, with the application of climate impact and screening procedures emphasized as part of environmental assessment.

53. **Air quality.** Emissions of common air contaminants and fugitive dust may be elevated in proximity to active work sites during construction and O&M phases, these impacts will be short-term and localized to the immediate vicinity of drainage and flood control structures. Greenhouse gas (GHG) emissions may increase as a result of the subproject activities (i.e., vehicle and equipment operation, concrete production, disposal of excavated material, landfilling of residual wastes). Given the subproject's relatively minor contribution to common air contaminants and GHG emissions during construction, the overall significance rating of both these potential residual effects is considered to be negligible.

54. **Acoustic environment.** Noise levels during construction and O&M activities in immediate proximity of work sites are expected to increase. The duration of exposure will be relatively brief and imperceptible. The exposure represents a temporary, localized, adverse

[8] Urban Drainage Manual, May 1998
[9] PPTA projected rainfall intensity for a 1:10 year design storm by 2050 is only about 1% greater than the intensity for the same storm in 2030. It is therefore considered more cost-effective to plan and develop infrastructure for 2050 immediately that develop it in two stages.

residual effect of low significance for affected receptors. While building damage due to ground vibrations is unlikely, there may be annoyance to spatially located receptors during construction and O&M activities. The overall significance rating of potential residual effects is considered to be negligible.

55. **Socioeconomic and socio-community.** Concerns on existing provisions for pedestrians and other forms of transport will occur spatially during construction and O&M activities. Traffic movement along the drainage alignment and flood control structures will be improved once the activities are completed. Since the subproject will be improvement of existing infrastructures, it will not conflict with existing or planned land use. However, following improvement in infrastructures and services, added residential developments, commercial, and business facilities and increased densities are expected to develop and enhance Pirojpur pourashava. This can be considered a long-term cumulative benefit of the subproject.

56. Given the scale of the project it is likely that large numbers of local people will obtain at least temporary socio-economic benefits, by gaining employment in the construction workforce, and thus raising their levels of income. These benefits can bring wider social gains if they are directed at vulnerable[10] groups.

57. Upon completion of the project, the socio-community will be the major beneficiaries of this subproject. With the improved drainage and flood control structures, they will be provided with reliable and climate-resilient municipal services. In addition to improved environmental conditions, the subproject will reduce occurrence of water-related diseases and exposure to climate extremes. People would spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health. Beyond reducing the water-borne and water-washed diseases, providing better access to improved municipal services confers many other diverse benefits ranging from the easily identifiable and quantifiable (costs avoided, time saved) to the more intangible and difficult to measure (convenience, well-being). One set of benefits related to health impacts that are relatively easy to quantify, are the cost-offsets (costs avoided due to less illness). Cost savings in health care are mainly due to the reduced number of treatments of diarrheal cases. Also, patients will avoid costs incurred by seeking treatment, including expenditures on care, drugs and transport and the opportunity costs of time spent on seeking care. Another set of benefits related to less illness are the avoided days lost, with respect to formal or informal employment, other productive activities in the household, or school attendance. These are considered a long-term cumulative benefit.

58. **Community and workers health and safety.** No adverse residual effects to human health will occur as a result of construction or O&M activities. While exposure to elevated noise levels, fugitive dust and common air pollutants will occur in proximity to work sites, due to their short-term and localized nature, these effects are expected to be minor and insignificant with no measurable effects on human health.

59. Therefore the project will benefit the general public by contributing to the long-term improvement of municipal services and community livability in Pirojpur pourashava.

[10]Vulnerable groups as those without legal title to land and other assets; households headed by single earner females, the elderly or disabled; indigenous peoples (based on ADB OM); and households with incomes that are below the poverty line.

VI. INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

A. Public Consultation Conducted

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

61. Public consultations and focus group discussions (FGDs) were conducted by PPTA on 05 and 09-10 July 2013. The objective of the meetings was to appraise the stakeholders about environmental and social impacts of the proposed subproject and safeguards to mitigate the same. A questionnaire was designed and environmental information was collected. Key respondents included project-affected persons, who may suffer temporary access disruptions during construction activities, shopkeepers/businessmen from the subproject area, and daily commuters consulted randomly. Issues discussed and feedback received along with details of date, time, location, and list of participants are given in Appendix 6. The environmental concerns and suggestions made by the participants were listed, and discussed, and suggestions accordingly incorporated in the EMP.

B. Future Consultation and Disclosure

62. This IEE and other relevant documents will be made available at public locations in the pourashava and posted on the websites of executing agencies and ADB. The consultation process will be continued and expanded during the project implementation to ensure stakeholders participate fully in project execution, as well as to implement comprehensive information, education, and communication plan.

63. The public consultation and disclosure program with all interested and affected partied will remain a continuous process throughout the project implementation, and shall include the following:

(i) **Consultations during construction phase:** (a) public meetings with affected communities to discuss and plan work programs and allow issues to be raised and addressed once construction has started; and (b) 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 project monitoring and evaluation.

(ii) **Project disclosure:** (a) public information campaigns (via newspaper, flyers, and media) to explain the project to the wider city population and prepare them for disruptions they may experience once construction is underway; (b) 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; (c) formal disclosure of completed project reports by making copies available at convenient locations in the study areas, and informing the public of their availability; and (d) providing a mechanism through which comments can be made.

64. For the benefit of the community, the summary of the IEE will be translated in the local language and made available at (i) offices of executing and implementing agencies, (ii) area offices, (iii) consultant teams' offices; and (iv) contractor's campsites. It will be ensured that the hard copies of IEE 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 will be placed in the official website of executing and implementing agencies and the ADB website after approval of the IEE by ADB.

VII. GRIEVANCE REDRESS MECHANISM

65. A project-specific grievance redress mechanism (GRM) will be established to receive, evaluate, and facilitate the resolution of AP's concerns, complaints, and grievances about the social and environmental performance at the level of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project.

66. **Common GRM.** A common GRM will be in place for social, environmental, or any other grievances related to the project; the resettlement plans (RPs) and IEEs will follow the GRM described below, which is developed in consultation with key stakeholders. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The multi-tier GRM for the project is outlined below, each tier having time-bound schedules and with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.

67. Pourashava-wide public awareness campaigns will ensure that awareness on grievance redress procedures is generated through the campaign. The project implementation unit (PIU) safeguards assistant and institutional capacity and community development consultants (ICCDC) that will conduct pourashava-wide awareness campaigns to ensure that poor and vulnerable households are made aware of grievance redress procedures and entitlements, and will work with the PIU safeguards assistant to help ensure that their grievances are addressed.

68. Affected persons (APs) will have the flexibility of conveying grievances/suggestions by dropping grievance redress/suggestion forms in complaints/suggestion boxes that have already been installed by project pourashavas or through telephone hotlines at accessible locations, by e-mail, by post, or by writing in a complaints register in pourashava offices. Appendix 6 has the sample grievance registration form. 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 project management unit (PMU) safeguards officer will have the overall responsibility for timely grievance redressal on environmental and social safeguards issues and for registration of grievances, related disclosure, and communication with the aggrieved party through the PIU safeguards assistant.

69. **Grievance redress process.** In case of grievances that are immediate and urgent in the perception of the complainant, the contractor and supervision personnel from the project management and supervision consultants (PMSC) on-site will provide the most easily accessible or first level of contact for quick resolution of grievances. Contact phone numbers and names of the concerned PIU safeguards assistant, contractors, PMU safeguards officer, PMSC environmental and social safeguards specialists will be posted at all construction sites at visible locations.

(i) **1st Level Grievance.** The contractors, PIU supervision personnel and PIU safeguards assistant can immediately resolve issues on-site in consultation with each other, and will be required to do so within 3 days of receipt of a complaint/grievance. Assistance of ward level coordination committees (WLCC) will be sought if required for resolution of the issue, by any one or all of them jointly.

(ii) **2nd Level Grievance.** All grievances that cannot be redressed within 3 days at field/ward level will be jointly reviewed by the grievance redress committee (GRC) at town-level and PIU safeguards assistant (the second level of grievance redress), who will attempt to resolve them within 7 days.[11] The PIU safeguards assistant will be responsible to see through the process of redressal of each grievance.

(iii) **3rd Level Grievance.** The PIU safeguards assistant will refer any unresolved or major issues to the PMU safeguards officer and PMSC (third level of grievance redress), who will resolve them within 15 days.

(iv) **4th Level Grievance.** Very major issues that are beyond the jurisdictional authority of the GRC or those that have the potential to cause social conflicts or environmental damage or those that remain unresolved at PMU level, will be referred to the project steering committee (PSC)[12]. All paperwork (details of grievances) needs to be completed by the PIU safeguards assistant and circulated to the respective WLCC, GRC and PSC members at least a week in advance of the scheduled meetings. All decisions taken by the GRC and PSC will be communicated to the APs by the PIU safeguards assistant.

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

71. In the event that the established GRM is not in a position to resolve the issue, the affected person also can use the ADB Accountability Mechanism (AM) through directly contacting (in writing) the Complaint Receiving Officer (CRO) at ADB headquarters or the ADB Bangladesh Resident Mission (BRM). The complaint can be submitted in any of the official languages of ADB's DMCs. The ADB Accountability Mechanism information will be included in the PID to be distributed to the affected communities, as part of the project GRM.

72. **Recordkeeping.** Records will be kept by PIU of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed

[11] Grievance redress committees (GRC) have already been formed at town-level. For example in Pirojpur pourashava, the GRC comprises: Panel Mayor as Chairperson, and 1 councilor, the pourashava Executive Engineer, Secretary pourashava and pourashava administrative officer, as members. All town-level GRCs shall have at least one woman member/chairperson and AP representative or independent NGO as committee member. In addition, for project-related grievances, representatives of APs, community-based organizations (CBOs), and eminent citizens must be invited as observers in GRC meetings.

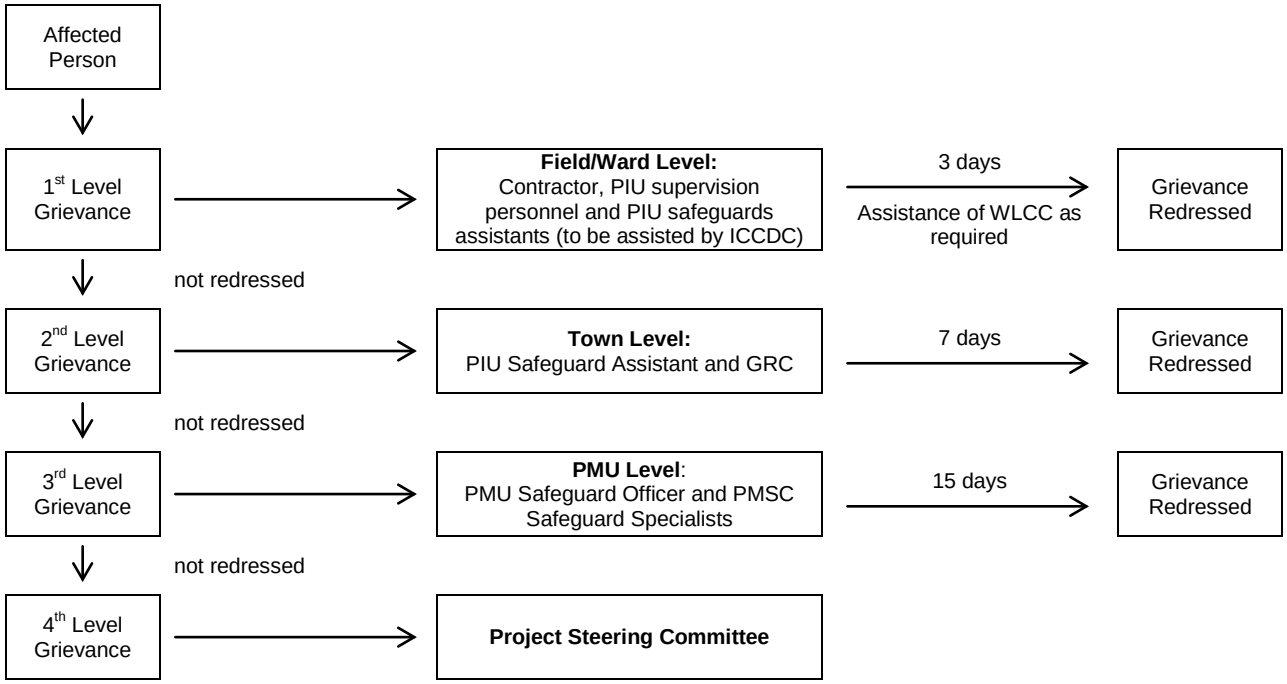
[12] The project steering committee (PSC) responsible for grievance redress will have the following as members: Secretary, Local Government Department, as chair; Chief Engineer, LGED; Chief Engineer, DPHE; Project Director, member secretary; General Economic Division, Planning Commission; Physical Planning, Water Supply and Housing (PPWS&H) Sector, Planning Commission; Representative of Implementation, Monitoring, and Evaluation Division of the Ministry of Planning; Representative of Economic Relations Division and Finance Division of the Ministry of Finance; Representative of Ministry of Environment and Forest (Climate Change Unit); Representative of Bangladesh Water Development Board (BWDB); Urban Development Directorate; Disaster Management Bureau; representatives of pourashavas (mayor, engineer, secretary/ chief executive officer, LGD engineer, DPHE engineer) and special invitees to advise the committee on technical issues.

corrective actions and the date these were effected and final outcome. The number of grievances recorded and resolved and the outcomes will be displayed/disclosed in the PMU office, municipal office, and on the web, as well as reported in monitoring reports submitted to ADB on a semi-annual basis.

73. **Periodic review and documentation of lessons learned.** The PMU safeguard officer will periodically review the functioning of the GRM in each town and record information on the effectiveness of the mechanism, especially on the project's ability to prevent and address grievances.

74. **Costs.** All costs involved in resolving the complaints (meetings, consultations, communication and reporting/information dissemination) will be borne by the concerned PIU at town-level; while costs related to escalated grievances will be met by the PMU. Cost estimates for grievance redress are included in resettlement cost estimates.

Figure 2: Grievance Redress Process



Note: GRC = grievance redressal committee; ICCDC = Institutional Capacity and Community Development Consultants; PIU = project implementation unit; PMSC = project management and supervision consultants;
PMU = project management unit; WLCC = ward level coordination committee

VIII. ENVIRONMENTAL MANAGEMENT PLAN

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

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

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

A. Safeguard Implementation Arrangement

78. **Executing Agency.** LGED will be the lead EA for the project, and DPHE will be a co-executing agency (for water supply and sanitation). A PMU will be established in LGED.

79. **Project Management Unit.** The PMU will be staffed with a safeguards officer and will receive support from safeguards specialists (environment and resettlement) on the DDS and PMSC consultant team. Key tasks and responsibilities of the PMU safeguards officer are as follows:

(i) confirm existing IEEs/EMPs are updated based on detailed designs and that new IEEs/EMPs are prepared in accordance with the EARF and subproject selection criteria related to safeguards;
(ii) confirm whether IEEs/EMPs are included in bidding documents and civil works contracts;
(iii) provide oversight on environmental management aspects of subprojects and ensure EMPs are implemented by project implementation unit (PIU) and contractors;
(iv) establish a system to monitor environmental safeguards of the project including monitoring the indicators set out in the monitoring plan of the EMP;
(v) facilitate and confirm overall compliance with all Government rules and regulations regarding site and environmental clearances as well as any other environmental requirements (e.g., Location Clearance Certificates, Environmental Clearance Certificates etc.), as relevant;
(vi) supervise and provide guidance to the PIUs to properly carry out the environmental monitoring and assessments as per the EARF;
(vii) review, monitor and evaluate the effectiveness with which the EMPs are implemented, and recommend necessary corrective actions to be taken as necessary;
(viii) consolidate monthly environmental monitoring reports from PIUs and submit semi-annual monitoring reports to ADB;
(ix) ensure timely disclosure of final IEEs/EMPs in locations and form accessible to the public; and
(x) address any grievances brought about through the Grievance Redress Mechanism in a timely manner.

80. **Implementing Agencies.** The participating pourashavas will be the IAs, and will establish a PIU within the pourashava structure.

81. **Project Implementation Unit.** The PIU will be staffed with a safeguards officer and will receive support from the PMU safeguards officer and safeguards specialists (environment and resettlement) on the DDS and PMSC consultant team. Key tasks and responsibilities of the PMU safeguards officer are as follows:

(i) include IEEs/EMPs in bidding documents and civil works contracts;
(iv) oversee day-to-day implementation of EMPs by contractors including compliance with all government rules and regulations;
(v) take necessary action for obtaining rights of way;
(vi) oversee implementation of EMPs including environmental monitoring by contractors;
(vii) take corrective actions when necessary to ensure no environmental impacts;
(viii) submit monthly environmental monitoring reports to PMU,
(ix) conduct continuous public consultation and awareness;
(x) address any grievances brought about through the Grievance Redress Mechanism in a timely manner as per the IEEs; and
(xi) organize an induction course for the training of contractors preparing them on EMP implementation, environmental monitoring requirements related to mitigation measures; and taking immediate actions to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation.

82. The community mobilizers in the Institutional Capacity and Community Development Consultants (ICCDC) will be responsible for formation of water and sanitation user groups identify follow-up actions to ensure sustainability of user groups formed; and implement and follow-up on behavioral change, 3R and WASH programs;[13]

83. **Civil works contracts and contractors.** EMPs are to be included in bidding and contract documents and verified by the PIUs and PMU. The contractor will be required to designate an environment supervisor to ensure implementation of EMP during civil works. Contractors are to carry out all environmental mitigation and monitoring measures outlined in their contract.

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

[13] Reduce, reuse and recycle (3R) and water, sanitation, and hygiene program (WASH)

Figure 3: Safeguards Implementation Arrangement

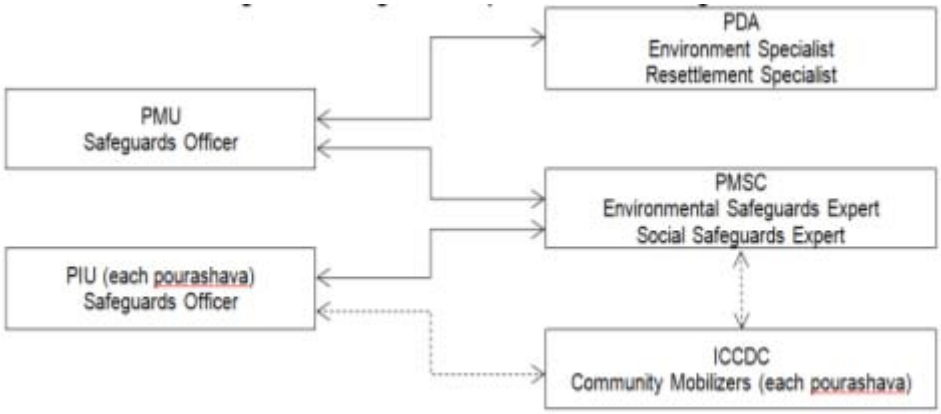


Table 10: Environmental Management and Monitoring Plan – Prior, During, and Post Construction Phase

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
1. Prior to Construction Activities						
Consents, permits, clearances, no objection certificate (NOC), etc.	Failure to obtain necessary consents, permits, NOCs, etc can result to design revisions and/or stoppage of works	- Obtain all necessary consents, permits, clearance, NOCs, etc. prior to start of civil works. - Acknowledge in writing and provide report on compliance all obtained consents, permits, clearance, NOCs, etc. - Include in detailed design drawings and documents all conditions and provisions if necessary	Project management unit (PMU), project implementing unit (PIU), project design advance (PDA) detailed design consultants, and project management and supervision consultants (PMSC)	Incorporated in final design and communicated to contractors.	Prior to award of contract	No cost required. Cost of obtaining all consents, permits, clearance, NOCs, etc. prior to start of civil works responsibility of PMU and PIU. Mitigation measures are included as part of TOR of PMU, PIU, PDA and PMSC.
Existing utilities	Disruption of services.	- Identify and include locations and operators of these utilities in the detailed design documents to prevent unnecessary disruption of services during construction activities - Require construction contractors to prepare a contingency plan to include actions to be done in case of unintentional interruption of services. - Require contractors to prepare spoils management plan (Appendix 4) and traffic management plan (Appendix 5)	PMU, PIU, PDA and PMSC	- List of affected utilities and operators; - Bid document to include requirement for a contingency plan for service interruptions (example provision of water if disruption is more than 24 hours), spoil management plan (Appendix 4), and traffic management plan (Appendix 5)	During detailed design phase - Review of spoils management plan: Twice (once after first draft and once before final approval)	No cost required. Mitigation measures are included as part of TOR of PMU, PIU, PDA and PMSC.
Construction work camps, hot mix plants, stockpile areas, storage areas,	Disruption to traffic flow and sensitive receptors	- Determine locations prior to award of construction contracts.	PMU, PIU, PDA and PMSC	(i) List of selected sites for construction work camps, hot mix plants, stockpile areas, storage areas,	During detailed design phase	No cost required. Mitigation measures are included as part of TOR of PMU, PIU,

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
and disposal areas.				and disposal areas. (ii) Written consent of landowner/s (not lessee/s) for reuse of excess spoils to agricultural land		PDA and PMSC.
Sources of Materials	Extraction of materials can disrupt natural land contours and vegetation resulting in accelerated erosion, disturbance in natural drainage patterns, ponding and water logging, and water pollution.	- Prepare list of approved quarry sites and sources of materials	PMU, PIU, PDA and PMSC	(i) List of approved quarry sites and sources of materials; (ii) Bid document to include requirement for verification of suitability of sources and permit for additional quarry sites if necessary.	During detailed design phase, as necessary with discussion with detailed design engineers and PIUs	No cost required. Mitigation measures are included as part of TOR of PMU, PIU, PDA and PMSC.
EMP Implementation Training	Irreversible impact to the environment, workers, and community	- Project manager and all key workers will be required to undergo EMP implementation including spoils management, Standard operating procedures (SOP) for construction works; health and safety (H&S), core labor laws, applicable environmental laws, etc	Construction Contractor	- Proof of completion (Safeguards Compliance Orientation) (ii) Posting of proof of completion at worksites (iii) Posting of EMP at worksites	During detailed design phase prior to mobilization of workers to site	Cost of EMP Implementation Orientation Training to contractor is responsibility of PMU and PIU. Other costs responsibility of contractor.
2. During Construction Activities						
A. Physical Characteristics						
Topography, landforms, geology and soils	Significant amount of gravel, sand, and cement will be required for this subproject. Extraction of construction materials may	- Utilize readily available sources of materials. If contractor procures materials from existing burrow pits and quarries, ensure these conform to all relevant regulatory requirements. - Borrow areas and	Construction Contractor	- Records of sources of materials	Monthly by PIU	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	cause localized changes in topography and landforms. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	quarries (If these are being opened up exclusively for the subproject) must comply to environmental requirements, as applicable. No activity will be allowed until formal agreement is signed between PIU, landowner and contractor.				
Water quality	Trenching and excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Prepare and implement a spoils management plan (Appendix 4). - Prioritize re-use of excess spoils and materials in construction activities. If spoils will be disposed, consult with Pirojpur local authority on designated disposal areas. - All earthworks must to be conducted during dry season to maximum extent possible to avoid the difficult working conditions that prevail during monsoon season such as problems from runoff. - Location for stockyards for construction materials shall be identified at least 300m away from watercourses. Place storage areas for fuels and lubricants away from any drainage leading to water bodies. - Take all precautions to	Construction Contractor	- Areas for stockpiles, storage of fuels and lubricants and waste materials; - Number of silt traps installed along trenches leading to water bodies; - Records of surface water quality inspection; - Effectiveness of water management measures; - No visible degradation to nearby drainages, *khals* or water bodies due to construction activities	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		minimize the wastage of water in the construction activities. - Take all precautions to prevent entering of wastewater into streams, watercourses, or irrigation system. Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies. - Ensure diverting storm water flow during construction shall not lead to inundation and other nuisances in low lying areas. - While working across or close to any water body, the flow of water must not be obstructed. Ensure no construction materials like earth, stone, or appendage are disposed of in a manner that may block the flow of water of any watercourse and cross drainage channels. - Monitor water quality according to the environmental management plan.				
Air quality	Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of	- Damp down exposed soil and any sand stockpiled on site by spraying with water when necessary during dry weather; - Use tarpaulins to cover soils, sand and other loose material when	Construction Contractor	- Location of stockpiles; - Number of complaints from sensitive receptors; - Heavy equipment and machinery with air pollution control devices;	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	vehicle-related pollutants (such as carbon monoxide, sulfur oxides, particulate matter, nitrous oxides, and hydrocarbons) which will affect people who live and work near the sites. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	transported by trucks. - Unpaved surfaces used for haulage of materials within settlements shall be maintained dust-free. - Arrangements to control dust through provision of windscreens, water sprinklers, and dust extraction systems shall be provided at all hot-mix plants, batching plants and crushers (if these establishments are being set up exclusively for the subproject). - Monitor air quality.		- Certification that vehicles are compliant with air quality standards.	and final location of subproject components	
Acoustic environment	Construction activities will be on settlements, along and near schools, and areas with small-scale businesses. Temporary increase in noise level and vibrations may be caused by excavation equipment, and the transportation of equipment, materials, and people. However, the	- Involve the community in planning the work program so that any particularly noisy or otherwise invasive activities can be scheduled to avoid sensitive times. - Plan activities in consultation with Pirojpur local authority so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. - Use of high noise generating equipment shall be stopped during night time.	Construction Contractor	- Number of complaints from sensitive receptors; - Use of silencers in noise-producing equipment and sound barriers; - Equivalent day and night time noise levels	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	proposed subproject will follow existing ROW alignment and impact is short-term, site-specific and within a relatively small area. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Horns should not be used unless it is necessary to warn other road users or animals of the vehicle's approach; - Utilize modern vehicles and machinery with the requisite adaptations to limit noise and exhaust emissions, and ensure that these are maintained to manufacturers' specifications at all times. - All vehicles and equipment used in construction shall be fitted with exhaust silencers. Use silent-type generators (if required). - Monitor noise levels. Maintain maximum sound levels not exceeding 80 decibels (dBA) when measured at a distance of 10 m or more from the vehicle/s. - If it is not practicable to reduce noise levels to or below noise exposure limits, the contractor must post warning signs in the noise hazard areas. Workers in a posted noise hazard area must wear hearing protection. - Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.				
Aesthetics	Based on	- Prepare the Debris	Construction	- Number of	- Visual inspection by	Cost for

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	preliminary design construction activities do not anticipate any cutting of trees (to be reassessed during detailed design stage) but will produce excess excavated earth (spoils), excess construction materials, and solid waste such as removed concrete, wood, packaging materials, empty containers, spoils, oils, lubricants, and other similar items. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	Disposal Plan - Remove all construction and demolition wastes on a daily basis. - Coordinate with Pirojpur local authority for beneficial uses of excess excavated soils or immediately dispose to designated areas Avoid stockpiling of any excess spoils - Suitably dispose of collected materials from drainages, unutilized materials and debris either through filling up of pits/wasteland or at pre-designated disposal locations. - All vehicles delivering fine materials to the site and carrying waste debris for disposal shall be covered to avoid spillage of materials. All existing roads used by vehicles of the contractor, shall be kept clear of all dust/mud or other extraneous materials dropped by such vehicles. - Lighting on construction sites shall be pointed downwards and away from oncoming traffic and nearby houses. - In areas where the visual environment is particularly important or privacy concerns for surrounding buildings exist, the site may require screening.	Contractor	complaints from sensitive receptors; - Worksite clear of hazardous wastes such as oil/fuel - Worksite clear of any wastes, collected materials from drainages, unutilized materials and debris - Transport route and worksite cleared of any dust/mud	PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of subproject components	implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		This could be in the form of shade cloth, temporary walls, or other suitable materials prior to the beginning of construction. - The site must be kept clean to minimize the visual impact of the site. Manage solid waste according to the following preference hierarchy: reuse, recycling and disposal to designated areas;				
B. Biological Characteristics						
Biodiversity	Activities being located in the built-up area of Pirojpur pourashava. There are no protected areas in or around subproject sites, and no known areas of ecological interest. Based on preliminary design there are no trees at the site that need to be removed (to be reassessed during detailed design stage).	- Check if tree-cutting will be required during detailed design stage. No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission of the environment management specialist. - All efforts shall be made to preserve trees by evaluation of minor design adjustments/ alternatives (as applicable) to save trees. - Special attention shall be given for protecting giant trees and locally-important trees (with religious importance) during implementation. - Prevent workers or any other person from removing and damaging any flora (plant/vegetation) and	Construction Contractor	- PMU and PIU to report in writing the number of trees cut and planted if tree-cutting will be required (to be determined during detailed design stage) - Number of complaints from sensitive receptors on disturbance of vegetation, poaching, fishing, etc.	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		fauna (animal) including fishing in any water body in the subproject vicinity. - Prohibit employees from poaching wildlife and cutting of trees for firewood.				
C. Socioeconomic Characteristics						
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Hauling of construction materials and operation of equipment on-site can cause traffic problems. However, the proposed subproject will follow existing ROW alignment. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Prepare and implement a Traffic Management Plan (Appendix 5) - Plan transportation routes so that heavy vehicles do not use narrow local roads, except in the immediate vicinity of delivery sites. - Maintain safe passage for vehicles and pedestrians throughout the construction period. - Schedule truck deliveries of construction materials during periods of low traffic volume. - Erect and maintain barricades, including signs, markings, flags and flagmen informing diversions and alternative routes when required. - Notify affected sensitive receptors by providing sign boards informing nature and duration of construction activities and contact numbers for concerns/complaints. - Leave spaces for access between mounds of soil. - Provide walkways and metal sheets where	Construction Contractor	- Traffic route during construction works including number of permanent signages, barricades and flagmen on worksite as per Traffic Management Plan (Appendix 5); - Number of complaints from sensitive receptors; - Number of signages placed at project location - Number of walkways, signages, and metal sheets placed at project location	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		required to maintain access across for people and vehicles. - Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. - Consult businesses and institutions regarding operating hours and factoring this in work schedules. Ensure there is provision of alternate access to businesses and institutions during construction activities, so that there is no closure of these shops or any loss of clientage. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.				
Socio-economic status	Subproject components will be located in government land and existing ROWs thus there is no requirement for land acquisition or any resettlements. Manpower will be required during the XXX-months construction stage. This can	- Employ at least 50% of labor force from communities in the vicinity of the site. This will have the added benefit of avoiding social problems that sometimes occur when workers are imported into host communities, and avoiding environmental and social problems from workers housed in poorly serviced camp accommodation. - Secure construction materials from local	Construction Contractor	- Employment records; - Records of sources of materials - Records of compliance to Bangladesh Labor Law of 2006 and other applicable standards	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	result to generation of contractual employment and increase in local revenue. Thus potential impact is positive and long-term.	market.				
Other existing amenities for community welfare	Although construction of subproject components involves quite simple techniques of civil work, the invasive nature of excavation and the subproject sites being in built-up areas of Pirojpur pourashava where there are a variety of human activities, will result to impacts to the sensitive receptors such as residents, businesses, and the community in general. Excavation may also damage existing infrastructure (such as water distribution pipes, electricity pylons, etc)	- Obtain details from pourashava nature and location of all existing infrastructure, and plan excavation carefully to avoid any such sites to maximum extent possible; - Integrate construction of the various infrastructure subprojects to be conducted in Pirojpur (roads, water supply, etc.) so that different infrastructure is located on opposite sides of the road where feasible and roads and inhabitants are not subjected to repeated disturbance by construction in the same area at different times for different purposes. - Consult with local community to inform them of the nature, duration and likely effects of the construction work, and to identify any local concerns so that these can be addressed. - Existing infrastructure (such as water distribution pipes,	Construction Contractor	- Utilities Contingency Plan - Number of complaints from sensitive receptors	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	located alongside the roads. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	electricity pylons, etc.) shall be relocated before construction starts at the subproject sites. - Prior permission shall be obtained from respective local authority for use of water for construction. Use of water for construction works shall not disturb local water users. - If construction work is expected to disrupt users of community water bodies, notice to the affected community shall be served 7 days in advance and again 1 day prior to start of construction. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.				
Community health and safety	Construction works will impede the access of residents and businesses in limited cases. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Contractor's activities and movement of staff will be restricted to designated construction areas. - Locations of hot-mix plants, batching plants and crushers (if these establishments are being set up exclusively for the subproject) shall be shall be located at least 100 m away from the nearest dwelling preferably in the downwind direction. - Consult with Pirojpur local authority on the	Construction Contractor	- Number of permanent signages, barricades and flagmen on worksite as per Traffic Management Plan (Appendix 5); - Number of complaints from sensitive receptors; - Number of walkways, signages, and metal sheets placed at project location - Agreement between landowner	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		designated areas for stockpiling of, soils, gravel, and other construction materials. - If the contractor chooses to locate the work camp/storage area on private land, he must get prior permission from the environment management specialist and landowner. - Use small mechanical excavators to attain faster trenching progress. For rock and concrete breaking, use non-explosive blasting chemicals, silent rock cracking chemicals, and concrete breaking chemicals.[14] - Under no circumstances may open areas or the surrounding bushes be used as a toilet facility. - Recycling and the provision of separate waste receptacles for different types of waste shall be encouraged. - A general regard for the social and ecological well-being of the site and adjacent areas is expected of the site staff. Workers need to be made aware of the following general rules: (i) no alcohol/drugs on site; (ii)		and contractors in case of using private lands as work camps, storage areas, etc.		

[14] These products come in powder forms, and once mixed with water (being the catalyst) simply expand, and crack the rock from hole to hole. This product is environmentally friendly and can be washed away after it has been used.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		prevent excessive noise; (iii) construction staff are to make use of the facilities provided for them, as opposed to ad hoc alternatives (e.g. fires for cooking, the use of surrounding bushes as a toilet facility); (iv) no fires permitted on site except if needed for the construction works; (v) trespassing on private/commercial properties adjoining the site is forbidden; (vi) other than pre-approved security staff, no workers shall be permitted to live on the construction site; and (vii) no worker may be forced to do work that is potentially dangerous or that he/she is not trained to do. - Interested and affected parties need to be made aware of the existence of the complaints book and the methods of communication available to them. The contractor must address queries and complaints by: (i) documenting details of such communications; (ii) submitting these for inclusion in complaints register; (iii) bringing issues to the environment management specialist's attention immediately; and (iv) taking remedial action				

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		as per environment management specialist's instruction. - The contractor shall immediately take the necessary remedial action on any complaint/grievance received by him and forward the details of the grievance along with the action taken to the environment management specialist within 48 hours of receipt of such complaint/grievance.				
Workers health and safety	There is invariably a safety risk when construction works such as excavation and earthmoving are conducted in urban areas. Workers need to be mindful of the occupational hazards which can arise from working in height and excavation works. Potential impacts are negative and long-term but reversible by mitigation measures.	- Comply with requirements of Government of Bangladesh Labor Law of 2006 and all applicable laws and standards on workers H&S. - Ensure that all site personnel have a basic level of environmental awareness training. If necessary, the environmental management specialist and/or a translator shall be called to the sites to further explain aspects of environmental or social behavior that are unclear. - Produce and implement a site health and safety (H&S) plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use	Construction Contractor	- Site-specific H&S Plan - Equipped first-aid stations - Medical insurance coverage for workers - Number of accidents - Records of supply of uncontaminated water - Condition of eating areas of workers - Record of H&S orientation trainings - Use of personal protective equipment - % of moving equipment outfitted with audible back-up alarms - Permanent sign boards for hazardous areas - Signages for storage and disposal areas	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing (H&S) training[15] for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. - Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances - Maintain necessary living accommodation and ancillary facilities in functional and hygienic manner in work camps. Ensure (i) uncontaminated water for drinking, cooking and washing, (ii) clean eating areas where workers are not exposed to hazardous or noxious substances; and (iii) sanitation facilities are available at all times. - Provide medical insurance coverage for		- Condition of sanitation facilities for workers		

[15] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		workers; - Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; - Provide visitor orientation if visitors to the site can gain access to areas where hazardous conditions or substances may be present. Ensure also that visitor/s do not enter hazard areas unescorted; - Ensure the visibility of workers through their use of high visibility vests when working in or walking through heavy equipment operating areas; - Ensure moving equipment is outfitted with audible back-up alarms; - Mark and provide sign boards for hazardous areas such as energized electrical devices and lines, service rooms housing high voltage equipment, and areas for storage and disposal. Signage shall be in accordance with international standards and be well known to, and easily understood by				

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		workers, visitors, and the general public as appropriate; and - Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.				
D. Historical, Cultural, and Archaeological Characteristics						
Physical and cultural heritage	Pirojpur pourashava was established in 1885. However, construction works will be on existing drainages and built-up areas of Pirojpur thus risk for chance finds is low.	- All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. - Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. - Stop work immediately to allow further investigation if any finds are suspected.	Construction Contractor	- Records of chance finds	- Visual inspection by PIU and supervision consultants on monthly basis - Frequency and sampling sites to be finalized during detailed design stage and final location of) subproject components	Cost for implementation of mitigation measures responsibility of contractor.
E. Others						
Submission of EMP implementation report	Unsatisfactory compliance to EMP	(i) Appointment of supervisor to ensure EMP implementation (ii) Timely submission of monitoring reports including pictures	Construction contractor	- Availability and competency of appointed supervisor - Monthly report	- Monthly monitoring report to be submitted by PIU to PMU - PMU to submit semi-annual monitoring report to ADB	Cost for implementation of mitigation measures responsibility of contractor.
3. Post-construction Activities						

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
Post-construction clean-up	Damage due to debris, spoils, excess construction materials	(i) Remove all spoils wreckage, rubbish, or temporary structures (such as buildings, shelters, and latrines) which are no longer required; and (ii) All excavated roads shall be reinstated to original condition. (iii) All disrupted utilities restored (iv) All affected structures rehabilitated/compensated (v) The area that previously housed the construction camp is to be checked for spills of substances such as oil, paint, etc. and these shall be cleaned up. (vi) All hardened surfaces within the construction camp area shall be ripped, all imported materials removed, and the area shall be topsoiled and regrassed using the guidelines set out in the revegetation specification that forms part of this document. (vii) The contractor must arrange the cancellation of all temporary services. (viii) Request PMU/CSS to report in writing that worksites and camps have been vacated and restored to pre-project conditions before acceptance of work.	Construction Contractor	PMU/CSS report in writing that (i) worksite is restored to original conditions; (ii) camp has been vacated and restored to pre-project conditions; (iii) all construction related structures not relevant to O&M are removed; and (iv) worksite clean-up is satisfactory.	- Prior to turn-over of completed works to pourashava	Cost for implementation of mitigation measures responsibility of contractor.

Table 41: Environmental Management and Monitoring Plan – O&M Phase

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
A. Physical Characteristics						
Water quality	Run-off from stockpiled debris/sediments from drainages which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Take all precautions to prevent entering of run-off into streams, watercourses, or irrigation system. Install temporary silt traps or sedimentation basins along the drainage leading to the water bodies. - Remove all debris/sediments immediately. - Dispose debris/sediments at a designated site such as landfill. It is important that the designated disposal site's base is of a non-permeable membrane in order to prevent leachate that can contaminate the soil and groundwater.	Pirojpur pourashava	- No visible degradation to nearby drainages, *khals* or water bodies due to construction activities	Duration of repair works	Included in O&M cost
Air quality	Moving debris/sediments from drainages may create dusts during dry season. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Use tarpaulins to cover soils, sand and other loose material.	Pirojpur pourashava	- No complaints from sensitive receptors	Duration of repair works	Included in O&M cost

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
Acoustic environment	Temporary increase in noise level and vibrations. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.	- Plan activities in consultation with Pirojpur local authority so that activities with the greatest potential to generate noise are conducted during periods of the day which will result in least disturbance. - Identify any buildings at risk from vibration damage and avoiding any use of pneumatic drills or heavy vehicles in the vicinity. Complete work in these areas quickly.	Pirojpur pourashava	- No complaints from sensitive receptors	Duration of repair works	Included in O&M cost
B. Biological Characteristics						
Biodiversity	Activities in the built-up area of Pirojpur pourashava. There are no protected areas in or around subproject sites, and no known areas of ecological interest.	- No trees, shrubs, or groundcover may be removed or vegetation stripped without the prior permission. - Prevent workers or any other person from removing and damaging any flora (plant/vegetation) and fauna (animal).	Pirojpur pourashava	- No complaints from sensitive receptors	Duration of repair works	Included in O&M cost
C. Socioeconomic Characteristics						
Existing provisions for pedestrians and other forms of transport	Road closure is not anticipated. Traffic may be interrupted temporarily. The impacts are negative but short-term, site-specific within a relatively small	- Maintain safe passage for vehicles and pedestrians during maintenance activities. - Erect and maintain barricades, including signs, markings, flags and flagmen informing diversions and alternative routes when required.	Pirojpur pourashava	- No complaints from sensitive receptors	Duration of repair works	Included in O&M cost

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	area and reversible by mitigation measures.	- Notify affected sensitive receptors by providing sign boards informing nature and duration of maintenance activities and contact numbers for concerns/complaints. - Leave spaces for access between mounds of soil. - Provide walkways and metal sheets where required to maintain access across for people and vehicles. - Increase workforce in front of critical areas such as institutions, place of worship, business establishment, hospitals, and schools. - Consult businesses and institutions regarding operating hours and factoring this in work schedules. - Ensure any damage to properties and utilities will be restored or compensated to pre-work conditions.				
Workers health and safety	Workers need to be mindful of the occupational hazards working in confined spaces such as closed drains. Potential impacts are negative and long-term but reversible by mitigation	- Comply with requirements of Government of Bangladesh Labor Law of 2006 and all applicable laws and standards on workers H&S. - Ensure that all site personnel have a basic level of H&S training. - Produce and implement a O&M health and safety	Pirojpur pourashava	- No complaints from sensitive receptors - No complaints from workers related to O&M activities - Zero accident	Duration of repair works	Included in O&M cost

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
	measures.	(H&S) plan which include measures as: (i) excluding the public from worksites; (ii) ensuring all workers are provided with and required to use personal protective equipment (reflectorized vests, footwear, gloves, goggles and masks) at all times; (iii) providing (H&S) training[16] for all site personnel; (iv) documenting procedures to be followed for all site activities; and (v) maintaining accident reports and records. - Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances - Provide H&S orientation training to all new workers to ensure that they are apprised of the basic site rules of work at the site, personal protective protection, and preventing injuring to fellow workers; - Ensure the visibility of workers through their use				

[16] Some of the key areas that may be covered during training as they relate to the primary causes of accidents include (i) slips, trips and falls; (ii) personal protective equipment; (iii) ergonomics, repetitive motion, and manual handling; (iv) workplace transport; and (v) legislation and responsibilities. Training can provide the foundations of competence but it does not necessarily result in a competent worker. Therefore, it is essential to assess staff competence to ensure that the training provided is relevant and effective. Supervision and monitoring arrangements shall be in place to ensure that training has been effective and the worker is competent at their job. The level of supervision and monitoring required is a management decision that shall be based on the risks associated with the job, the level of competence required, the experience of the individual and whether the worker works as part of a team or is a lone worker.

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		of high visibility vests when working in or walking through heavy equipment operating areas; - Mark and provide sign boards. Signage shall be in accordance with international standards and be well known to, and easily understood by workers, visitors, and the general public as appropriate. - Disallow worker exposure to noise level greater than 85 dBA for duration of more than 8 hours per day without hearing protection. The use of hearing protection shall be enforced actively.				
D. Historical, Cultural, and Archaeological Characteristics						
Physical and cultural heritage	Pirojpur pourashava was established in 1885. However, construction works will be on existing drainages and built-up areas of Pirojpur thus risk for chance finds is low.	- All fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest discovered on the site shall be the property of the government. - Prevent workers or any other persons from removing and damaging any fossils, coins, articles of value of antiquity, structures and other remains of archaeological interest. - Stop work immediately to allow further	Pirojpur pourashava	- Records of chance finds	Duration of repair works	Included in O&M cost

Field	Impacts	Mitigation Measures	Responsible for Implementation	Monitoring Indicator	Frequency of Monitoring	Cost and Source of Funds
		investigation if any finds are suspected.				

B. Institutional Capacity Development Program

85. The PMSC environmental safeguards specialists will be responsible for trainings on environmental awareness and management in accordance with both ADB and government requirements. Specific modules customized for the available skill set will be devised after assessing the capabilities of the target participants and the requirements of the project. Typical modules would be as follows: (i) sensitization; (ii) introduction to environment and environmental considerations in water supply and wastewater projects; (iii) review of IEEs and integration into the project detailed design; (iv) improved coordination within nodal departments; and (v) monitoring and reporting system. The contractors will be required to conduct environmental awareness and orientation of workers prior to deployment to work sites. The proposed training project along with the frequency of sessions is presented in Table 12.

Table 5: Training Program for Environmental Management

Description	Contents	Schedule	Participants
Pre-construction stage			
Orientation workshop	**Module 1 – Orientation** - ADB Safeguards Policy Statement - Government of Bangladesh Environmental Laws and Regulations **Module 2 – Environmental Assessment Process** - ADB environmental process, identification of impacts and mitigation measures, formulation of an environmental management plan (EMP), implementation, and monitoring requirements - Review of environmental assessment report to comply with ADB requirements - Incorporation of EMP into the project design and contracts	1 day	LGED, DPHE, PMU, and PIUs officials involved in the project implementation
Construction stage			
Orientation program/ workshop for contractors and supervisory staff	- Roles and responsibilities of officials/contractors/consultants towards protection of environment - Environmental issues during construction - Implementation of EMP - Monitoring of EMP implementation - Reporting requirements	1 day	PMU PIUs Contractors
Experiences and best practices sharing	- Experiences on EMP implementation – issues and challenges - Best practices followed	1 day on a regular period to be determined by PMU, PIUs, and PMSC	PMU PIUs Contractors

C. Staffing Requirement and Budget

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

(i) Conducting environmental assessments of new subprojects, preparing and submitting reports and public consultation and disclosure;
(ii) Application for Environmental Clearance; and

(iii) Implementation of EMP and long-term surveys.

87. The infrastructure involved in each scheme is generally straightforward and will take between three and nine months to build. Environmental monitoring during construction will also be straightforward and will involve periodic site observations and interviews with workers and others, plus checks of reports and other documents. This will be conducted by PMSC environmental management specialist assisted by the PMU environment officer. The PDA environmental management specialist will update the IEE as necessary and perform tasks as specified in the TOR. Therefore no separate budget required for PMSC environment management specialist.

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

89. The operation phase mitigation measures are again of good operating practices, which will be the responsibility of Pirojpur pourashava. All monitoring during the operation and maintenance phase will be conducted by LGED and DPHE, therefore, there are no additional costs.

90. The indicative costs of EMP implementation are shown in Table 13.

Table 6: Indicative Cost of EMP Implementation

	Particulars	Stages	Unit	Total Number	Rate (Taka)	Cost (Taka)	Cost covered by
A.	**Mitigation Measures**						
1.	Compensatory plantation measures	Construction	Per tree	50	1,500	75,000	Civil works contract
B.	**Monitoring Measures**						
1.	Air quality monitoring	- Pre-construction - Construction	Per location	20	30,000	60,000	Civil works contract
2.	Noise levels monitoring	- Pre-construction - Construction	Per location	20	10,000	200,000	Civil works contract
C	**Capacity Building**						
1.	(i) Orientation workshop for officials involved in the project implementation on ADB Safeguards Policy Statement, Government of Bangladesh environmental laws and regulations, and environmental assessment process; (ii) induction course contractors, preparing them on EMP implementation and environmental monitoring requirements related to	Module 1 – immediately upon engagement of the PMSC environmental safeguards specialist Module 2 – prior to award of civil works contracts (twice a year for 4 years) Module 3 – prior to start of Phase 2 and upon completion of	lump sum		Module 1 – 30,000 Module 2 – 30,000 Module 3 – 30,000	90,000	Covered under Institutional Strengthening and Awareness Building contract

	Particulars	Stages	Unit	Total Number	Rate (Taka)	Cost (Taka)	Cost covered by
	mitigation measures; and taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of implementation; and (iii) lessons learned information sharing	the project					
D.	**Consultants Costs**						
1.	PMSC Environmental Safeguards Specialist	Responsible for environmental safeguards of the project	24 person months (spread over entire project implementation period)			7,000,000	Remuneration and budget for travel covered in the PMSC contract
E.	**Administrative Costs**						
1.	Legislation, permits, and agreements	Permit for excavation, tree-cutting permits, etc	Lump sum		50,000	50,000	These consents are to be obtained by contractor at his own expense.
		Environmental assessment and environmental clearances as per ECA and ECR requirements Obtaining right of way clearances with related national agencies.	Lump sum		100,000	100,000	LGED DPD cost for municipal infrastructures
F.	**Other Costs**						
1.	Public consultations and information disclosure	Information disclosure and consultations during preconstruction and construction phase, including public awareness campaign through media	As per requirement	Lump sum		1,000,000	Covered under PMSC and ICCDC contracts
2.	GRM implementation	Costs involved in resolving complaints (meetings, consultations, communication, and reporting/information		Lump sum		As per PMU budget	PMU cost

	Particulars	Stages	Unit	Total Number	Rate (Taka)	Cost (Taka)	Cost covered by
		dissemination)					
3.	Any unanticipated impact due to project implementation	Mitigation of any unanticipated impact arising during construction phase and defect liability period		Lump sum	Contractor's liability	As per insurance requirement	Contractor's insurance

IX. MONITORING AND REPORTING

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

92. PMSC will submit monthly monitoring and implementation reports to PMU, who will take follow-up actions, if necessary. PMU will submit semi-annual monitoring reports to ADB. The suggested monitoring report format is in Appendix 9. Subproject budgets will reflect the costs of monitoring and reporting requirements. For projects likely to have significant adverse environmental impacts during operation, reporting will continue at the minimum on an annual basis. Monitoring reports will be posted in a location accessible to the public.

93. For projects likely to have significant adverse environmental impacts, LGED and DPHE will retain qualified and experienced external experts to verify its monitoring information. LGED and DPHE will document monitoring results, identify the necessary corrective actions, reflect them in a corrective action plan, and for each quarter, will study the compliance with the action plan developed in the previous quarter. Compliance with loan covenants will be screened by the Local Government Division (LGD) of the Ministry of Local Government, Rural Development, and Cooperatives (MLGRDC).

94. ADB will review project performance against the MLGRDC's commitments as agreed in the legal documents. The extent of ADB's monitoring and supervision activities will be commensurate with the project's risks and impacts. Monitoring and supervising of social and environmental safeguards will be integrated into the project performance management system. ADB will monitor projects on an ongoing basis until a project completion report is issued. ADB will carry out the following monitoring actions to supervise project implementation:

(i) conduct periodic site visits for projects with adverse environmental or social impacts;
(ii) conduct supervision missions with detailed review by ADB's safeguard specialists/officers or consultants for projects with significant adverse social or environmental impacts;
(iii) review the periodic monitoring reports submitted by EAs to ensure that adverse impacts and risks are mitigated, as planned and as agreed with ADB;
(iv) work with EAs to rectify to the extent possible any failures to comply with their safeguard commitments, as covenanted in the legal agreements, and exercise remedies to re-establish compliance as appropriate; and

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

X. CONCLUSION AND RECOMMENDATIONS

95. The process described in this document has assessed the environmental impacts of all elements of Pirojpur drainage subproject. All potential impacts were identified in relation to design and location, construction, and operation phases.

96. Planning principles and design considerations have been reviewed and incorporated into the site planning process whenever possible; thus, environmental impacts as being due to the project design or location were not significant.

97. Most of the individual elements of the subproject are relatively small and involve straightforward construction and operation, so impacts will be mainly localized and not greatly significant. Most of the predicted impacts are associated with the construction process, and are produced because that process is invasive, involving trenching and other excavation. However, the routine nature of the impacts means that most can be easily mitigated. Mitigation measures have been developed to reduce all negative impacts to acceptable levels. Mitigation will be assured by a program of environmental monitoring to ensure that all measures are implemented, and will determine whether the environment is protected as intended. It will include observations on- and off-site, document checks, and interviews with workers and beneficiaries. Any requirements for corrective action will be reported to the ADB.

98. The stakeholders were involved in developing the IEE through discussions on-site and public consultation, after which views expressed were incorporated into the IEE and in the planning and development of the subproject. The IEE will be made available at public locations in the city and will be disclosed to a wider audience via the ADB, LGED, and DPHE websites. The consultation process will be continued and expanded during project implementation to ensure that stakeholders are fully engaged in the project and have the opportunity to participate in its development and implementation. A grievance redress mechanism is described within the IEE to ensure any public grievances are addressed quickly.

99. The PMU and PMSC will be responsible for monitoring. The PMSC will submit monthly monitoring reports to PMU, and the PMU will send semi-annual monitoring reports to ADB. ADB will post the environmental monitoring reports on its website.

100. The EMP will assist the PMU, MASC, and contractors in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed project. The EMP will also ensure efficient lines of communication between the implementing agency, project management unit, and contractors. A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on all contractors operating on the site, and will be included in the contractual clauses. Non-compliance with, or any deviation from, the conditions set out in this document shall constitute a failure in compliance.

101. The citizens of Pirojpur will be the major beneficiaries of this subproject. With the improved drainage and flood control structures, they will be provided with reliable and climate-resilient municipal services. In addition to improved environmental conditions, the subproject will reduce occurrence of water-related diseases and exposure to climate extremes. People would spend less on healthcare and lose fewer working days due to illness, so their economic status should also improve, as well as their overall health.

102. Therefore the proposed subproject is unlikely to cause significant adverse impacts and net environmental benefits to citizens of Pirojpur will be positive. The potential impacts that are associated with design, construction and operation can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of the IEE, there are no significant impacts and the classification of the subproject as Category “B” is confirmed. No further special study or detailed environmental impact assessment (EIA) needs to be undertaken to comply with ADB SPS (2009). However per Government of Bangladesh Environment Conservation Act, 1995 (ECA, 1995) and Environment Conservation Rules (ECR, 1997), the subproject is categorized as “red” and Location Clearance Certificate (LCC) and Environmental Clearance Certificate (ECC) must be obtained from the Department of Environment (DoE).

Appendix 1: Rapid Environmental Assessment Checklist

Screening questions	Yes	No	Remarks
A. Project siting Is the project area adjacent to or within any of the following environmentally sensitive areas?	✓		Pirojpur pourashava covers an area of 29.46 km^2 with population density of 2,038 per km^2.The area is predominantly residential.
Cultural heritage site		✓	
Protected area		✓	
Wetland		✓	
Mangrove		✓	
Estuarine		✓	
Buffer zone of protected area		✓	
Special area for protecting biodiversity		✓	
B. Potential environmental impacts Will the project cause…		✓	
Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		✓	Not applicable. Construction works will be on existing roads and bridges in built-up areas of Pirojpur.
Encroachment on precious ecology (e.g. sensitive or protected areas)?		✓	Not applicable. There are no protected areas in or around subproject sites, and no known areas of ecological interest in Pirojpur.
Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?	✓		Excavations may result to silt-laden runoff during rainfall which may cause siltation and reduction in the quality of adjacent bodies of water. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	✓		Due to excavation, run-off from stockpiled materials, and chemical contamination from fuels and lubricants. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	✓		Conducting works at dry season and moving large quantity of materials may create dusts and increase in concentration of vehicle-related pollutants. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?		✓	Not applicable. Construction will not involve use explosives and chemicals. Excavation will be done manually. Construction contractors will be required to implement health and safety (H&S) plan.
Noise and vibration due to blasting and other civil works?	✓		Temporary increase in noise level and vibrations may be caused by excavation equipment, and the transportation of equipment, materials, and people. The impacts are negative but short-term, site-specific within a relatively small area and reversible by mitigation measures.
Dislocation or involuntary resettlement of people?		✓	Not applicable. Land acquisition and resettlement are not required for the subproject.
Dislocation and compulsory resettlement of people living in right-of-way?		✓	Not applicable. There are no encroachers or residential/commercial structures in the ROWs

Screening questions	Yes	No	Remarks
Disproportionate impacts on the poor, women and children, indigenous peoples or other vulnerable groups?		✓	Not applicable.
Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?		✓	Not applicable.
Hazardous driving conditions where construction interferes with pre-existing roads?		✓	Road closures are not required. Construction contractors will be required to implement traffic management plan and coordinate with Pirojpur local authority.
Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI and HIV/AIDS) from workers to local populations?		✓	Construction contractors will be required to provide sanitation facilities and ensure proper waste management at all times. Contracts will include provisions on STI and HIV/AIDS.
Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?		✓	Construction contractors will be required to ensure cleanliness at all times to prevent breeding of mosquitoes and rodents.
Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?		✓	Not applicable.
Increased noise and air pollution resulting from traffic volume?		✓	Not anticipated.
Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?		✓	Not anticipated.
Social conflicts if workers from other regions or countries are hired?		✓	Priority in employment will be given to local residents.
Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		✓	Improved management systems through capacity building and institutional development will ensure reduced burden on services and infrastructure.
Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?		✓	Not applicable. Construction will not involve use of explosives and chemicals.
Community safety risks due to both accidental and natural causes, 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.		✓	Operational area will be clearly demarcated and access will be controlled. Only worker and project concerned members will be allowed to visit the operational sites.

Climate Change and Disaster Risk Questions The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	Yes	No	Remarks
Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)?	✓		Low lying areas of Pirojpur are subject to flooding during heavy rainfall in monsoon. Preliminary designs integrate a number of measures, both structural and non-structural, to mainstream climate resilience, including: (i) road level rise as required; (ii) increase of bitumen carpeting thickness; (iii) proper compaction; (iv) prefer cement concrete (CC) pavement where there are threats of inundation; (v) temperature reinforcement in CC pavement where there are threats of inundation; (vi) cross-drains as required; (vii) for CC roads, guide wall to protect erosion and sliding; and (vii) turf and tree plantation along the roads.
Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (e.g., increased extreme rainfall increases flooding, damaging proposed infrastructure)?	✓		
Are there any demographic or socio-economic		✓	Proposed project will not impact any

aspects of the Project area that are already vulnerable (e.g., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?			marginalized population, rural-urban migrants, illegal settlement, etc.
Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by paving vulnerable groundwater recharge areas, or using water from a vulnerable source that is relied upon by many user groups, or encouraging settlement in earthquake zones)?		✓	

Appendix 2: Environmental Standards and Application Fees

The standards for air, water, sound, odor and other components of the environment applicable to the project shall be determined in accordance with the standards specified in Schedules 2, 3, 4, 5, 6, and 8 of ECR, 1997.

	Standards	**ECR, 1997 (Rule 12) http://www.moef.gov.bd/html/laws/env_law/178-189.pdf**
1.	Air	Schedule 2
2.	Inland surface water	Schedule 3
	Drinking water	
3.	Sound	Schedule 4
4.	Sound Originating from Motor Vehicles or Mechanized Vessels	Schedule 5
5.	Emission from Motor Vehicles	Schedule 6
7.	Odor	Schedule 8

The standard limits of discharge of liquid waste and gaseous emissions applicable to the project shall be determined in accordance with the standards specified in Schedule 9 and 10

	Environmental Component	**ECR, 1997 (Rule 13) http://www.moef.gov.bd/html/laws/env_law/178-189.pdf**
1.	Sewage Discharge	Schedule 9
2.	Waste from Industrial Units or Projects Waste (see discharge to inland surface water and irrigated land)	Schedule 10

The fees for issuance of environmental clearance certificate and its renewal shall be payable in accordance with Schedule 13. The fees for analysis of samples of water, liquid waste, air and sound and also the information or data derived from such analysis are described in Schedule 14.

	Fees	**ECR, 1997 (Rule 14 and 15) http://www.moef.gov.bd/html/laws/env_law/178-189.pdf**
1.	Environmental clearance certificate or renewal	Schedule 13
2.	Supplying various analytical information or data or test results of samples of water, effluent, air and sound	Schedule 14

[1]"SCHEDULE – 13

Fees for Environmental Clearance Certificate or Renewal
[See Rules 7(5), 8(2) and 14]

1. Industrial unit or project

Investment (in Taka)	Fees for Environmental Clearance Certificate (in Taka)	Certificate Renewal Fee
(1)	(2)	(3)
(a) Between Tk. 100,000 and 5,00,000	Tk. 1,500	One-fourth of the fees in Column (2).
(b) Between Tk. 5,00,000 and 10,00,000	Tk. 3,000	-Do-
(c) Between Tk. 10,00,000 and 50,00,000	Tk. 5,000	-Do-
(d) Between Tk. 50,00,000 and 10,000,000	Tk. 10,000	-Do-

[1] *Schedule-13 was substituted by Notification S.R.O. No. 234-Law/2002 dated 24/08/2002 and came into force on 26/08/2002 being the date of publication in Bangladesh Gazette extraordinary issue.*

(1)	(2)	(3)
(e) Between Tk. 10,000,000 and 2,00,000,000	Tk. 25,000	One-fourth of the fees in Column (2).
(f) Between Tk. 2,00,000,000 and 5,00,000,000	Tk. 50,000	-Do-
(g) Above Tk. 5,00,000,000	Tk. 1,00,000	-Do-

Appendix 3: Sample Outline Spoils Management Plan

I. Spoils information

- A. Materials type
- B. Potential contamination
- C. Expected volume and sources
- D. Spoil classification

II. Spoils management

- A. Transportation of spoil
- B. Storage of spoil
- C. Contaminated spoil
- D. Approved reuse and/or disposal sites

III. Records of reuse and/or disposal

Appendix 4: Sample Outline Traffic Management Plan

A. Principles

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

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

B. Operating Policies for TMP

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

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

3. **Figure A2 to Figure A12** illustrates the operating policy for TMP for the construction of water pipes and the sewers along various types of roads.

C. Analyze the impact due to street closure

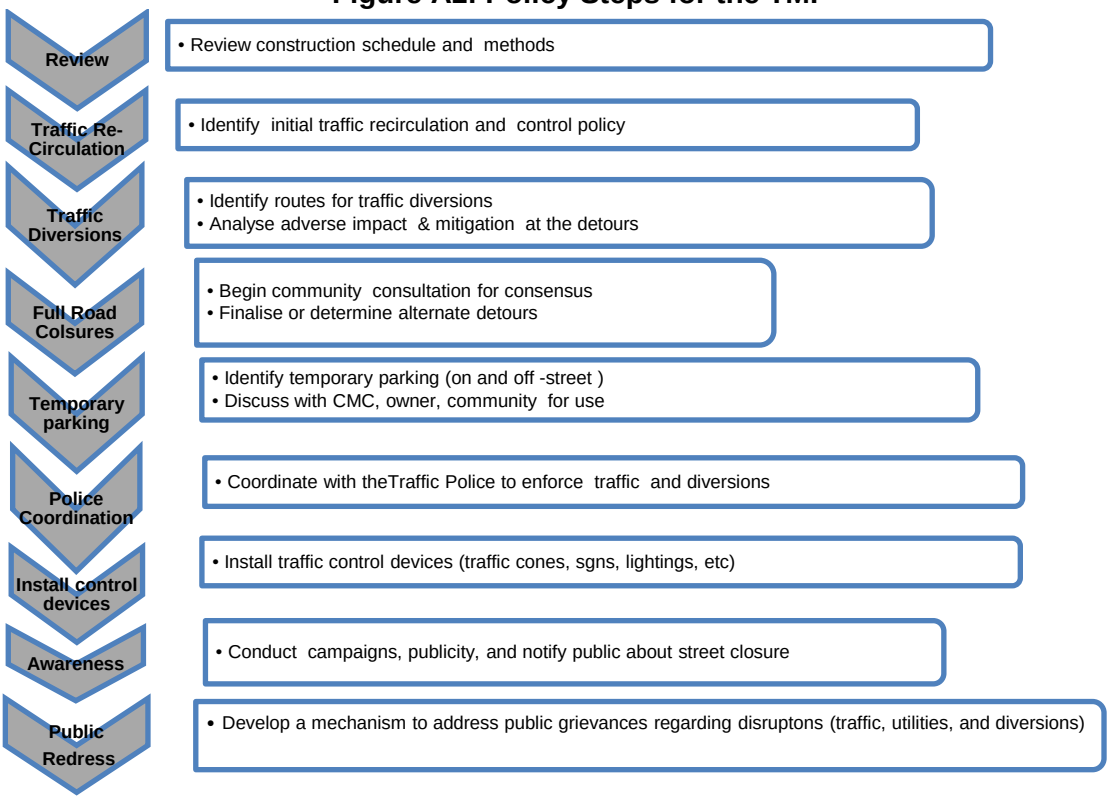
4. Apart from the capacity analysis, a final decision to close a particular street and divert the traffic should involve the following steps:

(i) approval from the ULB/CMC/Public Works Department (PWD) to use the local streets as detours;
(ii) consultation with businesses, community members, traffic police, PWD, etc, regarding the mitigation measures necessary at the detours where the road is diverted during the construction;
(iii) determining of the maximum number of days allowed for road closure, and incorporation of such provisions into the contract documents;

(iv) determining if additional traffic control or temporary improvements are needed along the detour route;
(v) considering how access will be provided to the worksite;
(vi) contacting emergency service, school officials, and transit authorities to determine if there are impacts to their operations; and
(vii) developing a notification program to the public so that the closure is not a surprise. As part of this program, the public should be advised of alternate routes that commuters can take or will have to take as result of the traffic diversion.

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

Figure A1: Policy Steps for the TMP



D. Public awareness and notifications

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

6. The awareness campaign and the prior notification for the public will be a continuous activity which the project will carry out to compensate for the above delays and minimize public

claims as result of these problems. These activities will take place sufficiently in advance of the time when the roadblocks or traffic diversions take place at the particular streets. The reason for this is to allow sufficient time for the public and residents to understand the changes to their travel plans. The project will notify the public about the roadblocks and traffic diversion through public notices, ward level meetings and city level meeting with the elected representatives.

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

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

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

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

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

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

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

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

11. Procedures for installing traffic control devices at any work zone vary, depending on road configuration, location of the work, construction activity, duration, traffic speed and volume, and pedestrian traffic. Work will take place along major roads, and the minor internal roads. As such, the traffic volume and road geometry vary. The main roads carry considerable traffic; internal roads in the new city areas are wide but in old city roads very narrow and carry considerable traffic. However, regardless of where the construction takes place, all the work zones should be cordoned off, and traffic shifted away at least with traffic cones, barricades, and temporary signs (temporary “STOP” and “GO”).

12**.** **Figure A2 to Figure A12** illustrates a typical set-up for installing traffic control devices at the work zone of the area, depending on the location of work on the road way, and road geometrics:

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

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

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

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

Figure A2 & A3: Work on shoulder or parking lane and shoulder or parking lane closed on divided road

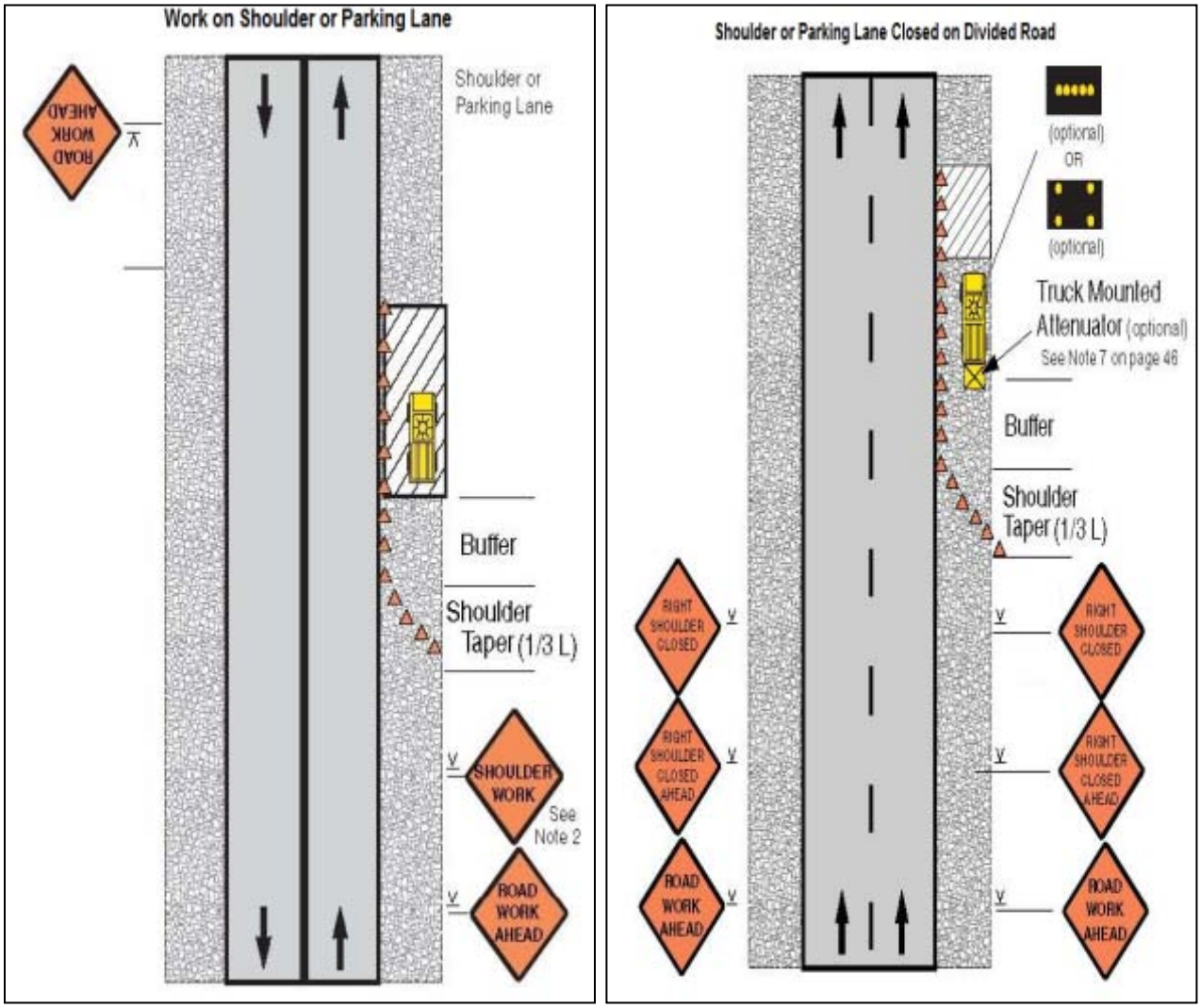


Figure A4 & A5: Work in Travel lane & Lane closure on road with low volume

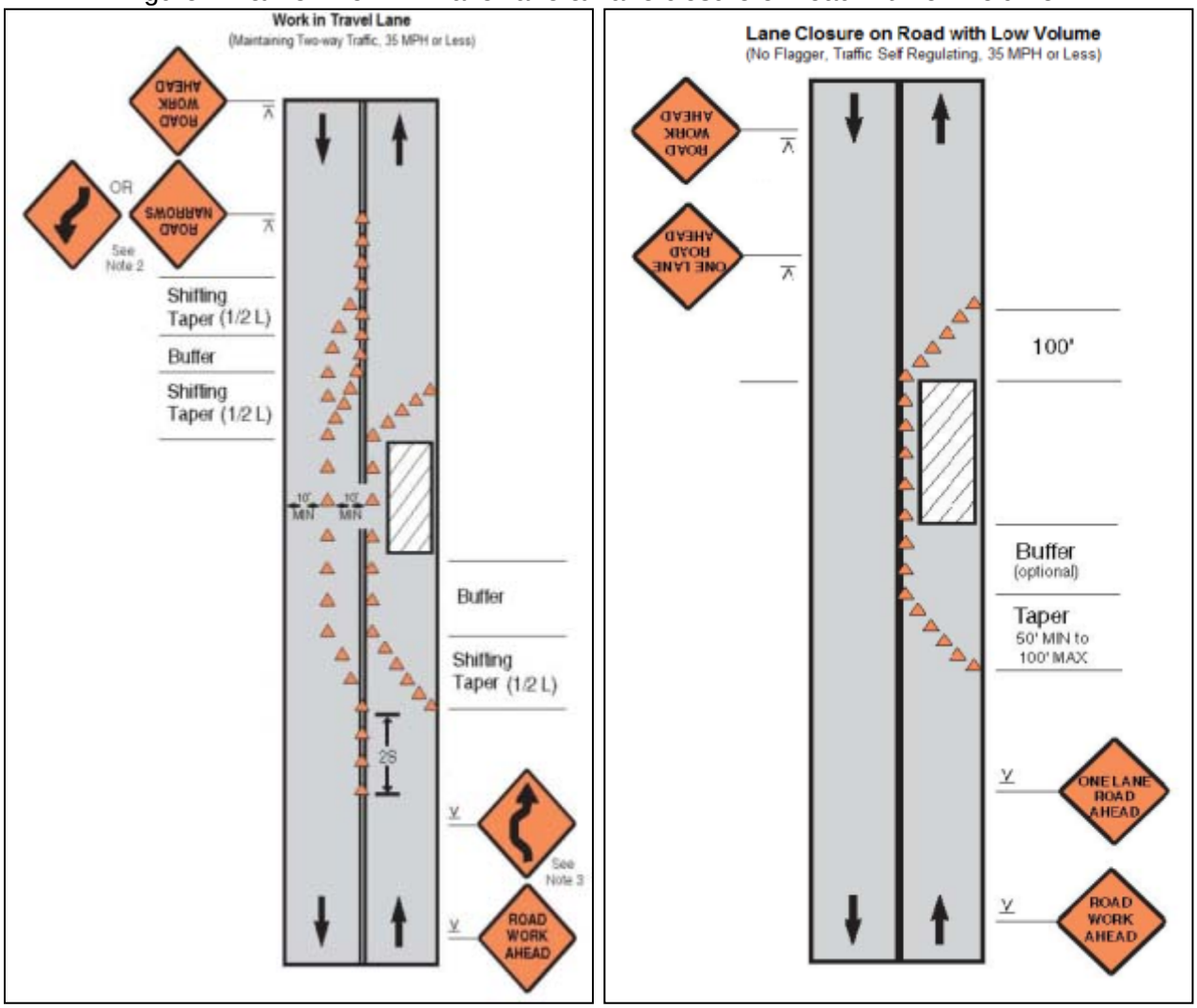
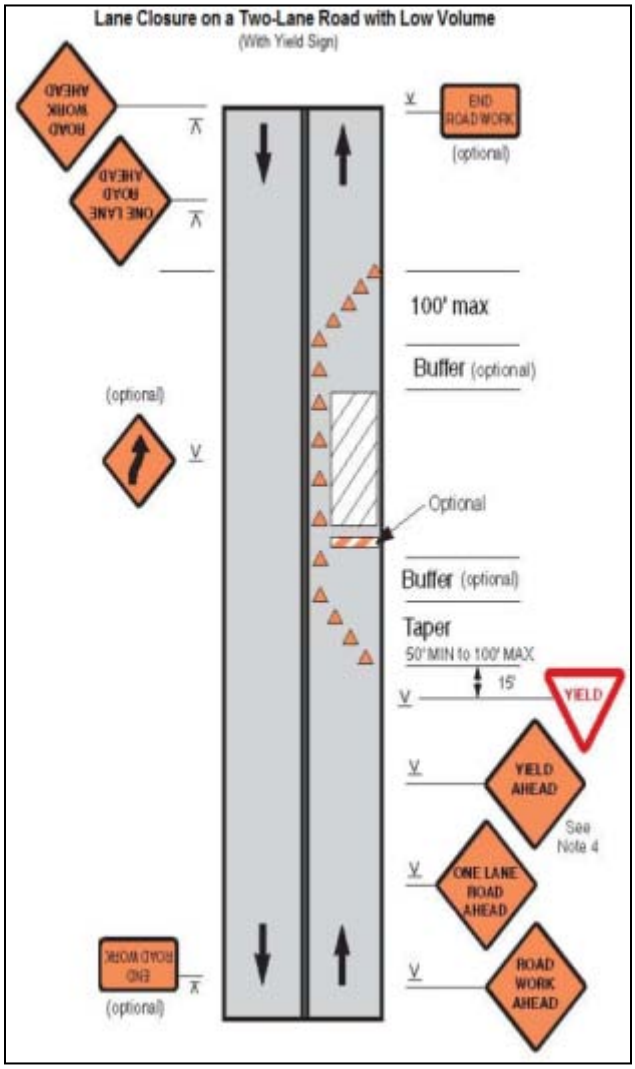


Figure A6 & A7: Lane closure on a two-line road with low volume (with yield sign) & Lane closure on a two-line road with low volume (one flagger operation)



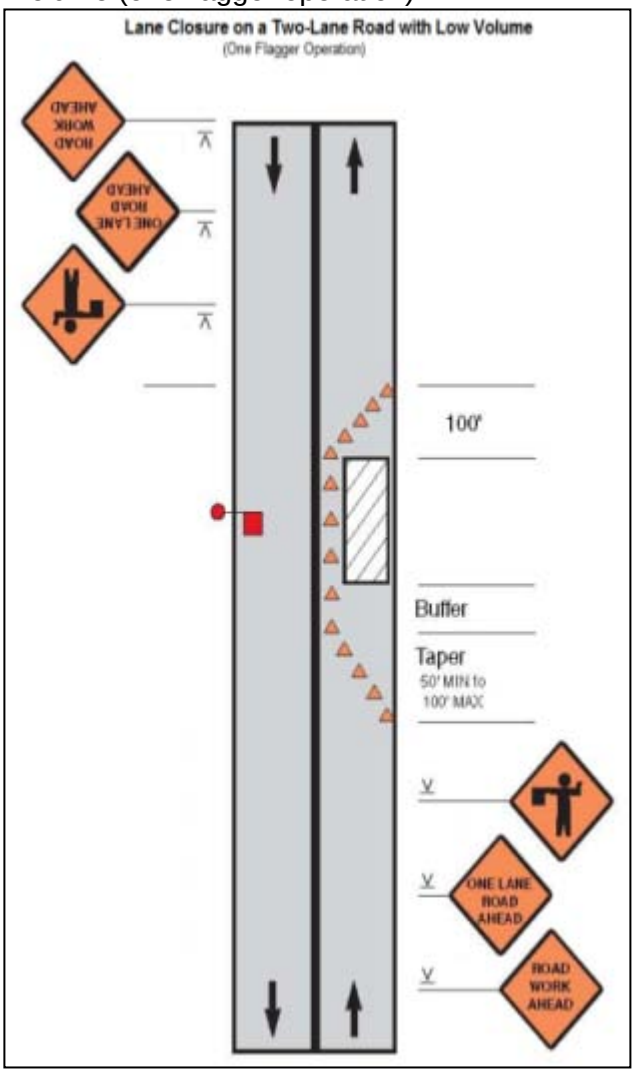


Figure A8 & A9: Lane Closure on a Two-Lane Road (Two Flagger Operation) & Lane Closure on a Four-Lane Undivided Road

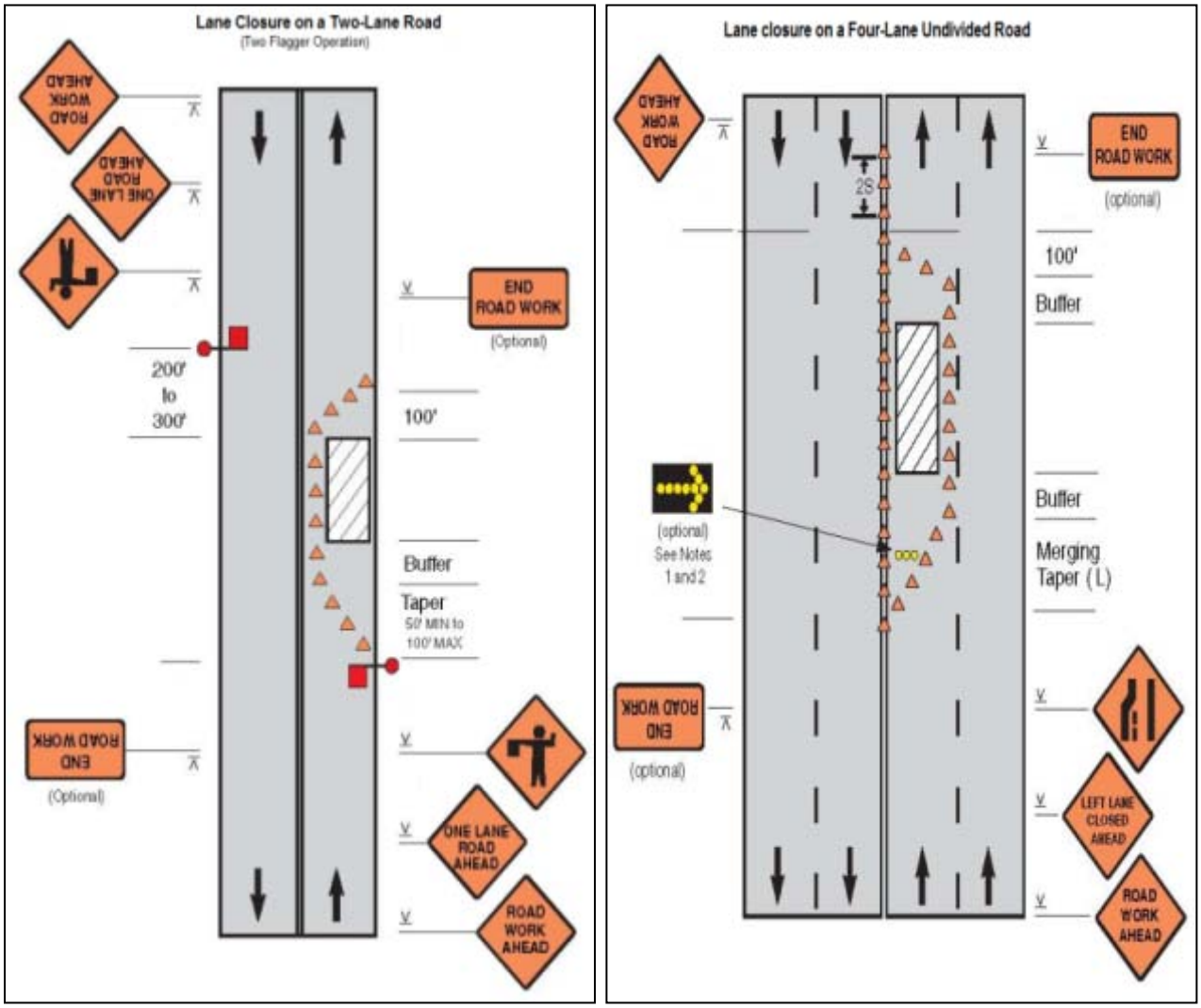


Figure A10 & A11: Lane Closure in Divided Roadway & Half Road Closure On Multi-Lane Roadway

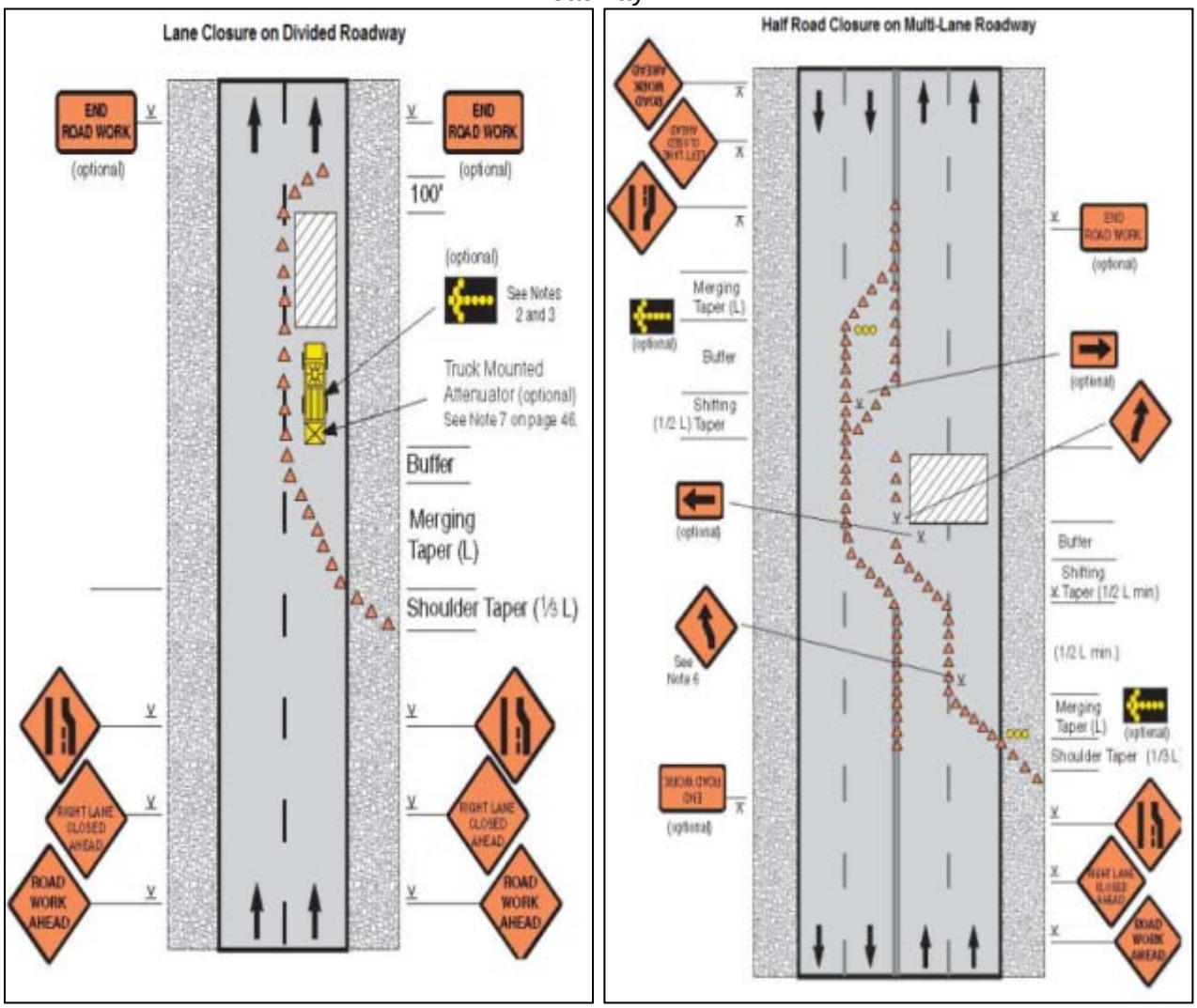
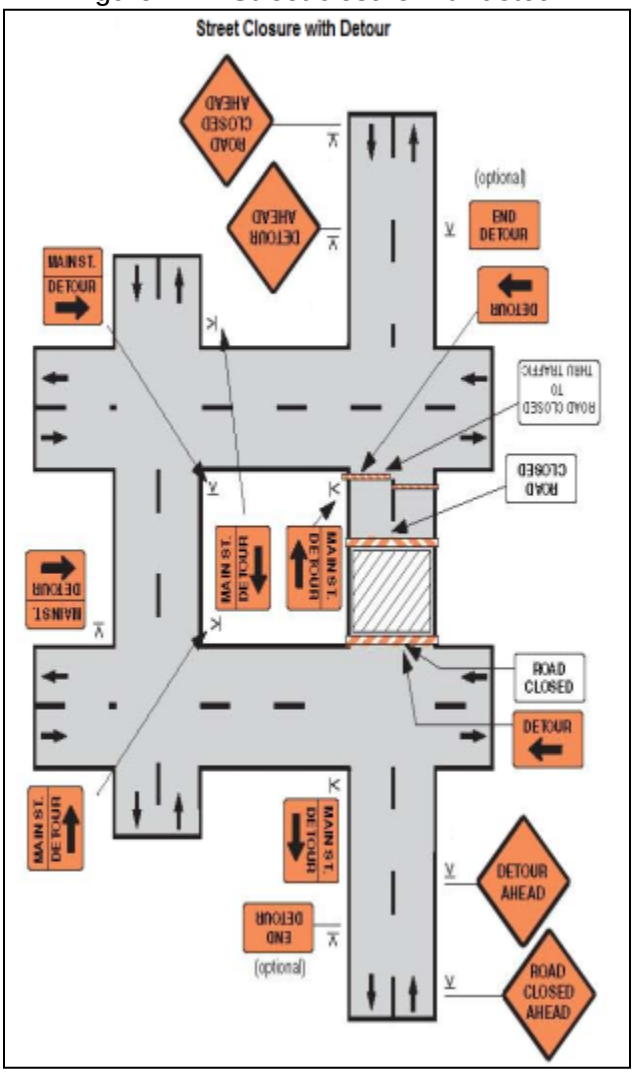


Figure A12: Street closure with detour



Appendix 5: Records of Public Consultations and FGDs

Minutes of Discussion Meeting held in DOE Office regarding EARF of CTIIP at 10:30AM on 09-09-2013
Venue: Chamelee Conference Room
Attendance in the Meeting:

The following persons are present in the meeting
1. Md. Shahjahan, Addl. Director General, DOE, Dhaka. Tel:+88-02-8181767, email: shahjahan@doe-bd.org; shahjahan5519@yahoo.com
2. Dr. Sultan Ahmed, Joint Secretary, Director (Natural Resources Management and Research), DOE, Dhaka. Tel:+88-02-8181784; Cell:+88-0155-2328617, email: sulbul2002@yahoo.com
3. AKM Rafiqul Islam, Deputy Director (Research and Monitoring), DOE, Dhaka
4. SM Tarique, Deputy Director (EIA), DOE, Dhaka
5. Solaiman Haider, Deputy Director (Technical), DOE, Dhaka
6. Syed Nazmul Ahsan, Deputy Director (Environmental Clearance), DOE, Dhaka. Tel:+88-02-8181778; cell: +88-0181-9427358, email: nazmul@doe-bd.org; syednazmulahsan@yahoo.com
7. Md. Shamsuzzaman Shorkar, Assistant Director (EIA), DOE, Dhaka
8. Shah Md. Nur-e-Huda, Asst. Director (Environmental Clearance), DOE, Dhaka
9. Ninette, Ramirez, Environmental Specialist International (Recruited by ADB), email: ninette.ramirez@gmail.com
10. Md. Yasin Mozumder, Environmental Expert (National), CTIIP, Cell:+88-0171-1665408; +88-0173-1062331, email: yasin_afroza@yahoo.com

Agenda of Discussion:
Following item are discussed:
1. Classification of CTIIP subproject components as pr ECR, 1997;
2. Nature of documentation required for the locational and environmental clearances;
3. Confirmation that conformance to ADB safeguard policies will be considered as compliance to government requirements;
4. Confirmation that no additional studies are envisaged as the environmental assessment documents have been prepared satisfying both ADB and government requirement.

Background

The Coastal Towns Infrastructure Improvement Project (CTIIP) is a key infrastructure initiative of the Government of Bangladesh. The outcome of the project will be improved access to climate-disaster resilient municipal services, including (i) municipal infrastructure such as drainage, cyclone shelters, urban roads, bridges, culverts, solid waste management, bus terminals, slum improvements, boat landings, and markets, (ii) water supply, and (iii) sanitation.

Discussion:

- A draft Environmental Assessment and Review Framework (EARF) prepared by LGED for submitting to ADB and Ms Ninette presented draft EARF.
- CTIIP, four (4) project towns (Amtali, Galachipa, Pirojpur and Mathbaria) are selected for improvement infrastructure.
- Six (6), Initial Environmental Examination (IEE), will be prepared for each project town for complying ADB Safeguard Policy.

- Ms Ninette Presented one draft sample of Water Supply component of Amtali Pourashava.

View of Additional Director General (DG) (the Chairperson):

- (i) Considering time and money, prepare one IEE/EIA Report for each project town the report may containing several sections for Identification, Assessment, Prediction of impact of each subproject components. EMP and monitoring plan should also be prepared accordingly; OR (ii) prepare individual IEE/EIA for each components subproject town, submit at a time to DOE for clearance (i.e., six IEE/EIA, six volumes at a time) for each subproject town.
- Executive Agency (EA), here DPHE and LGED, will prepare the IEE/EIA as per ECA/ECR of DOE and submit to and submit to DG for environmental clearance.
- The report should be in accordance to DOE guidelines
- Formally submit an EARF prepared for ADB through Project Director to DOE for reviewing.
- Coastal Towns (Amtali, Galachipa, Pirojpur and Mathbaria) are not situated in ecological sensitive areas or within reserved locations.
- Finally, the DG assures providing every cooperation relating to environmental clearance.

FGD Summaries-Bridge Pirojpur Pourashava

SL No.	Proposed Project Facility/ Alignment Related to Which Discussion Held	Date	Venue	No. of Participants & gender	Key Safeguard Issues Discussed	Overall Concerns Expressed Related to Project	Suggestions From People	Willingness to Participate in Project
1	Bridge/ Roads/ Drainages	05-July 2013	Near Firoj Howlader House, Ward No-6-Pirojpur Pourashava	M=11 F=4 T=15	No resettlement issues there	Site selection is perfect maintain by Pourashava	Provide RCC Box culvert Provide railing both side of the bridge with electric post for lighting at night.	They will cooperate to built this bridge
2	Bridge/ Roads/ Drainages	09-July 2013	Near Shakil Khan's House, Ward No-8-Pirojpur Pourashava	M=16 F=0 T=16	No resettlement issues there	maintain by Pourashava	Provide railing both side of the bridge with electric post for lighting at night..	They will cooperate to built this bridge
3	Bridge/ Roads/ Drainages	09-July 2013	Near Shahjahan Khan's House, Ward No-8-Pirojpur Pourashava	M=12 F=3 T=15	No resettlement issues there	maintain by Pourashava	Provide railing both side of the bridge with electric post for lighting at night..	They will cooperate to built this bridge
4	Bridge/ Roads/ Drainages	10 July 2013	Over Varani Khal, connection between ward no 6 and 8,	M=15 F=0 T=15	No resettlement issue during construction period a	maintain by Pourashava/local committee	Provide railing both side of the bridge with electric post for lighting at	They will cooperate to built this bridge

SL No.	Proposed Project Facility/ Alignment Related to Which Discussion Held	Date	Venue	No. of Participants & gender	Key Safeguard Issues Discussed	Overall Concerns Expressed Related to Project	Suggestions From People	Willingness to Participate in Project
			Ward No-6-Pirojpur Pourashava		temporary bamboo bridge to be provided		night..	

(M=No. of male participants; F= No. of female participants; T=Total participants)

Photograph



FGD Near Piroj Halder House




FGD Near Shakil Khan House



FGD Near Shajahan Khan House



FGD Varani Khal

PARTICIPANTs LIST

Focus Group Discussion-CTIIP
List of Participants
Town: Pirojpur Pourashava
Location: Near Firoj Hawlader's House, Ward No: 6
Meeting Place: Firoj Hawlader's House
Date: 05-07-2013
Time: 11.00 am

Sl.No	Name	Occupation
1	Md. Firoj Howlader	Business
2	Md. Nasir Akand	Service
3	Md. Mohashin Howlader	Business
4	Md. Razzak Howlader	Service
5	Md. Zakir Howlader	Service
6	Md. Younus Sheikh	Agriculture
7	Md. Tofazzal Sharif	Service
8	Md. Siraj Khan	Service
9	Md. Saidul Sheikh	Service
10	Md. Nizam Howlader	Service
11	Most. Fatema Begom	Housewife
12	Most. Shiopi Begom	Housewife
13	Most. Dali Akhter	Housewife
14	Most. Madhuri	Housewife
15	Md. Badsha Sheikh	Agriculture

Focus Group Discussion-CTIIP
List of Participants
Town: Pirojpur Pourashava
Location: Near Shakil Khan's House, Ward No: 8
Meeting Place: House of Aminul Islam
Date: 09-07-2013
Time: 4.00 pm

Sl.No	Name	Occupation
1	Md. Aminul Islam	Business
2	Abdul Khaleque Sheikh	Business
3	Md. Jahangir Hossain	Rickshaw Puller
4	Md. Pervej Khan	Business
5	Shahjahan Sheikh	Business
6	Md. Zakir Hossain	Business
7	Md. Shajahan Howlader	Social worker
8	Md. Abdullah Al Wadud	Service
9	Md. Ruhul Amin	Business
10	Md. Mostaq Ahmed	Service
11	Md. Touhidul Islam	Student

Sl.No	Name	Occupation
12	Md. Sirajul Islam	Student
13	Md. Faizullah	Student
14	Md. Musa	Student
15	Md. Ilias Ahmed	Business
16	Md. Touhidul Islam	Business

Focus Group Discussion-CTIIP
List of Participants
Town: Pirojpur Pourashava
Location: Near Shahjahan Khan House, Ward No: 8
Meeting Place: Shahjahan Khan House
Date: 09-07-2013
Time:11.30 am

Sl.No	Name	Occupation
1	Md. Saiful Islam	Business
2	Md. Mezbah	Daily labor
3	Kazal Begom	Housewife
4	Rina Begom	Housewife
5	Md. Mobarok	Daily labor
6	Md. Faruk	Service
7	Abdur Razzak	Daily labor
8	Md. Touhidul Islam	Business
9	Md. Monjurul Kader	Service
10	Rekha Begom	Housewife
11	Md. Al Amin	Service
12	Md. Zihad	Business
13	Md. Hasan	Business
14	Md. Baizid	Business
15	Md. Shovan	Business

Focus Group Discussion-CTIIP
List of Participants
Town: Pirojpur Pourashava
Location: **Over Varani Khal connection between ward no 6 and 8**, Ward No: 6
Meeting Place: **Vijora Rickshaw stand**
Date: 10-07-2013
Time: 4.00 pm

Sl.No	Name	Occupation
1	Md. Chand Mia	Daily Labor
2	Md. Nizam	Daily Labor
3	Md. Badal Shen	Business
4	Md. Jalil Sheikh	Business
5	Md. Imus	Daily Labor
6	Md. Hemayet Ali Sheikh	Service
7	Abdul Mannan Kazi	Business
8	Md. Dulal Howlader	Business
9	Md. Anwarul Kabir	Social worker
10	Md. Alamgir Hossain	Service
11	Md. Harun Sheikh	Business
12	Md. Emdadul Sikder	Business
13	Md. Haidul Howlader	Agriculture
14	Md. Monir Mollik	Daily Labor
15	Md. Kalam Sikder	Service

Appendix 6: Sample Grievance Registration Form

(To be available in Bangla and English)

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

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

FOR OFFICIAL USE ONLY

Registered by: (Name of Official Registering Grievance)	
Mode of Communication: Note/Letter E-mail Verbal/Telephonic	
Reviewed by: (Names/Positions of Officials Reviewing Grievance)	
Action Taken:	
Whether Action Taken Disclosed:	Yes No
Means of Disclosure:	

Appendix 7: Sample Semi-Annual Reporting Format

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

I. INTRODUCTION

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

No.	Sub-Project Name	Status of Sub-Project				List of Works	Progress of Works
		Design	Pre-Construction	Construction	Operational Phase		
		☐	☐	☐	☐		
		☐	☐	☐	☐		
		☐	☐	☐	☐		

Compliance status with National/ State/ Local statutory environmental requirements

No.	Sub-Project Name	Statutory Environmental Requirements	Status of Compliance	Action Required

Compliance status with environmental loan covenants

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

II. COMPLIANCE STATUS WITH THE ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

- Provide the monitoring results as per the parameters outlined in the EMP. Append supporting documents where applicable, including Environmental Site Inspection Reports.
- There should be reporting on the following items which can be incorporated in the checklist of routine Environmental Site Inspection Report followed with a summary in the semi-annual report send to ADB. Visual assessment and review of relevant site documentation during routine site inspection needs to note and record the following:

(i) What are the dust suppression techniques followed for site and if any dust was noted to escape the site boundaries;

(ii) If muddy water was escaping site boundaries or muddy tracks were seen on adjacent roads;

(iii) Adequacy of type of erosion and sediment control measures installed on site, condition of erosion and sediment control measures including if these were intact following heavy rain;

(iv) Are there designated areas for concrete works, and refueling;

(v) Are there spill kits on site and if there are site procedure for handling emergencies;

(vi) Is there any chemical stored on site and what is the storage condition?

(vii) Is there any dewatering activities if yes, where is the water being discharged;
(viii) How are the stockpiles being managed;
(ix) How is solid and liquid waste being handled on site;
(x) Review of the complaint management system;
(xi) Checking if there are any activities being under taken out of working hours and how that is being managed.

Summary Monitoring Table

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

Overall Compliance with CEMP/ EMP

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

III. APPROACH AND METHODOLOGY FOR ENVIRONMENTAL MONITORING OF THE PROJECT

Brief description on the approach and methodology used for environmental monitoring of each subproject

- Monitoring of environmental IMPACTS on PROJECT SURROUNDINGS (ambient air, water quality and noise levels)
- Brief discussion on the basis for monitoring
- Indicate type and location of environmental parameters to be monitored
- Indicate the method of monitoring and equipment to be used
- Provide monitoring results and an analysis of results in relation to baseline data and statutory requirements

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

Air Quality Results

Site No.	Date of Testing	Site Location	Parameters (Government Standards)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Site No.	Date of Testing	Site Location	Parameters (Monitoring Results)		
			PM10 µg/m3	SO2 µg/m3	NO2 µg/m3

Water Quality Results

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

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

Noise Quality Results

Site No.	Date of Testing	Site Location	LAeq (dBA) (Government Standard)	
			Day Time	Night Time

Site No.	Date of Testing	Site Location	LAeq (dBA) (Monitoring Results)	
			Day Time	Night Time

IV. SUMMARY OF KEY ISSUES AND REMEDIAL ACTIONS

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

V. APPENDIXES

Photos
Summary of consultations
Copies of environmental clearances and permits
Sample of environmental site inspection report
Others