GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

Environmental Assessment Report

Construction of Road and Drain at Different Location of Manikgonj Pourashava.

Subproject Package No.-01

Manikgonj Pourashava, Manikgonj.

BANGLADESH MUNICIPAL DEVELOPMENT FUND (BMDF)

MUNICIPAL GOVERNANCE AND SERVICES PROJECT (MGSP)

July-2018

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ABBREVIATIONS

AP (AP's)	Affected Person
BDT	Bangladeshi Taka
BOQ	Bill of Quantity
BMDF	Bangladesh Municipal Development Fund
CC	Cement Concrete
CIP	Capital Investment Plan
CP	Contingency Planning
EA	Environmental Assessment
ECR	Environmental Conservation Rules
EMP	Environmental Management Plan
EPP	Emergency Preparedness Planning
ES	Environmental Screening
EMF	Environmental Management Framework
FGD	Focal Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GRP	Grievance Redress Procedure
MGSP	Municipal Governance and Services Project
MD	Managing Director
PPEs	Personal Protective Equipment's
PMU	Project Management Unit
RCC	Reinforcement Cement Concrete
RP	Relevant Reports
OHWT	Over Head Water Tank
ULB	Urban Local Body
WB	World Bank
XEN	Executive Engineer

EXECUTIVE SUMMARY

BACKGROUND

All the proposed interventions are proposed within the Manikgonj Pourashava and within the existing right of way of the Pourashava. There are no environmentally sensitive areas in the subproject locations. Assessment of the potential environmental impacts due to the subproject, as part of the EA exposes that the impacts shall be largely generic construction related impacts associated with improvement of roads and drain. For all construction related impacts, environmental management measures are integrated into the EA. This subproject package consists of 13 roads that will be reconstructed in their original right-of-ways and alignments with improved subgrade, sub base, base course, and surfacing. However, out of 13 roads drain component is only included with two different road. The existing right-of-way is mostly clear, and for which no acquisition for land is required.

The subproject has been categorized as 'Orange-B category as per ECR-97 and as well as accordance with WB Safeguard Policy and an EA is carried out that provides mitigation measures for impacts and a monitoring and reporting protocol.

METHODOLOGY OF THE STUDY

The EA study was carried out using reconnaissance survey, field visits, consultation with stakeholders and others, review of existing data, assessment to identify adverse impacts and preparation of EMP and post-project Environmental Monitoring Programme. Geographic information system, and noise quality determination tools were used to analyze the likely impact of proposed subproject activities. Physical assessments were made for entire corridors with respect to terrestrial and aquatic aspect.

SUMMARY OF SUBPROJECT-RELATED IMPACTS AND BENEFITS

The following presents a summary of the potential impacts to natural, social, economic, and cultural resources as a result of the proposed roadway improvement project.

Impact Category	Impact Assessment
Land Use	• Existing land use adjacent to the roadways will not change as a result of the subproject (but the land value will be increased).
Site Clearing Work	• Road sides trees and natural grown vegetation to be cut down to provide uniform road width.
Noise	• Moderate adverse impacts to adjacent residential and commercial properties, during construction works. • Change in noise levels will not exceed State regulatory thresholds at any location
Tribal People	• No minority, or tribal populations exist on site or within the immediate area and, therefore, no impacts will fall on such populations. The subproject will not adversely impact the character of the community surrounding the roadway.
Air Quality	• No measurable impacts are anticipated

Water Quality	• Though, the drains are designed only for the storm water; however, storm water may carry wash-out materials which may disturb the aquatic environment of the outfall. In addition, dumping of solid wastes, household wastewater into the drain and illegal toilet connections may create pollution in the aquatic environment.
Threatened and Endangered Species	• There is no threatened and endangered species in the subproject area. So, no impacts are anticipated to threatened or endangered species habitat.
Drainage Congestion	• Drainage congestion is minor. However, erratic rainfall may create drainage congestion for short term.
Pollution of Construction Debris	• Improper collection and disposal of the generated wastes materials may degrade the quality of the surrounding environment and degrade the aesthetic value.
Benefit Category	**Benefit Assessment**
Traffic Safety	• Substandard roadway elements will be eliminated, reducing potential crashes. Additional roadway features such as lighting, and pavement drainage will contribute to the improvements in motorized vehicles and pedestrian safety. • Separate walk way will reduce the probable accident by avoiding speedy vehicle path way.
Water logging	• RCC drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. • This will prevent formation of muddy and slippery surface on the road.

CONSULTATION, DISCLOSURE AND GRIEVANCE REDRESS

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

MONITORING AND REPORTING

The PMU-BMDF, and PIU (Pourashava), will be responsible for safeguard monitoring. The PIU (Pourashava) will submit monthly monitoring reports to PMU-BMDF, and the PMU-BMDF will send quarterly monitoring reports to WB.

BASELINE ENVIRONMENT

Baseline environment is concerned with existing physical, chemical and biological conditions of the area where the plant is going to be set up. The surface water, and noise level have been analyzed to evaluate the primary baseline of the area. The data of air quality will be analyzed

prior to the construction, to evaluate the baseline data. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from development and operational phases of the subproject can be compared. In physicochemical component, parameters are included as; land, water quality, soil quality, air quality, climate and noise. Biological environment covers general description on floral and faunal species in the study area. Socio-economic environment presents social structure, housing pattern, etc.

FORECAST AND EVALUATION OF IMPACTS

To maintain logical sequence of the EA process, the possible mitigation/enhancing measures for significant impacts are discussed in the chapter-6. Beneficial impacts and enhancement during development and operation phase have been identified and found that the subproject will ensure safe potable water to the dwellers of Pourashava.

ENVIRONMENTAL MANAGEMENT PLAN

Environmental management is concerned with the implementation of the measures necessary to minimize or offset adverse impacts and benefit enhancement measures identified. In order to be effective, environmental management must be fully integrated with the overall project management effort. A monitoring program needs to be put in place to assess any adverse impacts on the environment. Sections **7-1** and **7-2** set out the management measures to be taken with regard to controlling the potential impacts which could occur during the construction and operational phases of the subproject, and indicates responsibilities for the various actions concerned.

INSTITUTIONAL ARRANGEMENTS

BMDF is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. BMDF has established a Project Management Unit (PMU) to manage all aspects of loan project implementation, coordinate construction of subprojects across all towns, and ensure consistency of approach and performance. The Environmental and Social Safeguard Specialists have been appointed to coordinate social and environmental issues. Environmental review of subproject and monitoring implementation of mitigation measures are primary functions of the Environmental and Social Safeguarded Specialist within the PMU.

The EA has been prepared by the Environmental Consultant of ULB assisting the PMU-BMDF at the time of the detailed design. Costs for mitigation measures and monitoring are considered at the time of bid document preparation and in contract procurement. A Project Implementation Unit (PIU) will be established at the Manikgonj Pourashava, staffed by Manikgonj Pourashava and supported by PMU-BMDF staff. The PIU-engineers are trained in ensuring the environmental safeguard compliance issues during implementation (capacity building has already ensured by BMDF).

The PIU will hire Construction Contractors (CC) to build elements of the infrastructure. Environmental Specialists within the PMU will assist PIU to ensure that the construction packages comply with environmental safeguards and the Environmental Monitoring Plan contained in the EA. Inspection of progress in construction will be undertaken locally by the PIU, supported by the PMU-BMDF. During implementation, the contractor will submit monthly progress reports to the PIU, which includes a section on EMP implementation. The PIU will submit reports to the PMU

for review. The PMU will review progress reports to ensure that all the mitigation measures are properly implemented. The PMU will consolidate monthly reports and submit quarterly reports to WB for review.

CONCLUSIONS AND RECOMMENDATIONS

The citizens of Manikgonj Pourashava will be the major beneficiaries of this subproject. The proposed subproject is unlikely to cause significant adverse impacts and net environmental benefits to citizens of Manikgonj Pourashava and it adjacent unions 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.

The EA report has been prepared before the detailed engineering design. In this regard, any major changes during detailed design, or any major additional work other than the proposed subproject activities will require updating of this environmental assessment. It shall have to be sent to WB for concurrence before civil works commence. Moreover, the executing agencies have to submit the detailed engineering designs to WB, which will review them and examine whether major changes or major additional works have been included.

1 INTRODUCTION

1.1 Background of the Project

The Government of Bangladesh (GoB) intends to enhance the capacity of urban local bodies (ULBs) in development and management of urban infrastructure, and improve municipal governance and services through undertaking the Municipal Governance and Services Project (MGSP) in selected Pourashava and City Corporations. The Local Government Engineering Department (LGED) and the Bangladesh Municipal Development Fund (BMDF) will implement the project with participation of the selected ULBs. The project will be financed by IDA, with GoB contribution for land acquisition and management, and Municipalities equity for accessing BMDF competitive finance. Under the MGSP the LGED will implement about 20 types of sub-projects in 26 ULBs, which include 22 Pourashava and 4 City Corporations; while the BMDF will implement about 13 types of sub-projects in 119 Pourashava.

Both the LGED and the BMDF intends to ensure that the proposed infrastructure takes into account the environmental concerns in accordance with the Environment Conservation Rules 1997, and the World Bank Safeguard Policies. In this regard under MGSP a framework approach has been adopted for EA; the EA has two major components: (a) Overall environmental assessment, and (b) Development of Environmental Management Framework (EMF). Hence, to meet the regulatory requirement EA or EMP (based on screening) is mandatory to implement any subproject under MGSP.

1.2 Subproject Background

Manikgonj is a district in central Bangladesh. It is a part of the Dhaka Division. Manikgonj is located about 64 km west of Dhaka district and is well connected with different parts of the country by National Highway-5 and river Kaliganga, a branch of the mighty Padma[1].

Manikgonj Pourashava is an “A” type, which was established in the year of 1958.The Pourashava has an area of 42.50 sq. km, divided into 9 wards with a total population of 1, 20,000. Density of population per sq. km is 1,236 whereas the average household size are 4.5 respectively. It is located in between latitude 23°51'32.15"N and longitude 90° 0'23.36"E.[2] It is bounded by Saturia Upazilla on the north, nawabganj (Dhaka) and Harirampur Upazilla on the south, Singair and Dhamrai Upazilla on the east, Harirampur and Ghior Upazilla on the west.

In the Pourashava area, there are no major industrial and manufacturing establishments. However, there is a wholesale market for agricultural products. Other trade includes husking mills, flourmills, oil mills, saw mills, poultry farms, cold storage, piciculture schemes and brick fields. In addition, adjacent to the Dhaka-Aricha N-5 National Highway, a BSCIC sponsored industrial town is established which is located outside of the Pourashava.

The subproject areas are important centers of economic activities of the Pourashava which are mostly connects with Dhaka-Aricha National Highway. Like other fast growing towns, Manikgonj Pourashava also faces infrastructural problems due to lack of adequate and improved road and drainage networks. Hence, planned and integrated development of road and drainage network facilities can boost-up the infrastructural improvement.

[1] *Banglapedia, Manikgonj Pourashava*.
[2] *Web Site, manikganjpourashava.gov.bd/, Manikgonj Pourashava, Manikgonj*

This subproject includes the following components: BC Road, HBB Road and RCC Drain, The significant features of the subproject are mentioned below:

Name of the Subproject	(i) Construction of Manora Road from Dhaka-Aricha Highway to H/O Hazrat Ali. (ii) Improvement of road from front of Upazilla complex Dhaka-Aricha Highway to Islami Hospital Manikgonj via Joyra High School Molar (Ch. 0-750m). Link-1: Joyra Road from Bangladesh Hat Road to H/O Jahid. Link-2: Bangladesh Hat Road to Joyra. Link-3: Construction of BC Road from Bangladesh Hat Road to Govt. Morgir Frame. Link-4: Construction of RCC Drain from Dhaka-Aricha high way to H/O Kamal. (iii) Improvement of Naragngai Road from NPI to Dhaka-Aricha road Vai Vai Bazar via H/O Aziz. Link-1: H/O Yousuf to H/O Intaz via H/O Wazed Karani. (iv) Improvement of Katcha Bazer Road from Katcha Bazer to West Seauta Graveyard Mosque. (v) Improvement of Road from H/O Dorbesh to Shop of Mannan via H/O Shohid Madbor, Uchutia Mosque. (vi) Construction of HBB Road from Dhaka-Aricha Highway to H/O Dr. Fajal Ali at Kandorkandi. Link-1: Brack office to East Side of Brick Field. (vii) Construction of HBB Road with drain from Kandorkandi H/O Bokso Kabiraj to H/O Abdus Salam at Nowkhanda. Link-1: Improvement of road from Dhaka-Aricha high way Akiz Jorda Factory to H/O Nazimuddin. (viii) Improvement of Balayet Hossain Road from Dhaka-Aricha Highway to Biltu Club. Link-1: Improvement of road from Balayet Hossain Road's H/O of Pakhi Mia to H/O Monir with Box culvert. (ix) (a) Construction of HBB road from Khilinda Graveyard to H/O Nizimuddin. (b) Improvement of Road from Nabagram Mosque to Dhaka-Aricha Highway near Jagir Bridge. (c) Construction of BC Road from Fatema Nabab Madrasha to Dergram Bazer. (x) Construction of HBB road from Nabagram mosque to Nowkhanda Kali mondir via Nowkhanda Eidgha Mat. (xi) Construction of HBB road from Nabagram H/O Montu Gosh to Borai H/O Babar Ali. (xii) Construction of BC and HBB road from H/O Kashem to H/O Sokur Ali at Nabogram (Palpara road). (xiii) Improvement of Maddah Hijuli road from H/O Kazimuddin to H/O Chan Mia. Link-1 : H/O Vetku to H/O Akkel.
Package No.	MGSP/Manikgonj/ 2017-18/W-02

District Name	Manikgonj
ULB Name	Manikgonj Pourashava
Structural Design Option	BC Road, HBB Road RCC Drain
Jurisdiction area:	Wards no1, 2 and 3
Beneficiary Population	About 70,000
Tribal People	None
Land Acquisition	Not required
Estimated Cost	96.3 million in BDT
Subproject Duration	18months
Tentative Start Date	August-2018
Tentative Completion Date	January-2020

1.3 Aims of the Study

This report presents the finding of an Environmental Assessment (EA) of road and drain subproject. The objective of the study is to provide an examination and assessment of the principal environmental impacts of the subproject activities. The outline of an environmental management plan also suggested with an indication of the extent of work to be done to keep the development and environment compatible. In this context, it should be noted that the term "environment" and its derivatives have been used in a wide sense, which covers not only physical and chemical aspect, but also the human dimension. The specific objectives of this EA are to:

- Present a brief discussion on the EA process and its role in the planning and implementation of development subprojects;
- Present a general description of the subproject and the process;
- Present a description of the pre-project environment;
- Delineate the significant environmental issues found and believed to be involved;
- Identify the environmental impacts of the subproject and quantify them to the extent possible;
- Suggest plan for management of the environment, during the implementation and operation.
- To present the findings for public input.
- To provide sufficient information to serve as a record for environmental approvals and consultations as required by law.

1.4 Scope of the EA

The EA report was prepared on the basis of proposed engineering works, field investigations, stakeholder consultation, primary and secondary data collection, screening of all baseline environmental parameters, environmental quality baseline monitoring, and review of other similar project reports in Bangladesh. The study conducted on 13 March in the year of 2018. The EA

covers the general environmental profile of the subproject area including physical, ecological, environmental, social, cultural and economic resources. Baseline environmental monitoring (primary data) was carried out on water (surface), and noise quality measurements. The EA includes an overview of the potential environmental impacts and their severity, and proposes necessary mitigation measures and environmental management plan for each of the identified and anticipated impacts. Three numbers of public consultations were conducted as part of the EA.

1.5 Methodology of the EA

The methodology used for this study is based on the procedures described in Environmental Guidelines, (Volume 1 and 2)[3] published by Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF) and the other relevant regulation of Bangladesh as well as World Bank Guidelines for Environmental and Social Considerations

- Scoping workshop organization with various stakeholders at the beginning of the subproject preparation activities;
- Reconnaissance survey was taken up to collect baseline information in devised formats;
- Analysis of collected data was carried out;
- Documentation of baseline conditions was done by doing on site environmental monitoring
- Analysis and assessment of various alternatives was taken up;
- Identification and assessment of various impacts was done;
- Formulation of mitigation, and avoidance measures was done for identified impacts;

[3] Environmental Assessment Volume 1: Overall Environmental Assessment [Draft Final Report], September 2013.Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh;

Environmental Assessment Volume 2: Environmental Management Framework (EMF) [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh;

2 SUBPROJECT DESCRIPTION

2.1 Setting of the Subproject Site

The development work involves road and drain construction work at different location (Jurisdiction of the word no1, 2 and 3) of the Manikgonj Pourashava. All the development work goes within the exiting right of way of the Manikgonj Pourashava. The land of the proposed intervention is solely owned by the Manikgonj Pourashava. These subproject area belong the mixed land use pattern of commercial, administrative and residential area of the Pourashava. However, most of place of the subproject sites are basically urban and semi urban residential setting with few commercial activities. Despite the dominating of urban and semi urban setting there are few residential cum agricultural rural setting was observed during site visit. Locations for various improvements in base map and topographic map are shown in figure

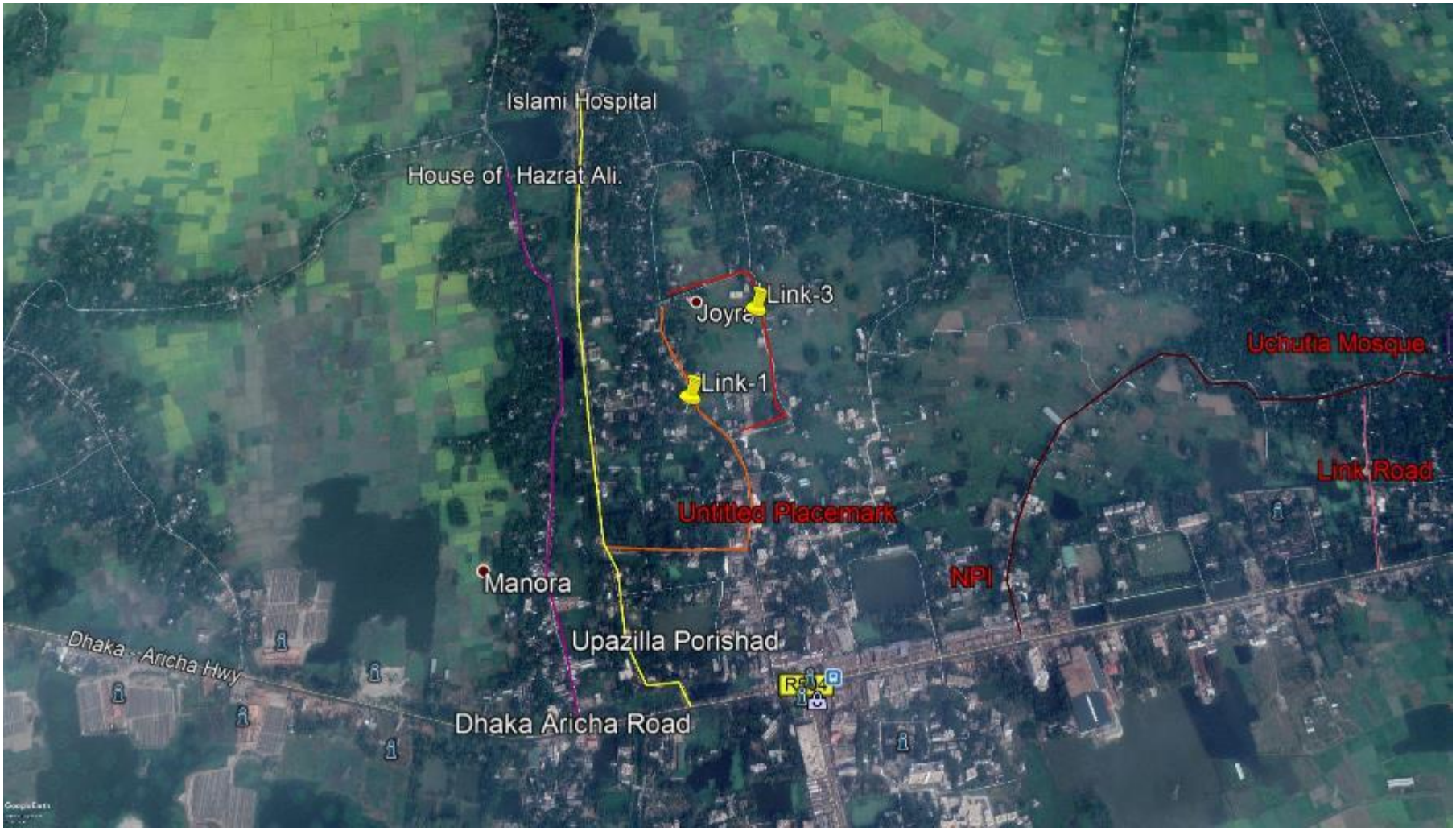

Figure 2-1: Topographic Feature of Monora Road, and Upazilla Road and its influence Area


H/O Shohid Madbor
Uchutia Mosque
H/O Dorbesh
Link Road
Bata Rd
NPI
Dhaka - Aricha Hwy

Figure 2-2: Topographic Features of NPI Road and H/O Darbesh Road and Its influence Area

Figure 2-3: Topographic Feature of Dhaka Aricha Road to House of Fajal Ali and its influence Area

2.2 Subproject Scope of its Components

Width of the road and capacity of the drain may be variable depending on the availability of space and catchment area respectively. Total 18157m road is proposed while drain is proposed for 1760 m.

Subgrade and base courses of the existing road will be rebuilt on some roads and as well as for the road widening work where road width is not uniform, whereas elsewhere new materials will be placed on top of the existing roadway and extension portion materials.

2.3 Present Status and Need for the Subproject

Monora Road is located at the jurisdiction of the ward no. 1 of the Manikgonj Pourashava and it is the semi urban residential area of Pourashava. Its starts from the Dhaka Aricha Highway and end at House of Hazrat Ali. Currently this road is badly damaged from the Ch. 0-150m and last 100m. However, remaining part is partially damaged. This damaged road contains lots of pot holes and uneven road surface due to dilapidated of asphalt layer. Therefore, subproject area vehicles and pedestrian has faced trouble to use this road. So, considering the bad surface condition of road and non-uniform road width, it is necessities to replace the old damaged BC road by new BC pavement on the existing road.

Figure 2-4: Current situation of the Monara Road

Upazilla Complex Road is consist of the mixed land use pattern of residential and administrative hub with few commercial activities. It is the urban area of the Pourashava which is situated at ward no-1 of the Manikgonj Pourashava. This road starts from the Upazilla Complex (near Dhaka Aricha Highway) and end it near Islamia Hospital. It is the important road of the Pourashava as well as for adjacent unions. By using this road, subproject area people and adjacent unions (Gorpora, Horgonj) peoples reach the Pourashava to meet their commercial and administrative requirement. But, at present this road with link roads are badly damaged. Most of the section of the road is scarped of wearing surface with lots of big potholes and

uneven surface. During site visit it was observed that, existing potholes is accumulating the rain water which is hampering the traffic movement. Even, this condition of road is accelerates the frequent road accident. In this context, subproject area and its adjacent areas people have been suffering lots from this ruthless road. Hence, to mitigate the suffering of the peoples 2225m long new BC road will be constructed with uniform road width.

On the country, Link-4 road is the densely residential area, but there is no drainage facilities. Hence, after rain this area become flooded and it remains until drying up. So, RCC drain is needed in the subproject area. Hence, RCC drain with cover slab will be constructed from Dhaka-Aricha Highway to H/O Kamal. This drain will be connected with Joyra Khal.

Figure 2-5: Current Situation of the Upazilla Road

Figure 2-6: Current Situation of the Joyra Khal

At Naragngai Road, first 200m (approximately) is commercial hub and rest of the part is residential area except few portion of the agricultural activities at the last 400m.This road belong the ward no.1 and 2 of the Manikgonj Pourashava. This is the important road of the Pourashava and also for the adjacent Jagir Union. Because this road is the main way of the Jagir union peoples to move the Manikgonj City. It is the low elevate area of the Pourashava compare to the other place. In addition, there are lots of low land and seasonal spring along the

road. Therefore, every year at monsoon period this road become flooded from the over flow of the road side water bodies. Consequently, existing BC pavement is damaging frequently. During site visit, it is revealed that, most of the section there is no BC carpeting and very much uneven which is inconvenient for the road users as well as traffic. Even existing road width is average 3m. But this width is not uniform Hence, considering the present bad surface condition of road and narrow road width, it is badly needed to improve the existing damage BC road to new BC pavement with adequate road width as well as road level. So, 1990m long BC road of uniform width will be constructed from NPI to Dhaka-Aricha road.

Figure 2-7: Current situation of the NPI to Dhaka-Aricha road.

Katcha Bazer Road is the commercial place of the Pourashava**.** The existing BC road is badly damaged in the entire road containing cracks, pot holes, edge broken and depressions are prevalent. The road surface is also uneven and width of the road is narrow and non-uniform which average on 3.66m. Hence, the normal traffic operation and pedestrian movement is hampering. Additionally, this damaged roads creates dust which have discomfort felling to seller and buyer of the katcha bazar and nearby residents. So, for better traffic operation damaged BC road will be replaced by new BC pavement .Therefore, new BC road of uniform width, 425m length has been proposed from Katcha Bazer to west Seauta Graveyard Mosque.

Figure 2-8: Current Situation of the Kacha Bazar Road.

At H/O Dorbesh to Shop of Mannan Road, the existing road is BC. Most of the road section is partially damaged and few section is totally damaged due to loss of wearing surface. Loss of wearing surface has created potholes in the road. Therefore, traffic movement are interrupted. Hence, 700m long and 3m width of BC road has been proposed from H/O Dorbesh to Shop of Mannan Road.

Figure 2-9: Current Situation of the H/O Dorbesh to Shop of Mannan Road

Dhaka-Aricha Highway to H/O Dr. Fajal Ali Road is located at the ward no -2 of the Pourashava. The subproject sites is the rural area of the Pourashava where agricultural activities was observed during the site visit. The existing road is the earthen road. This road is badly damaged. During monsoon period this road become worsen due to its muddy and slippery surface. That time this road become unsuitable for the pedestrian. During site visit it is also observed that, this road is not suitable for the motorized vehicles. Hence, subproject area people are facing trouble to carrying their agricultural product in to the bazar area. In this circumstances, Pourashava has been proposed HBB road on the existing earthen road from Dhaka-Aricha Highway to H/O Dr. Fajal Ali Road.

Figure 2-10: Current Situation of the Dhaka-Aricha Highway to H/O Dr. Fajal Ali Road

At present, from Kandorkandi H/O Bokso Kabiraj to H/O Abdus Salam at Nowkhanda Road and Link Road at Akij Jarda Road are earthen road. Both of the road is badly damaged. Therefore, pedestrian and vehicles movement is hampered. Hence, 1480m long BC road from H/O Bokso Kabiraj to H/O Abdus Salam at Nowkhanda road is proposed. While at link road 420m long HBB road is proposed from Dhaka-Aricha Highway near Akiz Jorda factory to H/O Nazimuddin.

On the other hand, there is no drainage facilities in this subproject area. Therefore after rain storm water can't not drain out in the subproject area. Resulting adjacent to subproject area houses and shops become flooded. So, to mitigate the adverse situation in the subproject area RCC drain with cover slab has been proposed Kandorkandi H/O Bokso Kabiraj to H/O Abdus Salam at Nowkhanda Road.

Figure 2-11: Current Situation of the Kandorkandi H/O Bokso Kabiraj to H/O Abdus Salam at Nowkhanda. Road

At present, **Khilinda Graveyard to H/O Nizimuddin Road** is damaged earthen road. This road will be developed with HBB road. **At Nabagram Mosque to Dhaka-Aricha Highway** Road near Jagir Bridge, the existing BC road is entirely partially damaged. Therefor traffic movement is interrupted. Hence, this damaged BC road will be replaced to new BC road. **At Fatema Nabab Madrasha to Dergram Bazer Road** the existing road is HBB. This road is damaged due to missing of bricks in the HBB road. So, traffic movement is hampered. Hence, Pourashava has decided to improve this HBB road by BC road.

Figure 2-12: Current Situation of the Subproject Roads

Currently **Nabagram Mosque to Nowkhanda Kali Mondir Road** is the damaged CC and HBB road and the existing width of the road is on average 2-3m. Due to this damaged road and non-uniform road width, subproject community have been suffering lots for long time to carrying the agricultural products into the nearby local bazar. To overcome this problem Pourashava has been decided to improve this old CC and HBB road by new HBB road.

Figure 2-13: Current Situation of the Nabagram Mosque to Nowkhanda Kali Mondir Road.

Nabagram H/O Montu Gosh to Borai H/O Babar Ali Road is the semi urban area of the Pourashava and it is located at the jurisdiction of the ward no.2 of the Pourashava. At Present, the existing road is the earthen road. This earthen road generates dust at dry season which has discomfort feeling to the local community. Moreover, at rainy day this road become muddy and slippery. Hence, to minimize the suffering of the community people BC road has been proposed on the exiting earthen road.

Figure 2-14: Current Situation of the Nabagram H/O Montu Gosh to Borai H/O Babar Ali Road

Maddah Hijuli road from H/O Kazimuddin to H/O Chan Mia road is situated in the rural area of the Pourashava (at ward no.2). At present, about from Ch.0-150m is BC road while rest of the part is earthen road. But most of the section of the road is badly damaged due to scraped out of the wearing surface and many pot holes are exist on the road surface and width of the road is on average 3m. However, entire length of the road are not 3m in width.

Additionally, these potholes accumulates the storm water which aggravate the damage of the BC road and earthen road. Hence, traffic movement is interrupted. Therefore, 430m long BC road of uniform width has been proposed.


Figure 2-15: Current Situation of the Maddah Hijuli road from H/O Kazimuddin to H/O Chan Mia road

2.4 Justification of Selection of the Subproject

With the facilitation of PMU and WB, the Pourashava prepared the CIP list. According to the CIP list, Manikgonj Pourashava prepared the priority list of the subprojects considering the demand and requirement. As a part of the reconnaissance survey, PMU Officials and hired consultants' visited and evaluated the existing site condition of the subproject.

From the environmental screening it is revealed that the ecological impacts due to this subproject will not be significant, though 71 numbers of trees to be felled down. The subproject has adverse impacts on the physicochemical environment. However, it is anticipated that the adverse impact is not significant and limited in the subproject boundary. The Pourashava authority has consulted with the beneficiaries. The beneficiaries have no objection regarding the implementation of the subproject. Considering the significant potential benefits that will derive after completion, the local community demands and welcome this subproject.

It should be noted that 213 numbers of tress will be planted under this subproject to compensate the ecological impact caused by the subproject and to enhance the ecological condition. In addition, adequate and appropriate mitigation measures will be formulated in the EMP to minimize the adverse impacts. In fact, this subproject will be designed and implemented considering the standard measures to safeguard environment. Consequently, the environmental impacts associated with the construction activities will be relatively minor in comparison to the significant environmental benefits resulting from subproject operation.

2.5 Key Subproject Activities and Implementation Process

The general activities for the subproject includes: Site clearing & grubbing works, construction of the semi-pucca site office, construction of the labor shed and relocation of the electric poles and GI poles.

The key activities for BC and HBB Road include:

- Dismantling of the damaged BC , CC and HBB road;

- Earth work in box cutting;
- Earth filling work;
- Sand filling on the road bed;
- Mechanical compaction;
- Brick work on edging;
- Compacted aggregate sand sub base course;
- Preparation of compacted WBM base
- Providing prime coat;
- Laying pre-mixed dense bituminous surfacing wearing course

The key activities for RCC Drain include:

- Earth work in excavation of the foundation;
- Pumping and bailing out of water as per requirement;
- Lying of polythene sheet;
- Sand filling for the preparing foundation bed;
- Plain cement concrete work in foundation;
- Manufacturing and placing of CC blocks;
- Fabrication of the ribbed or deformed bar;
- Reinforced cement concrete work.

2.6 Category of subproject

For BC and HBB road and RCC Drain

- According to ECR 1997: Orange B
- According to WB classification : Category B

Considering the anticipated environmental impacts, primarily drain and road can consider as Orange-B as per ECR-97. According to the WB classification, it can classify as Category *B.*

2.7 Analysis of Alternatives

This section examines alternatives to the proposed subproject sites, technology, design, and operation in terms of their potential environmental impacts, and the feasibility of mitigating these impacts. It also states the basis for selecting alternative options for the component. The analysis of alternatives for the subproject components was carried out as part of the feasibility study, and has been taken forward.

a) Analysis of the Alternative Routes/ Alignments/ Location

(i) Analysis of alternative routes/ alignments for BC and HBB Road:

The existing BC, HBB and CC road will be replaced by the new BC and HBB pavement using the same alignment. Therefore, analysis of alternatives routes/ alignment is not really applicable

(ii) Analysis of alternative routes/ alignments for RCC drain:
The following three alignments can primarily be considered for alternative analysis.

Route/Alignment	Advantages	Disadvantages
Alternative-1 (both sides of the road)	-Easier house connection -Ease of construction without much disruption to traffic	-Two drainage lines need to be constructed -Expensive-it needs more money, area and time.
Alternative-2 (median/center of the road)	-Single drain needs to be constructed along the median	-Difficult to make house connection
Alternative-3 (one side of the road)	-Single drain needs to be constructed -It is suitable for single lane road	-Difficult to make house connections from other side of the road -It is not suitable for more than single lane road.

As per sites requirement three alternative has been recommended. Designer will be decided with the assistance of ULB engineer which one is suitable for the subproject areas.

b) Analysis of the Alternative Designs

(i) Analysis of the Alternative Designs for BC road:

For a road subproject, alternative designs may include asphalt road, CC road, HBB and RCC road. Through a comparative study considering the advantages of the BC road, CC road, HBB road and RCC road, the consultants examined which one is feasible. General advantage and disadvantage of the BC, CC and RCC roads are shown in following table.

Design Alternatives	Advantages	Disadvantages
Alternative 1: Bituminous Carpeting (BC) Road	• Low Construction cost; • Provide smooth surface; • Aesthetic value is high	• Frequency of maintenance is relatively high; • Early damaged in heavy rainfall
Alternative 2: CC Road	• Do not require frequent repairing like BC roads; • Durability is more than BC road but less than RCC road	• Concrete roads do not require frequent maintenance but if damaged the whole concrete slab needs to be replaced; • Costly higher than BC road
Alternative 3: HBB Road	• Require less construction cost; • Construction time is less	• Frequent maintenance is required • Surface is not smooth
Alternative 3: RCC Road	• Capacity of passing heavy loaded vehicles • RCC road is not damaged in heavy rainfall • Frequency of maintenance is relatively low.	• High construction cost • Provide relatively less smooth surface

This is an improvement subproject where the damaged BC and HBB road will be replaced by the new BC and HBB road on the place of exiting road surface. Hence, in this cases no alternative design is considerable. However, when existing earthen road will develop, it will take place as a BC road because it has more aesthetic value than rough surface that provided by RCC and CC road and during expansion of the utility services for instance water supply line, gas line BC road is more flexible than RCC and CC road. Therefore, considering the low construction cost and high aesthetic value and as a whole to meet the Pourashava demands, BC road is recommended by the designer.

(ii) Analysis of alternative designs for drain:

For a RCC drain subproject, alternative designs may include RCC drain and earthen drain. The following table discusses the general advantages and disadvantages of RCC drain and earthen drain.

Design	Advantages	Disadvantages
Alternative 1: RCC drain	• Not prone to encroachment • Area above RCC drain could be used as a part of	• Higher cost of construction
Alternative 2: Earthen drain	• Less construction cost	• Need more land for construction of open earthen drain • Prone to encroachment, disposal of solid waste/ debris
Alternative 3: Pipe drain	• Require less time to construction	• Maintenance is difficult

The selected design is alternative 1 because RCC drain is advantageous than other.

c) Analysis of the Alternative Technologies/ Methods of the Construction

Method of the construction should be selected based on the available technologies in Bangladesh and with the assistance of the consultant, the Pourashava Officials. However, to minimize occupational health and safety risks and for effective use of the human labors, it is highly recommended to adapt mechanical system where possible for instance concrete mixer machine for casting, mechanical vibrator machine, and other electro-mechanical equipment as per requirement.

3 DETAILED ENVIRONMENTAL AND INFRASTRUCTURAL FEATURES

The major environmental and infrastructural features in the subproject area have been collected from the field investigation. Manikgonj Pourashava survey team has also performed the conditional survey. Hence, the survey data is also used for preparation of the report. The finding of the sites inspection and investigation are shown in following tables. Effort has been given for getting major environmental and infrastructural features within 100 m of both sides from the center of the road at 100 m longitudinal intervals. The major environmental and infrastructural features of the different subproject sites are given in the following table.

Table 3-1 Major Environmental and Infrastructural Features from Construction of Manora road from Dhaka-Aricha high way to H/O Hazrat Ali.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		semi pucca resident, trees, khal
		√	semi pucca resident, trees, khal
100-200	√		semi pucca and tin shed resident
		√	Pucca, semi pucca and tin shed resident
200-300	√		Pucca, semi pucca and tin shed resident, tress, vegetation coverage
		√	semi pucca resident, stationary shops
300-400	√		pucca resident, low land
		√	tin shed resident, trees
400-500	√		tin shed resident, trees, low land
		√	tin shed resident
500-600	√		tin shed resident
			low land
600-700	√		pucca resident
		√	ditch, vegetation coverage
700-800	√		tin shed and semi pucca resident
		√	low land, vegetation coverage, trees
800-855	√		tin shed and semi pucca resident, trees
		√	tin shed and semi pucca resident,

Table 3-2 : **Major Environmental and Infrastructural Features from front of Upzilla complex Dhaka-Aricha Highway to Islami Hospital Manikganj via Joyra High School Moor.**

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
0-100	√		Upazilla office, Khal
		√	Khal, trees, electric pole
100-200	√		Upazilla office, trees, boundary wall
		√	Khal, trees
200-300	√		pucca, semi pucca and tin shed resident, trees
		√	Khal, trees, vegetation coverage
300-400	√		govt. poultry firm, pucca , semi pucca and tin shed, clinic
		√	Khal, trees
400-500	√		pucca building, trees
		√	Khal, trees

500-600	√		semi pucca and tin shed residents, trees
		√	Khal, trees
600-700	√		Ditch, vegetation coverage
		√	open space, trees
700-800	√		Tin shed semi pucca and pucca resident, boundary wall, trees, shops
		√	Local market, tin shed semi pucca and pucca resident,
800-900	√		Local market, tin shed semi pucca and pucca resident,
		√	Local market, tin shed semi pucca and pucca resident, trees, boundary wall
900-1000	√		Local market, tin shed semi pucca and pucca resident,
		√	Local market, tin shed semi pucca and pucca resident,
1000-1100	√		Workshops, tin shed semi pucca and pucca resident,
		√	furniture shop, tin shed semi pucca and pucca resident,
1100-1200	√		Sharif corporation, tin shed semi pucca and pucca resident,
		√	Life insurance office, open space, teal stole, trees
1200-1300	√		Motin saw mill, trees, stationary shops,
		√	Market, tin shed semi pucca and pucca resident
1300-1400	√		Islamia hospital, Boundary wall, electric pole
		√	Local bazar, semi pucca and tin shed residents
1400-1550	√		semi pucca and tin shed residents, vegetation coverage, trees
		√	semi pucca and tin shed residents, vegetation coverage, trees
Link-1: Joyra Road from Bangladesh Hat Road to H/O Jahid.			
00-100	√		low land , trees, vegetation coverage
		√	Mosque, residents
100-200	√		Ramjan Ali Hostel, trees, boundary wall
		√	semi pucca building
200-240	√		Jahid Holdings, tin shed and pucca residents
		√	tin shed and pucca residents, electric pole, trees, shops
Link-3: Bangladesh Hat Road to Govt. Morgir Frame.(Poultry Farm)			
00-100	√		pucca building, trees
		√	semi pucca building
100-200	√		govt. morgir firam, boundary wall
		√	semi pucca residents, trees
200-280	√		govt. morgor firam, trees, vegetation coverage
		√	trees, vegetation coverage

Table 3-3: Major Environmental and Infrastructural Features from NPI to Dhaka-Aricha road Vai Vai Bazar via H/O Aziz.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		N P I College, varieties shops, trees
		√	Pucca residents, varieties shops
100-200	√		Semipucca and pucca residents, salon, trees,
		√	Semipucca and pucca residents, trees, electric pole
200-300	√		N P I Office, boundary wall, shops
		√	Tin shed, semipucca and pucca residents, boundary wall, trees

300-400	√		Ditch, trees, vegetation coverage
		√	Ditch, trees, vegetation coverage
400-500	√		Ditch, trees, vegetation coverage
		√	Ditch, trees, vegetation coverage
500-600	√		Semi pucca and pucca residents
		√	Ditch, trees
600-700	√		Ditch, trees
		√	Semipucca and tin shed residents, electric pole
700-800	√		Tin fence, boundary wall ,trees, semipucca residents
		√	Semipucca residents
900-1000	√		Pucca, semi pucca and tin shed Residents
		√	Tree, vegetation coverage
1000-1100	√		Boundary wall, semipucca residents
		√	Ditch, trees
1100-1200	√		Boundary wall, Pucca, semi pucca and tin shed Residents
		√	Pucca, semi pucca and tin shed Residents
1200-1300	√		Tree, pucca, semi pucca and tin shed Residents
		√	Semipucca residents
1300-1400	√		Boundary wall, Pucca, semi pucca and tin shed Residents
		√	Pucca, semi pucca and tin shed Residents
1400-1500	√		Boundary wall, Pucca, semi pucca and tin shed Residents
		√	Pucca, semi pucca and tin shed Residents
1500-1600	√		Mosque, pucca, semi pucca and tin shed Residents
		√	Khal, trees, pucca, semi pucca and tin shed Residents
1600-1700	√		Ditch, tin shed residents,
		√	trees, pucca, semi pucca and tin shed residents
1700-1800	√		Semipucca residents, trees
		√	Semipucca and tin shed residents
1800-1900	√		Shops, Semipucca and tin shed residents
		√	Shops, trees, semi pucca and tin shed residents, boundary wall
1900-2000	√		Ditch, seasonal spring, trees
		√	Tin shed, Ditch, seasonal spring, agricultural filed
2000-2100	√		open Space, agricultural filed, pucca, semi pucca and tin shed Residents
		√	pucca, semi pucca and tin shed Residents,
2100-2200	√		Khal, agricultural filed, tress
		√	Khal, agricultural filed, trees, electric pole

Table 3-4: Major Environmental and Infrastructural Features from H/O Dorbesh to Shop of Mannan via H/O Shohid Madbor, Uchutia Mosque.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca , semi pucca and tin shed residents, boundary wall, trees
		√	Low Land, vegetation coverage, seasonal spring
100-200	√		semi pucca and tin shed residents, boundary wall, trees
		√	semi pucca and tin shed residents, boundary wall, trees
200-300	√		semi pucca and tin shed residents, boundary wall, trees
		√	Seasonal spring, semi pucca and tin shed residents, boundary wall, trees
300-400	√		semi pucca and tin shed residents, boundary wall, trees
		√	Vegetation coverage, semi pucca and tin shed residents, boundary wall, trees
400-500	√		semi pucca and tin shed residents, boundary wall, trees
		√	semi pucca and tin shed residents, boundary wall, trees
500-600	√		semi pucca and tin shed residents, boundary wall, trees
		√	seasonal spring, semi pucca and tin shed residents, boundary wall, trees
600-680	√		Seasonal Spring, semi pucca and tin shed residents, boundary wall, trees
		√	Seasonal spring, semi pucca and tin shed residents, boundary wall, trees

Table 3-5: Major Environmental and Infrastructural Features from Dhaka-Aricha High way Akiz Jorda Factory to H/O Nazimuddin

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Boundary wall, semi pucca and tin shed residents, trees
		√	Low land, vegetation coverage
100-200	√		Low land
		√	Low land
200-300	√		Semipucca Residents, trees, vegetation coverage
		√	Ditch
300-400	√		Pucca Residents, semi pucca and tin shed residents, trees
		√	Pucca Residents, trees, electric pole
400-420	√		Pucca Residents, semi pucca and tin shed residents, trees
		√	Pucca Residents, trees, electric pole

Table 3-6: Major Environmental and Infrastructural Features from Katcha Bazar to West Seauta Graveyard Mosque.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Varieties shops, tea stole, electric pole, trees
		√	Pilot Club, Flexi load Shop, Alom Electronic , electric pole, pucca and semi pucca residents
100-200	√		Stationary Shops, connecting road, electric pole, trees, pucca, semi pucca residents
		√	Pucca, semi pucca residents and commercial structure, electric pole
200-300	√		Pucca, semi pucca residents and commercial structure, khaber hotel, trees
		√	Pucca, semi pucca residents and commercial structure,
300-400	√		Pucca, semi pucca residents and commercial structure,
		√	Pucca, semi pucca residents and commercial structure,
400-425	√		Pucca, semi pucca residents and commercial structure, electric pole
		√	Pucca, semi pucca residents and commercial structure,

Table 3-7: Major Environmental and Infrastructural Features from Nabagram Mosque to Dhaka-Aricha high way near Jagir Bridge.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Low land
		√	Pond
100-200	√		Pucca, semi pucca and tin shed residents
		√	Pond, vegetation coverage
200-300	√		Low land, vegetation coverage
		√	Low land, vegetation coverage
300-400	√		Low land, vegetation coverage
		√	Pucca, semi pucca and tin shed residents, boundary wall
400-500	√		Open space
		√	Pond
500-600	√		Pucca, semipucca and tin shed residents
		√	Low land
600-700	√		Tin shed and semipucca residents
		√	Tin shed and semi pucca residents
700-800	√		Low land, vegetation coverage,
		√	Pucca, semi pucca and tin shed residents, boundary wall
800-900	√		Pucca, semi pucca and tin shed residents, boundary wall
		√	Low land
900-1000	√		Semi pucca resident
		√	Varieties shops, trees
1000-1100	√		Guide wall, trees
		√	Semi pucca resident
1100-1200	√		Guide wall, trees
		√	Low land, trees
1200-1300	√		Guide wall, trees
		√	Semi pucca resident
1300-1400	√		Guide wall
		√	Pucca, semi pucca and tin shed residents, boundary wall

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
1400-1500	√		Guide wall, pond
		√	Semi pucca resident
1500-1600	√		Varieties shops, semi pucca and tin shed residents, boundary wall
		√	Open space, trees, tin-shed and semipucca residents
1600-1700	√		Low land, vegetation coverage

Table 3-8 Major Environmental and Infrastructural Features Nabagram Mosque to Nowkhanda Kali Mondir via Nowkhanda Eidgha Mat.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Pucca and semi pucca resident, boundary wall
		√	Khal, water hyacinth
100-200	√		Ditch, trees
		√	Khal
200-300	√		Tin shed and semi pucca resident
		√	Khal, water hyacinth
300-400	√		Low land, water hyacinth
		√	Khal
400-500	√		Tin shed resident, semi pucca resident, boundary wall
		√	Eidgha math, boundary wall
500-600	√		Tin shed and semi pucca residents resident
		√	Eidgha math, boundary wall
600-700	√		Low land, trees
		√	Graveyard, trees, electric pole
700-800	√		Low land, trees, vegetation coverage
		√	Ditch
800-850	√		Nowkhanda kali mondir, trees, boundary wall
		√	Open space, tin shed and semi pucca and residents

Table 3-9: Major Environmental and Infrastructural Features from Bokso Kabiraj to H/O Abdus Salam at Nowkhanda.

Chainage (m)	Right	Left	Key Environmental and Infrastructural Features
00-100	√		Tin fence, semipucca and tin shed residents, electric pole, coaching center, trees, boundary wall
		√	Trees, pucca semipucca residents, boundary wall, shops
100-200	√		Semipucca and pucca residents, salon, trees,
		√	Semipucca and pucca residents, trees, electric pole
200-300	√		Pond, trees, semipucca and tin shed residents, electric pole
		√	Boundary wall, tin-shed and semipucca residents, low land
300-400	√		Semipucca and pucca residents, trees,
		√	Semipucca and pucca residents, trees, electric pole
400-500	√		Semipucca and pucca residents, trees,
		√	Semipucca and pucca residents, trees, electric pole
500-600	√		Semipucca and pucca residents, trees,
		√	Semipucca and pucca residents, trees, electric pole
600-700	√		Semipucca and pucca residents, trees,

		√	Semipucca and pucca residents, trees, electric pole
700-800	√		Semipucca and pucca residents, , trees,
		√	Semipucca and pucca residents, trees, electric pole
900-1000	√		Semipucca and pucca residents, trees,
		√	Tin fence, semipucca and pucca residents, trees,
1000-1100	√		Semipucca and pucca residents, trees,
		√	Semipucca and pucca residents, trees, electric pole
1100-1200	√		Semipucca and pucca residents, trees,
		√	Semipucca and pucca residents, trees, electric pole
1200-1300	√		Semipucca and pucca residents, , trees,
		√	Semipucca and pucca residents, trees, electric pole
1300-1400	√		Semipucca and pucca residents, , trees, electric pole
		√	Semipucca and pucca residents, trees,
1400-1480	√		Semipucca and pucca residents, , trees,
		√	Semipucca and pucca residents, trees, electric pole

The environmental and infrastructural features of the Palpara Road, Siddique Nagar to Vaya-para moor, Balayet Hossain Road are not shown in the table. These sites typically residential area having road side pucca, semipucca and tin shed residents, boundary wall, trees and electric poles. However, at Siddique Nagar road side area one mosque and govt. primary school was found.

4 BASELINE ANALYSIS OF THE ENVIRONMENTAL CONDITION

4.1 General Consideration

Baseline condition of environment states the present status of different components of environment in absence of the subproject. The main objective of examining the present environment is to provide an environmental baseline against which potential impacts from construction and operational phases of any subproject can be compared. A second important function of establishing a baseline for parameters such as air, noise and water quality is to ensure that any problems arising from existing sources are not erroneously attributed to the subproject under study. In the present study the different environmental components examined for setting baseline conditions of the subproject area, are physico-chemical, biological and socio-economical. In physico-chemical component, parameters included are land, water quality, air quality, climate, and noise.

4.1.1 Physical environment

Geology, Soils and Seismicity

Geology of Bangladesh is generally dominated by poorly consolidated sediments deposit over the past 10,000 to 15,000 years (Holocene age). It is mostly characterized by the rapid subsidence and filling of a basin in which a huge thickness of deltaic sediments were deposited as a mega-delta out built and progressed towards the south. The delta building is still continuing into the present Bay of Bengal and a broad fluvial front of the Ganges-Brahmaputra-Meghna river system gradually follows it from behind.

Soil Characteristics

The soil formation in Bangladesh is remarkably homogeneous in appearance, both vertically and laterally. It comprises layer of unconsolidated clay, about 10m thick near Dhaka, but apparently thinner to the east and possibly much thicker in the west of the Rajshahi district. The sand mineralogy in this area is broadly similar to that of the tertiary hill sediments. Mineral contents of the soil are high in quartz, relatively low in feldspar and mica, and with zircon, tourmaline, kyanite, staurolite, sillimanite, and epidote dominating the heavy mineral fractions. The content of easily weatherable minerals ranges from 4 to 9%. The soil of Bangladesh can broadly be classified into seven tracts: (1) Madhupur Tract or Red Soil Tract, (2) Barind Tract, (3) Tista Silt, (4) Brahmaputra Alluvium, (5) Gangetic Alluvium, (6) Coastal Saline Tract, and (7) Hill Tracts. Figure 4.14 shows the position of the project site on the soil tract map of Bangladesh.

The soil formation of Manikganj district falls under the Brahmaputra Alluvium floodplain. The dominant soil texture is sandy loam. The soils are acidic in character and the pH ranges from 5.5 to 6.8. The soils are naturally fertile and are recharged every year by fresh deposition by the floodwaters.

Seismicity

In the north and northeast of Bangladesh, there are areas of high seismic activity and some of the major earthquakes originating in these areas have affected the adjacent regions of the country. The whole of Bangladesh is divided into three seismic zones (Figure 4-1). The northern part of the country that includes the greater districts of Rangpur, Mymensingh, and Sylhet are in the Zone-I where earthquake shock of maximum intensity of IX of the Modified Mercalli Scale is possible. The Zone-II includes the greater districts of Dinajpur, Bogra, Dhaka and

Chittagong and the shocks of intensity of VIII are possible. The southern part of the country, the least active region, where the maximum intensity is not likely to exceed VII, is in the Zone-III. Manikganj district is under zone II. Figure 4-1 shows the locations the project study area in the seismic map of Bangladesh.

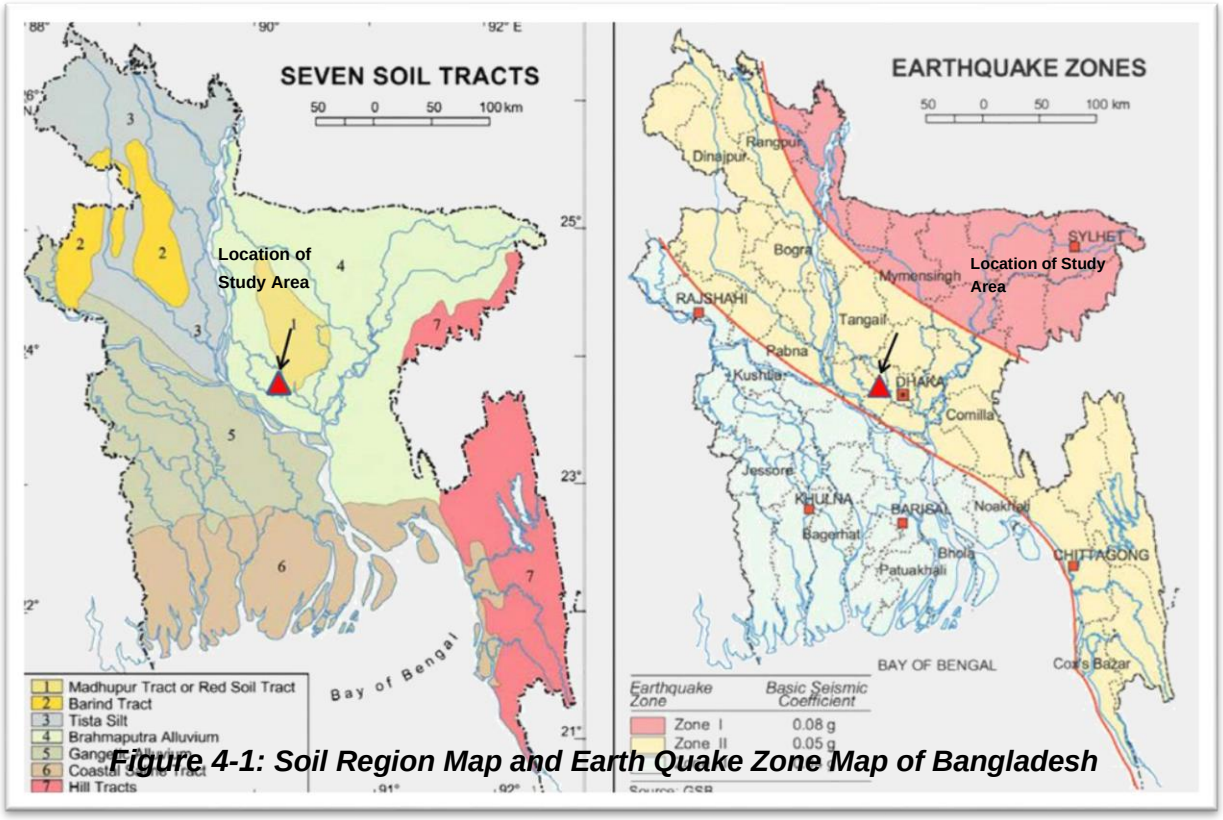

Figure 4-1: Soil Region Map and Earth Quake Zone Map of Bangladesh

4.1.1.1 Climate and meteorology

Bangladesh is located at the central part within the Asiatic monsoon region where the climate is tropical. Relatively small size of the country and generally low- lying area cause moderate spatial variation of temperature, precipitation, relative humidity, wind speeds and other climatic variables. However, the climate of Bangladesh exhibits pronounced temporal variability. This is because of the moisture-laden monsoon wind flowing predominantly from the southwest during summer and the comparatively dry and colder northwestern winds during winter. Three seasons are generally recognized: a hot, muggy summer from March to June; a hot, humid and rainy monsoon season from June to November during which more than 85% of the total annual rain-fall occurs; and a moderately cold, dry winter from December to February. The beginning of the rainy season vary from year to year; heavy rains may commence anywhere between mid-April and early June and may end anywhere between the end of September and mid-November. Usually winter season is dry with occasional rains. The early summer season is considered from March-April. During summer the air becomes hot with very low humidity. Baishaki cyclone and rains also dominate the early summer.

The Bangladesh Meteorological Department monitors different climatic variables from 35 sta-tions in Bangladesh. Among the station located at Agargaon, Dhaka is closest to the site and will best represent the meteorological condition of the site. Different meteorological data like

rainfall, temperature, relative humidity, evaporation, and solar radiation measured in these stations during the period 2001 – 2013 are summarized in Table 4-1.

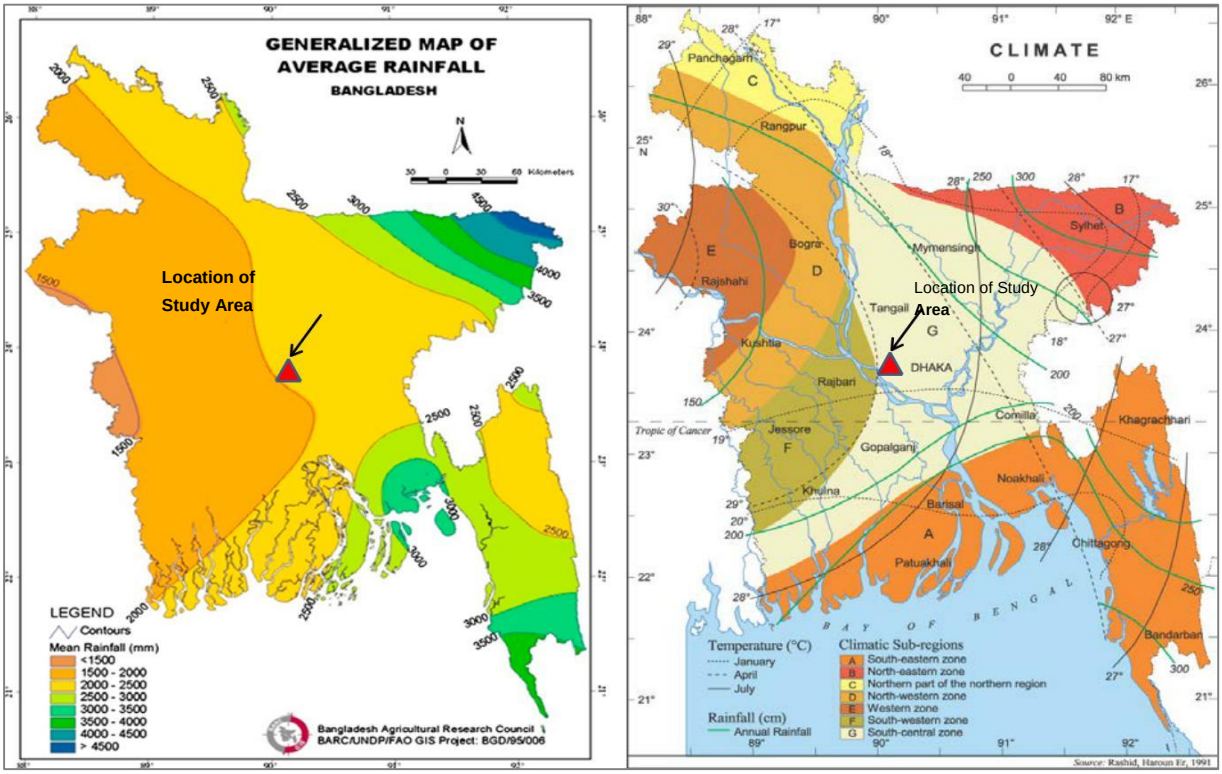

Figure 4-2**:** The locations of the subproject study site on the mean annual rainfall map of Bangladesh. (Map source: www.banglapedia.org)

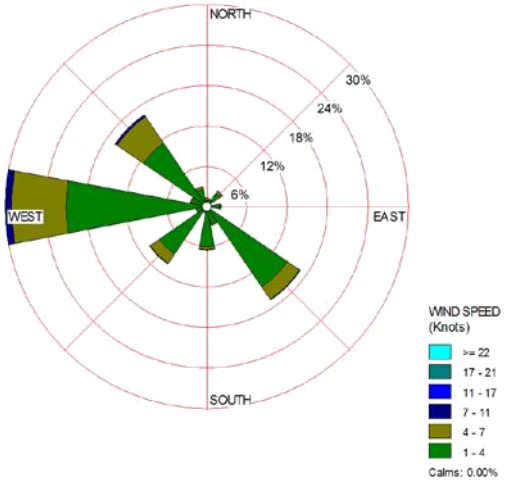

Figure 4-3**:** Wind rose plot of from the 2008-2012 wind speed/ direction data gathered from Dhaka BMD station showing predominant directions and speeds of wind.

Precipitation

The general pattern of precipitation (which consists entirely of rain) follows the monsoon pattern with the cooler, drier months of November to March, increasing rains in April and May and highest rainfall in the summer months of June to September when the prevailing wind direction from the southwest brings moisture-laden air from the Bay of Bengal. The winter period (November to February) is dry with very little rainfall. Figure 4-2 shows the location of the site in Manikganj District on the rainfall map and climatic zone map of Bangladesh. Figure 4-3 shows the wind rose plot from the data of the last 5 years indicating the dominant directions and wind speed prevalence.

Table 4-1: Monthly averages of climatic variables at the Dhaka BMD Station, 2001-2013

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	5	14	29	111	212	326	350	290	316	155	19	11
Mean Temp (°C)	18.0	21.9	26.0	28.1	28.5	28.4	28.3	28.5	28.2	27.1	23.7	19.9
Max Temp (°C)	28.3	32.3	36.0	36.7	36.5	35.7	34.8	34.8	35.0	34.8	32.3	29.2
Min Temp (°C)	10.1	12.4	16.5	19.3	20.6	22.7	23.9	24.0	23.7	20.6	15.8	11.8
Humidity (%)	69	60	59	68	72	80	81	80	80	76	70	71
Sunshine (Hours)	5.7	7.3	7.5	7.7	6.8	3.4	4.0	4.5	4.2	5.7	6.8	5.8
Solar Radiation (Cal/cm2/min)	166	207	231	244	229	175	189	192	172	183	174	146
Evaporation (mm/d)	2.6	4.0	5.0	5.5	5.3	4.1	3.8	3.8	3.6	3.5	3.3	2.5

Source: Bangladesh Meteorological Department

Relative Humidity

The spatial and temporal variation of Relative Humidity throughout the year is very low in Bangladesh. The relative humidity varies from 59% to 86%.

4.1.1.2 Hydrology (surface water, ground water, and rainwater)

Groundwater is the main source of potable water in the subproject area. Local people typically use deep tube-well water for drinking and other domestic purposes. The main surface water body in the study area is the Kaligonga River, Manikgonj Cannel, and Joyra Cannel which serves the purpose natural drainage of storm water. In addition, Dhaleshwari River flows very close to the Manikgonj Pourashava. The main stream flows north of Manikgonj and joins the other branch, the Kaliganga, south of Manikgonj. The

Kaliganga again joins with the Dhaleshwari. There is no remarkable source of industries which can pollutes the surface water bodies in the Pourashava. However, discharge of household wastes, kitchen waste from bazar area, and direct connection of sewer or toilet line in to the drain which is discharging their waste water in to the river or cannel might be degrade the surface water quality. In order to assess any domestic or industrial pollution in nearby areas, surface water can be a good indicator. Thus, to evaluate the existing condition of the surface water quality in the subproject area, contractor will performed water quality test at the beginning of the construction.

4.1.1.3 Flooding, water logging, and drainage pattern

There isn't any significant flooding in the region. Although, during the wet season, heavy rainfall can cause water logging due to lack of proper drainage systems in the city. The City has a few narrow drains that are not enough to carry storm and domestic waste water. The existing drainage system is not functional because people throw and dispose wastes in the drains. Figure 4-4 shows the positions of the project site over the flood risk map of Bangladesh. It can be observed that the subproject area is subject to low to Moderate River flooding. The Dhaleshwari River flows very close to the Manikgonj River.

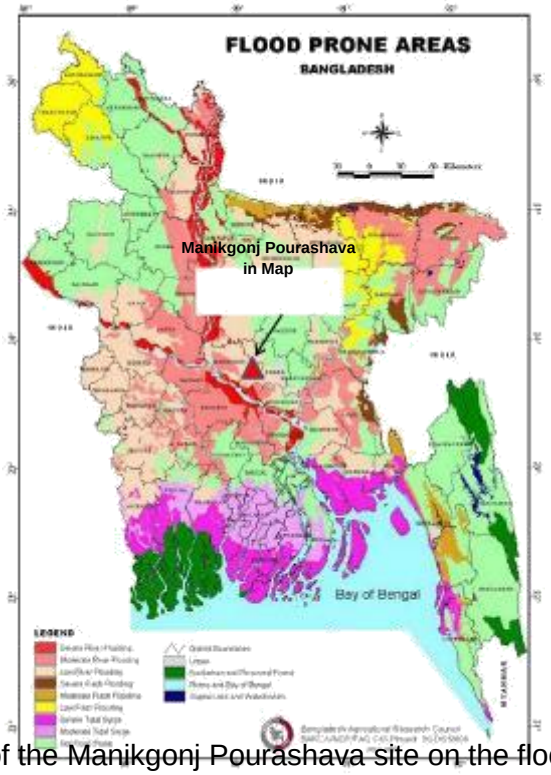

Figure 4-4: Locations of the Manikgonj Pourashava site on the flood risk map of Bangladesh (map source: BARC)

4.1.1.4 Air quality and dust

Air quality data of the sub-project area is not readily available. However, from visual observation air seems to be clear in the subproject area. The possibilities of air pollution from the industries is insignificant as there is no air polluting industries in the subproject area. Major atmospheric pollution is caused by man induced activities like - burning fossil fuels, construc-

tion works and transportation. During construction period use of subproject vehicles and construction equipment may degrade the air quality. However, proper implementation of mitigation measure which are addressed in the EMP is good enough to control the expected air pollution to be raised from construction activities. Moreover, to evaluate the existing condition of air quality contractor will perform the air quality test prior to construction. Following Table shows the Bangladesh National Ambient Air Quality Standard comparing the WHO Guideline standard.

Parameter	Environmental Conservation Rules,1997				WHO
	microgram/m^3				
	Industrial	Commercial and Mix use	Residential and Rural area	Sensitive area	
SPM	500	400	200	100	-
PM 2.5	65				10
PM10	150				20
SO_2	120	110	80	30	20
NO_2	100	100	80	30	40
Pb	.5				

4.1.1.5 Noise level

The major source of noise in the area is from transportation. However, the main mode of transportation in the Pourashava area is electric auto for the semi-urban and rural area of the Pourashava where density of the population is not high and use of motorized vehicles is also few. So, it is expected that noise nuisance would be insignificant. However, sophisticated machineries will be used at construction period which will produce little significant noise. But it would be temporary and site specific. Even, if proper measure are taken it would be within tolerable limit. As a part of the baseline study, noise level measurements were made at different locations around the proposed subproject sites. Table 4-2 shows the summary of noise level measurements carried out in different locations in and around the study area.

Table 4-2*: Ambient Noise Quality Analysis*

Noise level measurement locations	**GPS Co-ordinate**	**Day-time**	
		Equivalent Noise level (dBA),L_{eq}	**Maximum Noise level (dBA),L_{max}**
Staring Point of Manora road Near Dhaka Aricha	23°87'05.56"N 89°99'41.64"E	65.89	66.97
Near Upazilla Complex	23°52'23.84"N 89°59'51.08"E	60.12	65.78
Near NPI at Kacha bazar Road	23°52'17.49"N 90° 0'10.27"E	62.21	63.87
Near Pilot Cub At Dardesh Road	23°87'50.00"N 90°01'4168"E	49.87	50.54
Bangladesh (DoE) Standard			
Zone	Max	Min	

Industrial	75	70
Commercial	70	60
Mixed Area	60	50
Residential Area	55	45
World Bank Standard		
Industrial	70	70
Commercial, Residential, Educational	55	45

4.1.2 Biological Environment

4.1.2.1 Flora and fauna

The influence area of the subproject is full of natural flora (aquatic plants and terrestrial herbs, shrubs and trees) and fauna (birds, animals). The common natural native species of trees are found in the subproject area. The trees are mainly: Shiris, Shil-Korai, Rain Tree, Mahogany, Coconut, Beatle-nut, Palm Tree and common local fruit trees such as- Jackfruit, Mango, Berry, Guava, Lotkon, Dumur, Lemon, Ata, Dumur, Kaw etc. Excluding Kaligonga River bank, the subproject study areas have few low land / seasonal wetlands, Manikgonj Khal, Joyra Khal with some varieties of aquatic flora. The aquatic flora is divided into three major types, viz. tree, shrub and herb. These floral species grow in ponds, canals, ditches, river, seasonal wetland and low lying agricultural lands in submerged, free-floating, or rooted floating states. Lots of common local birds- such as Crow, Doel, Shalik, Hawk, Crow, Sparrow, Bulbuli, Cuckoos, Tia, Parrot, Chil, Dove and Water Fowl etc. were found during the site visit. Migratory birds are also available in the seasonal spring/ weatland and experimental paddy field during winter season.

4.1.3 Socio-Economic Environment

4.1.3.1 Land use pattern, status of housing and built-up infrastructure

The subproject area mostly consists of medium to high densely populated residential area with few commercial and administrative area of the Pourashava. The built-up infrastructure includes mainly pucca, semi-pucca and tin-shed residential houses and shops, educational institutions, industries, religious centers (Mosques and Temple), slum area, Upazilla Complex, hospital and health care center, trade and commerce (Bank and Bima), business centers (market and bazar, hotel and restaurant). Moreover, there are notable amount of agricultural activities in the subproject area.

4.1.3.2 Beneficiary population

The subproject area covers jurisdiction area of the ward 1, 2 and 3 of Manikgonj Pourashava. As per information by the municipality, considering the ward population about 70,000 people will benefit directly and many others indirectly.

4.1.3.3 Education

Manikgonj Pourashava has an average literacy rate of 73.52%[4].There are a few government and private schools and colleges present in the city. However, since it is very closest to the Dhaka City hence, notable amount of students of Manikgonj move to Dhaka for better education.

4.1.3.4 Tribal communities

There is no indigenous or tribal people settlement in the subproject influence area. Therefore, there is no measure needed for indigenous peoples' safeguard.

4.1.3.5 Archeological/Historical places

No known remarkable archeological or historically important structure or sites are reported in the survey area. So, no cultural impact is expected.

4.1.3.6 Land acquisition and resettlement

Since, the entire sub-project area is solely owned by the Municipality. So, land acquisition is not an issues to implement this subproject.

4.1.3.7 Local economies such as employment, livelihood

The subproject area is inhabited by the people of mixed occupations. In the Pourashava area, major income comes from business, enterprises, small trades, private sector jobs and government jobs in the town.

[4] *BBS, 2011 Bangladesh Bureau of Statistics*

5 ENVIRONMENTAL SCREENING

Environmental Screening (ES) for the subproject have been conducted with the purpose of fulfilling the requirements of GOB and WB. ES ensures that environmental issues are properly identified in terms of extent of the impacts. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework of the MGSP, was administered for identifying the impacts and their extents. The screening data and information for the **BC Road and RCC Drain** been formulated and are shown in below.

1) Potential Environmental Impact during Construction Phase:

(a) Ecological Impacts:

➢ Felling of trees	Significant □	Moderate □√	Minor □	Number of trees 71
➢ Clearing of vegetation	Significant □	Moderate □	Minor □√	
➢ Potential impact on species of Aquatic (i.e., water) environment	Significant □	Moderate □	Minor □ √	

The subproject area goes through developed mixed zone of residential, commercial and administrative area. However, due to site clearing work 71 numbers of trees (7 at Monara Road, 22 at Upazilla Road, 24 at Kandorkandi, 18 at Nabagram) to be chopped down at different subproject sites. However, these trees are not big in size in term of length and diameter. Major trees to be chopped down are: Mango, Betel Nut, Bakul, Pittaz, koroi, Sajina, Kath badam, Coconut, Jambura, Jackfruits, Ata. All the subproject road sides have natural grown vegetation which is to be needed clearing for implementing the proposed intervention. However, intensity of the vegetation coverage along the roads are not uniform. There are lots of surface water bodies like ponds, low ditches, and khals nearby subproject area. These surface water bodies may be polluted due to accidental leakage and spillage of oil, grace etc. or throwing of waste material into the road side water bodies. Taking the amount of trees to be felled down, overall ecological impact is considered as moderate.

(b) Physicochemical Impacts:

➢ Noise pollution	Significant □	Moderate □√	Minor □
➢ Air pollution	Significant □	Moderate □√	Minor □
➢ Drainage congestion	Very likely □	Likely □	Unlikely □√
➢ Water pollution	Significant □	Moderate □	Insignificant □√
➢ Pollution from solid/ construction wastes	Significant □	Moderate □√	Insignificant □
➢ Water logging	Significant □	Moderate □	Insignificant □√

This road and drain subproject component of the proposed subproject are located at different thirteen location. Most of the subproject sites will have negative impact on the physicochemical parameter (noise and air) due to use of hydraulic excavator, mechanical compaction machine, concrete mixer machine, vibrator machine, and mobilization of the equipment, vehicles movement for the transportation of the materials. However, the potential impact on air and noise from these subproject activities is manageable because these impact are site specific and context of impact is limited. Moreover, the construction work will be performed section wise to minimize the impact. Therefore, anticipated impact on noise and air is considered as moderate. The generated construction waste like loose soil, dismantling debris perhaps disturb the nearby community people if proper measure are not taken. Additionally these generated debris may also get worse condition for the road side water bodies if not properly collected and disposed. In addition, aesthetic landscape value and surrounding environment may be degraded from the improper collection and disposal of the generated wastes materials. Generally there will be no drainage congestion or water logging because most of earth work will be performed at dry season. Even there will provision for submergible pump to drain off the water if required. Furthermore there are lots of open space along the proposed road.

(c) Socio-economic Impacts:

➢ Traffic congestion	Very likely □	Likely □√	Unlikely □
➢ Health and safety	Significant □	Moderate □√	Insignificant □
➢ Impact on archaeological and historical	Significant □	Moderate □	Insignificant □√

- Employment generation Significant □√ Moderate □ Insignificant □

Currently, due to bad condition of the roads, motorized vehicles movement in the subproject area is very few. In addition, most of the roads are sited in the rural and semi urban residential area. Moreover, for all the roads there are adequate connecting and alternatives road. These roads will continue the vehicles and pedestrian movement during conduction period. So, expected impact on the traffic is insignificant. The proposed construction activities does not require use of heavy equipment and construction work will follow simple procedure with commonly used equipment. Hence, anticipated impact on health and safety is moderate. There is no archaeological and historical site within the influence area. The subproject has positive impact by generating work opportunities for the local people.

2) Potential Environmental Impact during Operational Phase:

(d) Ecological Impacts:

- Potential impact on species of aquatic (i.e., water) environment Significant □ Moderate □ Minor □√

At operation of road, does not have any impact on ecology. On the other hand, the waste water from the drain may degrade the water quality of the outfall if carries pollutants. Though, the drain is designed for storm water only. However, the storm water may carry washed-out materials, pollutants from any sources that may disturb the aquatic environment of the outfalls.

- Potential air quality Improvement □ No-improvement □ Deterioration □√
- Noise Level Improvement □ No-improvement □ Deterioration □√
- Drainage congestion Improvement □ √ Minor Improvement □ No Impact □
- Risk of water pollution Significant □ Moderate □ √ Minor □
- Pollution from solid waste Improvement □ Minor improvement □√ Minor □

During operation phase, improved and widened road may increase traffic volume. This may degrade the air quality and noise level due to black smoke emission and un-due use of hydraulic horn from the vehicles. The new drain will minimize drainage congestion and water logging problem. The storm water to be discharged through the drain may degrade the water quality of the outfall if it carries pollutants from any sources. Pollution from solid waste will be improved by restricting the throwing of the household waste material in to the drain.

(f) Socio-economic Impacts:

- Traffic Improvement □ √ No-improvement □ Adverse □
- Safety Improvement □ √ No-improvement □ Adverse □
- Employment generation Significant □ Moderate □ Minor □ √

After completion, these roads will improve the transportation facilities. By providing uniform pavement, it will also enhance traffic safety. In addition, new road will provide opportunities for the local people for using of CNG, battery operated rickshaw van and pickup and non-motorized vehicles for communicating and transportation of goods. New drain will improve drainage facilities and prevent the accumulation of the stagnant water on the road surface. This will prevent formation of muddy and slippery surface on the road. Consequently, it will enhance traffic safety.

3) Summary of the Possible Environmental Impacts of the Subproject:

The overall ecological impact due to the subproject implementation is not significant. However, the subproject has adverse impacts on the physicochemical components especially on air, noise and solid wastes. Nevertheless, it is anticipated that the adverse impact is not significant and limited in the subproject boundary. The subproject activities may degrade the air quality and noise level to a limited extent. The wastes generated due to the construction activities should be properly collected and disposed in a designated dumping site. The inputs that may

affect the environment will be mainly at construction phase and limited within the subproject boundary. Moreover, mitigation measures will be taken according to the EMP for minimizing the air, dust, and noise pollution.

Furthermore, the socio-economic feature mainly includes health and safety and employment generation. Safety concerns should be considered properly for both the construction and operation phases to avoid any potential safety risks. This subproject will have positive impacts in terms of generation of employment and business activities due to supplying of the materials and equipment.

6 SPECIFIC IMPACT, MITIGATION AND ENHENCEMENT MEASURES

The impacts, which are likely to be occurred in the different phases of the subproject, are identified in this section. In addition, evaluation of these impacts was done mentioning their origin and characteristics along with their possible mitigation/enhancing measures.

6.1 Impact Due to Subproject Location/ Preconstruction Phase

6.1.1 Disorder of Earth Surface

Cause of Impact

In the subproject sites, entire the road length are not belong uniform width. So, to provide uniform road width at few section of the proposed road, widening work may be required. Hence, these section to be elevated up to the existing road level by cutting and filling work. This land filling will be from its original level which will not disrupt the natural surface of earth and obstruct the natural drainage system of the area.

Mitigation Measure

The subproject intervention will not create any water logging and drainage problem as the Pourashava authority collects the soil to develop the area by carried sand from different places. Cross drainage works should be constructed to bypass the surface water and other discharges if required.

6.1.2 Constuction of Labour Shed

Cause of Impact

To meet the subproject basic demand, labor shed need to be constructed which will have to be constructed prior to the construction. The proposed location for the labor shed is at vacant place near kacha bazar which is located at Ward no-1. Unhygienic condition at the labor shed and generation of sewage and solid waste at the labor shed may cause degradation of the surrounding environment.

Mitigation Measures

To meet the workers basic needs labor shed will be constructed which will contains adequate ventilation facilities and standard living condition and it never be overcrowded. In addition, safe potable drinking water will be provided. Furthermore, contractor will construct two sanitary latrine considering 15 persons for one toilet at the labor shed (one for male and other for female).Proper health and safety of workers will be ensured through providing health and hygiene training to the workers by the Municipality and the contractor. Waste bins will be present at the labor shed, and the workers will be encouraged to dispose of all their garbage at the waste bins. All the waste will be collected daily and taken to the Municipality waste dump site at Muljan (near last boundary of Pourashava).

6.1.3 Ecological Impact Due to Felling of Trees and Clearing of Vegetation

Cause of Impact

Due to site clearing work for the road widening, total 71 numbers of trees need to be cut down at different sites. Beside this medium amount of vegetation clearing will be needed to implement the subproject.

Mitigation Measures

213 nos. of trees will be planted to compensate the felled down trees (preferably local fruits, flowers, medicinal and ornamental trees- Mango, Jackfruit, Plam, Jam, Neem, Amloki, Horitoki, Bohera, Shunalu, Arjun, Jarul, Palash, Krishnachura, Bakul, Mahogany, Rain Tree, Koroi at one sides of the Kandorkandi Road, Akiz Jorda Factory Road, Upazilla Road and anywhere suitable Pourashava owned places within the influence area of the subproject. Planting trees will enhance the ecological balance of the subproject area after their successful growth.

6.2 Impact at Construction Phase

6.2.1 Earth Work and Site Clearing Work for the Site Clearing

Cause of Impact

Each development project more or less requires site preparation. The preparation works for road and drain generally done during constriction stages includes-cut and filling work, soil export or import work and demolition of the existing brick drain, damaged BC and HBB road. The mentioned activities will arise the following impact- noise, generation of dust, soil erosion, drainage congestion and safety concern.

Mitigation Measures

Cutting and filling operation should be kept minimum. During earth work, will try to avoid loss of the topsoil. In addition, for backfilling work use of sand will be ensured. The subproject contractor should ensure construction of proper drainage facility. Regular water sprinkle should be ensured by the contractor to minimize elusive dust emission. Cover the exposed earth works with much fabric to minimize the dust. Moreover, proper care will be taken by the contractor during earth work and disposal work to avoid any undue disturbances to the nearby people. As a part of safe working procedures contractor should be ensured used of PPEs as per requirement. Undertaking construction work during dry seasons to minimize the water congestion. The heavy equipment should be operated at day time. The generated waste from the dismantling work will be deposed regularly and quickly in to the designated dump site of Pourashava at Muljan which is located at last boundary of Pourashava.

6.2.2 Pollution from the Construction Materials' Transportation and Storage

Cause of Impact

Lack of proper guideline for the construction material transportations, handling and storage may lead the occupational health and safety risk. On the contrary, dumping of the construction spoils, including accidental leakage of the oil, grease, and fuel in equipment yards is a significant hazard. These substances can be washed-out by the storm water and can be discharged in the nearby subproject area surface water bodies. Even the people to be engaged for the construction activities and local communities might endanger the physical and human habitats of the area.

Mitigation Measures

Safe transport, storage, and disposal of the construction materials, and the equipment have to be carried out in order to avoid the accidental spillage and loss and to minimize any health risk. Fuels, lubricants, and other hazardous materials should store over raised platforms and not directly on the ground. Place storage areas for fuels and lubricants away from any drainage

leading to water bodies. Maintain adequate moisture content of sand during transportation, compaction and handling. Carry the materials especially loose soil and sand with adequate cover. Contractor will responsible to avoid head loads for carrying soil, construction materials and construction equipment and disposal of the wastes at the designated Muljandump site which is located at last boundary of Pourashava.

6.2.3 Air Quality and Dust

Cause of Impact

The air quality in the subproject area may slightly deteriorate for the time being during construction activities. The major construction activities from which air emission mostly dust emission may occur are; unpaved road width, transportation of construction materials (especially fine aggregate), Opening-up of cement bags and empting the cement in order to mix with other construction material; black smoke emission from the subproject vehicles and equipment's, handling of sand, stone/brick chips may contain loose dust particles. These activities will temporally disturb the nearby resident and associates construction worker by creating eye irritation, skin irritation, respiratory difficulties and difficulties of breathing. However, emissions are temporary and not expected to contribute significantly to the ambient air quality and will be within prescribed limits.

Mitigation Measures

Regular sprinkling of water to be done on open surface and dust grounds until paving is done. Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling. Avoid use of dust generating equipment which produce significant amount of particulate matter far from the local residents. Contractor will responsible to ensure that all subproject vehicles and equipment are in good operating condition. Even periodically air quality test near subproject vehicles will be performed. The subproject management and contractor to enforce strictly use of personal protective as per requirement especially face mask and proper clothing to minimize the skin irritation, respiratory difficulties and difficulties of breathing.

6.2.4 Noise and Vibration

Cause of Impact

Noise and vibration caused by the equipment (concrete mixture machine, vibrator, asphalt plant, road cutter and excavator etc.) and movement of the construction vehicles, may temporarily disturb nearby residents and the sensitive areas. In the subproject, sensitive areas like roadsides houses, shops, administrative office and educational institutes are likely to be affected from the roadside noise, though the impacts are limited to the sites and very short-term.

Mitigation Measures

Transportation of the construction materials and noisy construction work have to be carried during the scheduled times, and mainly during the day. Even transportation of construction materials have to be carried with scheduled time. Where applicable and possible exceptionally noisy machines to be fitted with noise abating gear such as mufflers for effective sound reduction. Providing suitable hearing protection to all workers exposed to noise levels where it is more than regulatory limit.

6.2.5 Water Quality

Cause of Impact

The water quality may deteriorate if the construction materials, sand, construction wastes, effluent from the work camps, and food wastes are dumped in the roadside water bodies.

Mitigation Measure

Proper construction management including waste management as well as training of the operators and other workers should provide to avoid pollution of the water bodies. In addition, construction waste will carefully remove and taken to the municipal waste dump site at Muljan (not in the water bodies or lowland), for which contractor will be responsible.

6.2.6 Drainage and Impact on surface water

Cause of Impact

The potential impacts on local hydrology are mainly those of altered patterns as a result of onside construction and earthwork activities. The proposed subproject will affect natural drainage, surface and ground water quality if not managed the construction works properly. There could be siltation of water system or drainage from uncovered piles of construction materials.

Mitigation Measure

To avoid the drainage, earthwork of the subproject will mostly cover in the dry season. Additionally surface drainage shall be controlled to divert surface runoff away from the construction area. Even at construction sites pumping provision will be ensured by the contractor. Stock piling of spoil soil shall be selected at a safe distance from the drainage system. Containment of sanitary waste from camp site should be adequately disposed off to avoid surface and ground water contamination.

6.2.7 Impact on host comminutes from out sides worker

Cause of Impact

The differences in the cultures of workers (in case hiring is required) and local community may create some problems. Therefore, the unknown identity of the hired labor to the host communities has possibilities to create social crisis by involving with local politics, eve teasing or sexual abuse the campsite female worker or campsite nearby neighboring people may be affected.

Mitigation measures

The subproject proponent and his organization have practice of working with the workers of different cultures. It is recommended to aware of the out sides workers about the social & religious actability in the area so that they could maintain those when they will have touch with local community.

6.2.8 Occupational Health, Aesthetics and Safety

Cause of Impact

Construction activities lead to generation of dust, unpleasant view, obstruction in access of public properties due to excavation etc. which may have negative impact. Adequate waste management plan, air, soil, noise and water pollution controls are required to be adopted to prevent any impact on society. Also various health hazards are associated with construction

activity which may significantly impact the workers if not taken care like as mechanical failure of the equipment, traffic collision or accidents during operation of the equipment such as hydraulic excavator, steel cutter, head loads for carrying soil, construction materials and construction equipment; the sudden bad weather working conditions such as storm, thunder storm and earth quake etc. hazardous substances and wastes pose risks of the infections and diseases.

Mitigation Measures

- Provision of proper training to all workers for handling the construction equipment
- Provision of cautionary and guiding signage in local and English language indicating the hazard associated with the site
- Provision of the adequate latrines and separate toilets for the women;
- Wastewater from the toilet should be disposed off in septic tanks and soak pits and should not be allowed to accumulate at labor camp site or construction site
- Dustbins should be provided at labor camps for collection of waste and waste should be regularly disposed off through the concerned agency
- Temporary storm water drainage system should also be provided at camp site so as to drain the storm water and prevent accumulation of storm water at site and thus breeding of mosquitoes/flies
- Provision of personal protective equipment like safety jackets, helmets, gumboots, gloves, face mask, ear buds, goggles, safety shoes etc as per requirement and nature of job in which they are involved
- Job rotation should be carried out for workers exposed to high noise and dust areas
- Provision of First aid facility at the site and the labor camp
- Labor camps should be located at neat and clean location with no water logging issues
- Proper sanitation facility including toilets, bathing facility and washing facility should be provided at site and at labor camps for workers
- Clean drinking water supply should be provided to labor
- Brest feeding facility should be provided for kids if female workers are employed
- Regular inspection for hygiene and safety in labor camps should be done
- Construction debris should not be allowed to enter into aquaculture ponds located along the road
- Entrance to any road/structure should not be blocked for construction material
- Contractors will bear medical treatment costs. If any sever accidents such as loss of hands, legs or loss of working ability or any case of death needs compensation-(the amount of the compensation should be fixed considering the type of accidents).

6.2.9 Impacts on Social Environment

The positive impacts from the subproject are from the engagement of local labor force during construction works. All the positive and adverse impacts and mitigation measures for the social environment have been described in the social impact assessment (SIA) report.

6.2.10 Traffic Management

The proposed all the roads are in extensively damaged condition. Hence, traffic movement on these road is very few. Additionally, most of the sites are located in the rural and semi urban area of the Pourashava. In addition, there are adequate alternative and connecting road in the subproject area. During construction, these roads will helps to diversify the traffic which will minimize the impact on traffic. Moreover, Pourashava will inform the local people about subproject activities and inspiring them to use the alternative road.

During construction phase, interruption of the traffic movement and impact on the local traffic system due to the subproject activities will be monitored closely. Then separate traffic management plan will be provided if required. However, the following safeguard measures are recommended to minimize the impacts associated to the traffic movement:

- Inform local people about the subproject activities;
- Inspire local people to use connecting and diversion roads;
- Ensure schedule deliveries of material/ equipment during off-peak hours;
- Place traffic sign/cautionary sign to avoid undue traffic congestion and associated traffic control measures to limit possible disruption;
- The place of construction works should be fenced off with fences if required and should be isolated from general public access and marked with signs to ensure safe movement.
- At the points where traffic is to deviate from its normal path (whether on temporary diversion or part of the width of the carriageway), the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums, or a similar device to the directions of the vehicles.
- At night, the passage shall be delineated with lanterns or other suitable light source.
- For notification of construction activities, at least two signs shall be put up for each road, one close to the point of carriageway begins, and another will put on the end of the carriageway.

6.3 Impact on Operation and Maintenance

Cause of Impact

Once in operation the improved roadways may be responsible for an increase in noise and air emissions from increased vehicular traffic. There will be a tendency for increasing speed because of an improved driving surface, resulting possibilities of accidents. During operation phase, the throwing of waste material into the drain and silted up of outfall by various wastes may crates water stagnant in the drain and backflow of the drain.

Mitigation Measures

To control the probable accident beater traffic management need to be ensured. As a part of traffic management improved signage and speed barker near sensitive area need to be constructed. At operation, phase drain and out fall need to be cleared as per requirement to avoid backflow of the drain.

7 ENVIRONMENTAL MANAGEMENTPLAN (EMP)

The Environmental Management Plan (hereinafter, the Plan or EMP) aims to ensure the compliance of all activities undertaken during the preconstruction, construction and the operation of this subproject with the environmental safeguard requirements of WB and the Government of Bangladesh. Furthermore, it aims at integrating the environmental components of the subproject with existing initiatives and programs in these fields. The plan consists of mitigation, monitoring and institutional measures to be taken during preconstruction, construction and operation to minimize adverse environmental impacts, offset them, or reduce them to acceptable levels.

7.1 Access to Information

The environmental assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned personnel responsible for subproject implementation. It will also be made available to the public. The final assessment report will also be uploaded in the, Manikgonj Pourashava website, BMDF website and the World Bank website after approval.

7.2 Grievance Redress Mechanism

The project-specific Grievance Redress Mechanism (GRM) will be established by the PIU of Manikgonj Pourashava to receive, evaluate, and facilitate the solution of APs concerns, complaints and grievances concerning the social and environmental performance of the subproject. The GRM is aimed to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the subproject.

The grievance mechanism is related to resolve the risks and adverse impacts of the subproject. It addresses APs' concerns and complaints promptly, using an understandable and transparent process that is also gender responsive, and culturally appropriate. It is readily accessible to all segments of the affected people at no costs and without retribution. The mechanism should not impede access to the country's judicial or administrative remedies. The affected people will be appropriately informed about the mechanism.

BMDF has its own Grievance Redress Procedure (GRP), which it operates to address any dissatisfaction and complaints by the local people regarding its activities. This procedure is being applied to address any complaints or grievances through negotiations with the community leaders and representatives of the APs during implementation of the MGSP.

7.2.1 Grievance Redress Committee (GRC)

The discussions and negotiations has been conducted by the PIU of Manikgonj Pourashava and will be involved the APs and Grievance Redress Committee (GRC) headed by the Mayor of Manikgonj Pourashava. With the facilitation of Consultant, the Mayor nominated the GRC members and included representative from the Government Agencies, local NGO, and Civil Society. The GRC has been formed and established at Manikgonj Pourashava. The grievance box will be delivered to the Pourashava to receive complaints. The grievance response focal point will be available at Pourashava for instant response to an aggrieved person. The Focal Point of GRC committees will collect the written complaints or suggestions from the box, and produce them to the GRC for hearing and resolution. The members of the committee are:

1. Gazi Kamrul Hoda Selim, Mayor, Manikgonj Municipality, Chairman of GRC
2. Nazma Akter, Female Councilor, Manikgonj Municipality, Member of GRC

3. Abdus Salam, Teacher, Member of GRC

4. Md. Uzzal Hossain, Social Worker, Member of GRC

5. Kazi Hemayet Hossain Himu, NGO Worker, Member of GRC

6. Hazrat Master, NGO Worker, Member of GRC

7. Bellal Hossain Executive Engineer, Manikgonj Municipality, Member Secretary of GRC

7.3 Grievance Resolution Process

In case of grievances that are immediate and urgent in the opinion of the complainant, the contractor and PIU on-site personnel will provide the most easily accessible or first level of contact for quick resolution of grievances.

The phone number of the PIU official should be made available at the construction site sign-boards. The contractors and PIU safeguard focal person can immediately resolve on-site in consultation with each other, and will be required to do so within 7 days of receipt of a complaint/grievance.

All grievances that cannot be redressed within 7 days at site will be reviewed by the grievance redress cell (GRC) headed by Mayor of the Pourashava with support from PIU designated safeguard focal person. The PIU designated safeguard focal person will be responsible to see through the process of redressed of each grievance.

The PIU designated safeguard focal person will refer any unresolved or major issues to the PMU, BMDF. The PMU of BMDF in consultation with the MD of BMDF will resolve them within 30 days.

If the appellant is still not satisfied, he or she has the right to take the case to the public courts. Manikgonj Pourashava should also publish the outcome of cases on public notice boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by Manikgonj Pourashava.

Records of all grievances received, including contact details of complainant, date the complaint was received, nature of grievance, agreed corrective actions and the date these were effected and final outcome will be kept by PIU. The number of grievances recorded and resolved and the outcomes will be disclosed in the PMU office, Pourashava office, and on the web, as well as reported in monitoring reports submitted to WB on a quarterly year basis.

7.4 Institutional Concern Person for Environmental Safeguard Compliance

The Pourashava Officials, especially engineer in charge will be responsible for supporting the construction supervision with the facilitation of BMDF. The civil works contractors will implement the environmental mitigation measures.

The BMDF, with the help of Environmental Specialist will submit the monthly monitoring reports on Environmental Compliances to the World Bank.

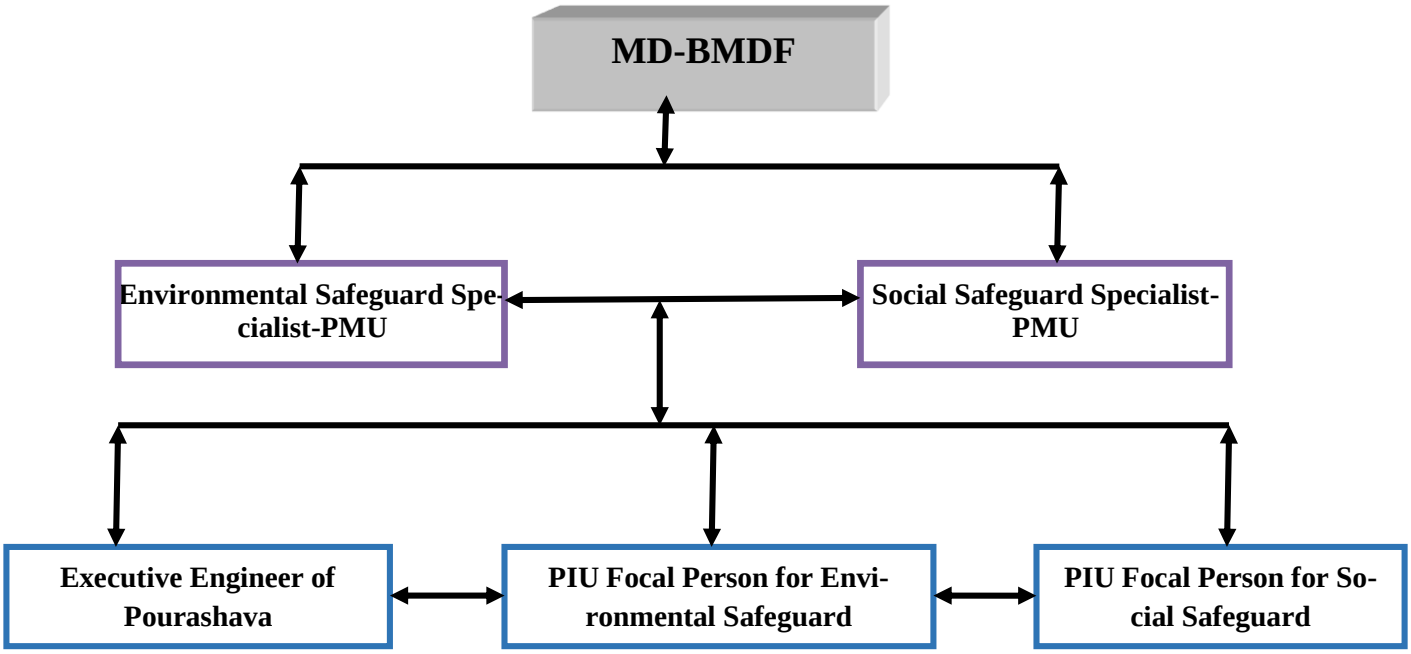

Figure 7-1: Environmental and Social Management Team (Tentative)

7.5 Capacity Building

A training program has been developed by the PMU of BMDF to build the capability of PIU of Manikgonj Pourashava. In addition, the hired consultants of Manikgonj Pourashava was also there. Under this training program PMU was organize an introductory course for the training of the Manikgonj Pourashava officials, preparing them on: (i) Environmental Screening, (ii) EMP Implementation, including environmental monitoring requirements related to mitigation measures; and (iii) taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures found during the course of the implementation. The contractor should be also included in the training program to enhance the Environmental awareness and orientation among the workers

7.6 Environmental Management Action Plan

The environmental management action plan has been outlined in Table 7.1. The mitigation measures as well as responsible parties to implement of the EMP are also incorporated in action plan.

Table 7-1: Anticipated Impacts during Construction and Corresponding Mitigation Measures with Monitoring guide line)

Activity/ Issues	Potential Impact	Proposed Mitigation &Enhancement Measure	Monitoring Method	Frequency of Monitoring	Responsible for Monitoring	
					Implement	Supervision
At Pre-construction stage						
Construction and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may cause water/ environmental pollution/	• Ensure construction of the labor shed and stockyard at the designated place (Vacant place near bus stand kacha bazar at ward no. 1.); • Construction of sanitary latrine considering 15 persons for one toilet at the labor shed and separate toilet for male and female; • Erection of “no litter” sign, provision of waste bins (introduce separate waste bins for organic and inorganic wastes); • Ensure wastes (solid wastes and other forms of the wastes) disposal at the dumping yard is located at the Muljan which is located last boundary of Pourashava. • Ensure emptying and cleaning of the waste bins regularly; • Drum trucks are available in the Pourashava. Hence, drum truck should be used for transportation of the wastes; • Cleanliness of premises and workers living places and at the Labor Shed; • Arrangement of the proper ventilation and temperature at the Labor Shed; • Protection against dust by using masks and covering of the head and body;	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

		• Proper disposal of the wastes and effluents;				
	Health Hazard of Labor	• Conduct formal and unofficial discussion to increase awareness about hygiene practices among the workers; • Arrange for readily available first aid unit including an adequate supply of sterilized dressing materials and appliances • 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. • Comply with requirements of Government of Bangladesh Labor law of 2006 and all applicable laws and standards on worker's Health and Safety; • Provide construction workers and local people with basic information on infectious diseases including HIV/AIDS • 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	Visual Observation	Regularly and As per requirement	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible development of labor camp into permanent settlement	• Contractor to remove labor camp at the completion of contract.	Visual Observation	End of the Construction work	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Outside labor force causing negative impact on health and social well-being of local people	• Ensure that contractor employ local work force to provide work opportunity to the local people and conduct formal and unofficial awareness program for the health and social well-being of the local people.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

At Construction Stage						
General construction works (Site Clearing, Earth work, Backfilling, fueling of subproject vehicles etc.)	Drainage congestion and flooding	• Ensure provision for adequate drainage of storm water, if needed; • Ensure provision for pumping of congested water, if needed; • Ensure adequate monitoring of drainage effects, especially if construction works are carried out during the wet season.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Air pollution	• Check regularly and ensure that all the subproject vehicles are in good operating condition; • Ensure contractor spray water on dry surfaces regularly to reduce dust generation; • Maintain adequate moisture content of soil and sand for transportation, compaction, bed preparation, backfilling and handling; • Ensure contractor sprinkle and cover stockpiles of loose materials (e.g., fine aggregates);	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Traffic congestion, effect on traffic and pedestrian safety	• Ensure schedule deliveries of material/ equipment during off-peak hours; • Avoid road side storage of the construction materials; • Place cautionary sign for the pedestrian and safety traffic movement. • Inform the local people about subproject activities and inspire them use to alternative road to avoid traffic jam. • Ensure flag man especially at road crossing • Increase workforce in front of critical areas such as administrative office, hospitals, and schools.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Noise pollution	• Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night;	Visual Observation/Analytical	Regularly and Periodically	Contractor	Primarily by PIU of Pourashava

		• Avoid prolonged exposure to noise (produced by equipment) by the workers; • Regulate use of horns and avoid use of hydraulic horns in subproject vehicles. • Any noise generating equipment should be performed after office or school hour. • Arrange ear plugging or ear muff if noise level at the construction site is severe.				Secondarily by PMU of BMDF
	Water and soil pollution	• Prevent discharge of fuel, lubricants, chemicals, and wastes into adjacent water bodies and soil; • Vehicle maintenance and refueling should be confined to the designated areas with sealing to prevent the spillage of lubricants and fuels on the water bodies and soil; • Restrict disposal of any construction waste into the nearby water bodies. • Location of stockyards for construction materials shall be identified at a safe distance from watercourses.	Visual Observation/ Analytical	Regularly/ Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Accidents	• Conduct formal and informal discussion for creating awareness about the accident; • Provides PPEs and ensure using of the personal protective equipment by the workers. • Maintain the register to record accidental events if occur;	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Spills and leaks of oil, toxic chemicals	• Proper handling of lubricating oil and fuel so that it does not fall on the soil and adjacent water bodies; • Collection and disposal of spills; • Waste petro-chemicals must be properly collected, stored and not directly disposed on the ground.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential Impact of BC road Construction						

Dismantle work/ Excavation/Earth work/	Generation of solid and construction waste due to the dismantle works; Generation of loose soil due to the earth excavation work and earth work.	• Cover expose construction wastes and loose dry soil with fabric; • Disposal of soil and construction wastes at dumping site near Muljan which is located at last boundary of Pourashava.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
IGS (improve sub grade) /sand filling	Air and dust pollution affecting nearby settlement	• Maintain adequate moisture content of the soil during construction transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Setting up and operation of asphalt plant	Possible degradation of the air quality by the suspended particles and increase of the noise level from asphalt plant affecting nearby settlements.	• Locate plant away from residential settlements; • Consider use of emulsified bitumen.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible water pollution (surface and ground water) by bitumen and solvents.	• Avoid spills and proper collection and disposal of the generated spills.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Possible preparation of the bitumen in open air and using of charcoal and wood as fuel.	• Strictly prohibit bitumen preparation in the open air and use of charcoal and wood as fuel.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Potential impact of RCC Drain						
Dismantling work for site clearing and	Generation of loose and clay soil due to the earth excavation work.	• Cover exposed loose dry soil and wastes materials before disposal; • Disposal of soil and construction wastes at existing dumping site at	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava

excavation work		Muljan which is located at last boundary of Pourashava.				Secondarily by PMU of BMDF
	Accidents from careless use of hydraulic excavator and hammer if needed.	• Carefully handle of the hydraulic excavator and hammer if needed.				
	Possible damage of road side infrastructure due to earth excavation for drain construction.	• Ensure drum sheet palisading work for shallow depth to stabilize the structure; • Ensure plunk palisading work for shallow depth to stabilize the structure; • Bolly drive for deep depth construction works.				
	Air pollution due to black smoke emission from excavator.	• Regular maintenance of the equipment.				
Sand filling /Back filling work	Air and dust pollution affecting nearby settlement	• Maintain adequate moisture content of soil and sand during transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
Cutting & welding of the reinforcement for RCC work	Noise pollution due to using of rod cutter and welding machine	• Avoid using of rod cutter and welding machine at night; • Avoid prolonged exposure to noise (produced by equipment) by workers.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
	Potential health and safety risks from rod cutter and welding machine if any	• Ensure use of the personal protective equipment (helmet, goggles, gloves, safety boot); • Availability and access to first-aid equipment and medical supplies in case of any accidents.	Visual Observation	Regularly	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF
RCC (reinforcement cement concrete) work	Air pollution due to black smoke emission from concrete mixer machine and vibrator machine	• Regular maintenance of the concrete mixer and vibrator machine to avoid any black smoke emission.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

	Noise nuisance from concrete mixer machine and vibrator machine	• Avoid operation of the concrete mixer and vibrator machine at night; • RCC work should be avoided at schooling time; • Inform local people about casting work and potential impacts.	Visual Observation/ Analytical	Regularly/Periodically	Contractor	Primarily by PIU of Pourashava Secondarily by PMU of BMDF

Table 7-2 Anticipated Environmental Impacts during Operation Phase and Corresponding Mitigation and Enhancement Measures

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of the BC and HBB road	Increase in traffic speed and accidents; Increased traffic congestion due to movement of increased number of vehicles; Damage to road by movement of heavy vehicles; spillage of water to bitumen road surface.	• Better traffic management; • Control heavy traffic movement.	Primarily by Pourashava
	Increased air and noise pollution affecting surrounding areas	• Traffic management, increased vehicle inspection	
Operation of the RCC drain	Pollution of downstream water body due to disposal of polluted water from the drain	• Ensure installation of septic tank by the household people in all establishment; • Stop connecting sanitation facilities to storm drain directly.	Primarily by Pourashava
	Blockage in the drain due to disposal of solid waste/debris	• Creation of awareness, introduce SWM system and install and maintenance cover in open manholes; • Regular maintenance / cleaning of the drain; • Stop throwing of the wastes materials in to the drain by the community people.	
	Possible backflow of water due to blockage in the drain and at outfall	• Proper maintenance and cleaning of the drain and outfall on regular basis.	

Most of the monitoring parameter evaluation will be done by visual observation except noise, air, and water quality parameter. These parameter will be monitored by analytically. Hence, analytical monitoring guideline are shown below in tabular form

Matrix Table of Monitoring Plan (Analytical Monitoring during construction phase)

Monitored Parameter/ Issues	Monitoring Method/Key Aspects	Location of Monitoring	Period & Monitoring Frequency
Noise level measurement	• Through digital instruments	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement

Ambient air quality/ Stack Emission	• Visually-black smoke; • Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards; • Through digital instruments.	• Sub-project site	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement
Waste Water quality	• Sampling; • Analysis at laboratory; • Data analysis of merits determination by using quality standards.	• At intake and outfall	• Two times at construction phase; • Reporting: Once in a month and immediately after measurement

7.7 Environmental Safeguard Cost during Construction Phase

Considering the environmental impacts and their mitigation measures for these subprojects, several items are included in the BOQ to address these issues. The estimated cost to implement the EMP is elaborated in ***Table*.7-3**

Table 7-3: Environmental Management Budget

Item No.	Description of the Items	Costs (Tk)
1	Establishment of labor camp (male shed - 15 ft x 30 ft and female shed 12 ft x 15 ft1) with living arrangement, drinking water facilities, cooking arrangement, mosquito net,, waste bin etc.	200,000.00
2	Masonry pucca platform (at least 100 sft size), providing brick soling and net cement finishing for keeping fuel and lubricants for machineries.	15,000.00
3	Dust suppression measures by water spraying in and around the subproject site, uncovered aggregates and loose materials such as stoke files of the roadside excavated earth etc. (lump sum)	60,000.00
4	Noise level measurement. It can be measured from the pre-approved public institute/ university two times during construction phase @Tk. 1,000.00 per measurement (3*7,000.00 Tk) and **one time after construction**	21,000.00
5	Air quality (SPM, PM10, and PM 2.5) measurement- it can be measured from the recognized environmental survey company, public institute/ university two times during construction phase and **one time after construction**	90,000.00
6	Water quality(pH, NH_3, BOD_5, COD, TDS,)- it can be measured two from the recognized environmental survey company, public institute/ university one times during construction phase and **one time after construction(**2*5*10000**)**	100000.00
7	Temporary camp site waste disposal facility: 2nos. (1no. of the organic waste and 1 nos. of the inorganic waste disposal facility) @Tk.20,000.00 (2*20,000.00 Tk)	40,000.00
8	Water supply (at the labor sheds):1nos. of tube well	60,000.00
9	Sanitation facilities (at the labor sheds): 3nos. of the toilets preferably portable toilets (1 no. for women and 2nos. for men) @ 20,000.00 (3* 20,000.00 Tk)	60,000.00
10	Providing safety gear packages like hand gloves, spectacles for eye protection, helmets, masks, ear plug, visible jacket, rubber shoes for 35 persons where 35 for workers and 10 for visitor (45*3,000.00Tk.) and one first aid box (1*2,500.00Tk)	135,000.00
11	Tree plantation for ecological enhancement work- preferably local fruits, flowers, medicinal and ornamental trees- (including protection and conservation during project defect liability period) 213 nos. of the trees @Tk 1,000.00 per tree (213* 1000.00)	213,000.00
12	Cautionary Sign 10 nos.	20,000.00
	Total	**10,14000.00**

8 PUBLIC CONSULTATION AND PARTICIPATION

8.1 Objective and Methodology

For determining the environmental and social impacts associated with subproject implementation, the GOB and WB give great importance on involving primary and secondary stakeholders of the subproject area. In order to collect local knowledge for baseline conditions, understand perceptions of the community regarding impact significance, and propose meaningful mitigation measures, participation of stakeholders is an integral part of the EA process. For conducting this EA, an attempt has been made to consult with a full range of stakeholders and Pourashava officials to obtain their views on subproject interventions.

The Public Consultation were conducted on 13 June 2018, through a mix of conventional approach which involved as participatory, focus group discussions (FGD) and one-to one interviews, during the environmental study of the proposed subproject in conformity with the WB's and DOE's environmental guidelines. However, for better understanding the socio-economic and environmental condition three focus group discussion has been conducted in the subproject study area (**Figure-8-1).**

The public consultations were conducted with the following objectives:

(i) To introduce awareness of the stakeholders about the subproject and to collect their opinion, suggestions for planning and designing of the subproject ;

(ii) To identify the need and concern of the public;

(iii) To assess cultural patterns and behavior of local communities. Stakeholder consultation, was targeted at people/communities who may – directly or indirectly, positively or negatively- be affected by the outcomes of a subproject. The consultations were conducted at two different tiers of stakeholders: local people and Pourashava Officials;

(iv) To identify the conflict issues in advance & to find acceptable solutions;

(v) To gather local knowledge before decision making of the proposed subproject

(vi) To assess cultural patterns and behavior of local communities.

Figure 8-1: Public consultation with local people and other stakeholders.

8.2 Issues Raised by the Participants

For the better traffic operation in the subproject area and to respite from water logging problem, subproject area peoples are highly interested about this subproject. They also said, they would help the Pourashava to implementing the subproject activities.

The participants raised the issues related to the infrastructure development of Manikgonj Pourashava. They emphasized on the subproject selection for the future development and also discussed about the procedure for the quality construction work. In the FGD, the participants discussed the requirements for the Pourashava future development through a list of the subprojects. The Key participants list of Focus Group discussion in the subproject study area is attached in the Appendis-2.

8.3 Feedback, Suggestions, and Recommendations of the Participants

In each of the consultation, participants were encouraged to share their observations, suggestions, and experiences on various environmental and safety issues and suitable mitigation and enhancement measures. The participants' feedback, suggestions, and recommendations from FGD can be cited:

- ✓ For the better traffic operation in the subproject area and to respite from water logging problem, subproject area peoples are highly interested about this subproject. They also said, they would help the Pourashava to implementing the subproject activities.
- ✓ All the proposed infrastructure implementation is badly needed for Manikgonj Pourashava, all will provide benefit, no major environmental concern
- ✓ All the participants felt that the proposed road construction subproject will facilitate a better traffic system. However, it was felt that accidents might increase in number if a

high standard of engineering design is not followed. Participants mentioned that safety measures are especially important for social institutions like schools, hospitals

- ✓ They are thinking that, due to implementation of this subproject few part of land may need to be acquired. According to the participants, this can be mitigated through proper compensation and amicable assistance to the affected persons.
- ✓ People expect employment generation for them from upcoming subproject
- ✓ Awareness and extent of the project and development components;
- ✓ All development works are essential but sound design and construction is necessary so that they are not affected by environmental pollution.
- ✓ Most of the participants expressed that the number of subprojects that have been selected for each financial year is not adequate.
- ✓ The participants also addressed the solid waste management issue to reduce environmental and public health hazards.
- ✓ Major problem is drainage congestion, less cleaning, drains are filled with solid waste
- ✓ The causes of water logging problem is mainly the inadequate drainage network, seasonal sub-mergence, clogging due to garbage dumping
- ✓ Special safety measures should be taken to avoid land subsidence due to heavy construction activities
- ✓ Flooding and water logging both affect access to key activities
- ✓ Traffic management is important
- ✓ During construction period public safety and workers' safety is important
- ✓ Participants suggested signage (speed limits, warnings etc.), pedestrian crossings in front of social institutions and to ensure that there are footpaths along the road
- ✓ The proposed road and drain construction subproject do not pass any protected or ecological critical area.
- ✓ They have suggested that, dust suppression, noise mitigation and road safety should be considered.

9 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions and Recommendations

The subproject intervention has moderate impacts on ecological environment due to felling of the trees. In addition, the subproject intervention has impacts on physicochemical components and socio-economic environment. However, from the study it is revealed that the projected impacts on physicochemical components and socio-economic environment are not significant. Most of the individual elements of the subproject involve simple construction and operation, so impacts will be mainly localized and limited within the subproject boundary. Most of the predicted impacts are associated with the construction process which is invasive. Hence, the impacts are largely manageable through mitigation measures. 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. 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 WB.

This study articulates well-structured EMP. This EMP will assist Pourashava Officials, PMU-BMDF and contractor in mitigating the environmental impacts, and guide them in the environmentally sound execution of the proposed subproject. A copy of the EMP shall be kept on-site during the construction period at all times. The EMP shall be made binding on contractor operating the site, and will be included in the contractual clauses.

It should be noted that environmental assessment report is a live document. Hence, due to changing circumstances during the construction phase if any, there might be minor adaptation needed for environmental, health and safety issues.

APPENDIX

Appendix 1: List of the Participants

Attendance of Local Participants in the Screening Exercise

Local Stakeholders, community members and WLCC/CBO)

Name of Subproject: package no: 2 to 5 (road, drain, Beautification, bridge, culvert)

Package : Package No: BMDF/ MANIKGANJ/ 2017-18/W.02.....5

Name of ULB : Manikganj **Upazila:** Manikganj Sadar

District : Manikganj **Date:** 13/6/2018

SL#	Name	Gender	Social Status	Contact Number	Signature/LTI
01	MD. Aslan Khan	M	Social Worker	0171356302	MD. Aslan Khan
02	Dipak Ghosh	M	"	01711909657	[illegible]
০৩	Mustafizure Rahman	M	Geogeneral Secretary Udich, Manikganj	01712249550	[illegible]
04	MD. Iqbal Khan	M	social worker	01742923401	[illegible]
০৫	[illegible]	M	[illegible]	[illegible]	[illegible]
06	[illegible]	M	Business	01729538494	[illegible]
০৭	[illegible]	M	[illegible]	01712307485	[illegible]
০৮	মরিয়ম	নারী	গৃহিনী	নাই	মরিয়ম
০৯	[illegible]	নারী	গৃহিনী	[illegible]	[illegible]
১০	নিপা	নারী	[illegible]	নাই	নিপা
১১	[illegible]	নারী	গৃহিনী	[illegible]	[illegible]
১২	[illegible]	নারী	গৃহিনী	নাই	[illegible]
১৩	[illegible]	নারী	চাকুরি	[illegible]	[illegible]
১৪	[illegible]	নারী	চাকুরি	01754135592	[illegible]
১৫	[illegible]	নারী	গৃহিনী	01798321070	[illegible]

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