GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

Bangladesh Municipal Development Fund (BMDF)

ENVIRONMENTAL ASSESSMENT REPORT

Name of the Sub-project:

Improvement of Road and Drain; Sub-Project-1

Municipal Governance and Services Project (MGSP)

Submitted by

Kaliakair Municipality

Disclaimer

This Environmental Assessment Report is prepared by the own fund of the Kaliakair Pourashava to fulfill the requirements of Bangladesh Municipal Development Fund (BMDF) in seeking the financial support for the "Improvement of Roads and Drains (SP-1)" under its Municipal Governance and Services Project (MGSP).

EXECUTIVE SUMMARY

Introduction: Kaliakair Municipality, having land area 27.28 $sq.km$ is located in between 24'05' North and 90'10' East latitudes It is bounded by Sreefaltali and Mouchak Union Parishad on the north, Atabah Union Parishad on the south, Mouchak Union Parishad on the east, Sreefaltali Union Parishad on the west. Total population is 7,00,000 of which male 3,13,416 & female 2,86,585; Muslim 231672, Hindu 34306, Buddhist 910, Christian 30 and others 85. Main rivers: turag, bangshi, Salda; Boali, Hawla, Ujan and Markaj beels and Goala and Betjuri canals are notable. Kaliakair Thana was formed in 1870 and it was turned into an Upazila in 1984. Kaliakair Thana was formed in 1923 and it was turned into an upazila' on 2 July 1983. Kaliakair municipality was formed in 2001. (Source: Population and Housing Census 2011)

The Kaliakair Pourashava has implemented different development projects with the fund of Annual Development Programme allocated by the government and UGIIP. Recently, the Pourashava has prepared its Capital Investment Plan (CIP) for its infrastructural development following a participatory approach with the technical assistance from Bangladesh Municipal Development Fund (BMDF) and identified the "Improvement of roads and drains" as the highest priority for meeting the long pending demand of roads and drains for ensuring easy and water logged free movement of Poura citizen and local vehicles within the Pourashava areas. All the priority of roads and drains of Kaliakair Pourashava have brought under Sub-Project-1. This sub-project is named as "Improvements of Roads and Drains (Sub-project-1)" and includes roads of CIP # R1, R2 and R3 along with drains of CIP # D1, D2, D3, D4, D5, D6, D7 and D8. The estimated cost of the sub-project is BDT 75 million and the duration of construction is 15 months starting in February 2019 and to be ended in April 2020.

Justification of selecting the sub-project: The proposed sub-project has significant importance in internal and external communication of the citizen of the Pourashava as well as drainage of household and industrial waste water. The condition of the roads is very bad having wearing surface, damaged WBM, pot holes, depressions, undulation and rubbish mixed pavements which make the inhabitants and vehicles very difficult to move from one place to another. This damaged condition of the roads causes frequent accident to the people by breaking parts and turning over the vehicles. The water logged situation on the roads causes untold sufferings to the citizen particularly school going children and women, and hampers regular movement and transportation

of official, drivers, traders and laborers. Thus, ultimately affect the regular income and livelihood of the citizens of the Pourshava. Therefore, the construction of proposed roads is crucially important for the Pourashava.

The drainage system of the Pourashava is very poor and there is limited number of storm drain within the Pourashava. The drains are severely damaged and mostly nonfunctional. Thus, causing water logged almost all the year round, and inhabitants of the Pourashava have been suffering a lot through intrusion of water into households even at this dry season. Bad smell and reproduction of mosquito fueled the sufferings of the citizen in manifolds. Therefore, the construction of drains within the Pourashava is highly important. The proposed drains will ensure the run-off of storm water and reduce the suffering of the people of the Pourashava.

Further, the subproject has significant social and economic benefits to the community people. After completion, the road subproject will provide smooth pavement for the safe movement of inhabitants and vehicles which will reduce the risk of accidents. By constructing smooth road surface and footpath over the drain, it will provide better, easy and safe movement facilities for the travelers. On the contrary, new drains will minimize the drainage congestion and water logged problem. In addition, the proposed subproject will significantly enhance the business facilities and hence increase the income of the people, businessmen and industrialists. It will also add the commercial and aesthetic value of the area. Therefore, considering these benefits, the subproject is selected for the implementation in Kaliakair Pourashava.

Location of the sub-project: The proposed roads and drains are located at the different parts of 07 Wards (out of 09 Wards) of the Kaliakair Pourashava. The Wards are ward # 3, ward # 4, ward # 5, ward # 6, ward # 7, ward # 8 and ward # 9.

Objective of the study: The general objective of the study is to determine the major environmental impacts that might be happened due to the implementation of the sub-project and to recommend possible mitigation measures to avoid or reduce identified adverse environmental impacts and to enhance positive impacts. The specific objectives include:

- Identifying existing environment condition at the sub-project areas for environmental components viz. air, noise, water, land, soil, biological and socio-economic aspects;
- Prediction and evaluation of positive and negative impacts that may result from the proposed sub-project;
- Undertaking public consultation and disclosure of project-related information;
- Formulation of an environmental management plan (EMP) to eliminate or minimize the adverse impacts of the project on the surrounding environment and affected communities;
- Preparing occupational health and safety to minimize any accident or emergency situation;
- Proposing plans for the post project monitoring, ongoing consultation and disclosure, EMP implementation, and institutional arrangement/organizational arrangement; and
- Suggestion and recommendation for abatement/mitigation/management measures to ensure environmental, biological, health and social compatibilities and also to comply with

the National Environmental legal requirements and national Environmental Quality standards.

Methodology of the study: This is a qualitative study. However, both quantitative and qualitative data are collected and analyzed to achieve the objective of the study and show the baseline information of the study areas. Quantitative data are collected from secondary sources and qualitative data are collected from primary sources using different qualitative approach and methods. The approach and methods those are applied during the assessment include: (i) Consultation with stakeholders and community people; (ii) Focus Group Discussion; and (iii) Field visit and observation.

Findings of environmental impact assessment: The key environmental and social impacts, and benefits those are found and anticipated during environmental screening, field observation and community consultation are given as below:

Land use: Existing land of right-of-way of the drains will be used. Hence, no loss of additional land will happen here. In addition, loss of community people use to land acquisition will be happened. However, the land value will be increased.

Site cleaning work: Widening of roads and drains requires cleaning of site. But, no tree or vegetation needs to be cut-off as the width of the drains will be existing right-of-way of the roads.

Noise level: Moderate adverse impact of noise level is anticipated to adjacent residential and commercial properties during construction works. However, change in noise levels will not exceed State regulatory thresholds at any location.

Air quality: No remarkable impact on air quality is anticipated.

Water quality: The constructed roads and drains will carry storm water, household waste water and industrial waste water to outfall areas which have moderate impact on aquatic environment. However, the existing water quality of the outfall is badly polluted by the household waste and industrial effluents. Therefore, the impact of newly added waste water could have minor impact on it. 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 sub-project area. So, no impact is anticipated to threatened or endangered species habitat.

Drainage Congestion: Temporary drainage congestion may happen and its impact will be minor. However, construction debris and wastes should be collected and disposed properly.

Solid waste management: Improper collection and disposal of the generated wastes materials may degrade the quality of the surrounding environment of laborer shed and degrade the aesthetic value. Therefore, proper solid waste management system should be in place.

Water logging: Temporary water logging may happen during construction period. However, water removing system should be in place.

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 sub-project will not adversely impact the character of the community surrounding the roadway.

Despite the above mentioned negative impacts, the sub-project will bring some positive impacts which are given as below:

Transportation and traffic Safety: Substandard and narrow roadway elements will be replaced by the newly constructed RCC and widened road which will ensure smooth movement of both light and heavy motorized vehicles and reduce traffic congestion and potential crashes. Additional roadway features such as lighting, and pavement drainage will contribute to the improvements in motorized vehicles and pedestrian safety.

Water logged: 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.

Employment and income generation: The roads and drains has a positive impact on the local and regional economy due to the generation of employment opportunity and will facilitate the trade and business of the commercial and industrial institutions and people living in the different parts of the Pourashava.

Conclusion and recommendations: It is concluded that the subproject is environmentally sound and sustainable. Significant improvement in quality of life and public welfare will result once the subproject is in operation. The potential environmental impacts seem very minimum and manageable, and it would be minimized by taking proposed mitigation measures. The adverse environmental impacts from the subproject will mostly take place during the construction stage. No endangered or protected species of flora or fauna are reported at the subproject site. The community people, businessmen and other stakeholders are highly towards the proposed RCC road and drain. However, some key recommendations are made for its smooth implementation and operation which are given as below:

- The condition of the roads and drains is very bad and public demand for this road is very high. The construction of the road should be started as soon as possible and should be completed within least possible time;
- Proposed environmental management plan should be implemented strictly both during operation and construction phase of the project;
- Suggestions and recommendation made by public for design and construction of road and drain, traffic management, solid waste management and waste water discharge should be taken into consideration;
- Proper training of maintaining environment, health and safety should be given to subproject management unit, contractor and workers in both construction and operation phase;

- Environmental monitoring should be conducted as proposed in environment management plan; and
- This plan could be updated at any stages of the construction and operation of the subproject in case of addressing the environmental issues those are not identified and raised at this stage.

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ABBREVIATION

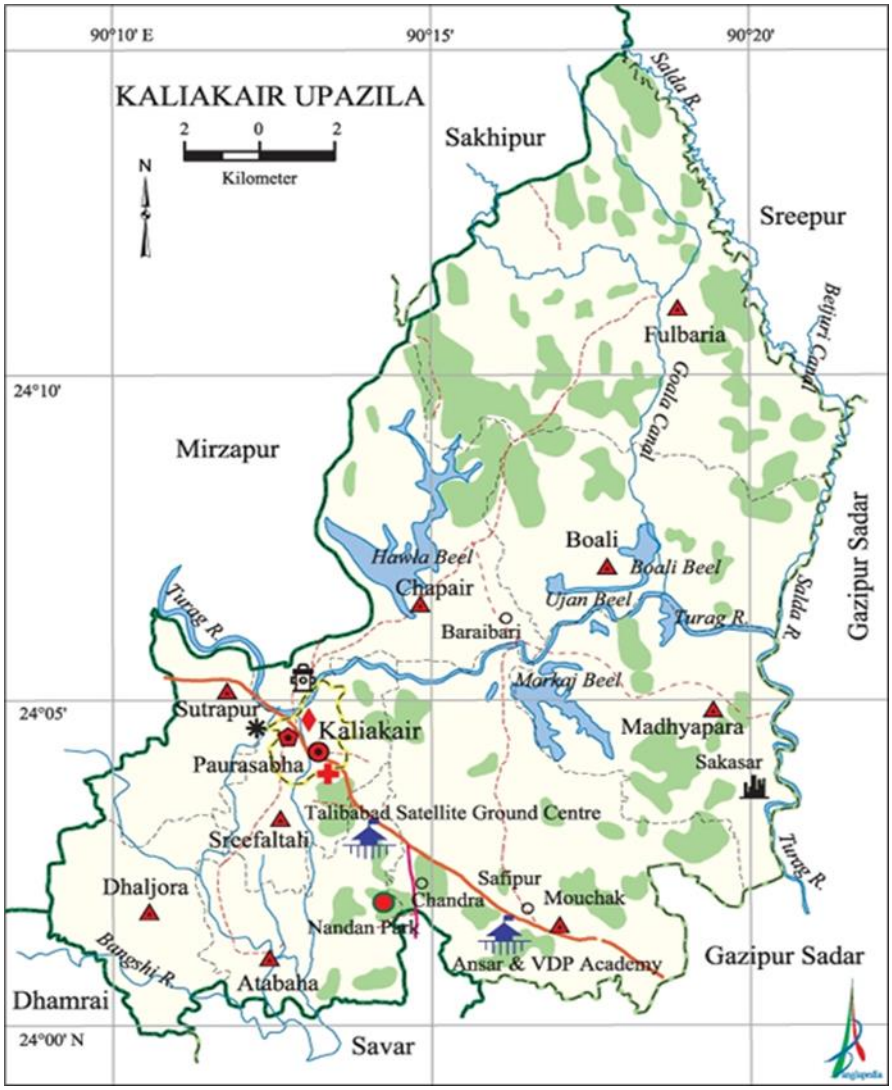
AP	Affected People
BBS	Bangladesh Bureau of Statistics
BDT	Bangladesh Taka
BMDF	Bangladesh Municipal Development Fund
BOQ	Bill of Quantity
CIP	Capital Investment Plan
DOE	Department of Environment
ECA	Environmental Conservation Act
ECoP	Environmental Code of Practice
ECR	Environmental Conservation Rules
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ES	Environmental Screening
FGD	Focus Group Discussion
GOB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GW	Ground Water
IUCN	International Union for Conservation of Nature
MD	Managing Director
MGSP	Municipal Governance and Services Project
NGO	Non-Governmental Organization
OP	Operational Policy
PIU	Project Implementation Unit
PMU	Project Management Unit
PPE	Personal Protective Equipment
RCC	Reinforced Concrete Cement
SPW	Supply Water

ULB	Urban Local Body
WB	World Bank

1. INTRODUCTION

1.1 Background of the Pourashava and the Sub-project

Kaliakair Municipality, having land area 27.28 $sq.km$ is located in between 24'05' North and 90'10' East latitudes It is bounded by Sreefaltali and Mouchak Union Parishad on the north, Atabah Union Parishad on the south, Mouchak Union Parishad on the east, Sreefaltali Union Parishad on the west. Total population is 7,00,000 of which male 3,13,416 & female 2,86,585; Muslim 231672, Hindu 34306, Buddhist 910, Christian 30 and others 85. Main rivers: turag, bangshi, Salda; Boali, Hawla, Ujan and Markaj beels and Goala and Betjuri canals are notable. Kaliakair Thana was formed in 1923 and it was turned into an upazila' on 2 July 1983. Kaliakair municipality was formed in 2001.



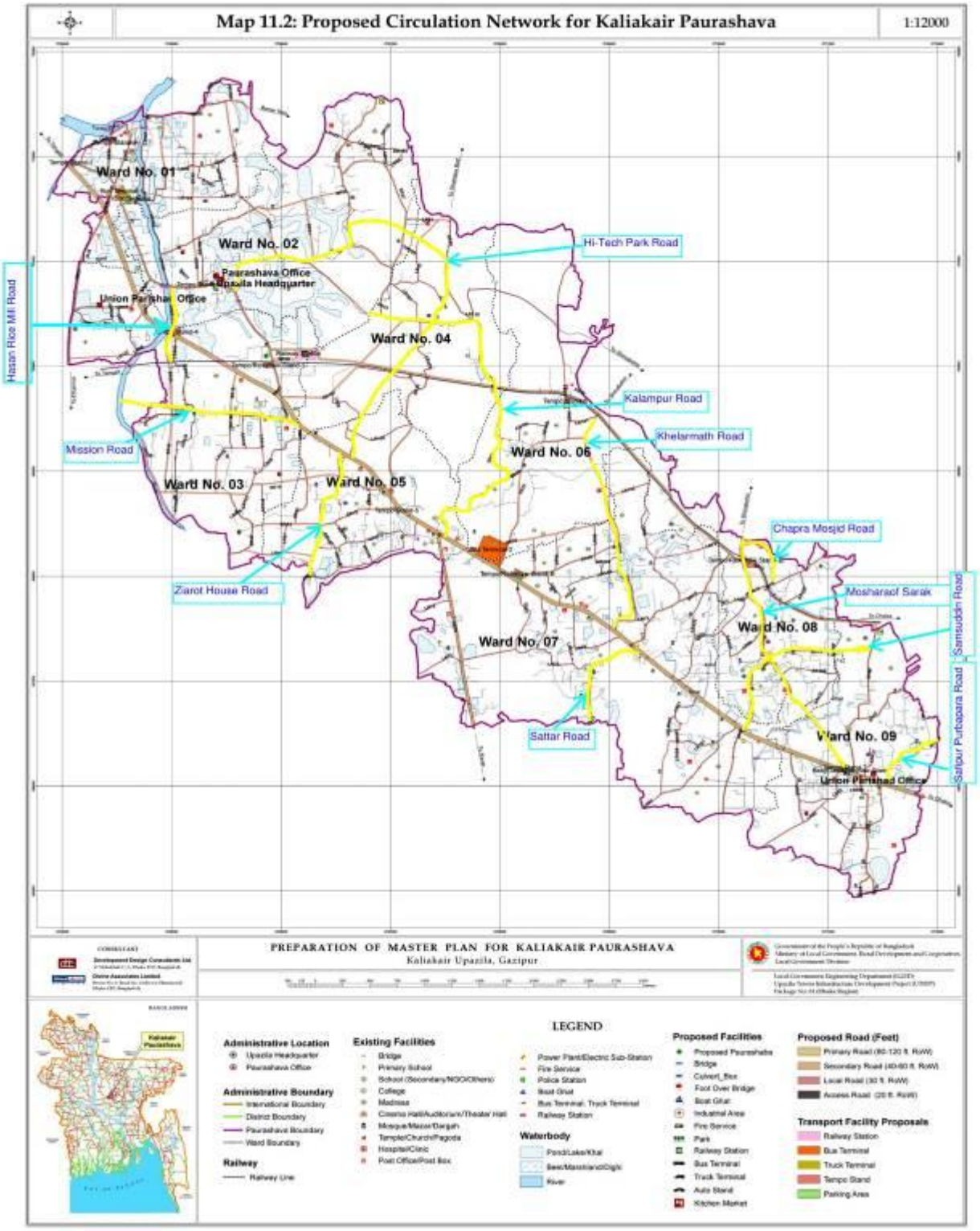
Map 1: Location map of Kaliakair District

Archaeological heritage and relics are Shiddhimadhav Sakashwar Buddhist Pillar, remnants of historical relics and Kotamoni Dighi of' Dholsamudra, Chandra Mosque at Mouchak. Kaliakair

has become independent at 13th December 1971. The literacy rate is average Average literacy 48.4%; male 54.9%, female 41.5%. Educational institutions: college 6, secondary school 35, primary school 115, madrasa 15. Noted educational institutions: Kaliakair Degree College (1968), Chapair BB High School (1910), Bhingoraj Talibabad Multilateral High School (1928), Kaliakair Baraibari AKU Institute and College (1949), Akkel Ali High School (1968), Ansar VDP High School (1985), Bhupenashari Girls'HighSchool. (Source: Population and Housing Census 2011)

Urbanization is considered to be closely and positively associated process with complex and mutually reinforcing links of the economic growth. In attaining and sustaining economic growth, it is essential to develop urban areas. The urban centers are the places of accumulation of economic activities, and the important hubs of production, processing, innovation and employment. The importance of urbanization with available urban facilities and services is growing day by day to meet the demand of growing population. Moreover, in the Kaliakair Pourashava, traffic volume is increasing day by day with the increase in population and vehicles. But, the narrow, substandard and damaged infrastructures cannot cope with the growing demand. Hence, planned development of road network and drainage system becomes essential to meet the emergent demand. Therefore, this sub-project will directly contribute to the economy, livelihood and social spheres of the citizen as well as to improve the overall environment of the Pourashava by constructing its infrastructures.

The Kaliakair Pourashava has implemented different development projects with the fund of Annual Development Programme allocated by the government and UGIIP. Recently, the Pourashava has prepared its Capital Investment Plan (CIP) for its infrastructural development following a participatory approach with the technical assistance from Bangladesh Municipal Development Fund (BMDF) and identified the “Improvement of Roads and drains” as the highest priority for meeting the long pending demand of roads and drains for water logged free movement. All the priority roads and drains of Kaliakair Pourashava have brought under one sub-projects. This sub-project is named as “Improvement of Roads and Drains (Sub-project-1)” and includes roads and drains located # 3, ward # 4, ward # 5, ward # 6, Ward # 7 and Ward # 8 of the Pourashava.



Map 3: Location map of proposed Roads and Drains under the sub-project

The Pourashava has already submitted an application for sub-credit to BMDF in order to the "Improvement of Roads and drains (Sub-Project-1)". The significant features of the sub-project are given in **Table 1-1** as below:

Table 1-1: The significant features of the proposed sub-project

Name of the Sub-Project	"Improvement of Roads and drains "(Sub-Project-1)".
Name of District	Gazipur
Name of ULB	Kaliakair Pourashava
Location of the Sub-project	The sub-project is located at 07 Wards (out of 09 Wards) of the Kaliakair Pourashava. The Wards are ward # 3, ward # 4, ward # 5, ward # 6, ward # 7, ward # 8 and ward # 9 of the Pourashava.
Service Areas	The sub-project will ultimately serve all the areas under the Pourashava. More specifically, the people living at ward # 3, ward # 4, ward # 5, ward # 6, ward # 7, ward # 8 and ward # 9 will frequently use the facilities.
Beneficiary Population	Primarily, all the people of the Pourashava will be benefitted. But, ultimately, all the people of the Gazipur district will be benefitted.
Tribal People	No tribal people are living in the sub-project influence areas.
Structural Design Option	Both RCC and BC road; and RCC drain at both sides and one side of the road based on the requirements.
Total length and width of drain	The total length of drains is 4490 m. The width of the drains varies from 1016 millimeters (mm) to 1320mm based on availability of land and requirements. The total length of roads is 5535 meters (m). The width of the road ranges from 3m to 5m based on availability of land and requirements.
Land Acquisition	Pourashava is the legal owner of lands.
Estimated Cost	BDT 75 millions
Sub-project Duration	15 months
Tentative Starting Date	February 2019
Tentative Completion Date	April 2020

1.2 Justification of Selecting the Sub-project

The proposed subproject has significant importance in internal and external communication of the citizen of the Pourashava as well as drainage of household and industrial waste water. The proposed roads under this subproject are mostly link roads and by lanes which are connected with

main roads of the Pourashava and hence, ultimately connected with Kaliakair-Tangail, Kaliakair-Savar and Kaliakair-Dhaka national highways. The proposed roads physically cover 6 Wards, out of 09 Wards, of the Pourashava but ultimately are being used by all inhabitants of all the Wards of the Pourashava. However, the condition of the roads is very bad having wearing surface, damaged WBM, pot holes, depressions, undulation and rubbish mixed pavements which make the inhabitants and vehicles very difficult to move from one place to another. This damaged condition of the roads causes frequent accident to the people by breaking parts and turning over the vehicles. The water logged situation on the roads during heavy rainfall at any season and especially during rainy season becomes ineffectual for the movement of vehicles and people and causes untold sufferings to the citizen particularly school going children and women, and hampers regular movement and transportation of official, drivers, traders and laborers. Thus, ultimately affect the regular income and livelihood of the citizens of the Pourshava. Therefore, the construction of proposed roads is crucially important for the Pourashava.

The drainage system of the Pourashava is very poor and there is limited number of storm drain within the Pourashava. The drains within the Pourashava, those are existing at present, are severely damaged and mostly nonfunctional. Thus, causing water logged in most of the areas of the Pourashava almost all the year round, and inhabitants of the Pourashava have been suffering a lot through intrusion of water into households even at this dry season. Bad smell and reproduction of mosquito fueled the sufferings of the citizen in manyfolds. Therefore, the construction of drains within the Pourashava is highly important. The proposed drains, beside the proposed roads, are connected or to be connected with households, offices and business establishments at one end and connected with main drains and ultimate different outfalls of the Pourashava at other end. Thus, ensure the run-off of storm water and reduce the suffering of the people of the Pourashava.

Further, the subproject has significant social and economic benefits to the community people. After completion, the road subproject will provide smooth pavement for the safe movement of inhabitants and vehicles which will reduce the risk of accidents. By constructing smooth road surface and footpath over the drain, it will provide better, easy and safe movement facilities for the travelers. On the contrary, new drains will minimize the drainage congestion and water logged problem. In addition, the proposed subproject will significantly enhance the business facilities and hence increase the income of the people, businessmen and industrialists. It will also add the commercial and aesthetic value of the area. Therefore, considering the benefits that will derive, the subproject is selected for the implementation in Kalikair Pourashava.

1.3 Policy Legal and Administrative Framework

There are some environmental laws and regulations under the environmental legal framework of Bangladesh for environmental protection and natural resources conservation. In addition, there are also some safeguard policies of World Bank to prevent and mitigate undue harm to people and their environment in the development process. All the sub-projects to be prepared and implemented under the BMDF should be in compliance with these environmental laws and policies of Bangladesh and World Bank. The proposed sub-project will also be prepared and implemented

in compliance with these laws and policies. The environmental laws and regulations of Bangladesh and the safeguard policies those are applicable to this sub-project are given as below:

National Environmental Laws and Regulations:

- National Environmental Policy 1992
- Bangladesh Environmental Conservation Act (ECA) 1995 amended 2002
- Environmental Conservation Rules (ECR) 1997 amended 2003
- National Land-use Policy 2001
- Bangladesh Labor Action 2006
- Bangladesh National Building Code

World Bank Safeguard Policies:

- OP/BP 4.01 Environmental Assessment
- OP/BP 4.04 Natural Habitats
- OP/BP 4.11 Physical Cultural Resources

Now, as per the environmental management framework of BMDF, it is required to conduct an environmental assessment of the proposed reconstruction of roads and drains sub-project in accordance with the legal regulatory framework of the Government of Bangladesh and World Bank policies. Therefore, the Kaliakair Pourashava has deployed an individual consultant to carry out the environmental impact assessment of the proposed road and drain as a sub-project.

2. OBJECTIVE AND METHODOLOGY

2.1. Objective of the Study

The general objective of the study is to determine the major environmental impacts that might be happened due to the implementation of the proposed sub-project and to recommend possible mitigation measures to avoid or reduce identified adverse environmental impacts and to enhance positive impacts. The specific objectives include:

- Existing environmental condition at the sub-project areas for environmental components viz. air, noise, water, land, soil, biological and socio-economic aspects;
- Prediction and evaluation of positive and negative impacts that may result from the proposed sub-project;
- Consideration of alternatives;
- Undertaking public consultation and disclosure of project-related information;
- Grievance redress mechanism;
- Formulation of an environmental management plan (EMP) to eliminate or minimize the adverse impacts of the project on the surrounding environment and affected communities;

- Preparing occupational health and safety to minimize any accident or emergency situation;
- Proposing plans for the post project monitoring, ongoing consultation and disclosure, EMP implementation, and institutional arrangement/organizational arrangement; and
- Suggestion and recommendation for abatement/mitigation/management measures to ensure environmental, biological, health and social compatibilities and also to comply with the National Environmental legal requirements and national Environmental Quality standards.

2.2. Scope and Methodology of the Study

2.2.1. Scope of the study

This study includes different dimensions of environmental issues those need to be considered at different stages of selecting, implementing, and operating the sub-project following the environmental policies of Government of Bangladesh and World Bank. The study was conducted 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 was conducted in the month of May of the year 2018. The study covers the general environmental profile of the sub-project 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.

Addressing the environmental issues in this sub-project includes a series of tasks carried out by the study. The scope and methods of this Environmental Assessment includes:

- Baseline Survey data acquisition of the baseline both environmental and social to carry out the Environmental Assessment;
- Understanding the technical aspects of the proposed sub-project through gathering and analyzing primary and secondary data;
- Explore the present environment condition of sub-project influence areas through reconnaissance survey and in consultation with community people;
- Identification of potential environmental impacts and evaluating the consequences through using given environmental screening format;
- Categorize the pollutions that may come out during pre-construction, construction and operation phases at sub-project site and surrounding areas through key informant interview and field observation;

- Discuss with the people living in the sub-project area about the mitigation measures suggested to avert the negative environmental impacts and to enhance the positive environmental impacts through stakeholders' consultations and general public consultation; and
- Assess the institutional aspects, and develop Environmental Management and Monitoring Plan for the sub-project in consultation with Mayor and other PIU members, and based on the findings of the study.

2.2.2. Methods of the study

The study is qualitative in nature and different qualitative methods are used to gather information. Both primary and secondary information are collected, analyzed and used to fulfill the requirements of the study. The primary information is collected following qualitative technique as given below:

- Consultation with stakeholders and community people;
- Focus Group Discussion; and
- Field visit and observation.

Consultation with stakeholders and community people: Consultative meeting with different stakeholders such as Ward Councilors, shop keepers, civil society members, representatives of business men, representative of association of bus, auto rickshaw and truck etc., community leaders and representative of community people is done to exercise the environmental screening using prescribed form of BMDF and filled in the screening form as per their information and opinion. Before starting the screening exercise, the participants are informed about the details of the project information and the way of implementing the sub-project.

Focus group discussion: Two focus group discussion (FGD) sessions are organized separately with male community participants and female community participants, mainly the people who are residing and running business adjacent to the proposed sub-project and using the roads and drains regularly to know their attitudes towards the proposed sub-project, its potential impact and their feedback, and suggestions on mitigating the potential negative impacts and enhancing the positive impacts of the sub-project.

Field visit and observation: Field visit and observation of different environmental features are done by the consultant to understand the overall environmental situation of the sub-project areas and the potential impacts of the sub-project on it during pre-construction, construction and operational stages.

In addition, some quantitative information is collected from secondary sources to complement the qualitative information. The secondary information is collected by reviewing national, district and Pourashava level documents and different websites.

3. SUB-PROJECT DESCRIPTION

3.1. Name of the Sub-project

The name of the sub-project is “Construction of Roads and Drains (SP-1)”

3.2. Brief Description of the Sub-project

The proposed sub-project will be consisted of both RCC and BC roads and RCC drains. The sub-project is consisted 3 roads and 8 drains. The total estimated length of the roads and drains are 4,490 m and 5535 m respectively. The width of the roads will be varied from road to road based on the requirements and availability of the land and will be ranged from 3m to 5m. The width of the drain will also be varied based on requirements and will be ranged from 1016 mm to 1320 mm. The drains will be constructed along both proposed and existing roads at one or both sides of the roads depending on site condition and to meet the design criteria. The drains will be covered by concrete slabs and it will be used as footpath. The concrete slab will also protect the drains from unwanted throwing of solid waste from households, commercial settings and administrative offices. Hence, will reduce the chance of being blocked and remain the drain functional to run off the storm water and grey water. The subgrade and base courses of the existing road will be rebuilt on some roads and as well as for the road widening work, whereas elsewhere new materials will be placed on top of the existing roadway and extension portions. The height of some roads and drains will also be raised to ensure the proper drainage system of the Pourashava.

The proposed roads and drains under this sub-project are distributed among the The Wards are ward # 3, ward # 4, ward # 5, ward # 6, ward # 7, ward # 8 and ward # 9 of the Pourashava. These areas consist of mixed land use pattern of commercial, industrial, administrative and residential area of the Pourashava. Various commercial, industrial, social, administrative and residential areas are established at the both sides of the road. Hence, the condition of the proposed drains is very poor. Due to the damaged condition of the drains, about 55% of the Poura area becomes water logged during rainy season and water logged situation persist at about 30%-40% of Poura area even in dry season. A short brief of proposed roads and drains is given in **Table 3-1** as below:

Road:

SL. No.	Name of Scheme	Length (m)	Estimated cost BDT- mill.
1	R1: Improvement of Kalampur road starting from Chandra Tri More to Hi-tech Park by RCC & DBC (Ch 0+000-3+110 km)	3110	36.841
2	R2: Improvement of Shapra Mosjid Road by RCC & DBC (Ch 0+000-0+620 km) & link road 0-300m (Effective length =920m)	920	8.543
3	R4: Improvement of Malek Spinning Mill Road by RCC (Ch 0+0.00-0+715 km)	715	10.408
	(A) Sub Total	4745	55.792

Drain:

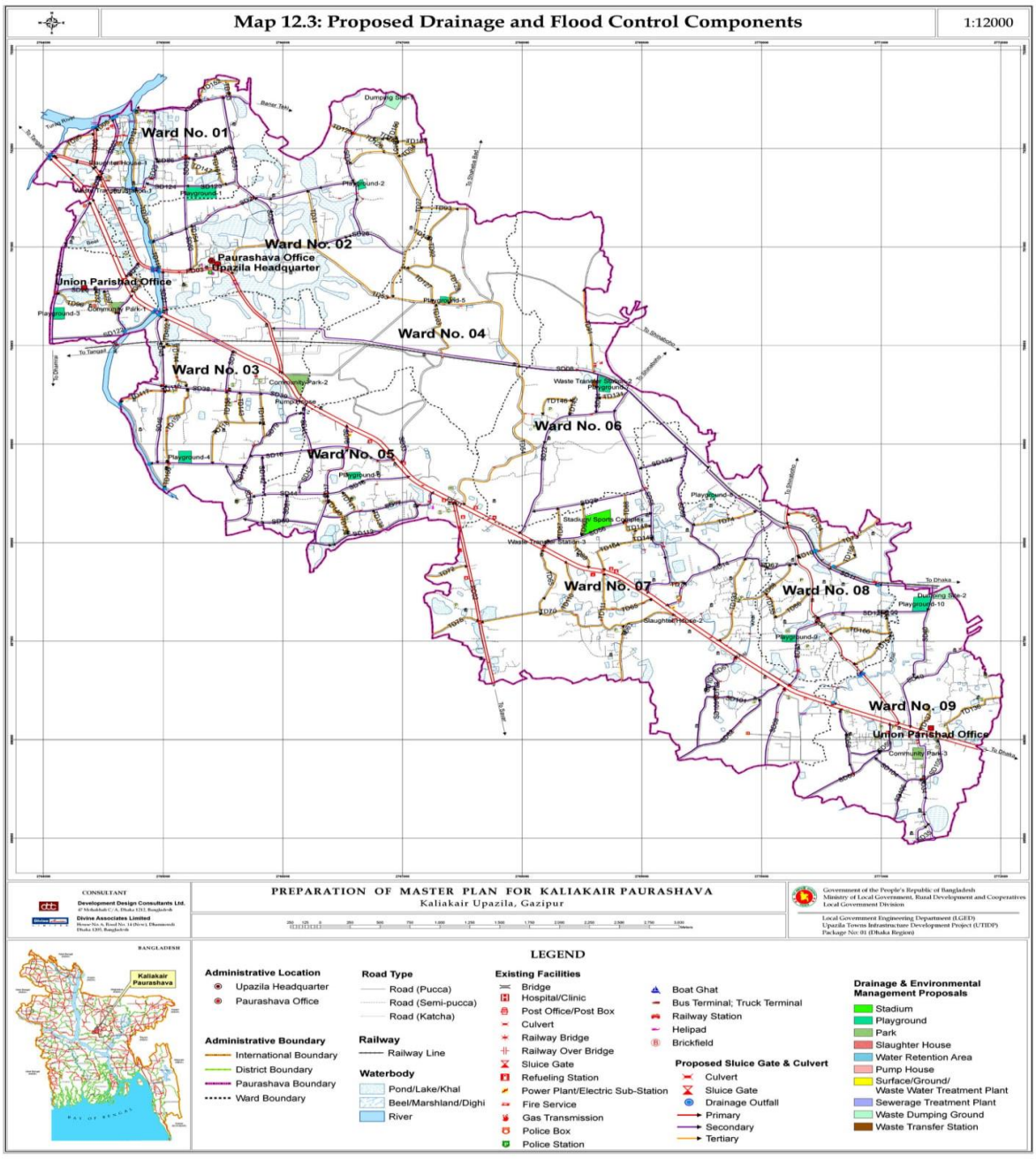
SL. No.	Name of *Table-4.3: Sub-project details (Drain Part)*Scheme	Length (m)	Estimated cost Mill BDT
1	D-1: construction of Malek Spinning Mill road side drain (Ch. 0+0.00-0+715 km)	715	9.098
2	D-2: Construction of RCC drain from Shofipur Bazar to IBN Shina Bridge (Ch. 0+0.00 to 0+500 km)	500	4.933
3	D-3 Construction of RCC Drain starting from Ibn Sinha Bridge to board mill (Ch. 0+0.00-1+820.00)	1820	23.998
4	D-4: Construction of Allaher dan collony road side drain (Ch 0+0.00 to 0+700.00)	700	7.228
5	D-5: Construction of Aziz Garments road side drain (Ch 0+0.00 to 0+700.00)	700	6.590
6	D-7: Construction of Haisa House road side drain (Ch 0+0.00 to 0+500.00)	500	5.020
7	D-8: Construction of Babul Sarker Mosque road side drain (Ch 0+0.00 to 0+500.00)	500	4.872
		5435	61.744

The proposed roads and drains under this sub-project will be constructed on the right-of-way of the existing roads and drains which are owned by the Pourashava. But, the proposed drains will be wider than the existing width and drains. However, acquisition of land will not be required as there are required space for widening drains. Hence, there is no need of removing any structures and earth filling to prepare the site for the construction.

3.3. Location of the Sub-project

The proposed roads and drains are located at the different parts of 07 Wards (out of 09 Wards) of the Kaliakair Pourashava. The Wards are ward # 3, ward # 4, ward # 5, ward # 6, ward # 7, ward # 8 and ward # 9. The location of drains among these Wards is given in **Table 3-2** for as below:

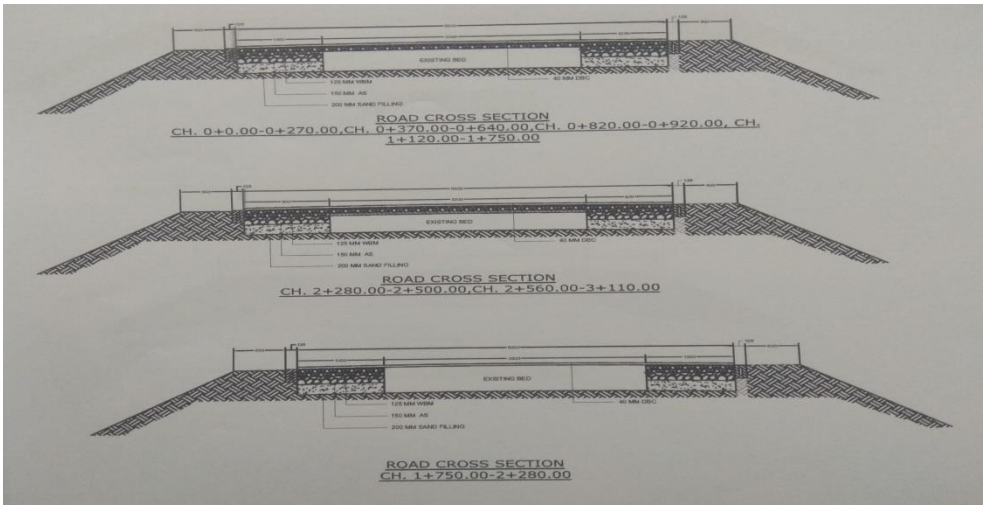
The location map of the proposed Roads and Drains is given as below:



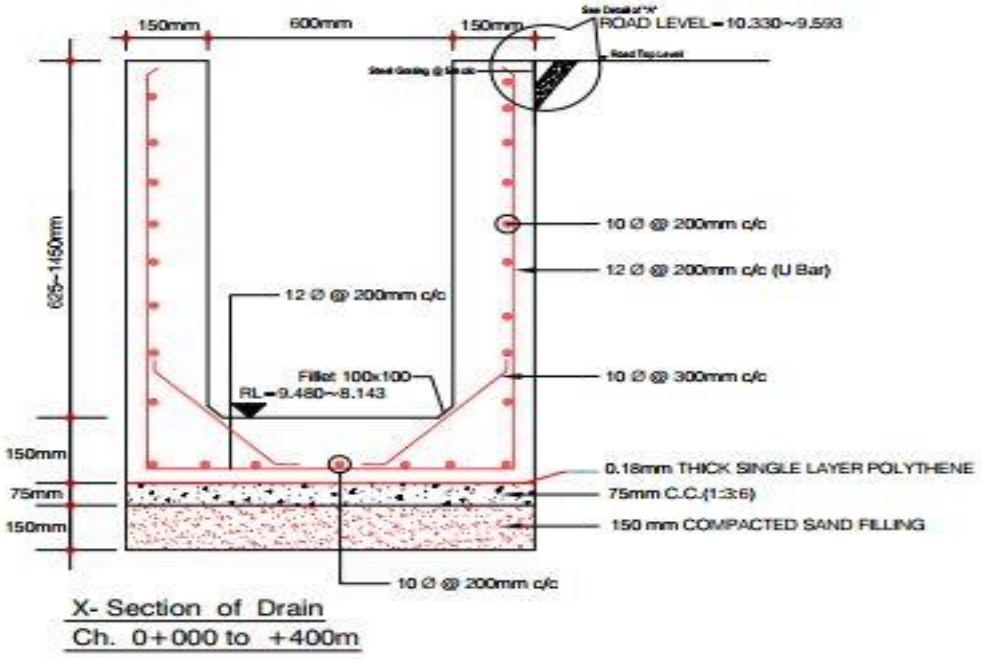
Map 3: **Location map of proposed Roads and Drains under the sub-project**

3.4. Layout of the Sub-project

The layout cross section drawing of proposed RCC road and drain is given as below:



Cross section of RCC road



Cross section of RCC drain

3.5. Ownership of the Sub-Project Land

The Kaliakair Pourashava is the legal owner of the land where the proposed roads and drains will be constructed. The proposed drains will be constructed at the right-of-way of the existing roads.

3.6. Present Condition of the Proposed Roads and Drains

All the roads those are proposed under this subproject are bituminous carpeting (BC) road. There are also few roads those have partial Katcha roads in addition to the BC roads. Under this subproject, all the roads will be reconstructed as BC road. The existing condition of the proposed roads is too bad. For about 10 years, no maintenance work is done on these roads. As a result, BC of the most of the roads is severely damaged. In some cases, no BC is found on roads. Due to long time use by the both light and heavy vehicles, the existing BC roads are severely damaged having damaged WBM, cracks, pot holes, broken edge, undulation and depressions. Waterlogged situation with bad smell and melted earth are found all along the CIP of road # R1, R2 and R3 during the field observation. The existing condition of specific roads is shown in **Table 3-3** which is given as below. In addition, **Figure 1, Figure 2, Figure 3,** show the present condition of the roads.

Further, the most of the drains those are proposed under this sub-project are brick drain and katcha drain. There are also few RCC drains. In addition, there are some drains having both brick drain and katcha drain. Now, under this sub-project, all the drains will be constructed as RCC drain. The existing condition of the proposed drains is very poor. All the drains are damaged having broken brick drains and filled in katcha drain resulting over flow of roads with long time water logged of the areas, bad smells with environmental pollution and breading space of mosquitos. Further, the final outfalls of the drains i.e. different sections of Turag River are highly polluted and have comparatively high river bed than the normal land area of the Pourashava. Thus it is causing low speed of water flow through the drains. Sometimes, back flow of water through the drains is also happening in these areas during the rainy season. The existing condition of specific drains is shown in **Table 3-3** and **Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, Figure 10, Figure 11** show the present condition which is given as below.

Fig-1: Kalampur road

Fig-2: Chapra Moshjid Road

Fig-3: Hasan Rice Mill Road

Fig-4: Drain beside Malik Spinning mill

Fig-5: Safipur Bazar drain

Fig-6: Ibne Sina bridge drain

Fig-7: Allahr Dan colony drain

Fig-8: Aziz Garments road side drain

Fig-9: Bhanga Mosjid drain

Fig-10: Haisa House road side drain

Fig-11: Babul Sarker Mosque road side drain

Table 3-3: Existing condition of proposed Roads and drains

Table 1-5: Existing condition of proposed roads and drains

CIP #	Name of Scheme	Effective length (m)	Existing condition of roads and drains
A. Roads			
R1	Improvement of Kalampur road starting from Chandra Tri morh to High-Tech Park Road	3110	Brick Soling are totally damaged , water logged, undulation and some portion constructed by RCC is good.
R2	Improvement of Chapra Moshjid Road	920	BC road having damaged WBM, water logged, undulation and partly katcha road.
R3	Improvement of Hasan Rice Mill Road	460	BC road having damaged WBM, water logged and undulation.
Total length of roads		**4490 m**	

B. Drains			
D1	Construction of Drain beside Malik Sppining mill road	715	300 mm
D2	Construction of Drain beside Safipur Bazar to Ibne Sina Bridge	500	No drain exist
D3	Construction of Drain Ibne Sina bridge to Bord Mill	1820	450 mm
D4	Construction of Allahr Dan colony road side drain	500	No drain exist
D5	Construction of Aziz Garments road side drain	500	No drain exist
D6	Construction of Bhanga Mosjid (Jora Pump) road side drain	500	300 mm
D7	Construction of Haisa House road side drain	500	No drain exist
D8	Construction of Babul Sarker Mosque road side drain	500	No drain exist
Total length of drains		**5535 m**	

3.7. Key Activities of the Sub-project and Implementation Process

3.7.1. The major activities to be carried out during preconstruction phase

General activities to be carried out during preconstruction phase include:

- Construction of semi-pucca site office;
- Construction of separate laber shed with latrine facilities for male and female;
- Construction of temporary fence around the labor shed and stockyard; and
- Construction of pucca platform for stocking construction materials

The major activities to be carried out during preconstruction phase of **BC roads** include:

- Site cleaning and grabbing works; and
- Alignment setting;

The major activities to be carried out during preconstruction phase of **RCC roads** include:

- Site cleaning and grabbing works; and
- Alignment setting;

The major activities to be carried out during preconstruction phase of **RCC drains** include:

- Site cleaning and grabbing works;
- Alignment setting; and
- Bollah palisading, if required.

3.7.2. The major activities to be carried out during construction phase

The major activities to be carried out during the construction phase of **BC roads** include:

- Box cutting, loosing, leveling and compacting;
- Sand filling on the existing road bed and on the extended portions at the both sides with compaction for improved subgrade;
- Brick end edging;
- Aggregate and sand filling with compaction;
- Water bound macadam for base coarse;
- Spraying lime coat;
- Laying bituminous carpeting with compaction for surface wearing; and
- Spreading bituminous and coarse sand for seal coating.

The major activities to be carried out during the construction phase of **RCC roads** include:

- Box cutting, loosing, leveling and compacting;
- Sand filling on the existing road bed and on the extended portions at the both sides with compaction for improved subgrade;
- Laying polythene sheets;
- CC casting of concrete sub base; and
- RCC casting including brick wall of both sides.

The major activities to be carried out during the construction phase of **RCC drains** include:

- Earth cutting with proper slope;
- Sand filling with compaction;
- Brick flat soling;
- Laying cement concrete;
- Laying polythene sheet;

- Fabrication of reinforcement;
- Construction of RCC for base drain and compaction;
- Construction of vertical wall of drain with weep hole and compaction;
- Construction of cover slab to be used for footpath; and
- Side sand filling with compaction.

3.7.3. The major activities to be carried out during operational phase

The major activities to be carried out during operational phase of the **BC roads** include:

- Road cleaning;
- Pot hole and depression repairing; and
- Shoulder repairing, if any.

The major activities to be carried out during operational phase of the **RCC roads** include:

- Road cleaning;
- Pot hole and depression repairing; and
- Shoulder repairing, if any.

The major activities to be carried out during operational phase of the **RCC drains** include:

- Drain cleaning and maintenance.

3.8. Category of the Sub-project

Environmental Screening (ES) for the BC roads and RCC drains has been conducted with the purpose of fulfilling the requirements of Government of Bangladesh (GOB) and the World Bank (WB). Environmental Screening ensures that environmental issues are properly identified in terms of extent of negative and positive impacts. Environmental Screening Checklist, as adopted in Appendix C of the Environmental Management Framework (EMF) of the MGSP, was administered for identifying the impacts and their extents.

- According to ECR 1997: Green □ Orange A □ **Orange B** □ √ Red □ Not Listed □
- According to WB classification: **Category B** □ √ Category C □

Considering the potential environmental impacts, primarily RCC and RC roads and RCC drains can be considered as **Orange B** as per ECR-97. According to the WB classification, it is of **Category B**.

3.9. Analysis of Alternatives

The analysis of alternatives of the proposed sub-project is done with respect to site, 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 sub-project 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 of BC and RCC roads

This is a reconstruction subproject where the existing BC road will be improved by BC pavement or replaced by the new RCC pavement using the same alignment. Therefore, analysis of alternatives routes/ alignment is not really applicable here.

(ii) Analysis of alternative routes/alignments of RCC drain

The following three alignments those are given in **Table 3-4** as below can primarily be considered for alternative analysis.

Table 3-4: Analysis of alternative routes/alignments of RCC drain

Route/Alignment	Advantages	Disadvantages
Alternative 1: Both sides of the road	▪ Easier house connection ▪ Ease of construction without much disruption to traffic. ▪ Top of the drain can be used as footpath for pedestrians and hence, can reduce the risk of accidents and ensure safe movement.	▪ Two drainage lines need to be constructed ▪ It is 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 and in consultation with ULB Engineers, the both **Alternative 1 and Alternative 2 are** recommended.

(b) Analysis of Alternative Design

(i) Analysis of alternative design of Roads

For this subproject, alternative designs may include BC, CC and RCC roads. Through a comparative study considering the advantages and disadvantages of the BC, CC and RCC road, the consultant may examine which one is feasible. The general advantage and disadvantage of the BC, CC and RCC roads are shown in following **Table 3-5**.

Table 3-5: Analysis of alternative design of road

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: 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

Bituminous Carpeting road provides comparatively smooth surfaces which have more aesthetic value than rough surface that provided by RCC and CC road. The provision of the further expansion of the utility services for instance water supply line, gas line etc is also easier for BC road. However, from environmental and capacity point of view, RCC and CC road is more feasible and less prone to damage and requires low frequency of maintenance. Therefore, based on the require of the sites and considering the environmental and capacity value of RCC road, chance of damage, frequency of maintenance and as a whole to meet the Pourashava demands as industrial area, **Alternative 1: BC road** and **Alternative 3: RCC road** are recommended in consultation with the ULB Engineers.

(ii) Analysis of alternative design of RCC drain

For a RCC drain sub-project, alternative designs may include RCC drain, earthen drain and pipe drain. The following **Table 3-6** discusses the general advantages and disadvantages of RCC drain, earthen drain and pipe drain.

Table 3-6: Analysis of alternative design of RCC drain

Design Alternatives	Advantages	Disadvantages
Alternative 1: RCC drain	▪ Not prone to encroachment ▪ Area above RCC drain could be used as a part of road/footpath ▪ Comparatively durable ▪ Easier to maintenance	▪ 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 ▪ Comparatively less durable
Alternative 3: Pipe drain	▪ Require less time to construction ▪ Comparatively durable	▪ Maintenance is difficult

Considering the durability, ease of maintenance and scope of using the top of RCC drain, **Alternative 1: RCC drain** is recommended in consultation with ULB Engineers.

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

The method of the construction should be selected based on the available technologies in Bangladesh and with the assistance of the consultant and 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. From the field investigation, it is revealed that, the existing road width is not enough to use the mechanical excavator. Hence, it is recommended to use manual trenching work for these sites.

3.10. Estimated Cost of the Sub-project

The estimated cost of the proposed drains is BDT 75 million.

3.11. Schedule of Implementation

The proposed sub-project will be started on February 2019 and will be completed by the end of April 2020. Therefore, the sub-project will be implemented within a period of 15 months.

4. BASELINE ANALYSIS OF ENVIRONMENTAL CONDITION

4.1. Physicochemical Environment

4.1.1.Important environmental features

Important environmental features in influence areas (both sides of the proposed road and drain) were observed and documented through field investigation. The detail investigation and assessment were made on identified key environmental and infrastructural features at the both sides of the proposed road and drain and the investigation findings shows that there are trees, open lands, ditches, educational institutes, shops, industries, electric poles and markets. The land use pattern of the influence areas was also observed and found human settlement, offices, commercial establishments, industrial establishments, health care facilities, educational institutions, and water bodies as depicted in **Table 4-1** as below. As an essential ingredient, an engineering and topographical survey was done that may need to be adjusted minor during the construction phase.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
Name of Scheme Improvement of Kalampur road starting from Chandra Tri morh to High-Tech Park Road; **Effective Length**: 3110 m; **Road #:** R1			
0-100	√		House: 45; Shop: 07; Electric Pole: 08; Tree: 40; and Pond: 01.
		√	House: 35; Shop: 05; Electric Pole: 05; and Tree:26.
101-200	√		House: 35; Shop: 04; Electric Pole: 06; Tree: 25; and Pond: 01.
		√	House: 25; Shop: 02; Electric Pole: 04; Tree: 20; and Pond; 01.
201-300	√		House: 20; Shop: 02; Electric Pole: 04; and Tree: 09.
		√	House: 20; Shop: 02; Electric Pole: 04; Tree: 09; and Pond; 01.
301-400	√		House: 18; Shop: 05; Electric Pole: 02; Tree: 07; and Pond: 01.
		√	House: 22; Shop: 04; Electric Pole: 03; and Tree: 04.
401-500	√		House: 16; Shop: 02; Electric Pole: 02; Tree: 06; and Commercial Institution: 01.
		√	House: 27; Shop: 04; Electric Pole: 06; Tree: 08; and Pond; 02.
501-600	√		House: 22; Shop: 07; Electric Pole: 06; and Tree: 02.
		√	House: 19; Shop: 02; Electric Pole: 05; Tree: 02; and Pond; 02.
601-700	√		House: 16; Shop: 04; Electric Pole: 04; and Tree: 02.
		√	House: 22; Shop: 03; Electric Pole: 03; Tree: 02; and Business Institution: 01.
701-800	√		House: 05; Shop: 01; Electric Pole: 02; and Tree: 47.
		√	House: 09; Shop: 3; Electric Pole: 07; and Tree: 55.
801-900	√		House: 09; Shop: 02; Electric Pole: 02; and Tree: 36.
		√	House: 08; Shop: 02; Electric Pole: 02; and Tree: 45.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
901-1000	√		House: 03; Shop: 04; Tree: 042; Electric Pole: 03, and Commercial Institution: 01.
		√	House: 3; Shop: 02; Electric Pole: 04; and Tree: 54.
1001-1100	√		House : 07; Shop : 03;Tree: 33;Electric Pole: 03, School; 2
		√	House: 07; Shop: 05; Tree: 26; Electric Pole: 02; and Commercial Institution: 02.
1101-1200	√		House: 02; Shop: 05; Tree: 32; Electric Pole: 03; and Commercial Institution: 02.
		√	House: 12; Tree: 25; Shop: 03; and Electric Pole: 02.
1201-1300	√		House: 15; Tree: 31; Electric Pole: 05 and Commercial Institution: 02.
		√	House: 09; Shop: 43; Tree: 04; and Electric Pole: 02.
1301-1400	√		House: 20; Shop: 05; Tree: 30; and Electric Pole: 04.
		√	House: 22; Tree: 03; Electric Pole: 03; Tree: 09; and Commercial Institution: 01.
1401-1500	√		House: 16; Shop: 02; Tree: 12; and Electric Pole: 05.
		√	House: 25; Shop: 04; Electric Pole: 02; Tree: 11; and Pond; 02.
1501-1600	√		House: 06; Shop: 01; Tree: 15; and Electric Pole: 02.
		√	House: 09; Shop: 02; Electric Pole: 02; Tree: 24; and Commercial Institution: 01.
1601-1700	√		House: 12; Electric pole: 04; Tree: 16; and Shop: 01.
		√	House: 09; Tree: 12; Electric pole: 02; and Shop: 03.
1701-1800	√		House: 09; Tree: 15; and Electric pole: 02.
		√	House: 10; Tree: 18; Electric pole: 02; Shop: 04; and Ditch: 01.
1801-1950	√		House: 12; Tree: 20; Electric pole: 04; Shop: 02; and Ditch:01.
		√	House: 12; Tree: 15; Electric pole: 03; and Shop: 01.
1951-2100	√		House: 06; Tree: 17; Electric pole: 04; and Shop: 02.
		√	House: 08; Tree: 11; Electric pole: 03; and Shop: 02.
2101-2250	√		House: 09; Tree: 08; Electric pole: 03; and Ditch: 02.
		√	House: 05; Tree: 07; and Shop: 01.
2251-2400	√		House: 11; Tree: 06; Electric pole: 05; and Ditch: 01.
		√	House: 04; and Tree: 16.
2401-2550	√		House: 14; Tree: 14; Shop: 01; and Electric pole: 04.
		√	House: 03; and Tree: 15.
2551-2735	√		House: 08; Tree: 16; and Electric pole: 04.
		√	House: 04; and Tree: 18.
2736-2900	√		House: 14; Tree: 09; Electric pole: 01; and Shop: 08.
		√	Electric pole: 04; and Kaliakair Edward College.
2901-3000	√		House: 16; Tree: 11; Electric pole: 01; and Shop: 01.
		√	House: 08; Tree: 16; and Electric pole: 04.
3001-3110	√		House: 11; Tree: 06; Electric pole: 05; and Ditch: 01.
		√	House: 05; Electric pole: 01; Tree: 03; Shop: 03; and Mosque: 01.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
Name of Scheme: Improvement of Chapra Moshjid Road; **Effective Length**: 920 m; **Road #:** R2			
0-100	√		Shop: 03; Electric pole: 06; House: 03;; Temple
		√	House: 03; Shop: 3; Electric Pole: 06, School: 01; and Temple: 01
101-200	√		House: 05; Shop: 02; and Electric pole: 03.
		√	House: 05; Shop: 2; and Electric Pole: 03.
201-300	√		House: 09; Shop: 02; Electric Pole: 02; and Tree: 36.
		√	House: 08; Shop: 02; Electric Pole: 02; and Tree: 45.
301-400	√		House: 45; Shop: 07; Electric Pole: 08; Tree: 40; and Pond: 01.
		√	House: 35; Shop: 05; Electric Pole: 05; and Tree:26.
401-500	√		House: 35; Shop: 04; Electric Pole: 06; Tree: 25; and Pond: 01.
		√	House: 25; Shop: 02; Electric Pole: 04; Tree: 20; and Pond; 01.
501-600	√		House: 20; Shop: 02; Electric Pole: 04; and Tree: 09.
		√	House: 20; Shop: 02; Electric Pole: 04; Tree: 09; and Pond; 01.
601-700	√		House: 18; Shop: 05; Electric Pole: 02; Tree: 07; and Pond: 01.
		√	House: 22; Shop: 04; Electric Pole: 03; and Tree: 04.
701-800	√		House: 16; Shop: 02; Electric Pole: 02; Tree: 06; and Commercial Institution: 01.
		√	House: 27; Shop: 04; Electric Pole: 06; Tree: 08; and Pond; 02.
801-920	√		House: 22; Shop: 07; Electric Pole: 06; and Tree: 02.
		√	House: 19; Shop: 02; Electric Pole: 05; Tree: 02; and Pond; 02.
Name of Scheme: Improvement of Hasan Rice Mill Road; **Effective Length**: 460 m; **Road #:** R3			
0-100	√		House: 16; Shop: 04; Electric Pole: 04; and Tree: 02.
		√	House: 22; Shop: 03; Electric Pole: 03; Tree: 02; and Business Institution: 01.
101-200	√		House: 05; Shop: 01; Electric Pole: 02; and Tree: 47.
		√	House: 09; Shop: 3; Electric Pole: 07; and Tree: 55.
201-300	√		House: 09; Shop: 02; Electric Pole: 02; and Tree: 36.
		√	House: 08; Shop: 02; Electric Pole: 02; and Tree: 45.
301-400	√		House: 03; Shop: 04; Tree: 042; Electric Pole: 03, and Commercial Institution: 01.
		√	House: 3; Shop: 02; Electric Pole: 04; and Tree: 54.
401-460	√		House : 07; Shop : 03;Tree: 33;Electric Pole: 03, School; 2
		√	House: 07; Shop: 05; Tree: 26; Electric Pole: 02;
		√	House: 05; Tree: 07; and Shop: 01.
Chainage (m)	**Left side**	**Right side**	**Key environmental and infrastructural features**
Name of Scheme:			

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
Construction of Drain beside Malik Sppining mill road. **Effective length: 715 m** **Drain #:** D1			
0-100	√		House: 26; Shop: 05; Tree: 15; and Electric Pole: 05.
		√	House: 32; Shop: 04; Electric Pole: 07; and Tree: 11.
101-200	√		House: 20; Shop: 02; Tree: 06; and Electric Pole: 02.
		√	House: 16; Shop: 01; Electric Pole: 05; and Tree: 08.
201-300	√		House: 32; Shop: 02; Electric Pole: 05; and Tree: 12.
		√	House: 26; Shop: 04; Electric Pole: 07; and Tree: 15.
301-400	√		House : 30; Shop : 02; Electric Pole:04; Tree: 16; and Pond; 04
		√	House: 29; Shop: 02; Electric Pole: 06; Tree: 10; and Pond: 02.
401-500	√		House: 40; Shop: 09; Electric Pole: 06; Tree: 22; Pond; 05; and Commercial Institution: 02.
		√	House: 44; Shop: 05; Electric Pole: 09; Tree: 25; and Pond: 02.
501-600	√		House: 50; Shop: 08; Electric Pole: 06; Tree: 30; and Pond; 02.
		√	House: 37; Shop: 04; Electric Pole: 04; Tree: 32; and Pond: 01.
601-715	√		House: 30; Shop: 05; Electric Pole: 04; Tree: 22; and Pond; 02.
		√	House: 45; Shop: 05; Electric Pole: 06; and Tree: 24.
		√	House: 28; Shop: 01; Electric Pole: 04; pond: 02; and School: 01.
Name of Scheme: Construction of Drain beside Safipur Bazar to Ibne Sina Bridge; **Effective length:** 500m; **Drain #:** D2			
0-100	√		House: 45; Shop: 07; Electric Pole: 08; Tree: 40; and Pond: 01.
		√	House: 35; Shop: 05; Electric Pole: 05; and Tree:26.
101-200	√		House: 35; Shop: 04; Electric Pole: 06; Tree: 25; and Pond: 01.
		√	House: 25; Shop: 02; Electric Pole: 04; Tree: 20; and Pond; 01.
201-300	√		House: 20; Shop: 02; Electric Pole: 04; and Tree: 09.
		√	House: 20; Shop: 02; Electric Pole: 04; Tree: 09; and Pond; 01.
301-400	√		House: 18; Shop: 05; Electric Pole: 02; Tree: 07; and Pond: 01.
		√	House: 22; Shop: 04; Electric Pole: 03; and Tree: 04.
401-500	√		House: 16; Shop: 02; Electric Pole: 02; Tree: 06; and Commercial Institution: 01.
		√	House: 27; Shop: 04; Electric Pole: 06; Tree: 08; and Pond; 02.
Name of Scheme: Construction of Drain Ibne Sina bridge to Bord Mill; **Effective length:** 1820m; **Drain #:** D3			
0-100	√		House: 12; Electric pole: 04; Tree: 06; and Shop: 01.
		√	House: 09; Tree: 12; Electric pole: 02; and Shop: 03.
101-200	√		House: 09; Tree: 05; and Electric pole: 02.
		√	House: 10; Tree: 08; Electric pole: 02; Shop: 04; and Ditch: 01.
201-300	√		House: 12; Tree: 10; Electric pole: 04; Shop: 02; and Ditch:01.
		√	House: 12; Tree: 10; Electric pole: 03; and Shop: 01.
301-400	√		House: 06; Tree: 07; Electric pole: 04; and Shop: 02.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
		√	House: 08; Tree: 10; Electric pole: 03; and Shop: 02.
401-500	√		House: 09; Tree: 08; Electric pole: 03; and Ditch: 02.
		√	House: 05; Tree: 07; and Shop: 01.
501-600	√		House: 11; Tree: 06; Electric pole: 05; and Ditch: 01.
		√	House: 04; and Tree: 06.
601-700	√		House: 14; Tree: 04; Shop: 01; and Electric pole: 04.
		√	House: 03; and Tree: 05.
701-800	√		House: 08; Tree: 06; and Electric pole: 04.
		√	House: 04; and Tree: 08.
801-875	√		House: 07; Tree: 05; Shop: 04; and Electric pole: 05.
		√	House: 04; Tree: 09; Electric pole: 03; and Shop: 03.
801-900	√		House: 04; Tree: 09; Electric pole: 01; and Shop: 08.
		√	Shop: 03; House: 03; Electric pole: 02; and Link road: 01.
901-1000	√		Market: 01; School: 01; and Electric pole: 03.
		√	Shop: 06; House: 03; and Electric pole: 02.
1001-1100	√		Shop: 06; Shop: 02; and Electric pole: 03.
		√	Shop: 03; House: 03; Electric pole: 02; and Link road: 01.
1101-1200	√		Market: 01; School: 01; and Electric pole: 03.
		√	Shop: 06; House: 03; and Electric pole: 02.
1201-1300	√		Shop: 03; Electric pole: 06; House: 03; Selim Najir Higher Secondary School; Temple: 01; Voluntary Organization.
		√	House: 03; Shop: 3; Electric Pole: 06, School: 01; and Temple: 01
1301-1400	√		House: 05; Shop: 02; and Electric pole: 03.
		√	House: 05; Shop: 2; and Electric Pole: 03.
1401-1500	√		House: 03; Electric pole: 04; By Lane: 01; Dustbin: 01; Shop: 02.
		√	House: 03; Shop: 2; Electric Pole: 04, By lane road: 01; and Dustbin: 01.
1501-1600	√		House: 05; Electric pole: 03; Culvert: 02; By Lane: 01; Shahid Ahmed Rafiq Girls School; and Dustbin: 02.
		√	House: 05; Electric Pole: 02; Culvert: 2; Dustbin: 02, School: 01; and By lane road: 01.
1601-1700	√		House: 06; Shop: 01; Tree: 02; and Electric Pole: 03.
		√	House: 5; Shop: 04; Electric Pole: 01; and Open Field: 01.
1701-1820	√		House: 07; Tree: 09; and Electric Pole: 04.
		√	House: 06; Shop: 01; and Tree: 07.
Name of Scheme: Construction of Allahr Dan colony road side drain; **Effective length:** 500m; **Drain #:** D4			
0-100	√		House: 09; Shop: 24; and Electric Pole: 02.
		√	House: 08; Shop: 31; Tree: 04; and Electric Pole: 02.
101-200	√		Shop: 15.
		√	House: 08; Shop: 15; and Electric Pole: 01.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
201-300	√		House: 03; Shop: 22; and Electric Pole: 01.
		√	House: 05; Shop: 21; and Electric Pole:01.
301-400	√		House: 05; Shop: 12; and Electric Pole: 02.
		√	House: 04; and Shop: 32.
401-400	√		Shop: 06; and Electric Pole: 03.
		√	House: 06; and Shop: 10.
401-500	√		House: 18; Shop: 05; Electric Pole: 02; Tree: 07; and Pond: 01.
		√	House: 22; Shop: 04; Electric Pole: 03; and Tree: 04.
Name of Scheme: Construction of Aziz Garments road side drain; **Effective length:** 500m; **Drain #:** D5			
0-100	√		Tree: 03; Shop: 2; Electric Pole: 04; Culvert: 1; district Library: 01; and Vacant Space: 02.
		√	Tree: 03; Market: 01; Electric Pole: 03; Culvert: 1; and Free space: 03.
101-200	√		House: 03; Electric Pole: 01; Free space: 01, Tree: 4; Workshops: 01, and By lane road: 01.
		√	House: 03; Electric Pole: 03; shop: 03; Free space: 1; and Tree: 03.
201-300	√		House: 05; Shop: 02; Tree: 2; By lane road: 01; Mosque: 01, and Business Institute: 01.
		√	House: 03; Electric Pole: 03; shop: 02; Free space: 1; and Tree: 02.
301-400	√		Shop: 01; Electric Pole: 02; Station Area: 01; and Rail Crossing: 01.
		√	House: 01; Electric Pole: 04; Free space: 1;.
401-500	√		House : 04; Vacant Space: 01, Tree: 5; and Workshop: 01
		√	Market: 02; Free space: 3; House: 02; Culvert: 1; and Shops: 02.
Name of Scheme: Construction of Bhanga Mosjid (Jora Pump) road side drain; **Effective length:** 500m; and **Road #:** D6			
0-100	√		House: 05; Shop: 05; Tree: 09; and Electric pole: 02.
		√	House: 06; Shop: 05; Electric pole: 03; and Tree: 08.
101-200	√		House: 05; Shop: 01; Tree: 22; and Electric pole: 05.
		√	House: 06; Tree: 16; Grave: 01; and Clinic: 01.
201-300	√		House: 06, Shop: 05; Electric pole: 04; and Tree: 09.
		√	House: 06; Shop: 01; Industry: 01; Electric pole: 01; and Tree: 02.
301-400	√		Mosque: 01; Tree: 09; and Electric pole: 03.
		√	House: 06; Tree: 09; Electric pole: 01; and Shop: 01.
401-500	√		House : 30; Shop : 02; Electric Pole:04; Tree: 16; and Pond; 04
		√	House: 29; Shop: 02; Electric Pole: 06; Tree: 10; and Pond: 02.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
Chainage (m)	**Left side**	**Right side**	**Key environmental and infrastructural features**
Name of Scheme: Construction of Haisa House road side drain; **Effective length:** 500m; and **Road #:** D7			
0-100	√		House: 26; Shop: 05; Tree: 15; and Electric Pole: 05.
		√	House: 32; Shop: 04; Electric Pole: 07; and Tree: 11.
101-200	√		House: 20; Shop: 02; Tree: 06; and Electric Pole: 02.
		√	House: 16; Shop: 01; Electric Pole: 05; and Tree: 08.
201-300	√		House: 32; Shop: 02; Electric Pole: 05; and Tree: 12.
		√	House: 26; Shop: 04; Electric Pole: 07; and Tree: 15.
301-400	√		House : 30; Shop : 02; Electric Pole:04; Tree: 16; and Pond; 04
		√	House: 29; Shop: 02; Electric Pole: 06; Tree: 10; and Pond: 02.
401-500	√		House: 40; Shop: 09; Electric Pole: 06; Tree: 22; Pond; 05; and Commercial Institution: 02.
		√	House: 44; Shop: 05; Electric Pole: 09; Tree: 25; and Pond: 02.
Name of Scheme Construction of Babul Sarker Mosque road side drain; **Effective length:** 500m; and **Road #:** D8			
0-100	√		House: 45; Shop: 07; Electric Pole: 08; Tree: 40; and Pond: 01.
		√	House: 35; Shop: 05; Electric Pole: 05; and Tree:26.
101-200	√		House: 35; Shop: 04; Electric Pole: 06; Tree: 25; and Pond: 01.
		√	House: 25; Shop: 02; Electric Pole: 04; Tree: 20; and Pond; 01.
201-300	√		House: 20; Shop: 02; Electric Pole: 04; and Tree: 09.
		√	House: 20; Shop: 02; Electric Pole: 04; Tree: 09; and Pond; 01.
301-400	√		House: 18; Shop: 05; Electric Pole: 02; Tree: 07; and Pond: 01.
		√	House: 22; Shop: 04; Electric Pole: 03; and Tree: 04.
401-500	√		House: 16; Shop: 02; Electric Pole: 02; Tree: 06; and Commercial Institution: 01.

Table 4-1: List of Key Environmental and Infrastructural Features at the both sides of proposed roads and drains

Chainage (m)	Left side	Right side	Key environmental and infrastructural features
		√	House: 27; Shop: 04; Electric Pole: 06; Tree: 08; and Pond; 02.
		√	Electric pole: 03; Shop: 18; House: 03; and Tree: 04.
401-500	√		House: 08; Shop: 02; Electric Pole: 02; and Tree: 15.
		√	House: 05; Shop: 2; and Electric Pole: 03.

There are no such infrastructures and environmental features such as trees and water bodies beside the drains those need to be removed or cut down or filled with earth. Hence, the sub-project will have no impact on the land use pattern of the Pourashava.

4.1.2. Transportation facilities, road network and traffic volume

The Pourashava data 2018 reveals that the Kaliakair Pourashava area is served by 199.89 km of road network. Among the total length of road network, 70 km is BC road, 13 km is RCC road, 91 km is HBB road, 25 km is earthen road and only 1 km is footpath. This data also shows that the condition of the most of the road (30%) is bad while 20% is moderately good and only 60% is good. The condition of BC road is extremely bad and only 10.19% of BC road is in good condition leaving 73.46% BC road in bad condition and the rest of BC road is in moderately good condition. However, the condition of 6.5 km road is very bad while only 1.5 km and the same length of roar are in good and moderately good condition.

The Final Master Plan 2011 shows that non-motorized transport (rickshaw, van, bicycle, etc.) dominates the traffic scene in the Kaliakair Paurashava where percentage of rickshaws and bicycles varies between 70 to 91% of the traffic and where 90% of all retail and wholesale food stuff are moved by rickshaws and vans. This Master Plan also shows that 90% of daily trips in Kaliakair Paurahava are made by rickshaws/vans, easy-bike and bicycles, while another 7% are made on foot and rest of the 3% made by cars. Average journey time within Paurashava area is around 20 minutes and 69% of all trips are related to either home or work, leaving another 15% which are made to schools and college. No major traffic congestion is observed anywhere in city except in front of Chandra Bus stand, Safipur bazar road and kaliakair bazar mostly due to lack of strict traffic rules enforcement. But during the rush hour of factories, entry-exit and lunch time there are traffic congestion in overall roads. The community Traffic Policing controlled the traffic congestion. The traffic rush is observed from 8am to 10am before noon and 4pm to 7pm in after noon. Paurashava sources revealed the existing condition of roads 60-70% are in bad condition. There is no foot path in Kaliakair Paurashava except safipur bazar.

In addition, consultation with community people reveals that the movement of vehicles through the proposed road is less than the actual movement of vehicles at present. There are some roads

through which no vehicle move and local people move through these roads only on foot. It is anticipated that five times more movement of vehicles will be happened after the construction of the road.

4.1.3. Climate

4.1.3.1. Temperature, rainfall and humidity

The precipitation diagram for Kaliakair shows on how many days per month, certain precipitation amounts are reached. In tropical and monsoon climates, the amounts may be underestimated.

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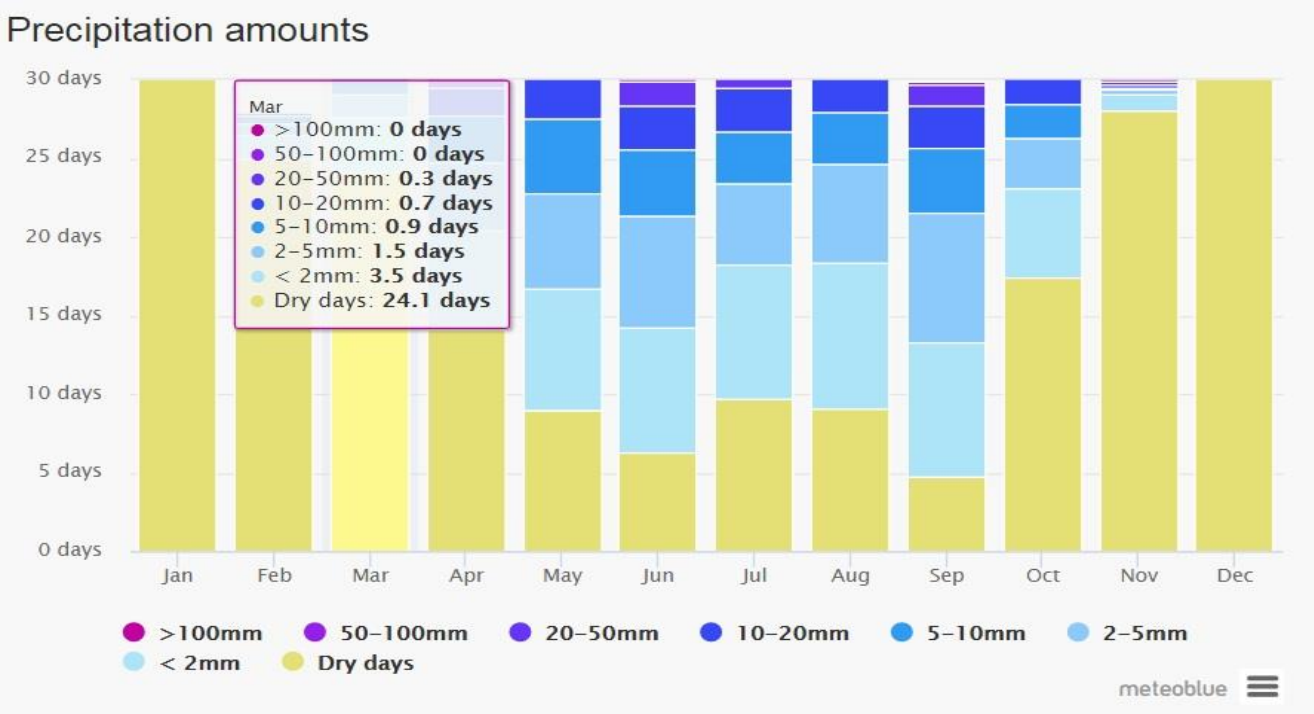


Figure 1: Average temperature and precipitation

The annual average relative humidity of Kaliakair district is 57%. The monthly average highest humidity is 76% that occur in the month of August. The **Table 4-3** which is given as below shows the detail of temperature, rainfall and relative humidity of the Kaliakair district.

The "mean daily maximum" (solid red line) shows the maximum temperature of an average day for every month for Kaliakair. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. Hot days and cold nights (dashed red and blue lines) show the average of the hottest day and coldest night of each month of the last 30 years. In winter, there is much less rainfall in Kaliakair than in summer. The climate here is classified as always by the Köppen-Geiger system. The average annual temperature in Kaliakair is 31.4 °C.

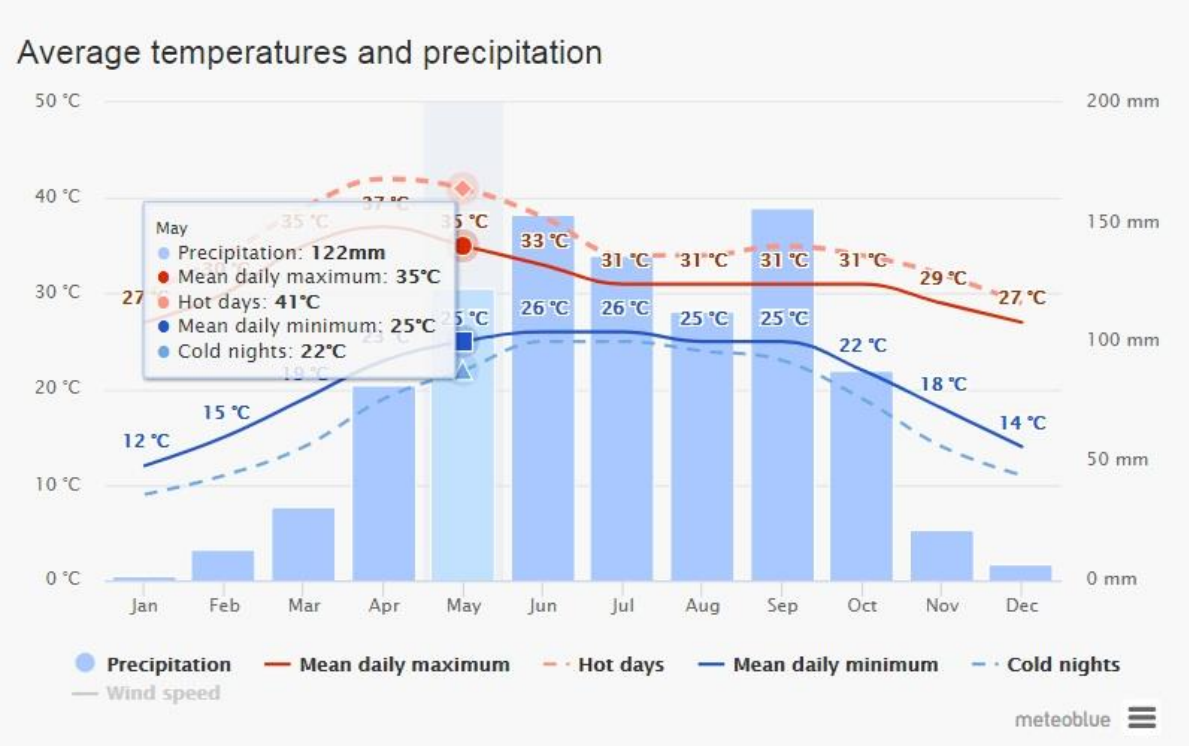


Figure 2: Precipitation Amount

(DataSourse:https://www.meteoblue.com/en/weather/forecast/modelclimate/kaliakair_bangladesh_9171969)

4.1.3.2. Occurrence of flood and river erosion

External flood is not likely to occur in the Pourashava area of Kaliakair. The down-stream part of the river is silted up by encroachment during the long ages.

Erosion is not occurred in the Pourashava areas. The Turag River has already been lost her natural levy in many years ago. So, erosion is absolutely absent in Kaliakair Pourashava area. (Source: Final Master Plan of Kaliakair Pourashava 2011)

4.1.4. Topography and drainage

Kaliakair Pourashava is a land of mixed topography. Bangladesh divided into five physical regions- the Ganges Delta proper to the South-West, the Para delta to the North-East and the South-East undulating Chittagong region. Ganges total flood plains is the tidal landscape has a low ridge and a basin relief crossed by many tidal rivers and creeks. Local differences in height are generally less than 1 m compared with 2-3 m on the Ganges floodplain. Madhupur tract is another Pleistocene upland block in the Bengal Basin is located in the central part of Bangladesh

comprising greater Dhaka and Mymensingh districts, between the courses of the Old Brahmaputra and the Jamuna rivers. Towards the south, this physiographic sub-region extends to as far as

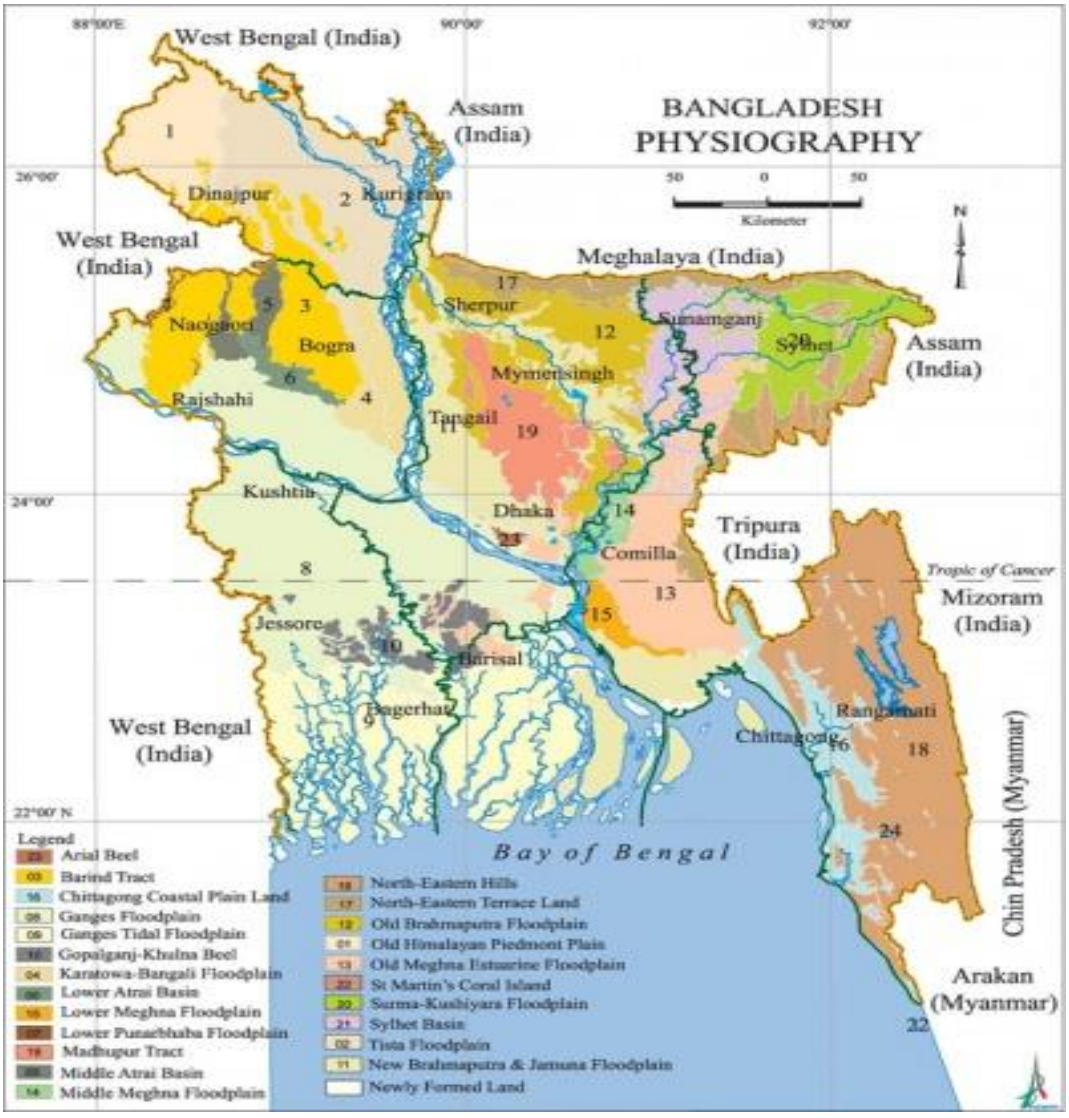


Figure 3: Physiographic map of Bangladesh

Dhaka, the capital of the country. Madhupur Tract measures about 4,105 sq. km. Comparable to the Baring Tract, the area belongs to a Pleistocene terrace consisting mainly of red coloured and mottled clays. It is characterized by plateau-like hillocks varying in height from 9 to 18.5m, and a dendritic drainage pattern, typical of all Pleistocene terraces in Bangladesh. The proposed project site is, mostly flat and cultivated. The Madhupur jungle contains Shal trees (Shorea robusta), the hardwood which is second to teak in value.

The Turag River serves as main drainage channel of the surface runoff for the Pourashava. At some of the places, the waterways namely secondary and tertiary drains are obstructed by solid

wastes, encroachments etc., resulting in decreasing the discharge capacity of the drainage system and eventually creating inundation of water. Inundation of water in some places are causing environmental hazard. The Pourashava Data 2018 shows that the Pourashava has 138.875 km drainage network within the Pourahsva areas amongst which 13.75 km is brick drain, 25.125 km is RCC drain and 102 km is Earthen drain.

In the core areas drains lies along the bank of the river Turag. As the Turag River is found to be a dead channel, there is no possibility of backflow from the river. (Source: Final Master Plan of Kaliakair Pourashava 2011)

4.1.5. Geology and soil

The Kaliakair Pourashava area forms a small part of the much larger Ganges and Brahmaputra Basin. Two Himalayan rivers, the Ganges and the Brahmaputra, drain to the Bay of Bengal as a combined river & carry the largest sediment load. These two rivers together with another non-Himalayan river, the Meghna, have built one of the largest delta in the world known as the Ganges-

Figure 4: Topographical map of Kaliakair

Brahmaputra Delta or the Bengal Delta. On its North-Eastward migration, the Ganges built several deltas and then abandoned them before finally occupying its present position. The Brahmaputra had an Eastward course as revealed by Renne's Atlas, building the early Brahmaputra delta near Mymensingh. At present the river has a straight southward course. However, while these two rivers previously debouched individually to the Bay of Bengal, at present they combine before finally emptying into the bay. These delta building activities of the rivers contributed to the formation of some 60% of the total Bangladesh coastline. The tract of the Kaliakair is of recent origin, raised by the deposition of sediments formed due to soil erosion in the Himalayas. The process has been

accelerated by tides from the sea face. The substratum consists mainly of Quaternary Era sediments, sand and silt mixed with marine salt deposits and clay. Geologists have detected a southeastern slope and tilting of the Bengal basin during the Tertiary. Because of neo-tectonic movements during the 10th-12th century AD, the Bengal Basin titled eastward. Evidence from borehole studies indicate that while the Western side of the Kaliakair is relatively stable, the South-East corner is an active sedimentary area and is subsiding.

The soil characteristics of the area can be described as the geological succession consisting of a series of interbedded silt/clay and sandy layers. It is observed from the geological cross section that interbedded layers of very loose to loose and loose to medium dense non-plastic fine sandy silt and silty fine sand exist in the area. Interbedded layer s of very loose to loose and very soft-to-soft silt or fine sand mixed with trace to little silt and traces of mica may be observed. Interbedded layers of medium dense silt and fine sand and having granular composition and plasticity characteristics similar the upper silt and fine sand layers then underline these layers. (Source: Final Master Plan of Kaliakair Pourashava, 2011)

4.1.6. Hydrology and water resources

Surface water

Jamuna (Young Brahmaputra) Floodplain an alternative name used for the mighty Brahmaputra river, because the Jamuna channel is comparatively new and this course must be clearly distinguished from that of the older one. Before 1787, the Brahmaputra's course swung east to follow the course of the present Old Brahmaputra. In that year, apparently, a severe flood had the effect of turning the course southward along the Jenai and Konai rivers to form the broad, braided Jamuna channel. The change in course seems to have been completed by 1830. Due to the upliftment of the two large Pleistocene blocks of the Barind and Madhupur, the zone of subsidence between them was turned in to a rift valley and became the new course of the Brahmaputra as the great Jamuna. Both the left and right banks of the river are included in this sub-region. The Brahmaputra-Jamuna floodplain again could be subdivided into the Bangali-Karatoya floodplain, the Jamuna-Dhaleshwari floodplain, and diyaras and chars.

The right bank of the Jamuna was once a part of the Tista floodplain, and now through the Bangali distributary of the Jamuna is a part of the bigger floodplain. Several distributaries of the Jamuna flow through the left bank floodplain, of which the dhaleshwari is by far the largest; this floodplain is sub-classed as the Jamuna-Dhaleshwari floodplain. The southern part of this sub-region was once a part of the Ganges floodplain. Along the Brahmaputra-Jamuna, as along the ganges, there are many diyaras and chars. In fact, there are more of them along this channel than in any other river in Bangladesh. There is a continuous line of chars from where this river enters Bangladesh to the off-take point of the Dhaleshwari. Both banks are punctuated by a profusion of diyaras. The soil and topography of chars and diyaras vary considerably. Some of the largest ones have point bars and swales. The elevation between the lowest and the highest points of these accretions may be as much as 5m. The difference between them and the higher levees on either bank can be up to 6m. Some of the ridges are shallowly flooded but most of the ridges and all the basins of this

floodplain region are flooded more than 0.91m deep for about four months (mid-June to mid-October) during the monsoon.

(Source: The Final Master Plan of Kaliakair Pourasva, 2011)

4.1.7. Air quality and dust

The Final Master Plan of the Pourashava shows that air pollution is quite a serious environmental consideration having adverse impacts within many parts of the Kaliakair Pourashava. About, 20.46% land of total land areas are industrial and transport vehicles are the major source of air pollution in the Pourashava area. These industries and vehicles produced huge black smoke and dust, which enters into the atmosphere and pollute the local environment. Severe air pollution area is Bus terminal and Truck terminal area. In summer season, the huge amount of dust is spread in atmosphere. There are no dust preventive measures and technologies in Paurashava area. But the 19.54% of forest land should be in extensive care. Municipal authority already takes some enviable steps about tree plantation and the protection of Mudhupur forest. Moreover, to evaluate the existing condition of air quality contractor will perform the air quality test prior to construction. Following **Table 4-2** shows the Bangladesh National Ambient Air Quality Standard comparing the WHO Guideline standard.

Table 4-2: 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				

4.1.8. Noise level

There was no existing noise pollution data of Kaliakair Pourashava area. High noise pollution has been observed in Kaliakair bus Terminal, Safipur Bazar road and Chandra Bus-stand. (Source: The Final Master Plan of Kaliakair Pourasva, 2011)

The purpose of ambient noise level measurement is to determine sound intensity at the different locations along the road alignment.

However, for this study, noise level at different locations along the randomly selected road alignment is measured to determine sound intensity of the sub-project areas of the Pourashava. The noise level measurement is performed during daytime with a calibrated (MASTECH_MS6508) sound level meter. A five-minute continuous noise level measurement is carried out at the selected locations in 'A' weighting and slow response mode with 1 sec interval, and the minimum, the average and the maximum noise levels are determined. **Table 4-3** shows the summary of noise level measurements those are carried out in different locations. It also shows the Bangladesh noise level standard for mixed areas.

Table 4.3: Noise Level Measurement

Noise level measurement locations	**Day-time**			**Bangladesh standard for mixed area (dBA),L_{max} (GoB 2006)**
	Minimum Noise level (dBA),L_{min}	**Average Noise level (dBA) L_{ave}**	**Maximum Noise level (dBA),L_{max}**	
Improvement of Drain beside Malek Sppining mill road	44	55	69	60
Improvement of Drain beside Safipur Bazar to Ibne Sina Bridge	45	51	73	60
Improvement of Drain beside Mosharaf Hossain Sarak from Ibne Sina bridge to cannel via Bord Mill and H/ Rafique and link1; H/O Azhar OC	43	60	78	60
Improvement of Drain beside Allahr Dan and Ageis Garments area	46	64	76	60
Improvement of Drain beside H/O Fetu Matabbar	37	42	59	60
Improvement of Drain beside Bhanga Mosjid area near Jora pump and Haisa House	45	57	72	60

4.1.9. Water Quality

The field observation shows that there are some ponds and low lands at the surrounding areas of the sub-project. All the ponds are man-made and used for fishing, water supply and domestic uses. In addition, there is a river named Turag River which flows through the Pourashava and divided it into two parts and this river is the main discharge point of the proposed drains. However, the water of the river is badly degraded due to disposing solid waste and industrial effluents as well as discharging black water from households and commercial establishments through the drainage network. Hence, the anticipated impact on the aquatic environment from the discharge of the storm water of the proposed drain is minor. The present cannel that joined to the Turag river is shown in the **Figure 6**. Information on ground water quality of the nearest tube-wells along the road has

been collected on spot discussion and consultation with the villagers. depth of ground water level varies from 5m to 8m. Potable ground water is available at an average depth of 60m to 70m. Ground water quality of HTWs for drinking purposes are provided in the following table:

Figure 6: Canel towards the Turag River

Table 4.4: The test result of different water quality parameters of the Pourashava

Drinking water quality parameters	Contents of HTW water (mg/L)	Permissible limit (mg/L), Bangladesh standard	Comments
Arsenic	0.008	Up to 0.05	Within permissible limit
Iron	1.13	Up to 1.00	Slightly Exceed permissible limit
Chloride	21	150-600	Below the permissible limit

Source: DPHE, Gazipur HTW Testing results

4.2. Biological Environment

No such document containing specific information of flora and fauna of the Kaliakair Pourashava is found during literature review of the study. However, District Statistics 2011 of Gazipur district contains detail information of flora and fauna of the district as a whole. As Kaliakair Pourashava is a part of this district, the growing trees and plants in this Pourashava is obviously influenced by this district. Hence, relevant information from this document is used for fulfilling the requirement of this study.

4.2.1. Floral habitat and diversity (terrestrial and aquatic)

Depending on environmental conditions, a large number of natural vegetation grows in the district. Uncultivated areas are covered by abundant natural vegetation. Reconnaissance field surveys were made to assess the various vegetation types/ecosystems present within the sub-project impact zone. Once established, the target areas were extensively surveyed and a species assessment was made. Standardized transects were laid in order to assess species composition and vegetation structure. To facilitate the identification of the maximum number of species, several visits were made. The study area (both directly and indirectly impacted area) occupies both terrestrial as well as aquatic ecosystems.

All the upazilas under Gazipur district fall within the physiographic unit known as Madhupur jungle tract (*Bhawal Garh*). In many parts of this tract, the terrace topograghy is not flat but consists of low rounded hills and ridges separated by a close pattern of shallow bides (*velleys*). Such areas occur extensively in Gazipur Sadar, Kaliakair, Shreepur, Kapasia and Kaliganj upazilas. Besides, few beels are situated in the periphery of some of the upazilas. The soil conditions in the Bhawal Garh are varied and often complex. A surprising range of soils is found, from red laterite soils at the extreme to almost undeveloped soils of raw Pleistocene clay at the other, with numerous intermediate stages developed between them and also with several kinds of soils occurring in the associated valleys. Various types of agricultural crops are grown in the district. Among cereal crops, boro covers the largest area followed by aman, aus and wheat mixed

aus and aman are also grown. Other crops include jute, mesta, mustard, vegetables and spices, sesame,sugarcane,pineapple,(*Ananascomosus*), guava (*Psidium guajava*) etc. Jack- fruit (*Artocarpus heterophyllus*) is extensively grown and is an important cash crop. A wide variety of trees, shrubs and thickets of bamboos and bananas and form the groves that surround the village homestead. Homestead agricultural plots and forests are closely interspersed trend. and it appears that the forest is rapidly disappearing because of lumber poaching and conversion of forest lands into agricultural plots. The Madhupur tract (*Bhawal Garh*) is dominated by coppice sal (shorea robusta), *garjan*, (Dipterocarpus turbinatus) covering about 80% of the tree stands in association with sheel koroy (*Albizzia procera*), kadam (*Anthocephalus cadamba*), ajuli (*Dillenia pentagyma*), jarul (*Legerstroemia speciosa*), banian tree (*Ficus benghalensis*), ashwatha (*Ficus religlosa*), bahera (*Terminalia bellirica*), haritaki (*Terminalia chebula*), black berry (*Syzygium cumini*) etc. The middle canopy comprises of neem (*Azadirachta indica*), kanchan (*Bauhinia variegate*), sonalu (*Cassia fistula*), minjiri (*Cassia siamea*), kumbhi (*careya arborea*), mango (*Mangifera indica*), amra (*Spondias mangifera*). Amloki (*Phyllanthus emblica*), bonboroi (*Zizyphus rugosa*), sinduri (*Mallotas philippensis*), ashoka (Saraca indica), sheora (Streblus asper), gab (Diospyros precatorius),mahaneem(*Garugapinnata*), etc. The lower canopy and the climbers-cum-lianas are composed of spatholobus roxburghii, gila entada pursaetha, kul (Zizyphus mauritiana), kumarika (*Smilax aspera*), gach alu (*Dioscorea sp*), babul (*Acacia arabica*), wood (*Fordia fruticosa*), bamboo (*Bambusa sp*.), sotthi (*Curcuma zedoaria*) etc. In the poorer forested areas there are large tracts with koroy as the main species and an under growth of kurchi, akanda, mankata (*Randia dumetorum*), thatch grass (*Arundinacea cylindrica*) and mimosa pudica. Furthermore, some aqua plants like lotus (*Nelumbo nucifera*), few species of waterlily (*Nymphaea nouchalia*), various hydrophytes and the weed known as water hyacinth (Telanthera philoxeroides), etc. are commonly seen in different ponds, ditches and shallow water bodies of this area.

4.2.2. Faunal habitat and diversity (terrestrial and aquatic)

Mammals: With the ruthless destruction of forests in the Modhupur tract (Bhawal Garh), most of the wild animals have disappeared from this area. However, some animals belonging to mammalian fauna are still found in the Gazipur district. They are hesus monkey(*Macacamullata*), wild boar (*Sus scrofa*), hispid hare (*Caprolagus hispidus*), jungle cat (*Felis chaus*), flying fox (*Pteropus giganteus*), shortnosed fruit bat (*Cynopterus spinx*), jackal (*Canis aureus*), common otter (*Lutra perspicillata*), common mongoose (*Herpestes edwardsi*), house mouse (*Musmusculus*), common house rat (*Bandicota bengalensis*), Indian porcupine (*Hystrix indica*), etc.

Birds: Different species of birds that are commonly found in this district are little cormorant (*Phalacrococan niger*), pond heron (*Ardeola grayii*), white breasted water hen (*Amaurornis phoenicurus*), spotted dove(*Streptopelia chinensis*), redbreasted parakeet (*Psittacula alexandari*), roseringed parakeet (*Psittacula enpatria*), koel (*Eudynamis scolopacea*), spotted owlet (*Athenebrama*), barn owl (*Tyto alba*), house swift (*Apus affinis*), whitebreasted kingfisher(*Helcyonsmyrnensis*), green bee-eater (*Merops orientalis*), lesser golden backed

woodpecker(Picus*myrmecophoneus*), black drongo (*Dicurus macrocercus*), greater racket-tailed drongo (*Dicrurusparadiseus*), common mayna (*Acridotheres tristis*), house crow (*Corvus splendens*), jungle mayna (*Acredotheres fuscus*), redvented bulbul (*Pycnotus cafer*), tailor bird (*Orthotomus sutorius*), magpie-robin (*Copsychus saularis*), shyama (*Copsychus malabaricus*), house sparrow(*Passerdomesticus*), weaver bird (*Ploceus phillippinus*), spotted munia(*Lonchurapunctulata*)etc.*District Statistics 2011*. Besides, different species of winter migrants that visit Bangladesh are also seen in the beel and char areas of the district. These include little ringed plover (*Charadrius hiaticus*), common sand piper (*Tringa hypoleucos*), common teal (*Anas crecca*), pintail (*Anas acuta*), common sheldduck (*Tadorna tadorna*), grey leg goose (*Anser anser*), common swallow (*Hirundo rustica*), large pariah kite (*Milvusmigrant lineatas*), brown shrike (*Lanius cristatus*), pied harrier (*Circus melenoleucos*), little stint (*Calidris minuta*), fantail snipe(*Gallinagogallinago*), pintailedsnipe (*Gallinagostenura*), greywagtail (*Motacillacinerea*) etc.

Reptiles and Amphibians: Reptiles that are commonly found in this district are peacock soft shell (*Trionyx hurum*), roofed turtle (*Kachuga tecta*), house lizard (*Hemidactylus frenatus*), shundh (*Gekko gecko*), bengal grey lizard (*Varanus bengalensis*), yellow speckled wolf snake (*Lycodonjara*), checkered keelback (*Xenochrophis piscator*), rat snake (*Ptyas nigromarginatus*), common smooth water snake (*Enhydris enhydris*), common krait (*Bungarus cacruleus*), banded krait (*Bungarus fasciatus*) etc. Amphibians are not rich in species but very much in numbers. Common amphibian includes Indian bull frog (*Rana trgerina*), skipper frog (*Rana cyanophlyctis*), cricketfrog(*Ranalimnocharis*), commontoad (*Bufomelanostictus*), ballonfrog (*Uperodonglobulosus*).

Fishes: Various water bodies of the district constitute habitats for fish population. A large veriety of fish that are found here are ruhi (*Labeo rohita*), katla (*Catla catla*), mrigel (Cirrhinus mrigala), kalibaush (Labeo calbasu), magur (*Clarias batrachus*), shing (*Heteropneustes fossilis*), shoil (*Channa striatus*), airh (*Mystus aor*), bele (G*lossogobius giuris*), boal (*Wallago attu*), phalli (*Notopterusnotopterus*),koi(*Anabastestudineus*),datina(*Acanthopagruslatus*),tengra(*Mystusvittatus*),chanda(*Mene muculata*), bain (*Mastacembelus armatus*), gozar *(Channa marulius*), kholisha (*Colisa fasciatus*), mola (*Amblypharyngodon mola*), pabda (*Ompok pabda*), sharputi (*Puntius sarana*), pangas (*Pangasius pangasius*) chingri (*Palaemon malcolmsonic*) etc. Inaddition, some exotic varieties of fish like tilapia (*Oreochromis mossambicus*), nailotica (*Oreochromis niloticus)*, silvercarp (*Hypophthalmicthys molitrix*), grasscarp (*Cteopharyngodonidella*) etc. are also cultivated.

4.3. Socioeconomic Environment

4.3.1. Status of land use pattern, housing and built-up infrastructure

A land use survey was conducted under UGIIP in 2007 and the survey reveals that the major part (31.15%) of the Kaliakair Pourashava area is being used for residential purposes. Industrial use is the second highest land use of the Pourashava containing 15.36% of land. A large part (7.93%) of the land is occupied by the water bodies including one river. The industrial and commercial use occupied 20.46% and 1.94% of land respectively. The detail land use classification under broad category in Kaliakair Pourashava area is given in **Table 4-7** as below:

Table 4.7: Land use status

Sl #	Landuse	Percentages
1	Residential	31.15%
2	Commercial	1.94%
3	Industrial	20.46%
5	Agricultural	15.36%
7	Others	10.55
	Total	100%

(Source: Municipality Data, 2018)

According to the Population and Housing Census 2011, the highest percentage of general households by type of structure of the Pourashava is pucca (14.2 %). The percentages of other general household by the type of structure of the Pourashava are 76.11% semi-pucca, 6% percent katcha and only 10% jhupri households.

In addition, the average household size of the Pourashava is 4.2. The percentage of tenancy of households in the Pourashava area shows that 25% people live in own house, 75% people live in rented house.

There are markets, shops, educational institutes, private and government offices, business establishments, industries etc in the surrounding areas of the sub-project.

4.3.2. Beneficiary population

All the people living in Kaliakair Pourashava will be benefited by the proposed sub-project. Therefore, a total of 6,00,000 people of the Pourashava will be benefited just after the construction of the sub-project.

Considering the current average growth rate of population in urban areas of the country as 3.2 percent per year and using the linear progression method of population projection formula, the estimated number of the population of the Pourashava will be 809443 in 2030 and 901886 in 2040. All these people will be benefitted from the proposed road. In addition, people coming from

different parts of the Kaliakair Sadar Upazill as well as Gazipur district to the Pourashava will also be benefitted. (Source: Population and Housing Census 2011)

4.3.3. Educational status

According to the Population and Housing Census 2011, the literacy rate of the Pourashava is 48.4 percent among the both sex where the literacy rate among the male is 54.9 percent and the female is 41.5 percent, slightly below from the male counterpart.

The Kaliakair Pourashava has a large numbers of different educational institutions. The Pourashava data 2018 reveals that there are 32 primary schools of which 10 are government and 20 are non-government, 6 colleges of which 2 are government and 9 are non-government, one government vocational or technical school, 2 governments vocational or technical colleges, 15 Hafijia madrasahs and 2 Alia madrasahs.

4.3.4. Livelihood and economic situation

According to a survey that was conducted under UGIIP at 2007 shows that the sub-project area is inhabited by the people of mixed occupation. Livelihood of the people of Kaliakair Pourashava is mainly dominated by trade and business. The service is also play significant role in maintaining the livelihood here. The Final Master Plan of Kaliakair Pourashava 2011 shows that Main sources of income Agriculture 51.5%, non-agricultural laborer 3.6%, commerce 13.63%, transport and communication 3.39%, service 15.4% and others 12.48%. Ownership of agricultural land Landowner' 58.48%, landless 41.52%; agricultural landowner: urban 54.61% and rural 68.92%. Main crops Paddy, jute, sugarcane, mustard. Extinct or nearly extinct crops Sesame, sweet potato, arahar, cotton, wheat, china. Main fruits Mango, jackfruit, banana, papaya, litchi, blackberry, pineapple, guava. Fisheries, dairies and poultries Fishery 169, dairy 255, poultry 511. Noted manufactories Textile mill, saw mill, rice mill, ice cream factory. Cottage industries Goldsmith, blacksmith, weaving, potteries, bamboo work, wood work, tailoring.

The economy of the Kaliakair is predominantly commercial. However, service and agricultural activities also plays significant role in the economy of this area. The income from non-farm establishments mainly comes from factories, saw mills, rice mills, construction, wholesale and retail trade, hotel and restaurant, transport storage and communication, bank, insurance and financial institution, real estate and renting, public administration and defense, education, health and social work, and community, social and personal services. There are about 60 no of industries. The prominent mills and factories include Transom Beverage Ltd, Interstoff Apparels Ltd, Ocotex Ltd, Devine group of Industries Ltd etc.

4.3.5. Water Supply and Sanitation

According to the Population and Household Census 2011, the most of the people (85.8%) of the Pourashava collect drinking water from tube well and 1% of the people from other sources.

Table 4.81: Potable water source of Kalikair Municipality

Facility	Quantity	Household Served (%)
Piped Water	-	-
Hand tube well (Municipality)	278	2%
Hand tube well (Private)	10957	87%
Hand tube well motorized (Private & Govt.)	1276	10%
Others (Pond & River)	123	1%
Total	12634	100%

(Source: Municipality Data, 2018)

However, the Pourashava data 2018 reveals that there is no underground sewerage system in Kaliakair Pourashava area. High income people made their toilets with septic tank but there is no facility to clean the septic tank in Pourashava. Most of the households connect their septic tank with storm water drains to discharge with fecal sludge and pollute the environment. Community sanitation facility is also limited here. There are five public toilets within Pourashava area which are installed by the Pourashava.

Table 4.9: Sanitation/Public Toilet

Sanitation Facilities	**Number**	**% of Households**
Single Pit Lartine	3036	24%
Twin Pit Latrine	3830	30%
Septic Tank with Flash	5658	45%
Use Hanging Latrine/ Open Space	110	1%
Total	**12,634**	**100%**

(Source: Municipality Data, 2018)

4.3.6. Land acquisition and resettlement

The sub-project will be implemented along the right-of-way of existing drains. And the land of all the sub-project sites is owned by the Pourashava. Hence, there is no need to acquire land. There is no human settlement and business establishments on the land of proposed sites for the sub-project. Thus, the issue of resettlement is absent here. In addition, the social expert will evaluate the

anticipated social issues regarding the sub-project intervention and measures will be given accordingly.

4.3.7. Tribal communities

There is no indigenous or tribal people settlement in the sub-project area. Therefore, there is no need to take any kind of protective measures for indigenous peoples' safeguard.

4.3.8. Cultural heritage and protected areas

Kaliakair Pourashava is very rich in cultural, historical and religious heritage. There are a number of places of interest within Paurashava area that can become attractions for tourists from home and abroad. These may be broadly classified as heritages and recreational sites. Important heritages in and around the city include Amusement centres and Tourist spots Nandan Park, Shiddhimadhav Pillar, Ansar VDP Academy, Bangladesh Scouts' National Training Centre, Baliadi Zamindar Bari, Sreefaltali Zamindar Bari, Talibabad Satellite Ground Centre. Cultural organisations Library 38, club 132, cinema hall 2, theatre group 5, women society 6.

5. ENVIRONMENTAL SCREENING

Environmental Screening (ES) for the sub-project 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 **RCC Road and Drain along with allied works** have been formulated and are shown as below.

5.1. Potential Environmental Impact during Construction Phase

(A) Ecological Impacts:

- Felling of trees : Significant □ Moderate □ **Minor** √□

  Number of trees: N/A
- Clearing of vegetation : significant□ Moderate □**Minor** □√
- Potential impact on aquatic species environment : Significant □ Moderate □**Minor** □√

The proposed road and drain goes through developed mixed zone of residential and commercial areas along the existing right-of-way of the roads and drain. All the roads and drains are connecting roads and drains. There is no tree on the right-of-way of the roads and drains. Thus, there is no need to cut down any trees. Hence, the ecological impact of felling of tress is considered as minor.

There is no need to clean vegetation for the implementation of the subproject. So, the impact of subproject on vegetation is considered as minor.

There are some surface water bodies like ponds, low ditches, and dead Turag River nearby the sub-project areas. Most of the drains are linked with dead Turag River as ultimate Outfall. The Turag River is already badly polluted by the industrial effluents. So, the impact of the sub-project

is considered as minor on it. However, the other 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, if it is not management properly. Therefore, the overall impact of the sub-project on the water bodies and its aquatic environment is considered as minor.

(B) Physico-Chemical Impacts:

- Noise pollution : Significant □**Moderate** √□Insignificant□
- Air pollution : Significant □**Moderate** √□ Insignificant□
- Drainage congestion : Very likely □ Likely□ Unlikely √□
- Water pollution : Significant □Moderate□ **Insignificant**√ □
- Solid waste pollution : Significant □Moderate □**Insignificant** √□
- Construction wastes : Significant □**Moderate**√□ Insignificant □
- Water logged : Significant □**Moderate** √□ Insignificant □

Most of the subproject 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, mobilization of the equipment and 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 drains of the subproject areas are already damaged and congestion is prevailing on. Hence, the additional impact of construction work on the drainage system will be very less. Therefore, there is no such chance to create additional drainage congestion by the subproject activities.

All of the roads and drains will be constructed within the Pourashava area where there are very few ponds. Hence, the generated debris from dismantling and loosing soils may not get worse for water bodies. Therefore, it is anticipated that the level of impact on water pollution from the proposed subproject will be insignificant.

The minimum amount of solid waste to be generated from labor shed and its kitchen and will have insignificant impact on solid waste pollution.

The construction works of subproject will generate construction waste like loose soil and dismantling debris may disturbs the nearby community people if proper measures are not taken. Additionally, 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. Hence, the impact of construction waste is considered as moderate.

The roads and drains will be construction together under this subproject and the subproject activities include earth works for preparing the site for construction. Thus, the total drainage system of the construction areas will remain non-functional during construction period. This may cause water logging situation even in minimum rainfall. Hence, the impact of the subproject on surrounding environment due to water logging is considered as moderate. However, most of earth

work will be performed in dry season to avoid water logging situation. Even, there will be a provision for submergible pump to drain off the water, if required.

(C) Socio-Economic Impacts:

- Traffic congestion **: Likely** □√ Unlikely □
- Health and safety : Significant □ **Moderate** □√ Insignificant □
- Impact on archaeological : Significant □ Moderate □ **Insignificant** □√
- Impact on historical : Significant □ Moderate □ **Insignificant** □√
- Employment generation : **Significant** □√ Moderate □ Insignificant □

The proposed roads are distributed among the most of the Wards of the Pourashava. All of the drains are used for a significant number of both light and heavy motorized and non-motorized vehicles movements. No vehicles will be allowed to move through these drains during the construction period. Hence, the impact of the sub-project on traffic congestion is considered as likely. However, there are some other roads in the Pourashava areas those will be used as alternatives during the construction of the proposed road to avoid the traffic congestion.

The proposed construction activities do not require the use of heavy equipment and construction work. It will follow simple procedure with commonly used equipment. Hence, anticipated impact on health and safety is moderate.

There are some archaeological and historical sites within the influence area. However, the proposed sub-project will have no significant impact on these as the proposed drains pass through these areas keeping a remarkable distance. Therefore, the impact of sub-project on it is considered as insignificant.

The sub-project has positive impact by generating huge work opportunities for the local labor during the construction period. Hence, the impact of the sub-project on employment generation is considered as significant.

5.2. Potential Environmental Impact during Operational Phase

(A) Ecological Impacts:

- Potential impact on species of aquatic: Significant □ Moderate □**Minor** √□

During operation of road, there will be no impact on ecology. On the other hand, the drains may have minor impact on the aquatic environment as it will carry the polluted industrial effluents to the outfall. The storm water that will flow through this drain will not be any impact on the aquatic environment if the drains are to be used properly. Thus, the impact of the subproject on aquatic species is considered as minor. However, the dumping of solid wastes and discharge of black water from household into the drains may create pollution in the aquatic environment of the outfall by the discharged water through these drains.

(B) Physico-Chemical Impacts:

- Potential air quality & 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** √ □No-improvement□ Deterioration □

During operational phase, the improved and widened road will decrease the dust on road. Thus, it will minimize the blow of dust during vehicle movement on these roads. In addition, it will ensure smooth surface for the movement of vehicles and reduce the traffic congestion on the roads. Thereby, it will reduce the use of frequency of using hydraulic horn by drivers and emission of black smoke from the vehicles. Therefore, the potential air quality and noise level will be improved.

The new drain will minimize drainage congestion and water logged problem. The storm water and grey water to be discharged through the drain may have minor impact on the water quality of the outfall if black water from the households and other administrative and commercial settings is not discharged into these drains. Pollution from solid waste will be improved by restricting the throwing of the domestic waste materials on road and into the drain. In addition, proper solid waste management system within the Pourashava areas may also facilitate to improve the pollution from solid waste.

(C) Socio-Economic Impacts:

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

After completion of the construction, the roads will improve the transportation facilities as well as movement of vehicles through smooth surface which will improve the overall traffic situation within the subproject influences areas by reducing the traffic congestion. By providing uniform pavement, it will also enhance traffic safety. 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 the safety of movement of community people. In addition, it will facilitate business opportunities, input supply facilities for industries and employment opportunities for local community people.

5.3. Summary of Possible Environmental Impacts of the Sub-project

The ecological impact due to the implementation of sub-project is minor. The possible disturbances of the aquatic environment may happen due to the discharge of the black water from households through storm drains after the construction of drains which should be restricted through the mobilization of community people and ensuring proper solid waste and fecal sludge management system by the Pourashava Authority.

The physico–chemical impact of the sub-project is site specific. During construction phase, moderate level of air and noise pollution, pollution from construction waste and water logging situation may happen. However, it will be improved after the completion of the construction of the sub-project. The contribution of this sub-project on drainage congestion, water pollution and solid

waste pollution is anticipated as insignificant. Moreover, it will be improved after the completion of the sub-project.

Among the negative socio-economic impacts of the sub-project, there is a possibility of traffic congestion and moderate level of impact on health and safety of worker and pedestrian due to the restriction of movement of vehicles through the drains under construction and the use of equipment and machineries for the construction works. However, the impact on archaeological and historical places will be insignificant. On the contrast, the employment opportunity of the local labor will increase significantly during the construction phase. Again, the sub-project will have positive impact on traffic situation, safety and employment generation during the operational phase as because the smooth surface will facilitate quick movement of vehicles resulting less traffic congestion; reduce the risk of accident due to lack of muddy, depression and undulation free surface of roads; and engagement of young people in driving of vehicles, easy and quick transportation of inputs and products of trades and businesses respectively.

6. ASSESSMENT OF ENVIORMENTAL IMPACTS AND ITS MITIGATION & ENHANCEMENT MEASURES

6.1. Potential Significant Environmental Impacts and Its Mitigation & Enhancement Measures during Pre-Construction Phase

6.1.1. Loss and displacement from agricultural land

Cause of Impact

All the drains go through the right-of-way of the existing roads and drains of the Pourashava. Thus, there will be no need to loss or displacement of agricultural land. Even, the widening of roads need not to remove or demolishing any infrastructures and environmental features. Thus, there is no loss of agricultural land as well as agricultural product in the Pourashava areas.

Mitigation Measures

There is no negative impact of this sub-project on agricultural land. Hence, no mitigation measure is required.

6.1.2. Disorder of earth surface

Cause of Impact

After site clearing work, to elevate the cleared land up to the existing road level, a part of land filling would be required to develop the site. 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 sub-project intervention will not create any water logged 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.

6.1.3. Constuction of labour shed

Cause of Impact

To meet the sub-project basic demand, two separate labor sheds, one for male and one for female, need to be constructed or renovated any structure which will have to be constructed or renovated prior to starting the construction works. The proposed locations for the labor sheds are at Pourashava owned vacant place near the construction site. Unhygienic condition at the labor sheds and generation of sewage and solid waste at the labor sheds may cause degradation of the surrounding environment.

Mitigation Measures

To meet the workers' basic needs labor sheds will be constructed or renovated which will contain 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 latrines 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 Pourashava and the contractor. Waste bins will be placed at the labor sheds, 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 Pourashava garbage disposing sites.

6.1.4. Ecological impact due to felling of trees and clearing of vegetation

Cause of Impact

Due to site clearing work for the road widening, no tree will be cut down along the right-of-way of the sub-project. The proposed roads and drains will be constructed within the areas of existing right-of-way of roads and drains. Even, no vegetation clearing will be needed to implement the sub-project. Therefore, it will have no impact on ecological environment.

Enhancement Measures

Although there is no ecological impact of this sub-project, the Pourashava Authority may plant trees at the road side for its beautification. It will also add additional value to the local ecological system and enhance the balance of ecological environment of the Pourashava.

6.2. Potential Significant Environmental Impacts during Construction Phase

6.2.1. Earth work and site clearing work

Cause of Impact

The sub-project less requires site preparation. The preparation works for this roads and drain will be done during constriction stage that includes cutting and filling work, soil export or import work and demolition of the existing infrastructure and damaged BC road. The mentioned activities will cause huge noise, generation of dust, soil erosion, drainage congestion and safety concern.

Mitigation Measures

Cutting and filling operation should be kept minimal. During earth work, it will be tried to avoid loss of the topsoil. In addition, for backfilling work use of sand will be ensured. The sub-project 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 ensure the use of PPEs as per requirement. Undertaking construction work during dry seasons will minimize the water logged. The heavy equipment should be operated at the day time. The generated waste from the dismantling work will be deposed regularly and quickly into the designated dump site of the Pourashava.

6.2.2. Pollution from transportation and storage of the construction materials

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 into the surface water. 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 be responsible to avoid head loads for carrying soil, construction materials and construction equipment and disposal of the wastes at the designated dump site.

6.2.3. Air quality and dust

Cause of Impact

The air quality in the sub-project 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 sub-project vehicles and equipment, 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 be responsible to ensure that all sub-project vehicles and equipment are in good operating condition. Even periodically air quality test near sub-project vehicles will be performed. The Sub-Project Implementation Unit (PIU) 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 sub-project, sensitive areas like roadsides houses, shops, and educational institutes are likely to be affected from the roadside noise, though the impacts are limited to the premises 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 has 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 or washed out 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 selected dumping place for organic waste and inorganic waste (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 sub-project 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 sub-project 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, disturbing campsite communities by asking water entering into the house and other regularly required household goods, eve teasing or sexual abuse of the campsite female worker or campsite nearby neighboring people.

Mitigation measures

The sub-project 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 and cultural actability in the area so that they could maintain those when they will have touch with local community. In addition, emphasis should be given to hire local workers especially the female workers from poor households.

6.2.8. Occupational health and safety, and aesthetics

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 female workers;
- Wastewater from the toilet should be disposed of 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 of 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 logged 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 laborers;
- Brest feeding facility should be provided for kids if breast-feeding 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 sub-project has some positive impacts on the local community and stakeholders. The positive impacts from the sub-project 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

Cause of Impact

Generally, the construction of road interrupts the traffic movement and selects alternative routes or a side of the constructed road for vehicles movement. But, considering the width of the project road, it will not be feasible to construct one side of the road leaving another side for vehicle movement. Hence, the alternative routes of the Pourashava to be used in this case and no motorized or non-motorized vehicles will not be allowed to move through the proposed road during construction phase. Therefore, the Pourashava authority will inform the local people about subproject activities and inspire them to use the alternative roads.

Besides, the drain will be constructed simultaneously with the construction of the road. So, there is no separate impact of drain on the traffic movement as well as management.

Mitigation Measures

- 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 regulation of traffic, the flagmen shall be equipped with red and green flags especially near at intersection;
- 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. Potential Significant Environmental Impacts and Its Mitigation and Enhancement Measures during Operational Phase

6.3.1. Air quality degradation

Cause of Impact

Once in operation, the improved drains of the roads will encourage the increased movement of different motorized and non-motorized vehicles. The emission of carbon dioxide as black smoke from the vehicles will degrade the air quality. This might affect the health of the local community people, young children passing through the road for schooling, businessmen and workers working within the area.

Mitigation Measures

The following mitigation and enhancement measures should be taken to minimize the air quality degradation:

- Vehicles those are emitting black smoke should not be allowed to move through this road; and
- Traffic police should be deployed in consultation with Traffic Control Authority at two sides of the entry points of Dhaka-Tangail highway to Answer road.

6.3.2. Noise pollution

Cause of Impact

Increased vehicular traffic and its use of hydraulic horns can create noise pollution. In addition, there is a chance of traffic congestion due to the movement of huge number of vehicles through this busy road and unnecessary blowing of horns during traffic congestion. This might affect the health of the local community people, young children passing through the road for schooling, businessmen and workers working within the area.

Mitigation Measures

The following mitigation and enhancement measures should be taken to minimize the noise pollution:

- The traffic control authority should control the use of hydraulic horn in motorized vehicles and minimize the traffic congestion at peak-hours.

6.3.3. Solid wastes generation and disposal

Cause of Impact

Throwing of solid wastes such as leftover food, foils, bottle and plastic from food and drink, market wastes etc. on drain can be happened. If these generated solid wastes are not disposed properly, it will create unpleasant environment and pedestrians will feel discomfort.

Mitigation Measures

The following mitigation and enhancement measures should be taken to ensure proper solid waste disposal and minimize its impact on environment:

- Sufficient numbers of waste bins should be in place at different market premises along the road sides.
- Solid wastes to be generated at the market along the road sides should be collected and disposed in selected landfill or dumping place by the Pourashava Authority.

6.3.4. Traffic congestion

Cause of Impact

There is a possibility of traffic congestion on this road due to the movement of motorized and non-motorized as well as small and large sized vehicles. Traffic congestion may also happen due to down loading and upload commercial materials and products stopping the carrying vehicles on any sites of the carriageway.

Mitigation Measures

The following mitigation and enhancement measures should be taken to minimize the impact of traffic congestions:

- Traffic police in consultation with Traffic Control Authority should be ensured at the cross-sections throughout the road to ensure proper traffic management and to reduce traffic congestion.
- Local transportation vehicles should not be allowed to stay long time at any diversion road and in front of the market.
- Direction/control sign for vehicle movement should be ensured at any diversion road and in front of the market.

6.3.5. Accident due to high speed of vehicles

Cause of Impact

There will be a tendency for increasing speed because of an improved driving surface that can result accidents. A huge number of garments workers, local people, shop keepers and school going children will pass through the road regularly. There are also some schools adjacent to the road. Hence, the issue of accident should be considered as an important.

Mitigation Measures

The following mitigation and enhancement measures should be taken to minimize the impact of accident:

- Speed breakers should be placed at certain interval of the road as well as in front schools and other important establishments; and

- Sign of speed limit should be placed at different places at the both side of the road.

6.3.6. Waste water disposal

Cause of Impact

The waste water to be generated from different households, markets and industries will be discharged into the constructed drain and finally will fall into the water bodies of outfall areas. The waste water particularly with industrial effluents can badly pollute the water of down fall water bodies, and subsequently decrease the water quality. It requires proper waste water collection, treatment and disposal facilities to minimize the water pollution.

Mitigation Measures

Following measures should be taken to minimize the impacts:

- Every industry should have an Industrial Waste Water Treatment Plants. Lime products can be used in industrial waste water treatment to adjust pH and alkalinity in coagulation, flocculation and biological treatment processes. Lime can also be used in industrial waste water treatment to soften process or boiler feed water, precipitate metals and non-metals and to adjust pH with membrane treatment.
- Finally, the treated water can be discharged into the constructed drain to run off to outfalls.

6.3.7. Impact on local community

In operation phase, the proposed sub-project has a positive impact on the community people by easing accessibility and creating business and employment opportunity. The local economy will be highly influenced by the constructed road by easing the transportation facilities for business and daily household services, and enhancing the land value of the surrounding areas. The improved road will encourage other industries to be installed by the industrialists which will create more employment opportunities. In addition, it will create more employment opportunity by engaging young people in transportation business and driving of motorized vehicles. The local people will be benefited by getting opportunity of easy and quick movement from one place to another place within the Pourashava as well as outside of the Pourashava.

By discharging the household waste water into the drain, the local community people will enjoy a pleasant environment without water logged and dirty condition in and around their house.

7. ENVIRONMENTAL MANAGEMENT PLAN

The objective of the environmental management plan (EMP) is to record environmental impacts resulting from the sub-project activities and to ensure implementation of the identified “mitigation measures”, in order to reduce adverse impacts and enhance positive impacts. Besides, it would also address any unexpected or unforeseen environmental impacts that may arise during

construction and operational phases of the sub-projects. The identified environmental impacts and its mitigation and enhancement measures are given in **Table 7-1** and in **Table 7-2** as below:

7.1.Environmental Management Plan (EMP) Matrix

The anticipated environmental impacts and corresponding mitigation and enhancement measures have been outlined in **Table 7-1** for preconstruction and construction phases and in **Table 7-2** for operational phase**.**

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
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 new labor sheds or renovate the selected houses and stockyard to be designated by the Pourashava. • 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 to be selected by the Pourashava. • Ensure emptying and cleaning of the waste bins regularly; • Drum trucks are available in the Municipality. 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;	Visual Observation	Regularly	Contractor	Primarily by the PIU of the Pourashava and Secondarily by the PMU of BMDF

		• Protection against dust by using masks and covering of the head and body; • 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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily

						by the 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
Construction Stage						
General construction works (Site Clearing, Earth work, Backfilling, fueling of sub-project 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
	Air pollution	• Check regularly and ensure that all the sub-project 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
	Traffic congestion, effect	• Ensure schedule deliveries of material/ equipment during off-peak hours;	Visual Observation	Regularly	Contractor	Primarily by the PIU of the

	on traffic and pedestrian safety	• Avoid road side storage of the construction materials; • Place cautionary sign for the pedestrian and safety traffic movement. • Inform the local people about sub-project 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 institutions, establishment, hospitals, and schools.				Pourashava and Secondarily by the PMU of BMDF
	Noise pollution	• Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; • Avoid prolonged exposure to noise (produced by equipment) by the workers; • Regulate use of horns and avoid use of hydraulic horns in sub-project 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.	Visual Observation /Analytical	Regularly and Periodically	Contractor	Primarily by the PIU of the Pourashava and Secondarily by the 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.	Visual Observation / Analytical	Regularly/ Periodically	Contractor	Primarily by the PIU of the Pourashava and Secondarily by the PMU of BMDF

		• Location of stockyards for construction materials shall be identified at a safe distance from watercourses.				
	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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
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 Pourashava designated dumping site.	Visual Observation	Regularly	Contractor	Primarily by the PIU of the Pourashava and Secondarily by the PMU of BMDF
IGS (improve sub grade)	Air and dust pollution affecting nearby settlement	• Maintain adequate moisture content of the soil during construction transportation, compaction and handling;	Visual Observation	Regularly	Contractor	Primarily by the PIU of the Pourashava and

/sand filling		• Carry the materials especially loose soil and sand with adequate cover.				Secondarily by the 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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
Dismantling work for site clearing	Generation of loose and clay soil due to the	• Cover exposed loose dry soil and wastes materials before disposal; • Disposal of soil and construction wastes at Pourashava designated dumping site.	Visual Observation	Regularly	Contractor	Primarily by the PIU of the Pourashava and

and excavation work	earth excavation work.					Secondarily by the 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 the PIU of the Pourashava and Secondarily by the PMU of BMDF
Cutting & welding of the reinforcem	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 the PIU of the Pourashava and Secondarily

ent for RCC work						by the 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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily by the 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 the PIU of the Pourashava and Secondarily by the 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 RCC 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;	• Better traffic management; • Control heavy traffic movement.	By the 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.	By the 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 parameters will be monitored by analytically. Hence, analytical monitoring guideline is shown below in tabular form.

7.2.Environmental Monitoring Plan

The Environmental Monitoring is important to record environmental impacts resulting from the sub-project activities and to ensure implementation of the mitigation measures identified earlier in order to reduce adverse impacts and enhance positive impacts from the sub-project activities. The environmental monitoring should be done at both constructional and operational phases.

Environmental monitoring requires a set of indicators that could be conveniently measured, assessed and evaluated periodically to observe the trends of change in base line environmental quality.

The following environmental monitoring plan should be adopted to monitor the activities of both construction and operational phases mentioned in the environmental management plan.

7.2.1. Monitoring during construction phase

The mitigation or enhancement measures outlines in EMP should be monitoring during construction period with regular interval in order to ensure its effective implementation to avoid the adverse effect of sub-project activities and to gain the positive impacts resulting for the activities. The environmental monitoring plan during the construction period is given in **Table 7-3** as below:

Table 7-3: 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

7.2.2. Monitoring during operational phase

Environmental monitoring during operational phase is limited to a number of impact parameters to see the actual performance of the sub-project. Monitoring of some issues might be necessary during the operational period of the sub-project those are given in **Table 7-4** as below.

Table 7-4: Monitoring plan (Visual observation during operation phase)

SL No	Issue	Key aspects	Monitoring frequency per year
1	Complaint from local people	Any significant complaint from local people and it's remedial procedure	4
2	Local drainage system	Maintaining proper drainage	4
3	Solid Waste Management	Proper management of solid wastes to be thrown on road	4

The environmental parameters to be monitored during operational phase are given in **Table 7-5** as below:

Table 7-5: Environmental parameters to be monitored (monitoring frequency)

Parameter	Location	Monitoring frequency per year
Air quality (SPM, PM_{10}, and PM $_{2.5}$)	At different points of the road	2
Water quality (BOD, pH, DO, TDS, Turbidity, NH_3)	At the nearby, surface water, ground water and drain water	2
Noise and Vibration	At different points of the road	2

7.3. Grievance Redress Mechanism

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

The grievance mechanism is related to resolve the risks and adverse impacts of the sub-project. 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) and they operate it 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.

7.3.1. Grievance redress committee (GRC)

Kaliakair Pourashava has formed a Grievance Redress Committee (GRC) headed by The Mayor. 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 will nominate a focal person. Complaints will be received through drop box, by post, email and website of Pourashava. The grievance box will be set up at construction site to received complaints. The grievance response focal point will be available at the Pourashava for recording the complaints and necessary response to an aggrieved person. It will receive complaints or suggestions, and produce them to the GRC for hearing and resolution. If any complaint is not resolved at Pourashava level, then the complaint will be produced to MD-BMDF. If it is not resolved by the MD-BMDF, then the sub-project will be dropped.

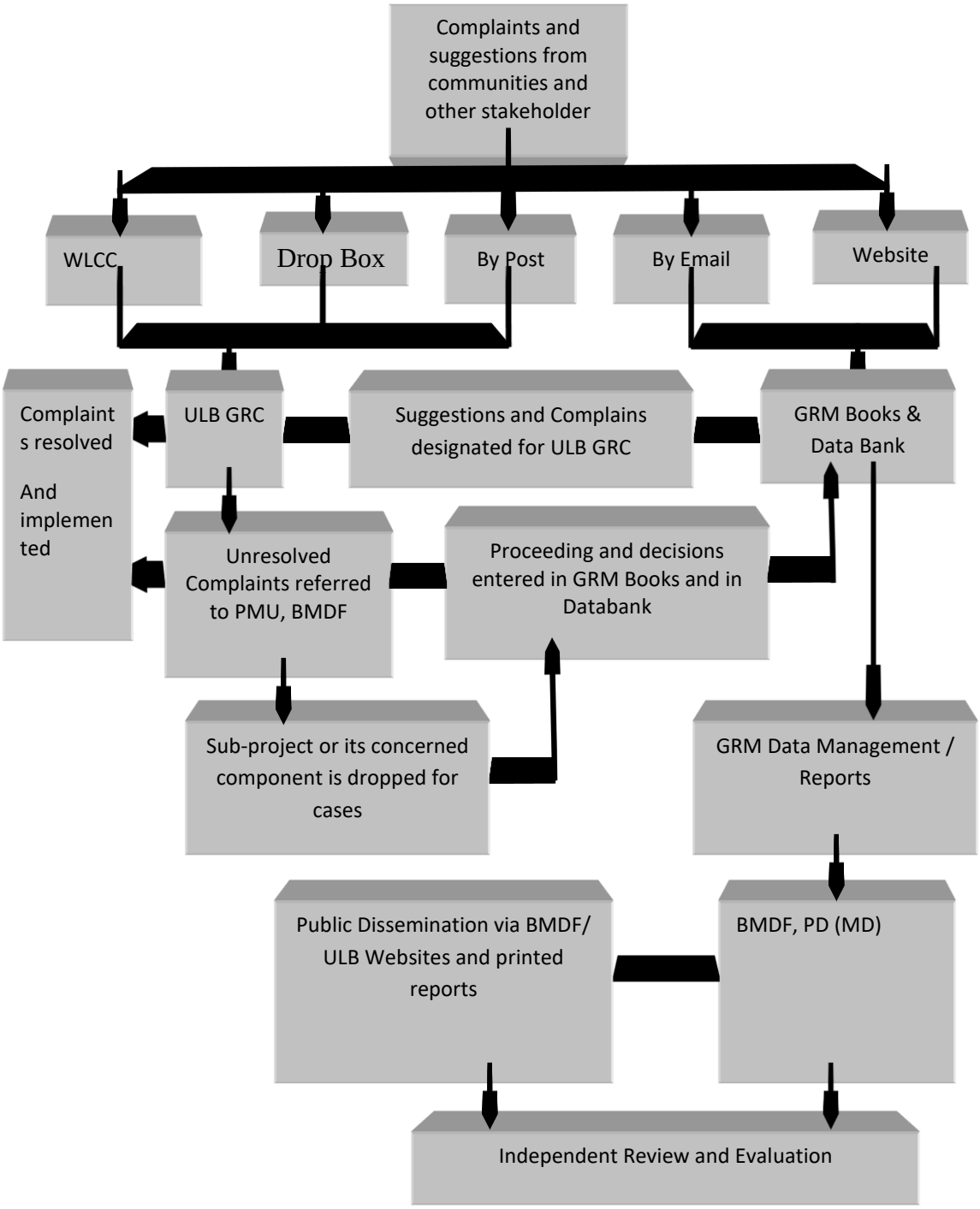
The structure of the GRC and membership are given as below:

Chairman	: ULB Mayor
Member-Secretary	: Head of the Engineering Section of ULB
Member	: Representative from local administration
	: Teacher from a local educational institution
	: Representative of a local NGO
	: Representative of civil society
	: Female ward councilor (of respective area)

The list of the GRC members along with office order of the Mayor is attached as **annexure 6**.

7.3.2. Grievance resolution process

Given flow chart will be followed for grievance resolution process of this sub-project.



Flow diagram 7-1: Grievance resolution process

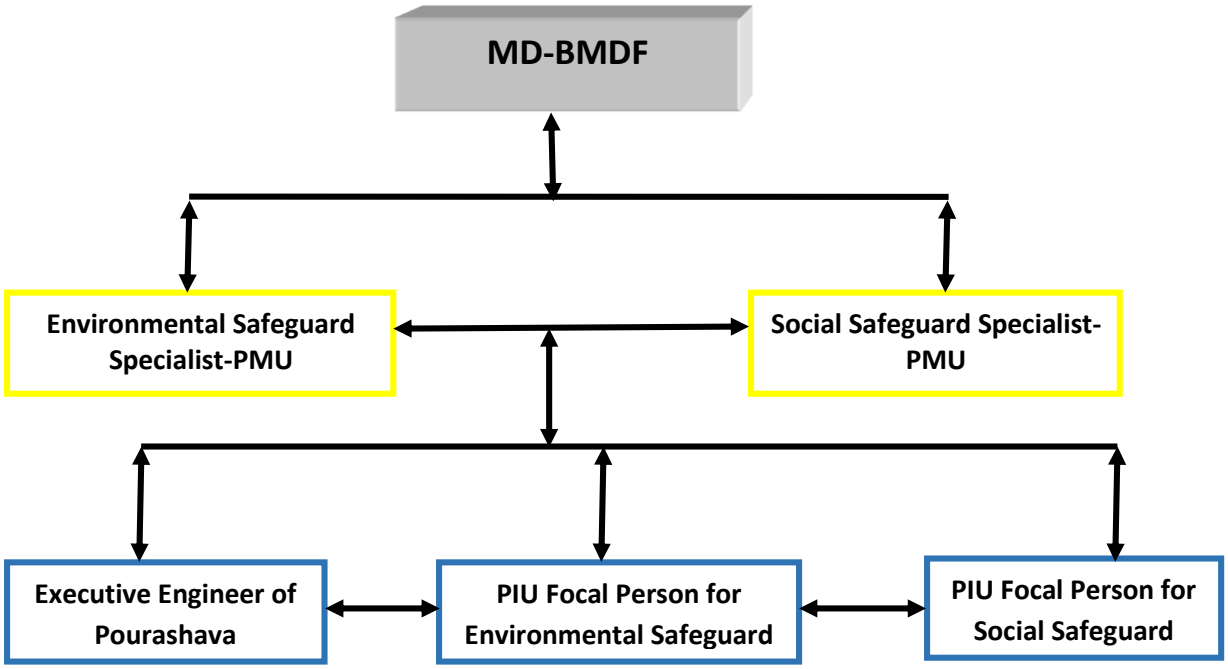
Note: If the appellant is still not satisfied, he or she has the right to take the case to the public courts. Kaliakair Pourashava should also publish the outcome of the cases on the public notice

boards. All costs involved in resolving the complaints (meetings, consultations, communication, and information dissemination) will be borne by the Kaliakair Pourashava. The Pourashava authority will try to resolve the issues (in most of the cases, in amicable settlement) within shortest possible time. However, the public court system is always open to resolve the issues.

7.4. Institutional Arrangement for Implementation of EMP

The Environmental Safeguard Compliance issues are directly vested the Pourashava Officials especially the Executive Engineer 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 Safeguard Specialist will submit the monthly monitoring reports on Environmental Compliances to the World Bank.



Flow diagram 7-2: Institutional arrangement for implementation of EMP

7.5. Capacity Building

A two-day long training program in participation of PIU members of Kaliakair Pourashava was organized by the PMU of BMDF to build the capability of PIU of Kaliakair Pourashava. The Consultant, hired by the Kaliakair Pourashava also participated in the training program. The PMU of BMDF organized this training program in order to enhance their capacity to conduct Environmental Assessment and Social Impact Assessment to be done for any proposed sub-project. A series of sessions were conducted by the Specialists of the PMU of BMDF. The major

sessions include: (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 PIU of Kaliakair Pourashava will organized an orientation of contractor, workers and other support staff on environmental issues to be considered and mitigation measures to be taken during pre-construction, construction and operational phases before deploying to the work sites in order to achieve the expected standards.

7.6. Estimation of Environmental Safeguard Cost of EMP

Considering the environmental impacts and their mitigation measures for the sub-project, several items are included in the BOQ for the environmental management. **Table 7-6** presents the estimated cost during construction phase and **Table 7-7** presents the estimated cost during operation phase for the environmental management. Cost during construction phase will be included in BOQ but Cost during operation phase will be bearded by Kaliakair Pourashava.

Table 7-6: Environmental management budget during construction phase

Item No.	Description of the Items	Costs (BDT)
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	Arrangement of temporary/ earthen drainage to drain out extra water logged due to rain and during construction works. All the temporary drains shall be filled up properly either at the end of event or at the end of works	50,000.00
4	Dust suppression measures by water spraying throughout the construction period in and around the sub-project site, uncovered aggregates and loose materials such as stockpiles of the sands, excavated earth etc. (Lump sum)	90,000.00
5	Air quality (SPM, PM_{10}, and $PM_{2.5}$) measurement- it can be measured from the recognized environmental survey company, public institute/ university one time before starting construction, two times during construction phase and one time just after construction.	120,000.00
6	Noise level measurement- it can be measured from the recognized environmental survey company, public institute/ university two times during construction phase and one time just after construction.	30,000.00

7	Water quality (pH, DO, TDS, BOD, Turbidity, NH_3) of both sides drain and underground water measurement- it can be measured from the recognized environmental survey company, public institute/ university one time before starting the construction, one time after the construction phase and two times during operation.	40,000
8	Wastes disposal facility during the construction period; collection, transportation, and dumping of the wastes at landfill site and providing sufficient bins; at least 6 bins (500 litre size) to be provided.	90,000.00
9	Water supply facilities (for the labor shed and work site):1 no. of tube well (depending on the site condition the contractor will select the option)	60,000.00
10	Sanitation facilities (at the labor shed): 2 nos. of the toilets preferably portable toilets (1 no. for women and 1 no. for men)	50,000.00
11	Providing PPE like hand gloves, spectacles for eye protection, helmets, masks, visible jacket, ear plug, safety boots for at least 30 person (25 for workers and 5 for visitor) and one first aid box with necessary medicine	100,000.00
12	Cautionary signs during construction: 8 nos.	15000.00
	Total	**8,60,000.00**

Table 7-7: Environmental management budget during operation phase (Annual)

Item No.	Description of the Items	Costs (BDT)
1	Air quality (SPM, PM_{10}, and PM $_{2.5}$) measurement- it can be measured from the recognized environmental survey company, public institute/ university two times per year at operation	60,000.00
2	Noise level measurement- it can be measured from the recognized environmental survey company, public institute/ university two times per year at operation	20000.00
3	Water quality (pH, DO, TDS, BOD, Turbidity, NH_3) measurement. It can be measured from the pre-approved public institute/ university	30000.00

	during operation period for waste water at underground water, drain and outfall @Tk. 10,000.00 per sample (2*3*5,000.00 Tk).	

Note: The environmental safeguard compliance issues and cost (like solid waste management, water supply, traffic management, drain cleaning, test of environment parameter etc.) are to be done by Kaliakair Pourashava.

8. COMPLIANCE WITH ENVIRONMENTAL CODE OF PRACTICES

The environmental code of practices (ECoPs) provides guidelines for environment management of the sub-projects to be implemented in different urban local bodies (ULBs) under MGSP. The main objective of the ECoP is to manage construction operations in harmony with the environment in an effort to contribute to the well-being of the community and the environment by (i) minimizing pollution, (ii) sustaining eco-systems, (iii) conserving cultural heritage, and (iv) enhancing amenity. In compliance with ECoP, following issues associated with the proposed sub-project are addressed during environmental assessment:

- Planning and design of the sub-project;
- Site preparation;
- Construction camps;
- Waste management;
- Water bodies;
- Water quality;
- Drainage;
- Public health and safety;
- Material storage, transport and handling;

In this assessment, it is found that some of the issues are not relevant to this sub-project. The issues those are found as relevant are addressed properly in this report.

9. PUBLIC CONSULTATION AND ACCESS TO INFORMATION

9.1. Introduction

Pubic Consultation is an effective tool for maintaining communication among the Pourashava authority, BMDF as funding authority, different stakeholders of the sub-project and community people where the sub-project will be implemented. It helps to facilitate and streamline decision making as well as fosters an atmosphere of common understanding among individuals, group and organizations that could be affected or be affected by the sub-project. It also ensures the transparency of the sub-project at all levels of planning, design, construction and operation. It is a continuous process by which opinion from public is sought on matters affecting them. Hence, as a part of IEE/EIA, an effective public consultation and access to information is important.

9.2. Objectives

The main objectives of the public consultation and access to information under this sub-project are: (i) to generate public awareness by providing information about the sub-project to all stakeholders, particularly the sub-project affected persons (PAPs) in a timely manner, and (ii) to provide opportunity to the stakeholders to raise their opinions and concerns on different aspects of the sub-project.

9.3. Methodology

Public consultation about the planning, design, implementation and operation is done at different stages following different participatory methods. The methods followed in public consultation are: (1) consultative meeting with different stakeholders, (ii) Focus group discussion with community people through the participation of male participants, and (iii) Focus group discussion with community people through the participation of female participants, girls and boys, and disable people.

One consultative meeting was organized at community level through the participation of concern stakeholders including Councilors of Kaliakair Pourashava, traders, shopkeepers, local leaders, community elites and representatives of business men from different locations of the road influence area. The participants were informed about the detail design and activities of sub-project going to be implemented. Environmental screening of the sub-project was also done in this meeting using the prescribed form mentioned in EMF of BMDF. They were asked to share their opinion, feedback and suggestions on environmental and social impacts of the sub-projects as well as the mitigation measures to avoid or reduce the potential impacts. The list of participants of this meeting is attached as **Annexure 5.**

One focus group discussion was organized with male community participants from different professions residing along the both sides of the proposed sub-project site. The participants were informed about the detail design and activities of sub-project going to be implemented and asked

about their opinion, feedback and suggestions on environmental and social impacts of the sub-projects as well as the mitigation measures to avoid or reduce the potential impacts. They spontaneously discussed about the problems and economic losses that they have been facing for a long time as well as benefits and importance of the drain for the community and business of the areas. The list of participants of this FGD is attached as **Annexure 3.**

Another focus group discussion was organized with female community participants living along the both sides of the proposed sub-project site. The participants were also informed about the detail design and activities of sub-project going to be implemented and asked about their opinion, feedback and suggestions on environmental and social impacts of the sub-projects as well as the mitigation measures to avoid or reduce the potential impacts on women's point of view. In this session, boys and girls, and disable people were also present. The list of participants of this FGD is attached as **Annexure 2**.

Special efforts were made to include the elderly, women, and vulnerable groups and to allow them to express their views regarding the sub-project implementation and operation. In all cases, the impression of stakeholders and general mass regarding sub-project implementation was highly positive and also expressed that they have been suffering a lot due to the lack of repair, reconstruction or improvement of the road as it is the only road to travel at different parts of the Pourashava and out of Pourashava.

9.4. Issues Raised by the Participants

The stakeholders and community people are highly interested about the sub-project. It is a long pending demand of them to the Pourashava to construct the drains. Most of the participants described their sufferings in daily life due to the damaged drains. They also assured that they will provide all sorts of required support from their side for constructing the drains. They also raised their concerns those are related to construction and operation of drains. The following issues were raised during community consultation:

- Water logging and unhealthy condition;
- Narrowness of drains;
- Height of roads and drains;
- RCC drains instead of brick drains;
- Solid waste and fecal sludge management;
- Noise pollution due to the construction work;
- Protection against the spreading of construction materials during construction work;
- Starting and completion of works within least possible time;
- Maintenance of roads and drains;
- Footpath over the drain for pedestrians;
- Damage of roads during connecting utility service lines;
- Stop the movement of heavy vehicles in small roads; and

- Quality of construction work;

9.5. Feedback, Suggestions, and Recommendations of the Participants

Stakeholders and community people both male and female provided the feedback, suggestions and recommendations during the consultative meeting and FGDs those are given as below:

- The water logging condition should be removed and healthy environmental condition should be retrieved by constructing and improving all the drains;
- The drains should be widened and the depth of the drains should be increased to ensure the functional water flow;
- The drain should be constructed in such a way that the household waste water can discharge easily to drain and no water can flow from one house to another house. It will help to avoid quarrels among the neighbor households;
- The height of roads and drains should be maintained in such a way that the storm water on road may discharge easily into the drain;
- The Pourashava should collect the household waste and remove the fecal sludge by introducing propoer solid waste and fecal sludge management system. In addition, there should be provision of penalty, if any household throw solid waste into drains and connect septic tank with the drains;
- The slope of the drains should be maintained so that it may pass water to the ultimate outfall without any back flow;
- Noise and air pollution should be controlled so that its impact might be minimum on community people;
- Sufficient protective measures should be taken so that no accident of workers and community people occurs during the construction work;
- The construction of drains should be completed within least possible time to reduce the transportation problem of the local people;
- The constructed roads and drains should be cleaned and regular maintenance of drains should be ensured by the Pourashava;
- The footpath over the top of the drains should be ensured, where required and possible, for the pedestrians;
- In most of the cases, utility lines are given after the construction road and it damaged the road. Hence, the utility lines should be given whether before the construction of road or there should be adequate provision of road repair and maintenance during providing utility lines;
- In most of the cases, small roads and drains of the Pourashava are being damaged due to movement of heavy vehicles those are being used for carrying construction materials for building of individual household. It is not rational to damage the public property for individual purposes. Hence, the movement of these heavy vehicles should be restricted in

the constructed roads by providing barrier at the entry point of each road so that limited height fleet can enter into the road only.

- Proper traffic control mechanism including sign of speed, sign of turning, community traffic police with flag at important points etc should be ensured;
- Community people and shop keepers should be mobilized through awareness campaign so that they can keep generated solid waste in own waste bin and no waste is thrown on the roads and drains. The Pourashava should ensure the collect, treatment and disposal of solid waste properly; and
- Overall the quality of the work should be ensured through proper monitoring of works as well as involving community people in monitoring.

9.6. 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 sub-project implementation. It will also be made available to the public. The final assessment report (both English and Bangla) will also be uploaded in the Kaliakair Pourashava website, BMDF website and the World Bank website after approval.

10. CONCLUSION AND RECOMMENDATIONS

10.1. Conclusion

On the basis of the findings of the environmental assessment, it could be concluded that the subproject is environmentally sound and sustainable. It will also improve the environmental condition of the subproject areas and significant improvement in quality of life and public welfare will result once the subproject is in operation. The potential environmental impacts seem very minimum and manageable, and it would be minimized by taking proposed mitigation measures. The adverse environmental impacts from the subproject will mostly take place during the construction stage. No endangered or protected species of flora or fauna are reported at the subproject site. The benefits of the subproject will be significant by creating employment and business opportunities during the construction and operational phases. There is no significant cumulative adverse impact during operation that is identifiable at this stage. The proposed subproject activities have no significant adverse environmental impact so far as a time bound execution program with application of advanced construction technology is ensured. The mitigation measures are well within such codes and practices of construction and operation of the proposed subproject.

10.2. Recommendations

The attitude of the community people towards the proposed roads and drains is highly positive as well as they have some recommendations to minimize some impacts of on the environmental and social environment during its construction and operation. The Government of Bangladesh and World Bank have some legal and social safeguard compliances issues those are applicable during

constructing and operating the proposed sub-project. Considering the above-mentioned issues and findings of the study, following key recommendations are made for smooth construction and successful operation of the roads and drains:

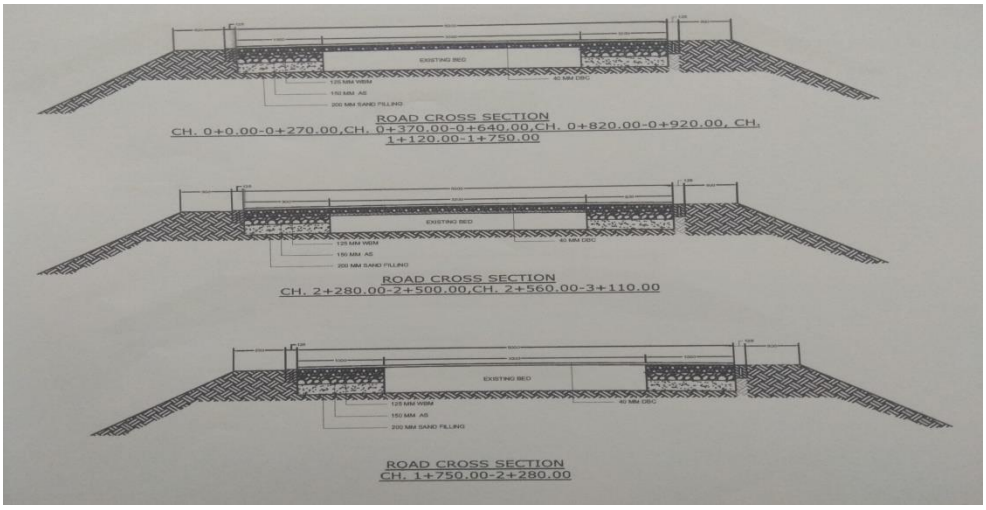
- The condition of the roads and drains is very bad and public demand for this road is very high. The construction of the road should be started as soon as possible and should be completed within least possible time;
- Proposed environmental management plan should be implemented strictly both during operation and construction phase of the project;
- Suggestions and recommendation made by public for design and construction of road and drain, traffic management, solid waste management and waste water discharge should be taken into consideration;
- Proper training of maintaining environment, health and safety should be given to subproject management unit, contractor and workers in both construction and operation phase;
- Environmental monitoring should be conducted as proposed in environment management plan; and
- This plan could be updated at any stages of the construction and operation of the subproject in case of addressing the environmental issues those are not identified and raised at this stage.

REFERENCES

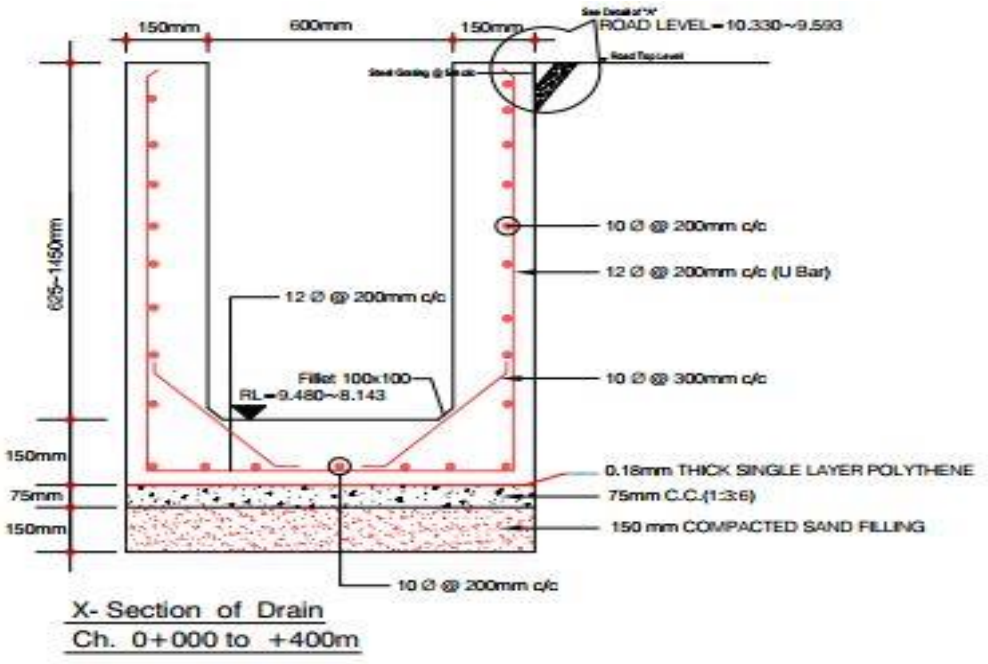
1. Bangladesh Bureau of Statistics. District Statistics 2011 of Kaliakair.
2. Bangladesh Bureau of Statistics. Bangladesh Population and Housing Census 2011.
3. Bangladesh Municipal Development Fund. Environmental Management Framework, 2017.
4. Final Master Plan of Kaliakair Pouraashava, May 2008.
5. Kaliakair Pourashava Data, 2018.
6. https://en.wikipedia.org/wiki/Kaliakair_District, Dated on 5 July 2018

ANNEXURES

Annexure 1: Design of RCC Roads and Drains



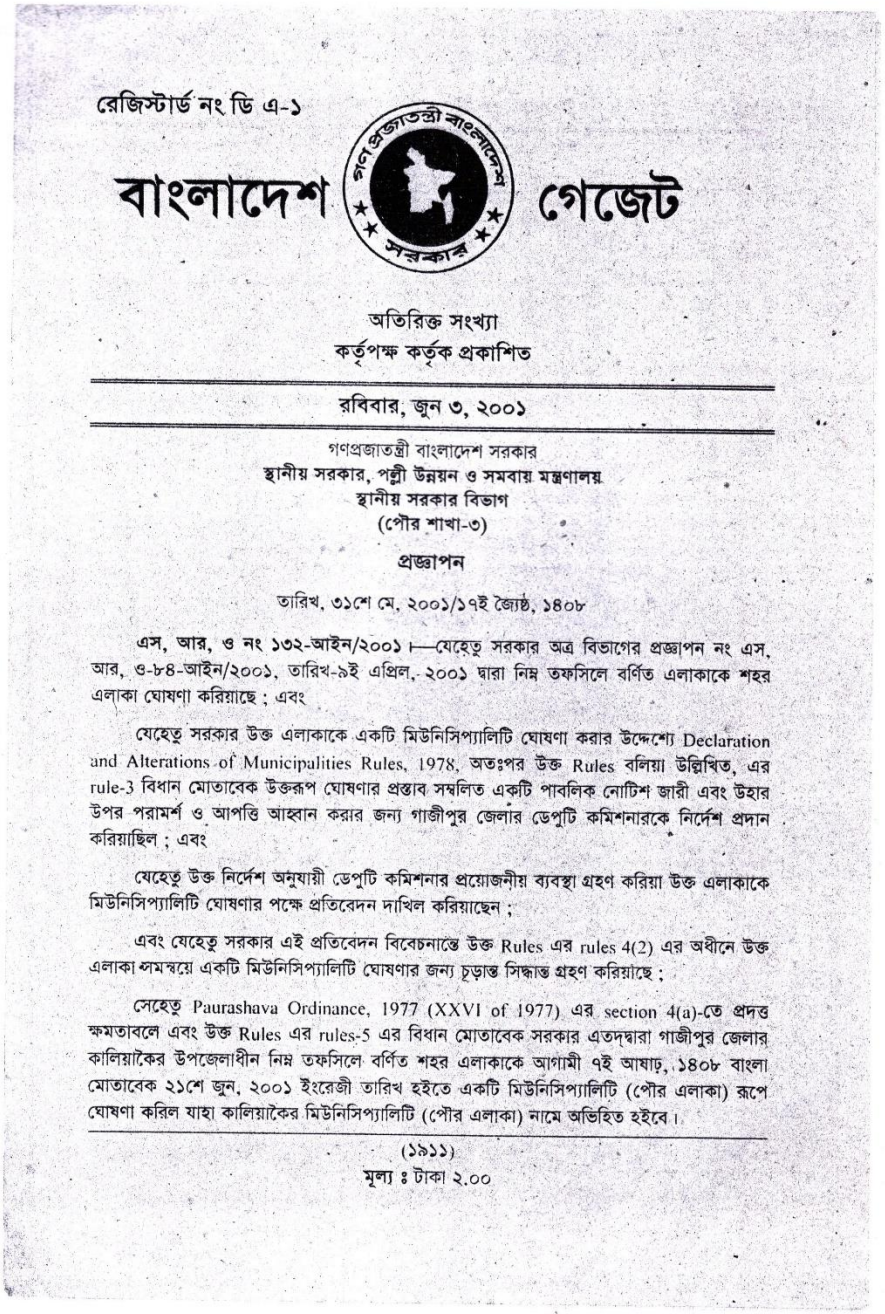
Cross Section of RCC Road



Cross Section of RCC Drain

Annexure 2: Legal document of the land

মূল কপি



রেজিস্টার্ড নং ডি এ-১

বাংলাদেশ গেজেট

অতিরিক্ত সংখ্যা
কর্তৃপক্ষ কর্তৃক প্রকাশিত

রবিবার, জুন ৩, ২০০১

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার
স্থানীয় সরকার, পল্লী উন্নয়ন ও সমবায় মন্ত্রণালয়
স্থানীয় সরকার বিভাগ
(পৌর শাখা-৩)

প্রজ্ঞাপন

তারিখ, ৩১শে মে, ২০০১/১৭ই জ্যৈষ্ঠ, ১৪০৮

এস, আর, ও নং ১৩২-আইন/২০০১।—যেহেতু সরকার অত্র বিভাগের প্রজ্ঞাপন নং এস, আর, ও-৮৪-আইন/২০০১, তারিখ-৯ই এপ্রিল, ২০০১ দ্বারা নিম্ন তফসিলে বর্ণিত এলাকাকে শহর এলাকা ঘোষণা করিয়াছে ; এবং

যেহেতু সরকার উক্ত এলাকাকে একটি মিউনিসিপ্যালিটি ঘোষণা করার উদ্দেশ্যে Declaration and Alterations of Municipalities Rules, 1978, অতঃপর উক্ত Rules বলিয়া উল্লিখিত, এর rule-3 বিধান মোতাবেক উক্তরূপ ঘোষণার প্রস্তাব সম্বলিত একটি পাবলিক নোটিশ জারী এবং উহার উপর পরামর্শ ও আপত্তি আহ্বান করার জন্য গাজীপুর জেলার ডেপুটি কমিশনারকে নির্দেশ প্রদান করিয়াছিল ; এবং

যেহেতু উক্ত নির্দেশ অনুযায়ী ডেপুটি কমিশনার প্রয়োজনীয় ব্যবস্থা গ্রহণ করিয়া উক্ত এলাকাকে মিউনিসিপ্যালিটি ঘোষণার পক্ষে প্রতিবেদন দাখিল করিয়াছেন ;

এবং যেহেতু সরকার এই প্রতিবেদন বিবেচনান্তে উক্ত Rules এর rules 4(2) এর অধীনে উক্ত এলাকা সমন্বয়ে একটি মিউনিসিপ্যালিটি ঘোষণার জন্য চূড়ান্ত সিদ্ধান্ত গ্রহণ করিয়াছে ;

সেহেতু Paurashava Ordinance, 1977 (XXVI of 1977) এর section 4(a)-তে প্রদত্ত ক্ষমতাবলে এবং উক্ত Rules এর rules-5 এর বিধান মোতাবেক সরকার এতদ্দ্বারা গাজীপুর জেলার কালিয়াকৈর উপজেলাধীন নিম্ন তফসিলে বর্ণিত শহর এলাকাকে আগামী ৭ই আষাঢ়, ১৪০৮ বাংলা মোতাবেক ২১শে জুন, ২০০১ ইংরেজী তারিখ হইতে একটি মিউনিসিপ্যালিটি (পৌর এলাকা) রূপে ঘোষণা করিল যাহা কালিয়াকৈর মিউনিসিপ্যালিটি (পৌর এলাকা) নামে অভিহিত হইবে।

মূল্য ঃ টাকা ২.০০

তফসিল

ক্রমিক নং	ইউনিয়নের নাম	মৌজার নাম	জে, এল, নং	দাগ নম্বর
১	২	৩	৪	৫
১।	মৌচাক	কোচাকুড়ি	৪১৪	১-২৫৯, ২০৬৯, ২০৭১, ২৬০-৬৮৭, ২০৬৭, ২০৬৮, ২০৭০, ২০৭৫, ২০৭৮, ২০৭৯, ৬৮৮-৯২৯, ৯৩১-৯৬৯, ৯৭১-১০৮৯, ২০৭২, ২০৮০, ১০৯০-১৪৫৬, ২০৭৬, ২০৭৭, ২০৮১, ১৪৫৭-১৮১৬, ২০৭৩, ২০৮২, ১৮১৭-২০৬৬, ২০৭৪।
		ভানারা	৪১২	১-৯২, ২০১-৯৪৩, ১১০১-১৪১৯।
		পাঁচলক্ষী	১৪৭	১-২৪০।
		বরাব	৪১১	১-৩৭৯, ৫০০-১০২০, ১২০১-১৪৫৯।
		কালামপুর	৪২৭	১-২১০, ৩২১-৮০০।
		ভুলুয়া	৪২৫	১-২৪০।
		সিনাবহ	৪২৬	১-৮৪০।
		মাঝুখান	৪১৩	১-৬৯০, ১০০১-১০৩০, ১০৬১-১৫১০।
		সফিপুর	৪২১	১-৪৭২, ৬০০-১০৭৪।
		হরিরা উৎপুলকার	৪১৬	১-১৭২।
		হাবিবপুর	৪১৮	১-১৮৬।
		উলুসারা	৪১৯	১-১৮৪।
		চান্দরা	৪২০	১-৩২৯, ৩৩০-৫০০ ছুট, ৫০১-৯৭১, ৯৭২-১১০০ ছুট, ১১০১-১৬৩৭, ১৬৩৮-২০০০ ছুট, ২০০১-২৮৩৮।
		পূর্ব চান্দরা	৪২২	১-৩৫০।
		মাটিকাটা	৪২৩	১-২৩১।
		কারলসুরিচালা	৪১৪	১-৫১৫।
২।	শ্রীফলতলী	গোয়ালবাথান	১৪৪	১-১০৮৯।
		পীরের টেকী	৫২	১-৮৮।
		লতিফপুর	১৪৩	১-৫৩৮।
		টেংলাবাড়ী	১৪২	১-১৯০।

Annexure 3: Attendance of community people in FGD (Female)

Name of Sub-project: Improvement of Drain, sub-project – 2

Package number:

Name of ULB: kaliakair Municipal **Name of District:** Gazipur

Date: 11.10.2018

Name of Place:

Level of participant community people (Female group)

Attendance of community people in FGD

Nos.	Name	Gender	Social status	Contact no.	Signature
১	[illegible]	Female	গৃহিনী	01979700155	[illegible]
২	[illegible]	Female	গৃহিনী	-	[illegible]
৩	[illegible]	Female	গৃহিনী	-	[illegible]
৪	[illegible]	Female	গৃহিনী	-	[illegible]
৫	[illegible]	Female	শিক্ষিকা	01791230216	[illegible]
৬	[illegible]	Female	গৃহিনী	-	[illegible]
৭	[illegible]	Female	গৃহিনী	-	[illegible]
৮	[illegible]	Female	গৃহিনী	-	[illegible]
৯	[illegible]	Female	গৃহিনী	-	[illegible]
		Female			
		Female			
		Female			
		Female			

Name of Sub-project:

Annexure 4: Attendance of community people in FGD (Male)

Name of Sub-project: Improvement of Drain, Sub-project – 2

Package number:

Name of ULB: Kaliakair Municipality Name of District: Gazipur

Name of Place Date: 11.10.2018

Level of participant: Community people (Male group)

Attendance of community people in FGD.

Nos.	Name	Gender	Social status	Contact no.	Signature
১	মো: আহমদ আলী -	Male	কাউন্সিলর কা: [illegible]	01712700212	[signature]
২	অধ্যক্ষ মোহাম্মদ আমিরুল ইসলাম শিকদার	Male	সাহিত্য সম্পাদক	01713502526	[signature]
৩	মোঃ আবুল হোসেন	Male	ব্যবসায়ী	01992221088	[signature]
৪	মো: আল মামুন	Male	ব্যবসায়ী	01718821344	[signature]
৫	মোঃ আব্দুল সবুর	Male	শিক্ষক	01739895180	[signature]
৬	মো: মুন্না	Male	ব্যবসায়ী	01777984644	মুন্না
৭	মোঃ [illegible] মিয়া	Male	ব্যবসায়ী	01789524973	[signature]
৮	মো: মিজানুর রহমান	Male	শিক্ষক	01775697507	[signature]
		Male			
		Male			
		Male			
		Male			
		Male			
		Male			

Annexure 5: Attendance of local Stakeholder, community member, WLCC/CBO in screening exercise

Name of Sub-project: Improvement of Drain, Sub-project – 2

Package number:

Name of ULB: Kaliakair Municipality Name of District: Gazipur

Name of Place Date: 11.10.2018

Level of participant: Local Stakeholders, community member, WLCC/CBO

Attendance of participants in social screening exercise.

Nos.	Name	Gender	Social status	Contact no.	Signature
1	Md. Shahidul Islam	Male	Businessman	01715943000	
2	Md. Amon Ahmed	Male	Business	01723689261	
3	Md. ARIFUL ISLAM	Male	Member, UP Union Parishad	01719145128	
4	Md. BULBUL AHMED	Male	Business	01726895033	
5	Md: Fazlul Haque	male	Business	01814863160	
6	MD. LAL MIHA	male	Business	01815-461474	
7	MOSHARAF	Male	"	01947354074	
8	[illegible]	Male	"	01761230572	
09	[illegible]	Female	Social worker		
10	Rowshan akhter Bulu	"	Service Holder	01726621444	
11	Kohinur AKter	"	Social worker	01819833416	
12	SUNIA AKTER	"	Housewife	01710622328	
13	[illegible]	"	NGO worker	01720638010	
14	Haripada Roy	Male	XEN, Kaliakoir Municipal	Off-1214343	

Annexure 6: List of GRC members along with the notification from the Mayor

কালিয়াকৈর পৌরসভা, গাজীপুর

ফোন-০৬৮২২-৫২১৫৬, ফ্যাক্স- ০৬৮২২-৫১৯০৪, e-mail: mayor_kaliakair@yahoo.com, xen_kaliakair@yahoo.com

স্মারক নং- কাপৌস/প্রকৌ/বিএমডিএফ/২০১৫-৬৩৮ তারিখঃ ২৫.০৫.২০১৬ খ্রি.

প্রাপক

ব্যবস্থাপনা পরিচালক
বাংলাদেশ মিউনিসিপল ডেভেলপমেন্ট ফান্ড (বি.এম.ডি.এফ)
গ্রামীন ব্যাংক ভবন, লেভেল-১৩
মিরপুর-২, ঢাকা-১২১৬

বিষয় ঃ বিবাদ মীমাংসা কমিটি (জিআরসি) গঠন প্রসঙ্গে।

সূত্র- (১) পত্রের স্মারক নং- বিএমডিএফ/এম-৪৫/২০১৪/৪৩৫, তারিখ-২২.০৫.২০১৬খ্রি.।

উপরোক্ত বিষয় ও সূত্রের আলোকে আপনার সদয় প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য জানানো যাচ্ছে যে, বিশ্বব্যাংকের অর্থায়নে বিএমডিএফ কর্তৃক অত্র পৌরসভায় এমজিএসপি এর আওতায় বাস্তবায়নাধীন/বাস্তবায়িতব্য উপ-প্রকল্প সমূহের নির্মানকাজ সম্পর্কিত কোন অনিয়ম, অভিযোগ উত্থাপিত হলে তা মীমাংসার লক্ষে সূত্রোক্ত পত্রের নির্দেশনা মোতাবেক নিম্নোল্লিখিত ০৭ সদস্য বিশিষ্ঠ বিবাদ মীমাংসা কমিটি গঠন করা হল-

ক্র.নং	নাম	পরিচিতি	কমিটির পদবী	মন্তব্য
১.	জনাব মোঃ মজিবুর রহমান	মেয়র, কালিয়াকৈর পৌরসভা	চেয়ারম্যান	মেয়র, সংশ্লিষ্ঠ পৌরসভা
২.	জনাব মোঃ সাজ্জাদ কবীর	উপজেলা প্রকৌশলী, কালিয়াকৈর	সদস্য	স্থানীয় প্রশাসনের প্রতিনিধি
৩.	জনাব মোঃ খলিলুর রহমান	প্রধান শিক্ষক, লতিফপুর মডেল সর. প্রাথ. বিদ্যালয়	সদস্য	স্থানীয় শিক্ষা প্রতিষ্ঠানের শিক্ষক
৪.	ব্যবস্থাপক	ভার্ক, কালিয়াকৈর	সদস্য	স্থানীয় এনজিও প্রতিনিধি
৫.	জনাব হাজী মোঃ রিয়াজ উদ্দিন	সমাজসেবক, লতিফপুর, কালিয়াকৈর	সদস্য	সুশীল সমাজের প্রতিনিধি
৬.	সংশ্লিষ্ঠ মহিলা ওয়ার্ড কাউন্সিলর	কাউন্সিলর (সংরক্ষিত)	সদস্য	সংশ্লিষ্ঠ মহিলা ওয়ার্ড কাউন্সিলর
৭.	প্রকৌ. হরিপদ রায়	নির্বাহী প্রকৌশলী, কালিয়াকৈর পৌরসভা	সদস্য	প্রকৌশল বিভাগের প্রধান

এমতাবস্থায়, বিষয়টি সদয় প্রয়োজনীয় ব্যবস্থা গ্রহণের নিমিত্তে প্রেরণ করা হলো।

২৫/৫/১৬

মোঃ মজিবুর রহমান
মেয়র
কালিয়াকৈর পৌরসভা, গাজীপুর