GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH

Local Government Engineering Department (LGED)

Local Government Division

Ministry of Local Government, Rural Development and Cooperatives

ENVIRONMENTAL ASSESSMENT (EA) REPORT

Name of the Subproject: a) Road improvement work from Koraighona Hossain Chairman's house to Siraj Master house b) Road improvement work from Koraighona Kalu Maji house to Moghpara via Sonkholapara c) Road from Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house d) Road improvement work from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel e) Improvement of Chiringa Station para road f) Construction of RCC road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house with Link road g) Road and drain from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid h) Construction of RCC drain from Shawnapuri culvert to Khodarkum via Sobujbag i) Drain and cross drain from Ghonosam bazar to Sobhaniakum j) Construction of RCC drain from Palakata Central Jame Mosque to Abu Salam's shop and k) Construction of Bhoramuhuri Haji Para road side RCC drain

Package No: MGSP/CHO/ 2018-19/W-11

Chakoria Pourashava, Cox's Bazar

Municipal Governance and Services Project (MGSP)

Design, Supervision and Management (DSM) Consultant Team

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF FIGURES

LIST OF PHOTOGRAPHS

ABBREVIATIONS

AP (AP's)	Affected Person
BDT	Bangladeshi Taka
BMD	Bangladesh Meteorological Department
BOQ	Bill of Quantity
CC	Cement Concrete
CIP	Capital Investment Plan
CP	Contingency Planning
DSM	Design, Supervision, and Management
EA	Environmental Assessment
ECR	Environmental Conservation Rules
EMP	Environmental Management Plan
EPP	Emergency Preparedness Planning
ES	Environmental Screening
FGD	Focal Group Discussion
GoB	Government of Bangladesh
GRC	Grievance Redress Committee
GRM	Grievance Redress Mechanism
GRP	Grievance Redress Procedure
IIS	Infrastructure Improvement Section
LGED	Local Government Engineering Department
MGSP	Municipal Governance and Services Project
PD	Project Director
PMU	Project Management Unit
RCC	Reinforcement Cement Concrete
RP	Relevant Reports
TL	Team Leader
ULB	Urban Local Body
WB	World Bank
XEN	Executive Engineer

1 INTRODUCTION

1.1 Subproject Background

Chakoria Pourashava is situated at Cox's Bazar District. Chakoria Pourashava established on December 14, 1994. At present, Chakoria is "A" type Pourashava. The Pourashava covers an area of 15.33 sq. km [*Chakoria Pourashava master Plan*]. As per *Population and housing Census 2011*, population of Chakoria Pourashava is 48262. Presently, Chakoria Pourashava consists of 126.08 km road network (among them 42.52 km pucca, 36.40 km semi-pucca and 47.16 km katcha). For drainage facility the Pourashava has 7.41 km drains. 427 nos. of natural or man-made ponds/ditches, 1 river and 4 khals also exist in the Pourashava area. Infrastructure and physical development are not attained significantly in the Chakoria Pourashava. Hence, this subproject is a continuation of the infrastructural development of the Chakoria Pourashava for the improvement of transport and drainage facilities.

This subproject includes: RCC roads and drains with allied works (RCC palisading, box culverts and road cross) including street lightng at different Wards (Wards no. 01, 02, 04, 05, 06, 07, 08 and 09) of Chakoria Pourashava. The significant features of the subproject are mentioned below:

Name of the Subproject :	a) Road improvement work from Koraighona Hossain Chairman's house to Siraj Master house Ch.0+00 to 0+820m b) Road improvement work from Koraighona Kalu Maji house to Moghpara via Sonkholapara Ch.0+00 to 1+000m c) Road from Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house Ch.0+00 to 0+350m d) Road improvement work from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel Ch.0+00 to 1+250m e) Improvement of Chiringa Station para road Ch.0+00 to 0+416m f) Construction of RCC road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house Ch.0+00 to 0+600m and Link Ch. 0+00 to 0+222m g) Road and drain from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid Ch.0+00 to 0+775m h) Construction of RCC drain from Shawnapuri culvert to Khodarkum via Sobujbag Ch.0+00 to 0+360m i) Drain and cross drain from Ghonosam bazar to Sobhaniakum Ch.0+00 to 0+850m j) Construction of RCC drain from Palakata Central Jame Mosque to Abu Salam's shop Ch.0+00 to 0+210m k) Construction of Bhoramuhuri Haji Para road side RCC drain Ch.0+00 to 0+360m
Package No. :	MGSP/CHO/2018-2019/W11

District Name :	Cox's Bazar
ULB Name :	Chakoria Pourashava
Jurisdiction Area :	Ward number 01, 02, 04, 05, 06, 07, 08 and 09
Structural Design Option :	RCC Road and drain with allied works (RCC palisading, box culverts and road cross drain)
Beneficiary Population :	About 64,449 as per information of Chakoria Pourashava
Tribal People :	No tribal people settlement found in the subproject area
Land Acquisition :	No private land acquisition is required
Estimated Cost :	203.283 million BDT
Subproject Duration :	09 Months
Tentative Start Date :	6th May, 2019
Tentative Completion Date :	6th January, 2020

1.2 Objectives of the Study

The aim of the study is to examine the environmental impacts due to construction and operation of the subproject and formulate the environmental management plan to minimize the negative impacts and enhance the positive impacts.

The specific objectives include:

- To assess the existing environmental conditions of the subproject site and its adjacent areas in order to establish a baseline framework against which potential environmental impacts due to implementation of the subproject would be compared;
- To identify and assess impacts resulting from the subproject during its construction phase and operation phase;
- To develop a rational environmental management plan with recommendations for mitigating adverse impacts and enhancing positive impacts and outlining environmental monitoring requirements both during construction and operational phase of the subproject.

1.3 Scope and Methodology of the Study

For the preparation of the subproject appraisal, environmental screening has been performed for all the subproject components. According to the screening, environmental assessment is required to fulfill the regulatory requirement of this subproject. The study methodology comprised the following activities:

- Desktop Study;
- Field Investigations and Data Collection;

- Data Analysis and Report Writing.

Desktop Study

The desktop study involved:

- Initial meetings with client, stakeholders to discuss the proposed subproject, including subproject activities;
- Collection and review of the baseline data, maps, reports and other relevant information on the existing environmental and social conditions of the subproject area;
- Review the relevant existing legislation, regulation and policies;
- Understand the anticipated technical processes that may affect the environment.

Field Investigation and Data Collection

A team of the consultants made a field investigation to the proposed site. Field investigations involved mainly site walks within the subproject area and the neighboring areas that may be affected by the subproject. The following key tasks were performed during the field visit:

- Taking photographs of the significant aspects to assist in describing the baseline environmental conditions of the subproject area;
- Interviews with representatives of the Chakoria Pourashava Officials within the subproject area and beneficiary and affected people within the subproject influence area;
- Obtaining relevant documents from the Pourashava and local people within the subproject influence area;
- Verifying information and data collected during the desktop study and to collect new information that may have been important in the assessment of the impacts and design of the mitigation measures.

Data Analysis and Report Writing

The data and information collected from all the sources (literature review, secondary and primary data, public consultation) were analyzed to describe the existing environmental setting of the subproject area, to identify the potential positive and negative impacts of the proposed subproject, as well as to provide preliminary suggestions for mitigation measures. Finally, this environmental assessment report has been prepared.

2 SUBPROJECT DESCRIPTION

2.1 The Study Area

The subprojects are located at different Wards of Chakoria Pourashava. “Koraighona Hossain Chairman’s house to Siraj Master house”, “Koraighona Kalu Maji house to Moghpara via Sonkholapara”, “Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house”, “Abbas Master’s house to Balagul Mobin Madrasa via Rajarbeel”, “Chiringa Station para road”, “Binamara Eddipara Mostak Ahmed’s shop to Nurul Kabir’s (Abbas Khalifa) house with Link road”, “Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid”, “Shawnapuri culvert to Khodarkum via Sobujbag”, “Ghonosam bazar to Sobhaniakum”, “Palakata Central Jame Mosque to Abu Salam’s shop” and “Bhoramuhuri Haji Para road” are situated within the jurisdiction of the wards no. 01, 02, 04, 05, 06, 07, 08 and 09 No. Wards of Chakoria Pourashava The location map, topographical features and layout plan of the subproject are shown in ***Figure 2.1.1, Figure 2.1.2*** and ***Figure 2.1.3***.

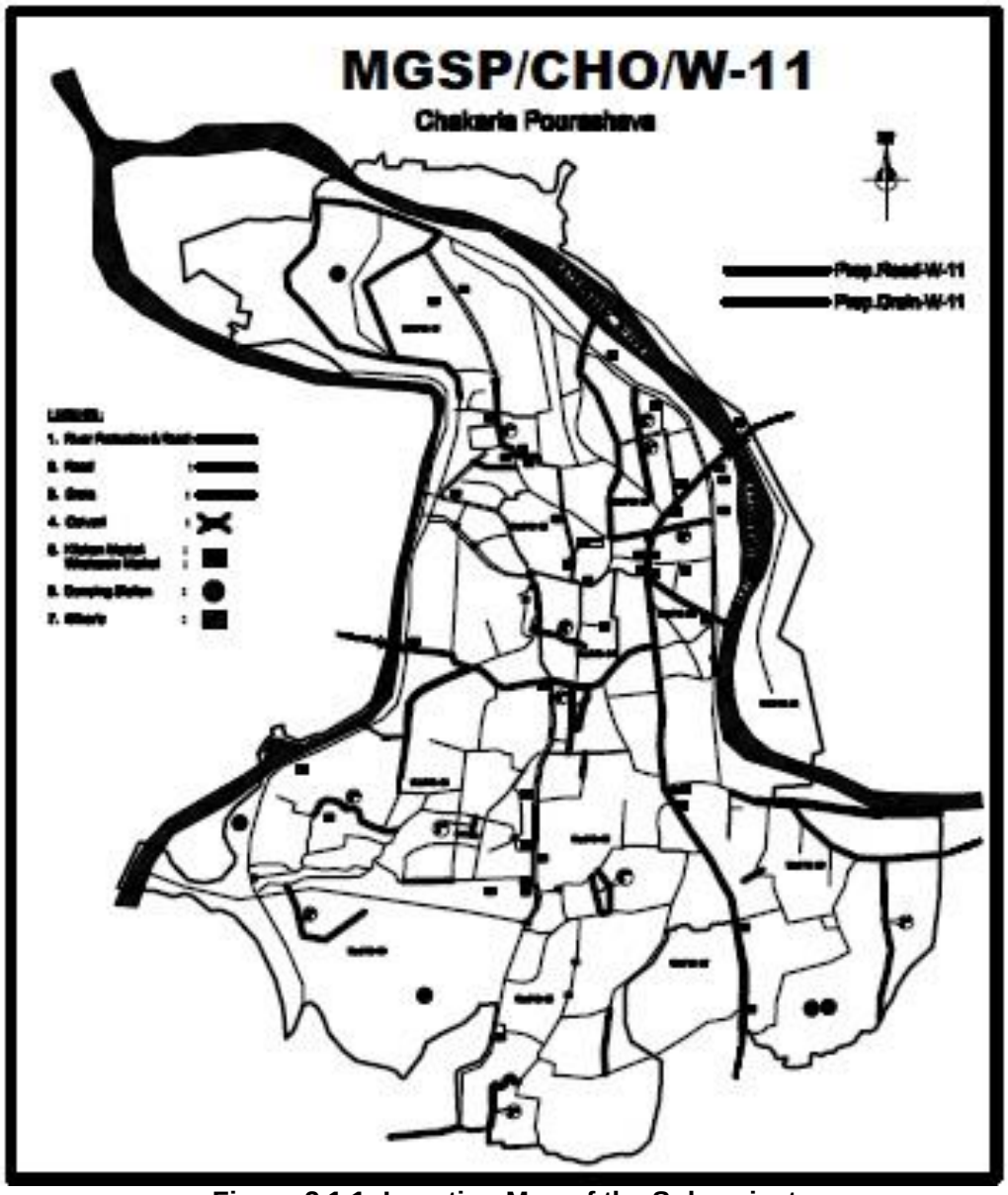


Figure 2.1.1: Location Map of the Subproject

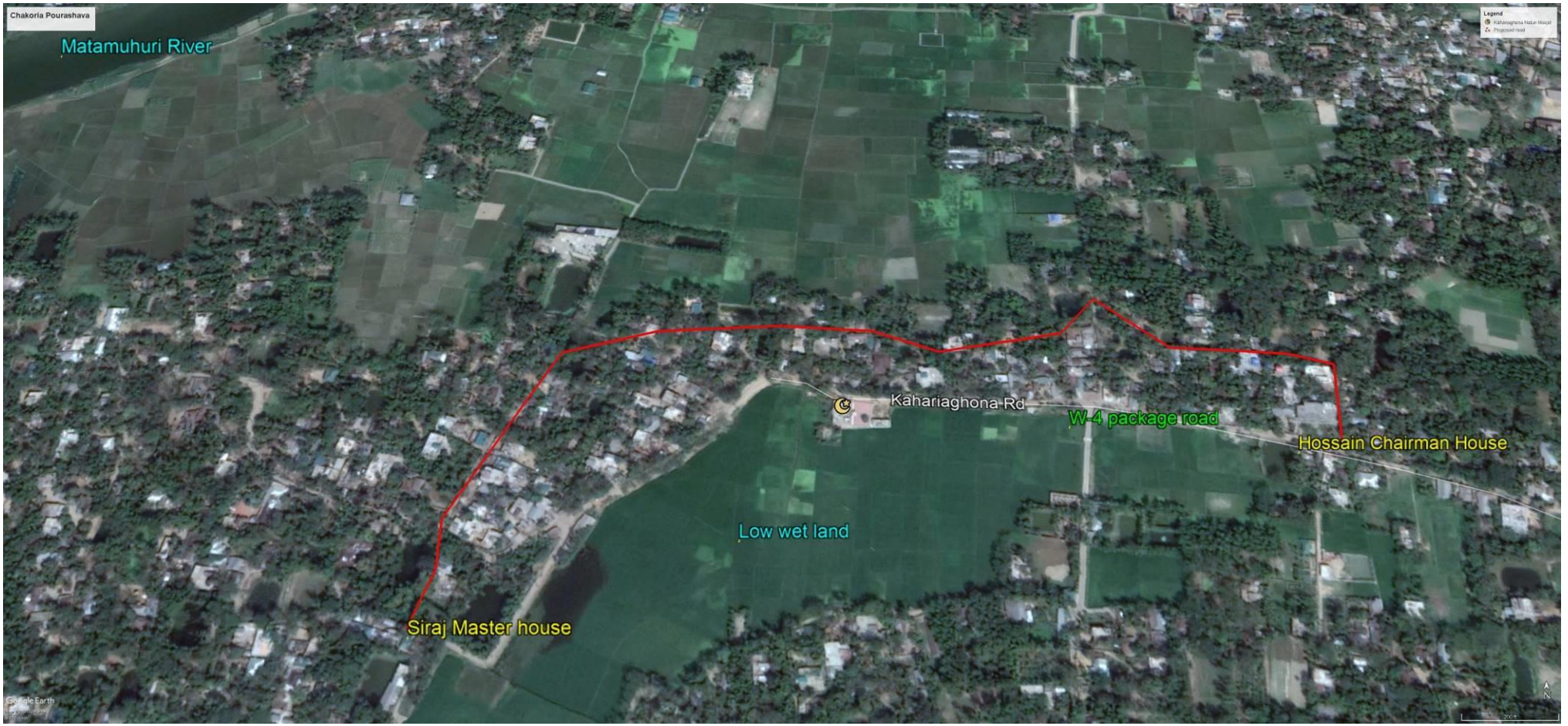


Figure 2.1.2 (a): Topographical Features of the proposed Subproject Road from Koraighona Hossain Chairman's house to Siraj Master house with influence area

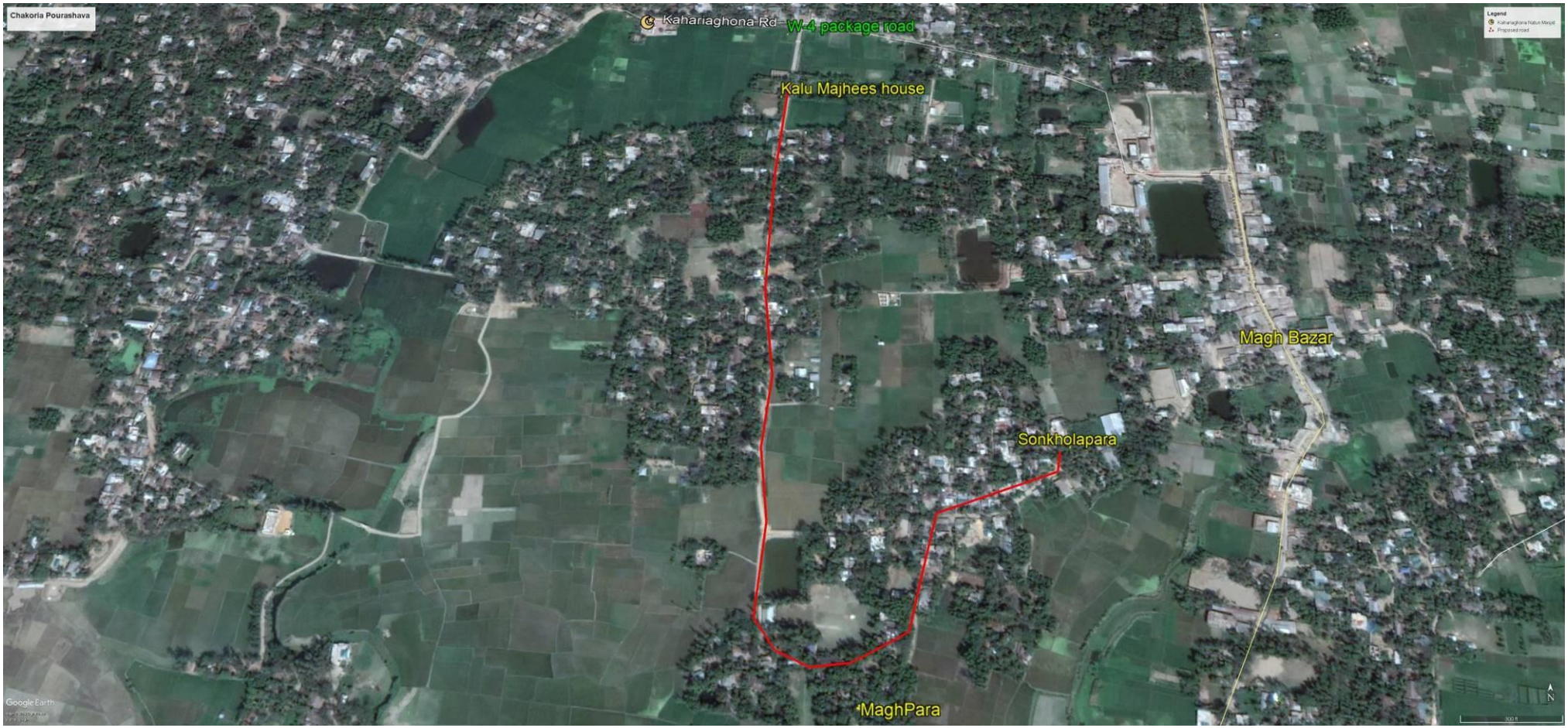


Figure 2.1.2 (b): Topographical Features of the proposed Subproject Road from Koraighona Kalu Maji house to Moghpara via Sonkholapara with influence area

Figure 2.1.2 (c): Topographical Features of the proposed Subproject Road from "Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house with influence area

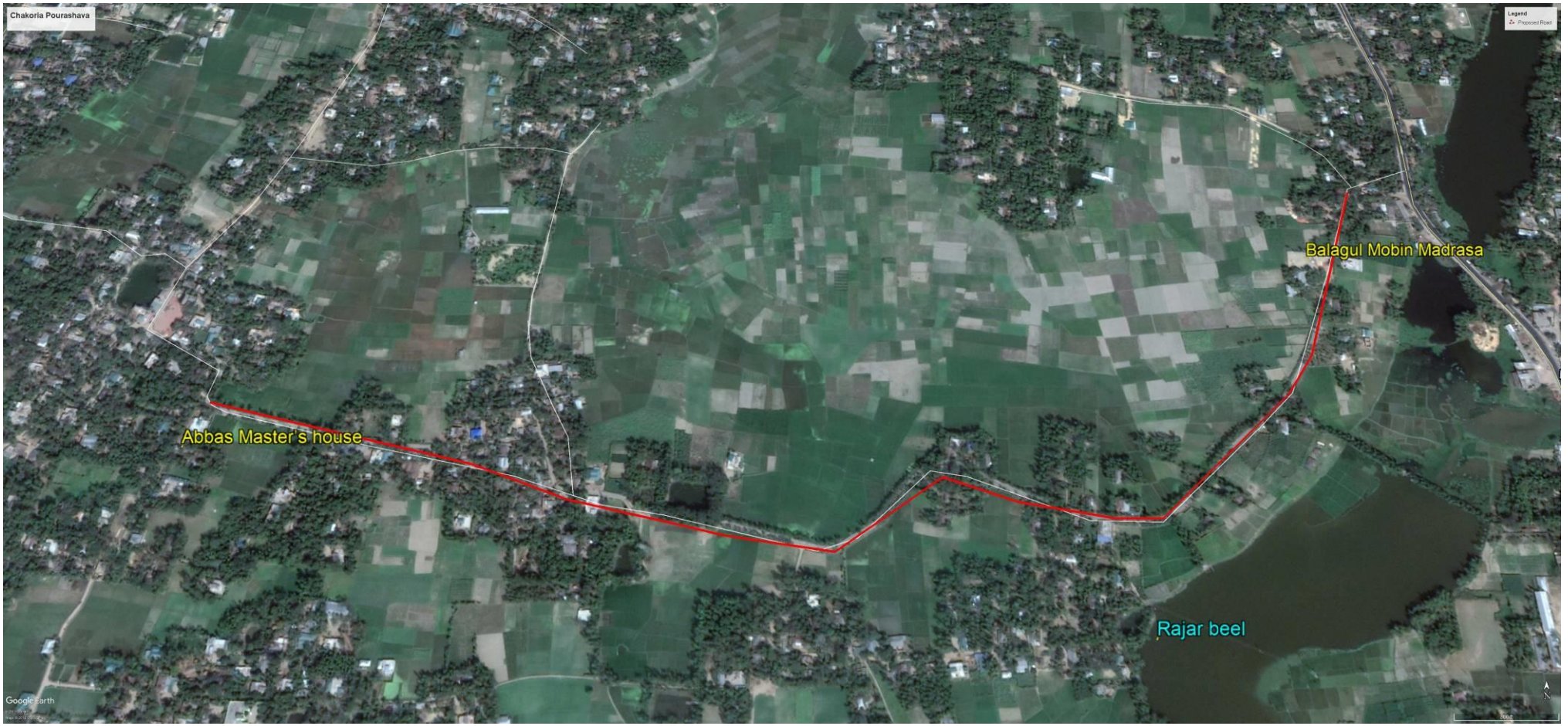


Figure 2.1.2 (d): Topographical Features of the proposed Subproject Road from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel with influence area

Figure 2.1.2 (e): Topographical Features of the proposed Subproject Road at Chiringa Station para road with influence area

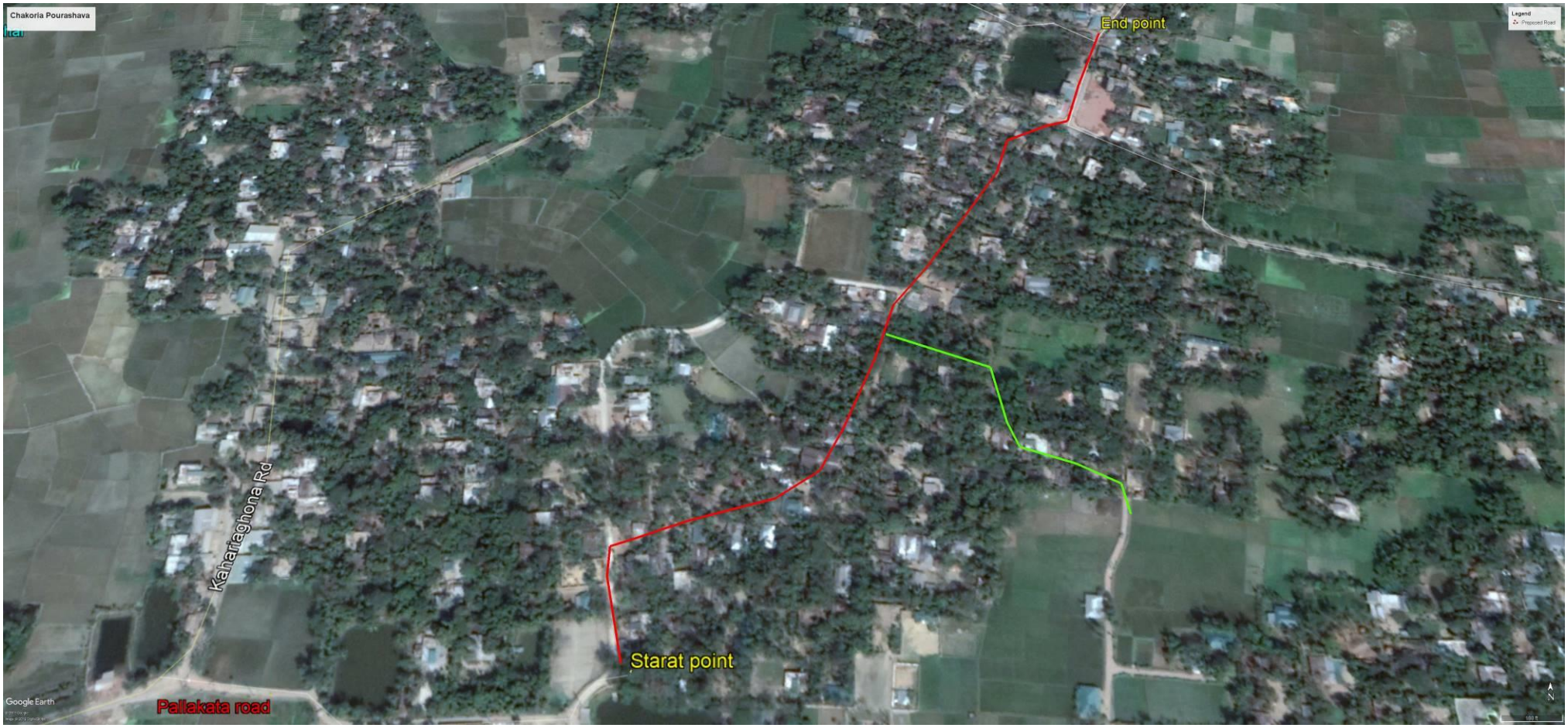


Figure 2.1.2 (f): Topographical Features of the proposed Subproject Road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house with Link road with influence area

Figure 2.1.2 (g): Topographical Features of the proposed Subproject area from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid with influence area

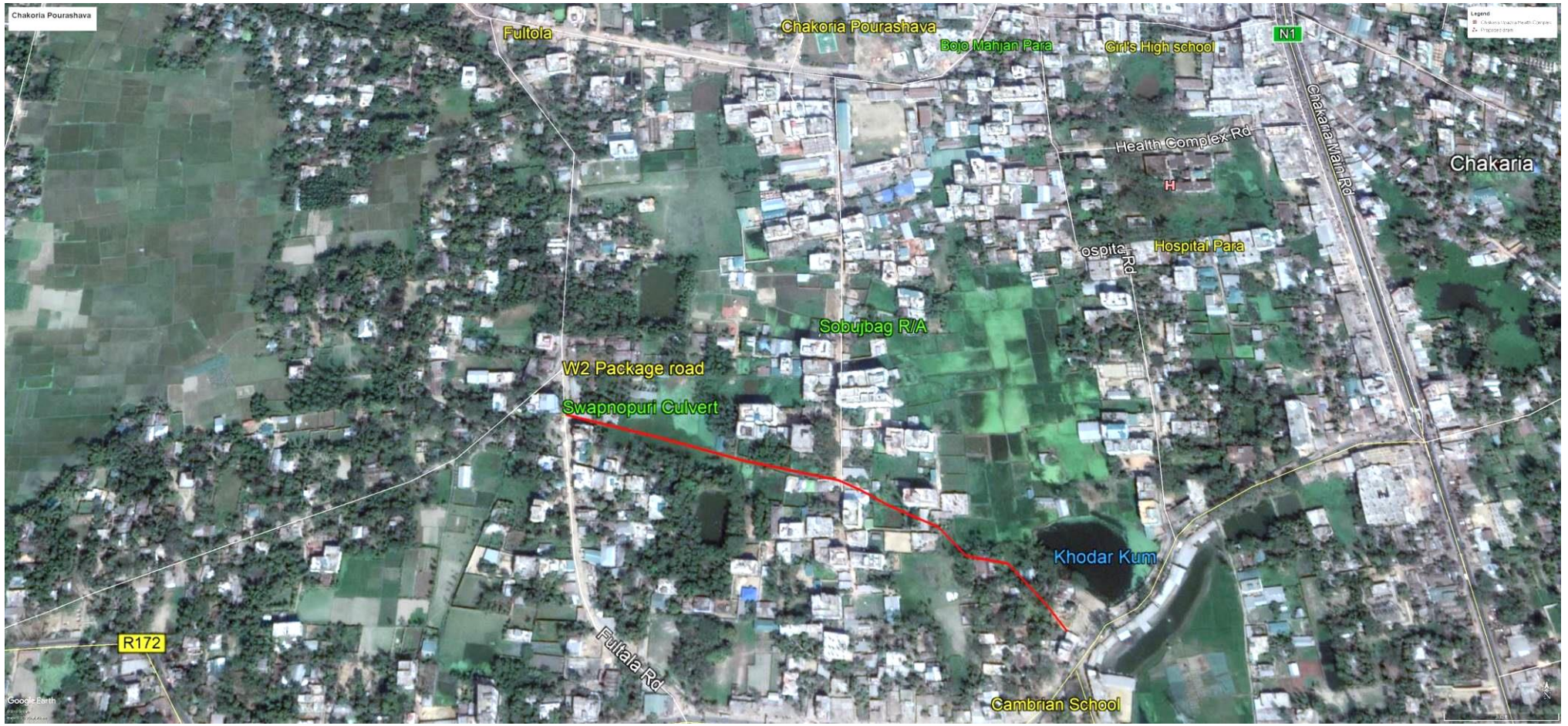


Figure 2.1.2 (h): Topographical Features of the proposed Subproject area from Shawnapuri culvert to Khodarkum via Sobujbag with influence area

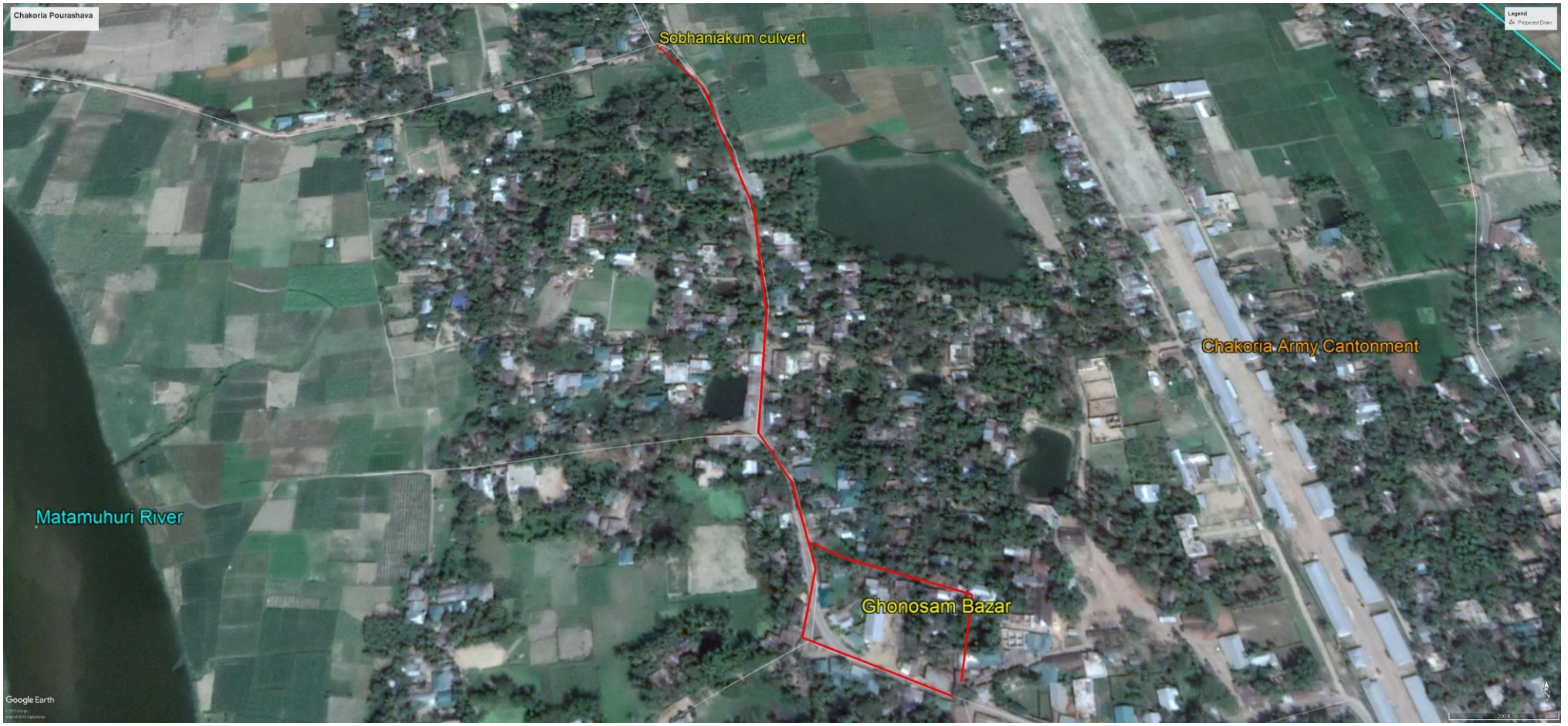


Figure 2.1.2 (i): Topographical Features of the proposed Subproject area from Ghonosam bazar to Sobhaniakum with influence area

Figure 2.1.2 (j): Topographical Features of the proposed Subproject area from Palakata Central Jame Mosque to Abu Salam's shop with influence area

Figure 2.1.2 (k): Topographical Features of the proposed Subproject area at Bhoramuhuri Haji Para road with influence area

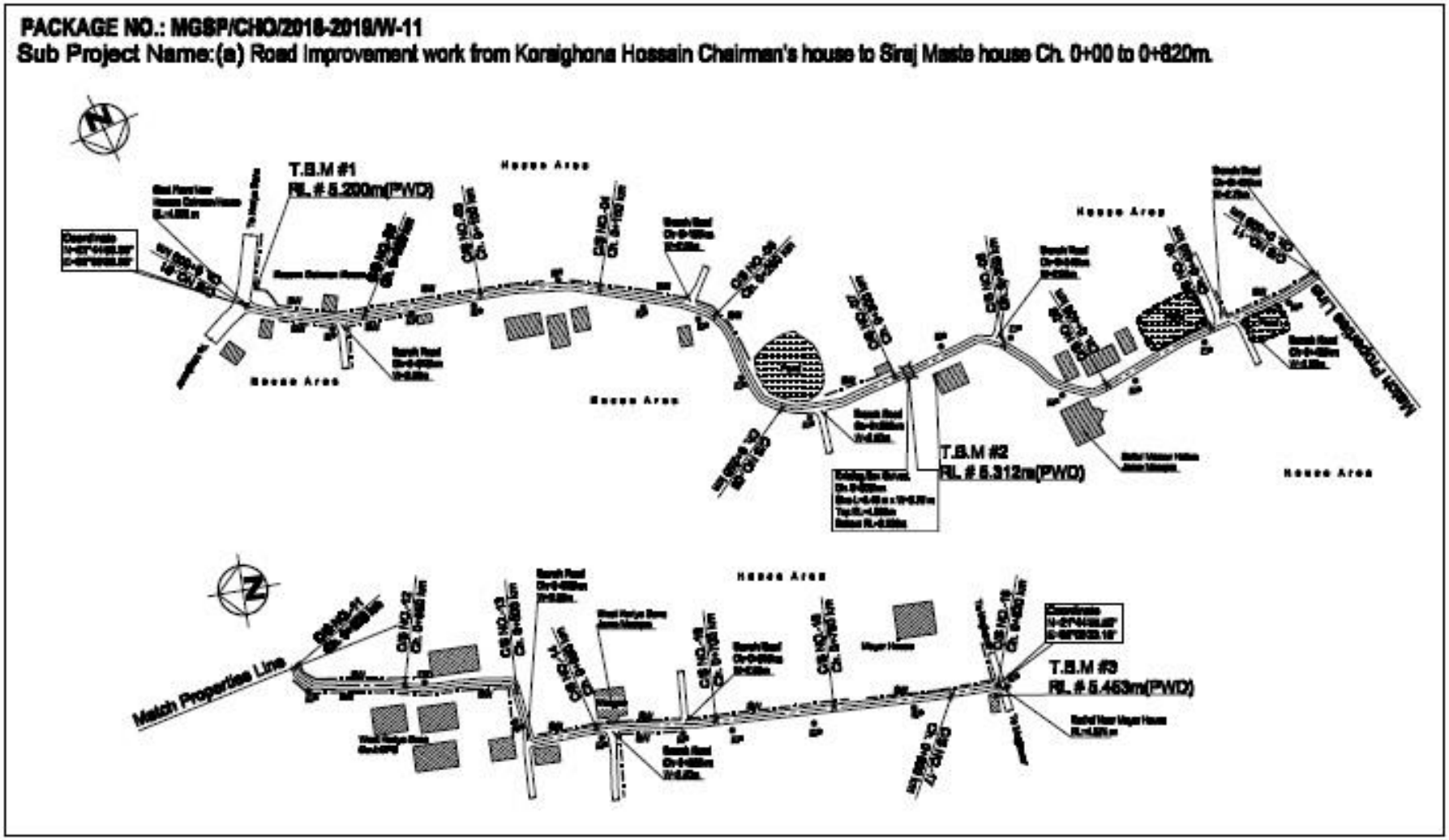


Figure 2.1.3 (a): Layout Plan of the proposed Subproject Road from Koraighona Hossain Chairman's house to Siraj Master House

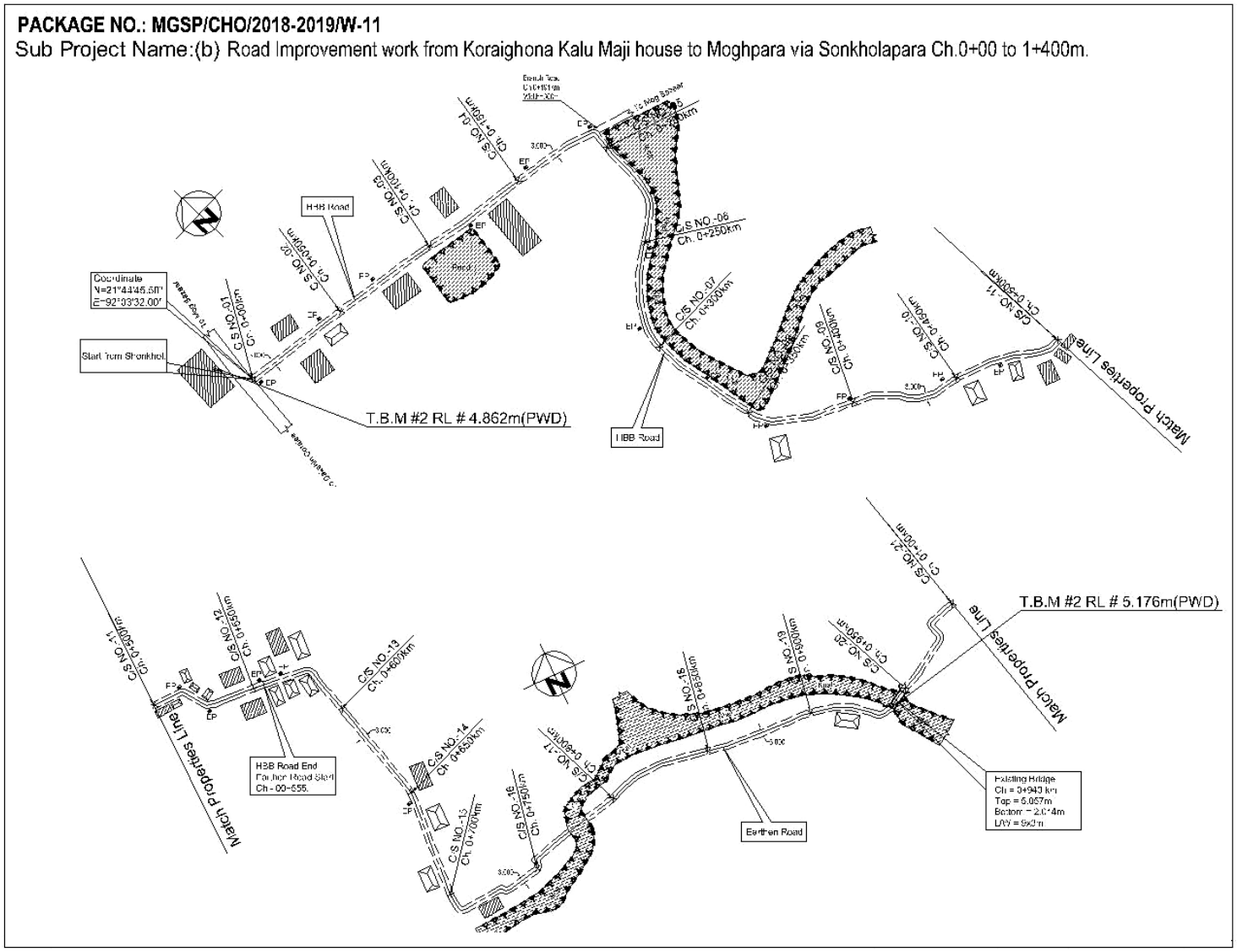


Figure 2.1.3 (b): Layout Plan of the proposed Subproject Road from Koraighona Kalu Maji house to Moghpara via Sonkholapara

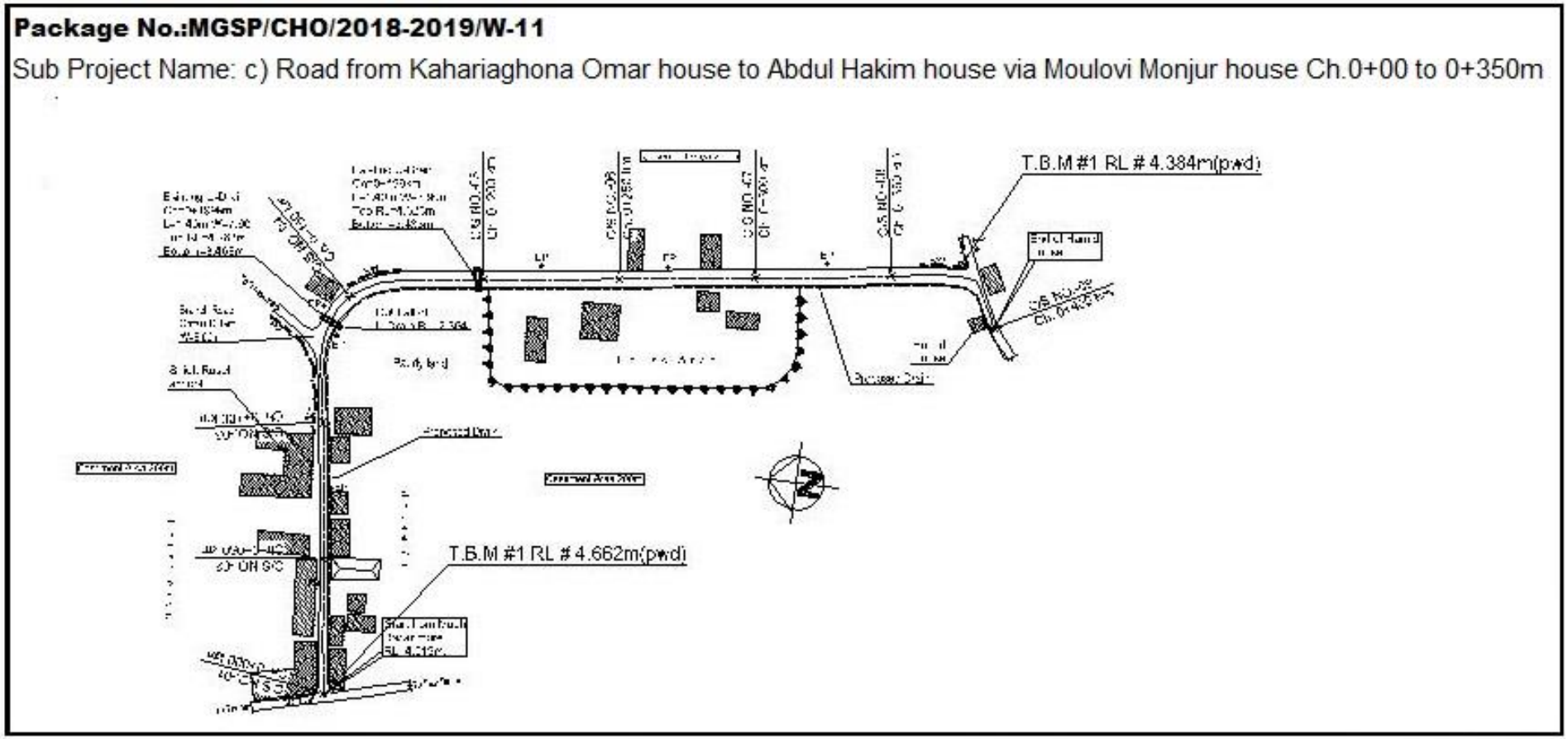


Figure 2.1.3 (c): Layout Plan of the proposed Subproject Road from "Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house

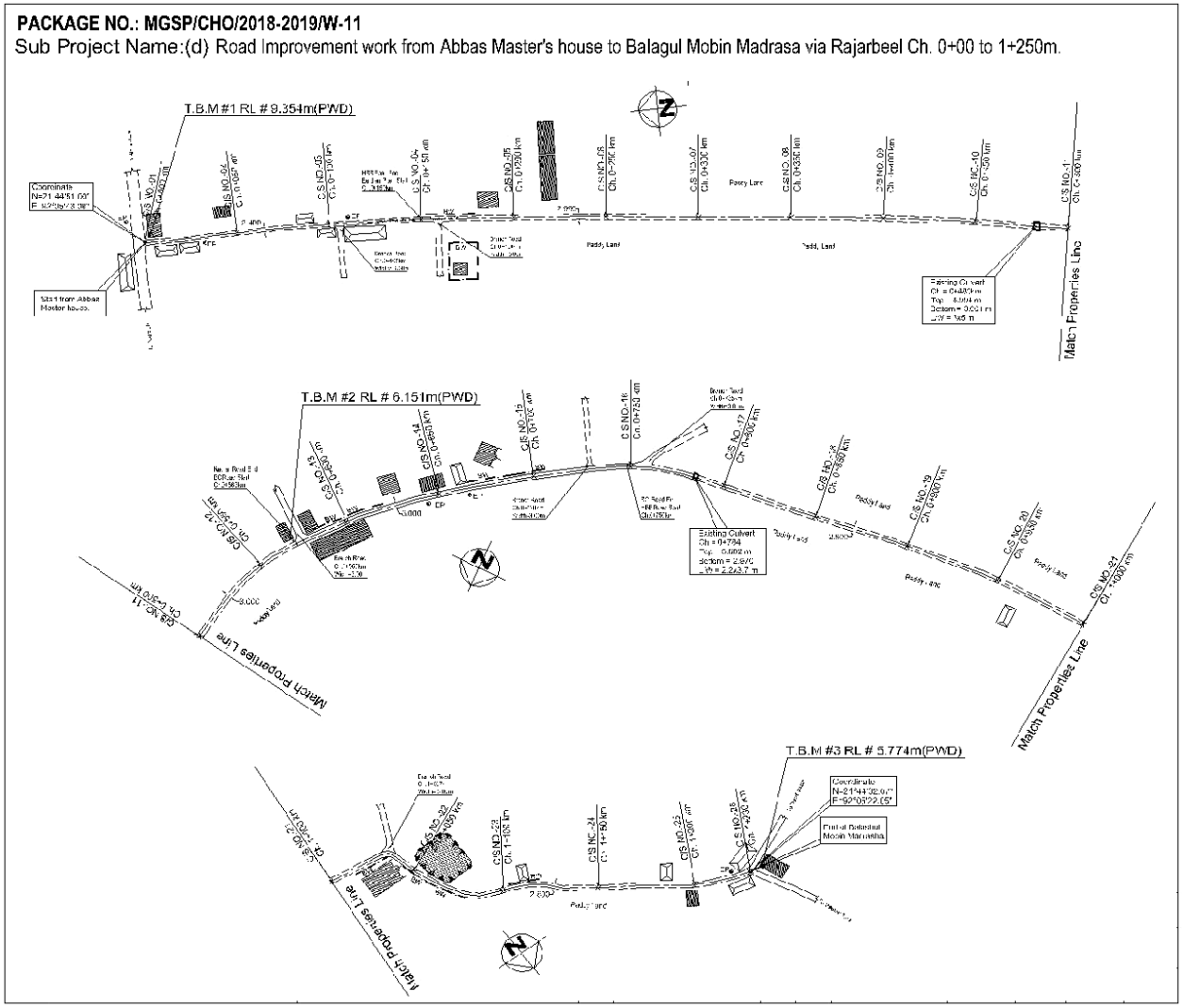


Figure 2.1.3 (d): Layout Plan of the proposed Subproject Road from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel

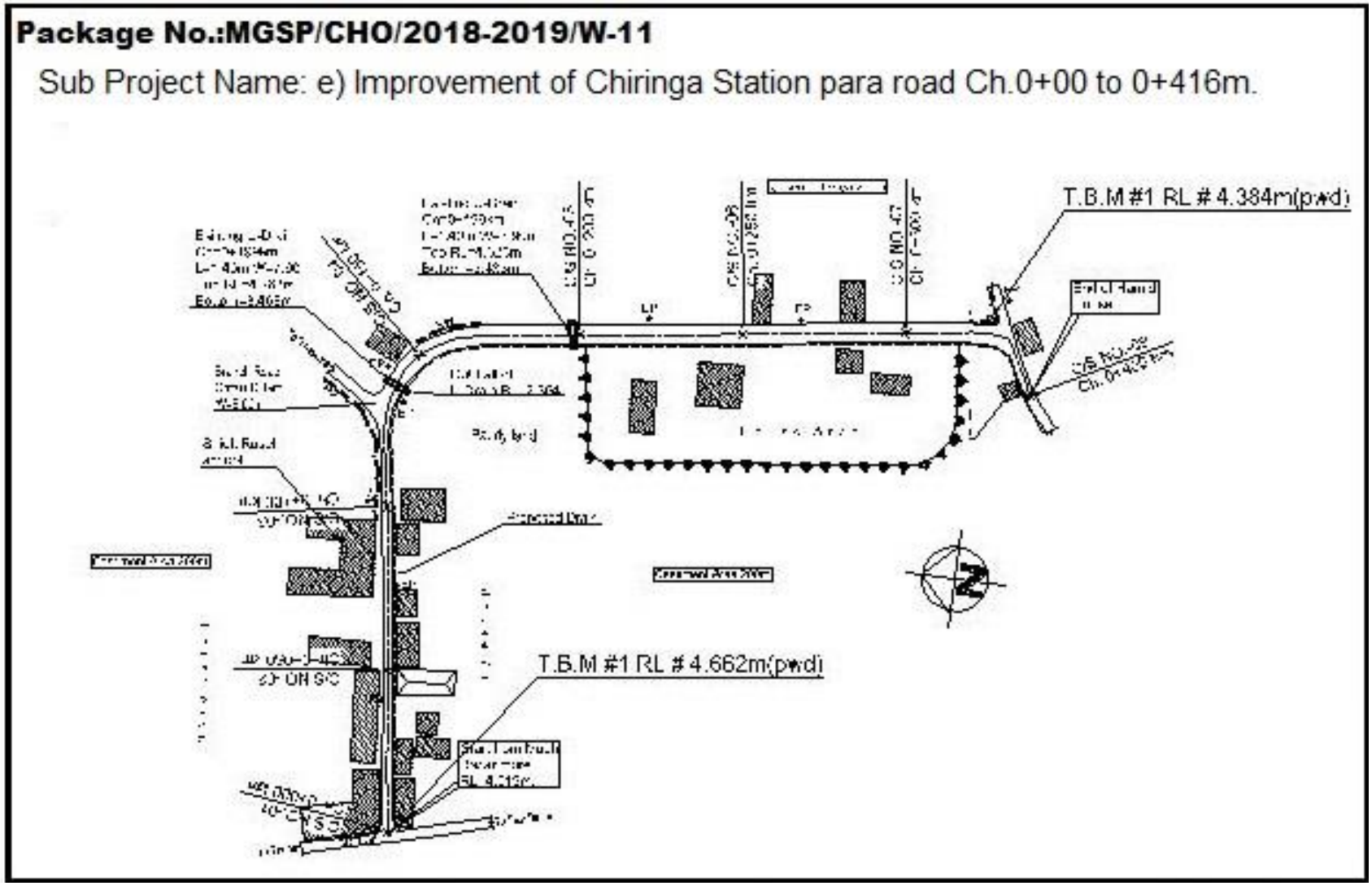


Figure 2.1.3 (e): Layout Plan of the proposed Subproject Road at Chiringa Station para road

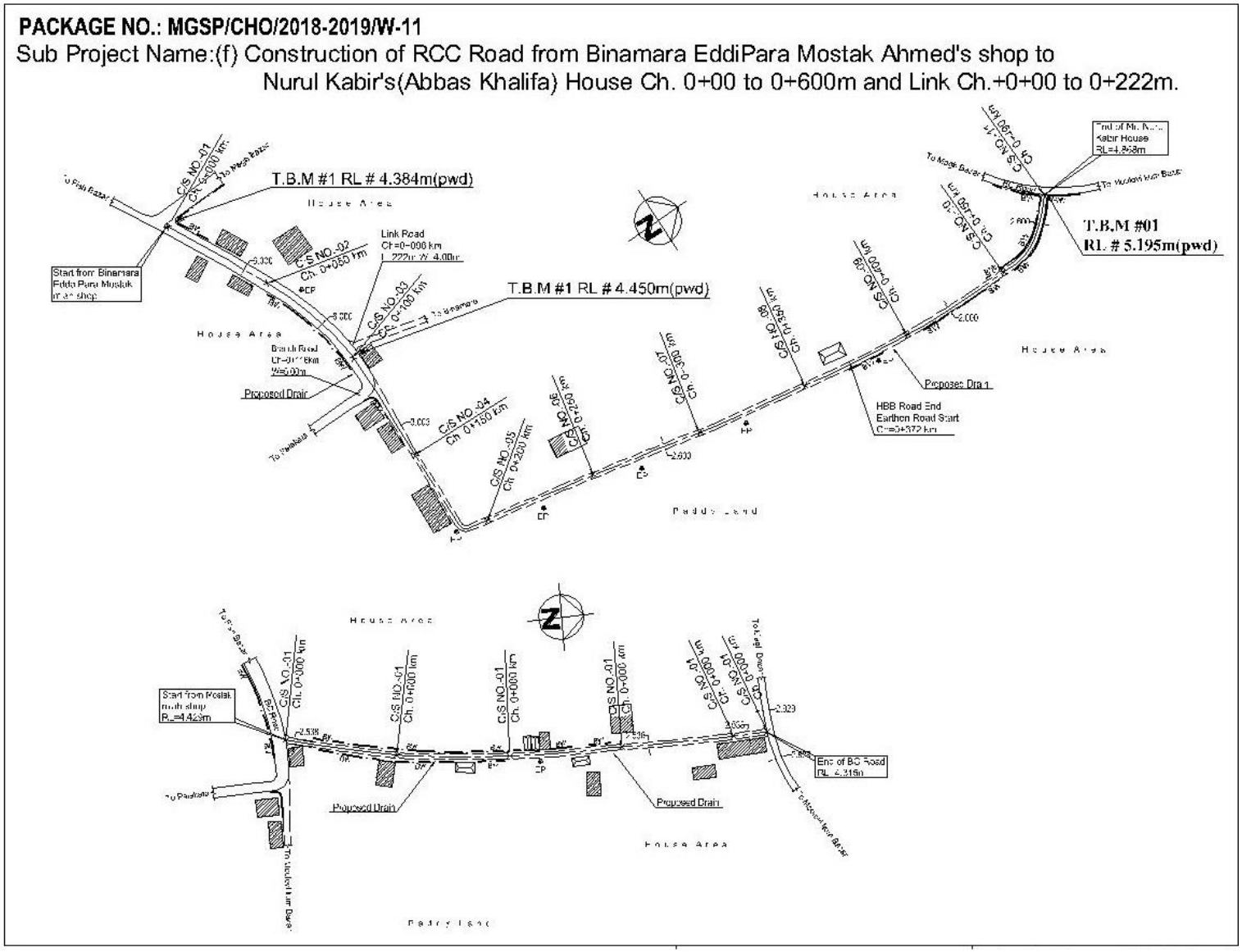


Figure 2.1.3 (f): Layout Plan of the proposed Subproject Road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house with Link road

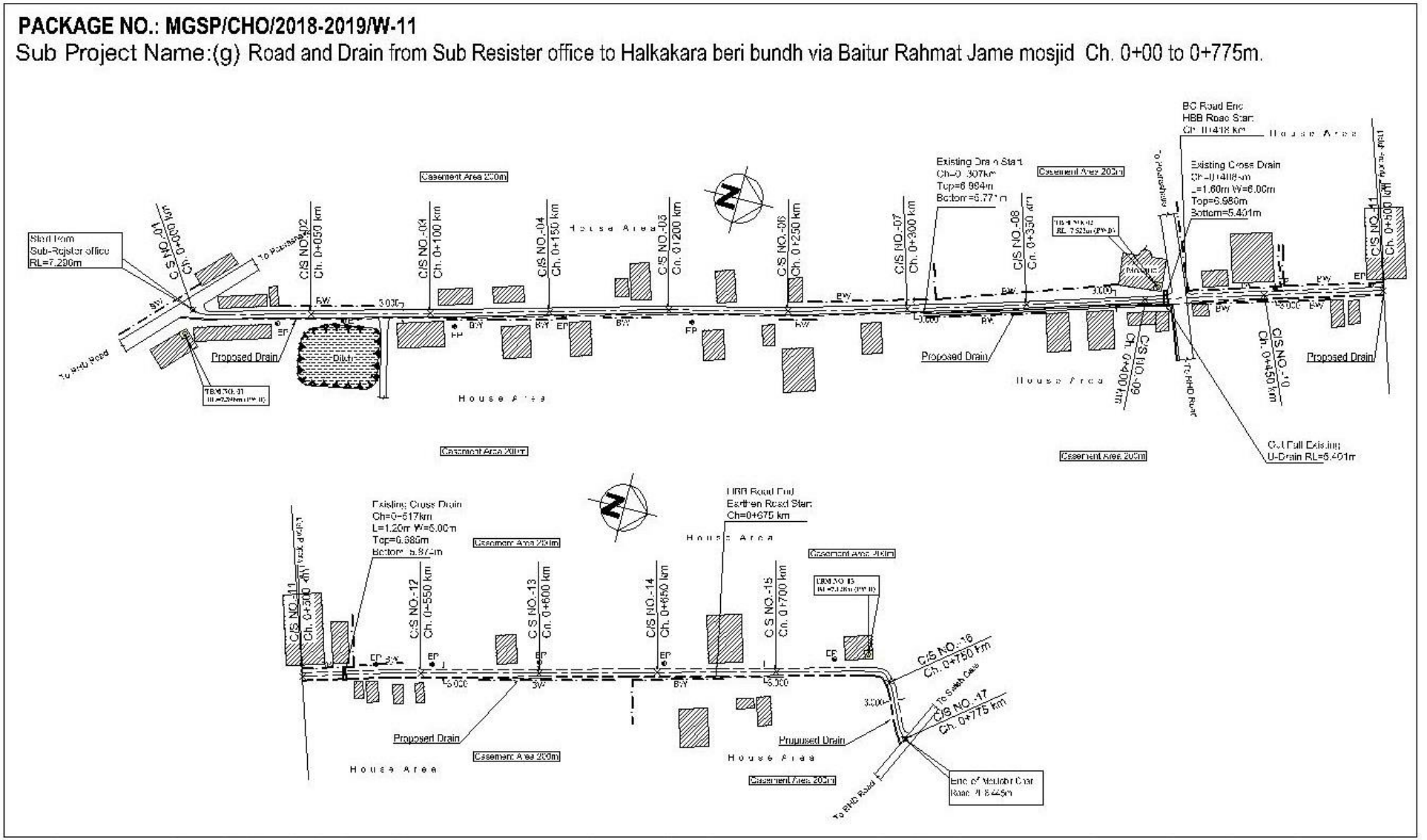


Figure 2.1.3 (g-i): Layout Plan of the proposed Subproject area from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid [Road part]

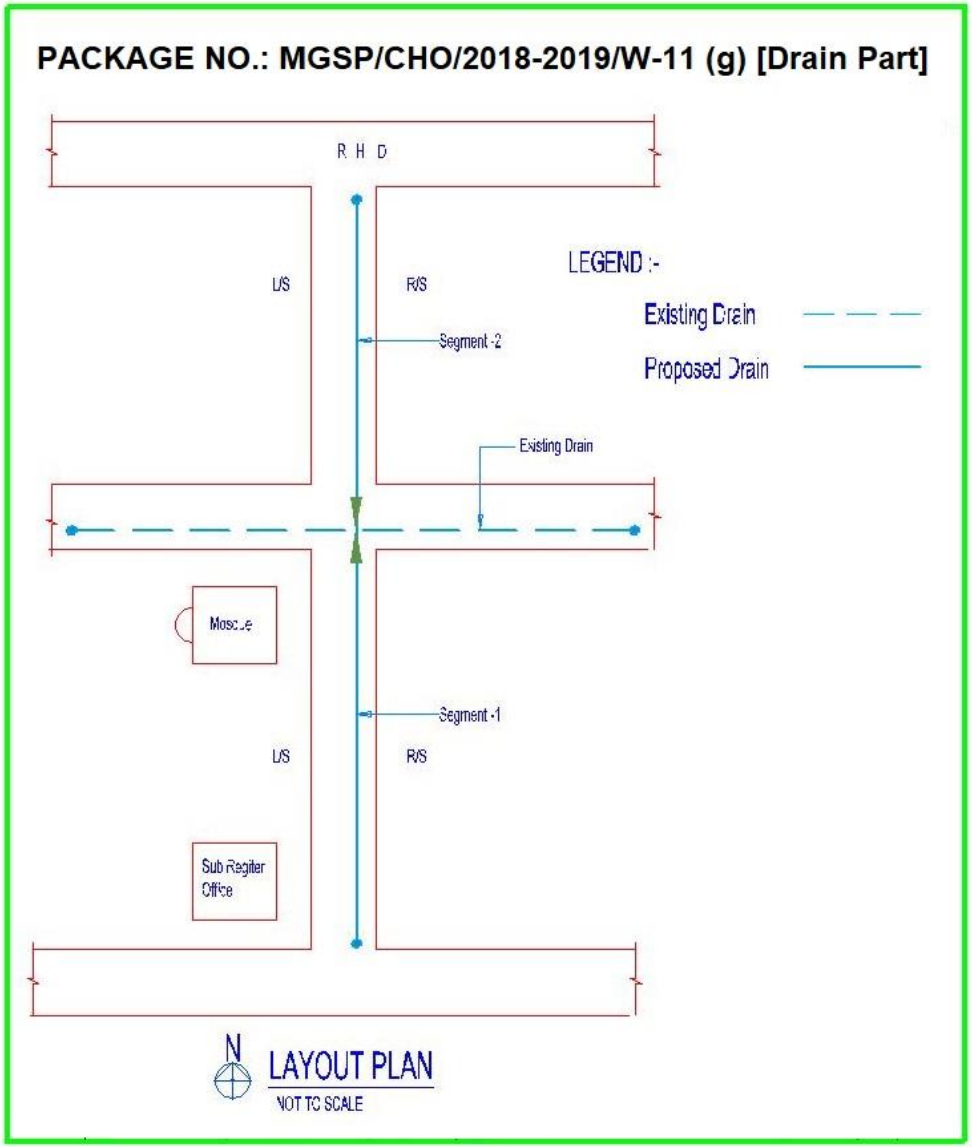


Figure 2.1.3 (g-ii): Layout Plan of the proposed Subproject area from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid [Drain part]

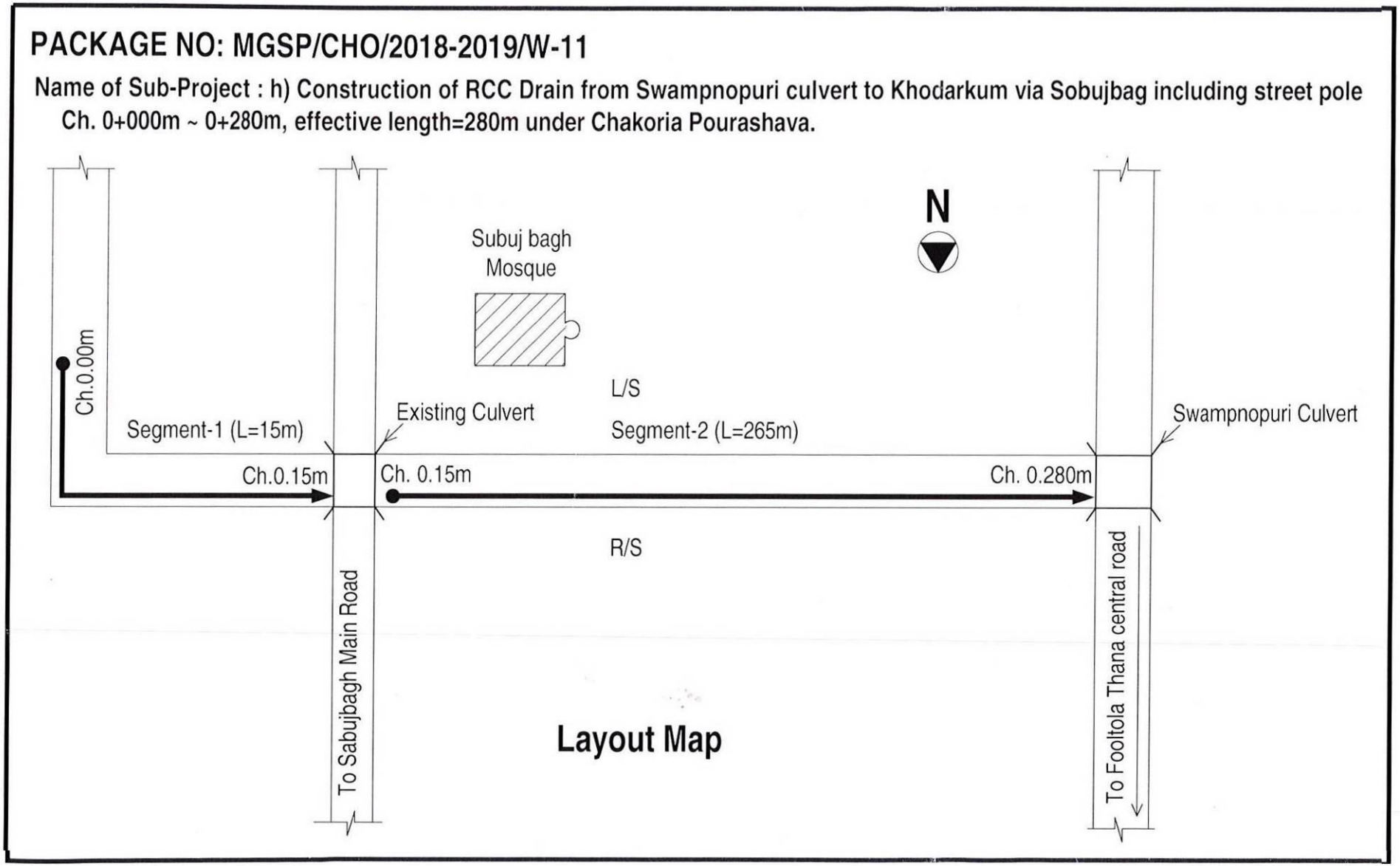


Figure 2.1.3 (h): Layout Plan of the proposed Subproject area from Shawnapuri culvert to Khodarkum via Sobujbag

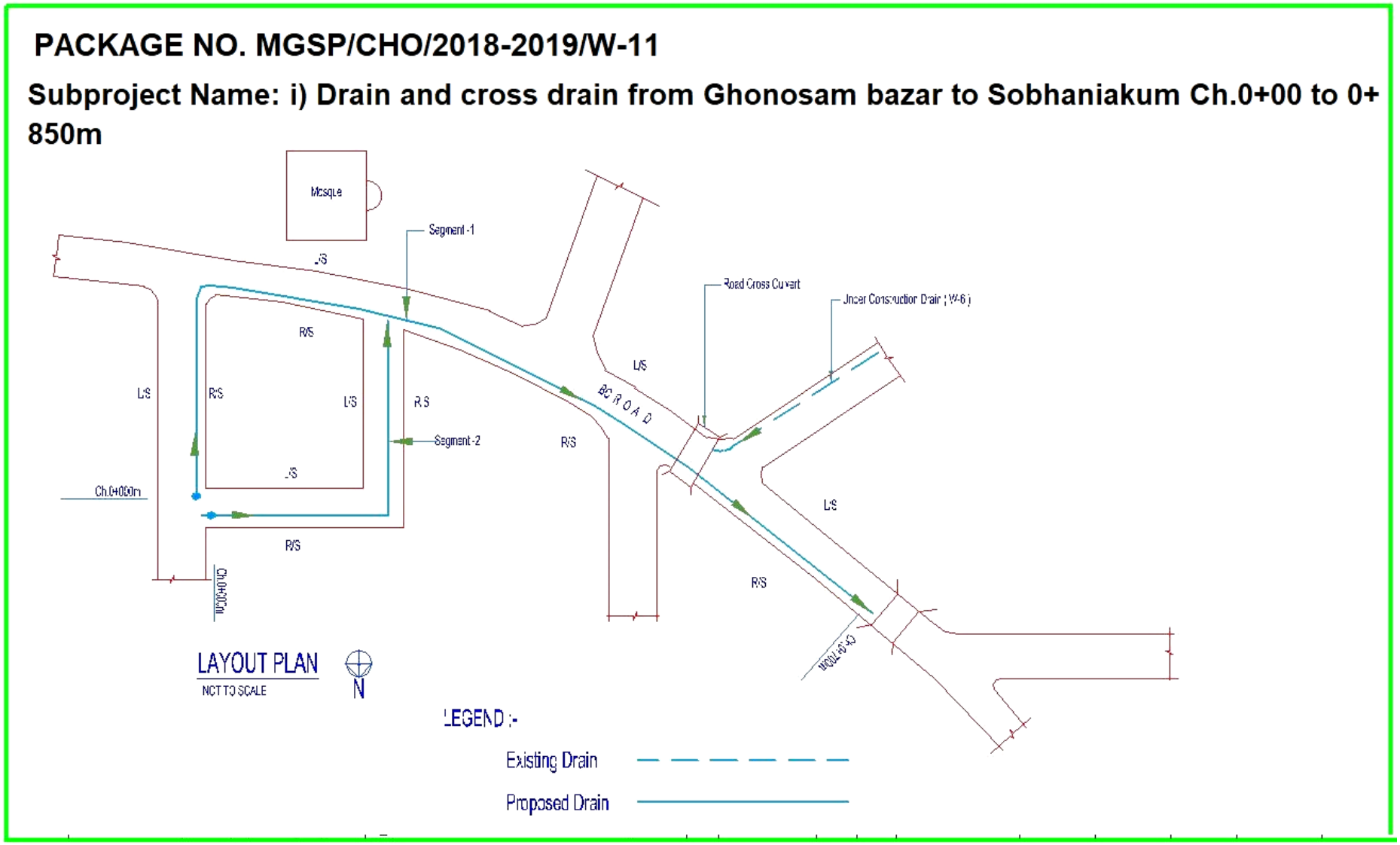


Figure 2.1.3 (i): Layout Plan of the proposed Subproject area from Ghonosam bazar to Sobhaniakum

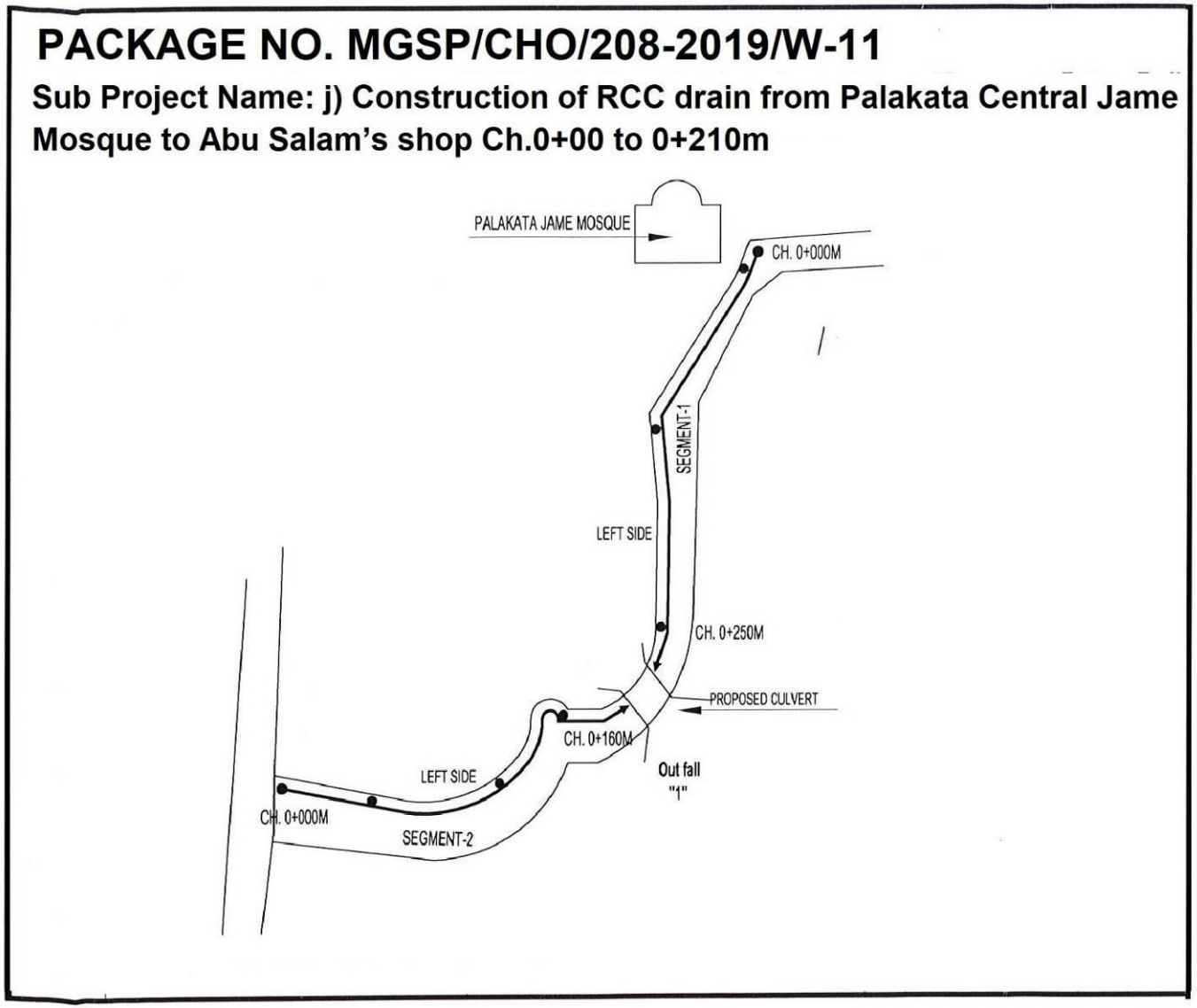


Figure 2.1.3 (j): Layout Plan of the proposed Subproject area from Palakata Central Jame Mosque to Abu Salam's shop

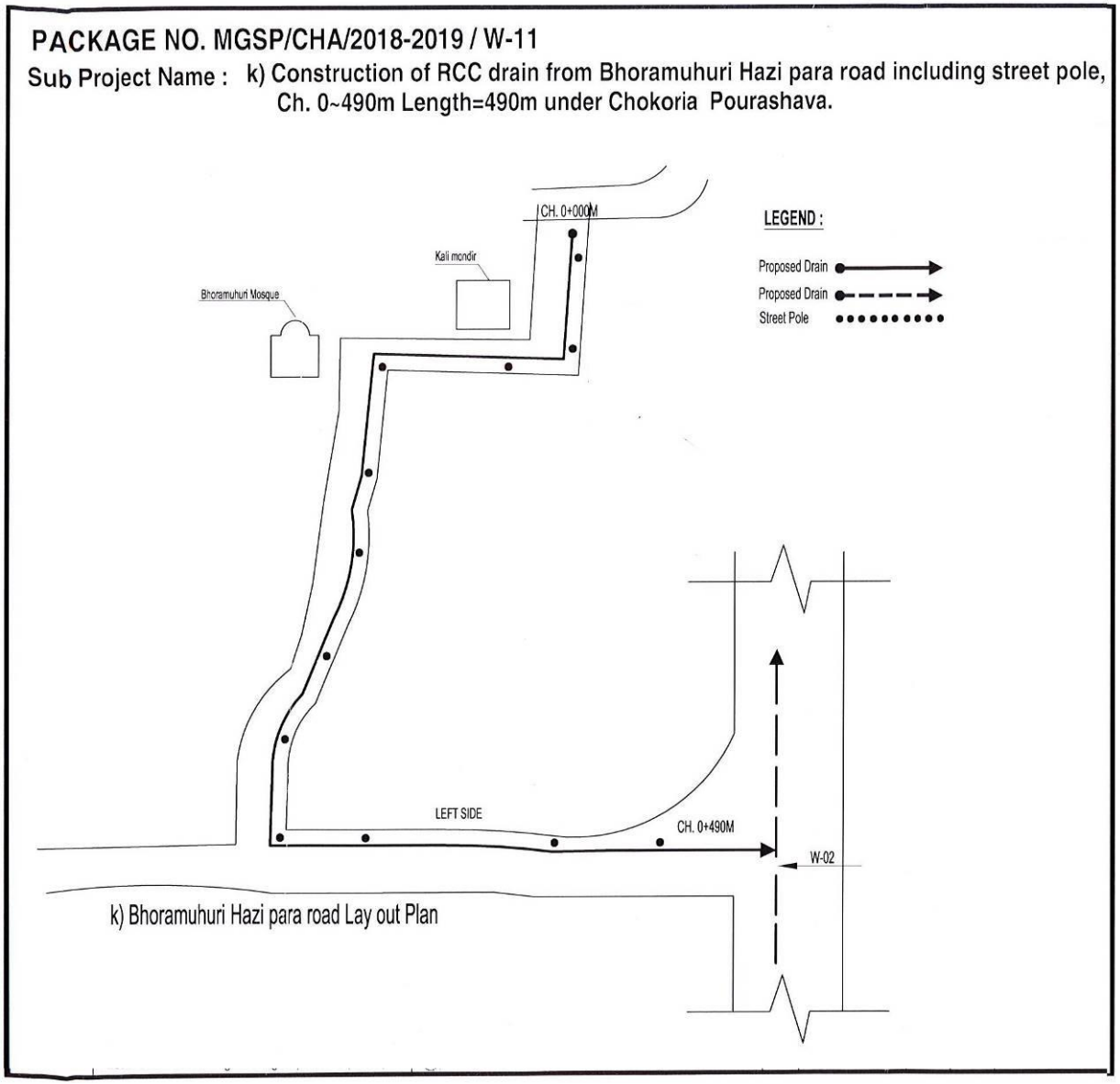


Figure 2.1.3 (k): Layout Plan of the proposed Subproject area at Bhoramuhuri Haji Para road

2.2 Current Situation, Proposed Intervention and Need for the Subproject

This subproject (Package: MGSP/CHO/2018-2019/W11) includes RCC pavement and drain with allied works (RCC palisading, road cross drain and box culverts) including street light at Koraighona Hossain Chairman's house to Siraj Master House (Ch. 0-820m), Koraighona Kalu Maji house to Moghpara via Sonkholapara (Ch. 0-1000m), Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house (Ch. 0-350m), Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel (Ch. 0-1250m), Chiringa Station para road (Ch. 0-416m), Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house (Ch. 0-600m) with Link road (Ch. 0-222m), Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid (Ch. 0-775m), Shawnapuri culvert to Khodarkum via Sobujbag (Ch. 0-360m), Ghonosam bazar to Sobhaniakum (Ch. 0-850m), Palakata Central Jame Mosque to Abu Salam's shop (Ch. 0-210m) and Bhoramuhuri Haji Para road side RCC drain (Ch. 0-360m). The subproject site is situated within the jurisdiction of the ward no. 01, 02, 04, 05, 06, 07, 08 and 09 of Chakoria Pourashava. The proposed road will be developed by replacing the existing damaged BC roads, brick paved (BFS) roads and earthen roads to new RCC pavements.

The proposed road from Koraighona Hossain Chairman's house to Siraj Master House (Ch. 0-820m) is passed through the Koraighona area. The road starts from Hossain Chairman's house and continues up to Siraj Master House at Koraighona area passes the Mayor's house. The existing road from Ch. 0+000 to Ch. 0+820m is bituminous carpeting type. The bituminous carpeting is worn out in most of the places of the road. Potholes and undulations are also formed on the road. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The crest width of the road varies from 3.0m to 3.5m. The slope of the roadway embankment ranges from 1:1 to 1:1.25 at the left side and 1:1 to 1:1.5 at the right. Soft shoulder is damaged in places of the road. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. By improving the proposed road - 150mm RCC with nominal reinforcement on the existing BC pavement is proposed, on priority basis for the community demand. This subproject influencing area is a low lying area, comprise of man-made water bodies (ponds) and natural low wet land, seasonal agricultural land on both sides of the proposed road to carry the storm water. The rain fall run-off is drawn easily on the sides of road and finally reach the watershed. Consequently, no drain beside the road is required. Nevertheless, it is proposed to provide RCC box culverts at Ch. 0+301m and Ch. 0+648m and 55m palisading is to be provided from at three stretches of road to protect the soft shoulder of road.

The proposed road from Koraighona Kalu Maji house to Moghpara via Sonkholapara (Ch. 0-1000m) is passed through the Koraighona, Sonkholapara and Maghbazar area. The road

starts from Kalu Maji house at Koraighona and continues up to Maghpara beside Maghbazar area. The existing road is brick flat soling paved. Undulations are formed on the road. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The existing pavement width is 2.0m and the crest width varies from 4.0m to 4.5m. Soft shoulder is damaged in places of the road. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. By improving the proposed road - 150mm improved subgrade, 150mm subbase and 150mm RCC with nominal reinforcement on the prepared subgrade is proposed, on priority basis for the community people. This subproject influencing area is a low lying area, comprise of man-made water bodies (ponds) and natural low wet land, seasonal agricultural land on both sides of the proposed road to carry the storm water. The rain fall run-off is drawn easily on the sides of road and finally reach the watershed. Consequently, no drain beside the road is required. Nevertheless, it is proposed to provide a road cross drain will be provided at Ch. 0+200m to divert water from one side to other side of road and 124m RCC retaining wall is to be provided at two stretches of the road to protect the roadway embankment.

The proposed road from Koraighona Omar house to Abdul Hakim house via Moulovi Monjur house (Ch. 0-350m) is passed through the Koraighona and Maghbazar area. The road starts from Omar house at Koraighona road and continues up to Abdul Hakim house via Moulovi Monjur house. The existing road from is damaged BFS type and most of the places of the road undulations are formed. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The crest width of the road varies from 3.5m t Soft shoulder is damaged in places of the road. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. By improving the proposed road - 150mm improved subgrade, 150mm subbase and 150mm RCC with nominal reinforcement on the prepared subgrade is proposed, on priority basis for the community people. This subproject influencing area is a low lying area, comprise of man-made water bodies (ponds) and natural low wet land, seasonal agricultural land on both sides of the proposed road to carry the storm water. The rain fall run-off is drawn easily on the sides of road and finally reach the watershed. Consequently, no drain beside the road is required. Nevertheless, it is proposed to provide a RCC road cross drain of size 1.0m x 1.0m will be constructed at Ch. 0+040m and 20m palisading is to be provided from Ch.0+170m to 0+190m to protect the soft shoulder of road.

The proposed road from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel (Ch. 0-1250m) will be developed by replacing the existing damaged Brick Flat Soling (BFS) and Bituminous Carpeting (BC) road to new RCC pavement. The existing brick flat soling pavement from Ch. 0-300m and Ch. 780-1250m is damaged. Undulations are formed on the brick flat soling road. From Ch. 300-780m the road is BC paved. The bituminous carpeting

and existing WBM is badly damaged. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The existing pavement width is 3.0m and the crest width varies from 3.5m to 4.0m. Soft shoulder is damaged in places of the road. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. By improving the proposed road - 150mm improved subgrade, 150mm subbase and 150mm RCC with nominal reinforcement on the prepared subgrade and at Ch. 0-300m and Ch. 780-1250m and 100mm WBM base together with 150mm RCC on the existing road at Ch. 300-780m is proposed on priority basis for the community people. This subproject influencing area is a low lying area, comprise of man-made water bodies (ponds) and natural low wet land, seasonal agricultural land on both sides of the proposed road to carry the storm water. The rain fall run-off is drawn easily on the sides of road and finally reach the watershed. Consequently, no drain beside the road is required. Nevertheless, it is proposed to provide 50m RCC retaining wall to protect the roadway embankment.

The proposed road at Chiringa Station para road (Ch. 0-416m) is passed through the Chirranga station para area. The proposed road starts from Chiringa Staion at Dhaka-Chittagong highway and ends at Poura bazar area. The existing road is damaged BC road type. The bituminous carpeting and existing WBM is badly damaged, undulations are formed on the road surface and the road become un-trafficable. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The existing pavement width is 3.0m and the crest width varies from 3.0m to 4.0m. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. By improving the proposed road - 75mm WBM and 150mm RCC with nominal reinforcement on the existing pavement is proposed on priority basis for the community people.

The proposed road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house (Ch. 0-600m) with link road (Ch. 0-222m) will be developed by replacing the existing damaged Brick Flat Soling (BFS) and earthen road to new RCC pavement. The existing road from Ch. 0+110 to 0+600m is brick paved and remaining stretch is earthen. The link road is earthen. In the rainy season the road become un-trafficable. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The crest width of the road varies from 3.0m to 4.0m. The slope of the roadway embankment ranges from 1:1 to 1:1.2 at the left side and 1:1 to 1:1.5 at the right. Soft shoulder is damaged in places of the road. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. To provide an easy and smooth traffic movement, increasing business volumes of the local inhabitants and reducing the maintenance cost of the road, improving the proposed road by 150mm improved

subgrade, 150mm subbase and 150mm RCC with nominal reinforcement on the prepared subgrade on priority basis for the community people. It is proposed to provide 27m RCC retaining wall to protect the roadway embankment.

The proposed road from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid (Ch. 0-775m) is passed through the Halkakara, Registr office, Beribandh, Jaliapara and Batua bazar area. The proposed road starts from Sub Register office besides the package MGSP/CHO/W-2 road and continues up to Beribandh at Jaliapara beside Batua bazar via Baitur Rahmat Jame mosjid. The existing road is bituminous carpeting paved from Ch. 0+00 to 0+400m. From Ch. 0+400 to 0+775m the road is brick soling paved. The BC is mostly damaged. Potholes and undulations are formed on the road. The BFS part is undulated. Again, the narrow width of the road creates traffic congestion and increases the rate of accidents which makes the road un-trafficable. The existing pavement width is 3.0m and the crest width varies from 4.0m to 4.25m. Considering the poor condition of the pavement with a narrow width in places, it is necessary to improve the road. To provide an easy and smooth traffic movement, increasing business volumes of the local inhabitants and reducing the maintenance cost of the road, improving the proposed road by 75mm WBM and 150mm RCC with nominal reinforcement on the existing pavement at Ch. 0-400m and 150mm improved subgrade, 150mm subbase and 150mm RCC with nominal reinforcement on the prepared subgrade at Ch. 400-775m on priority basis for the community people. This subproject influencing area is a low lying area, comprise of man-made water bodies (ponds) and natural low wet land, seasonal agricultural land on both sides of the proposed road to carry the storm water. But sometimes due to heavy shower the delay discharge makes the area temporary water logged and washed out the crops and hopes of the community. The existing road side drain is earthen and silted up without any proper outfall. Hence, a RCC road level drain is proposed at right side of the proposed road on need base for the community to get first relief from the water logging phenomenon. The Halkakara Khal and the Jaliakhali Beribandh cannel finally the River Matamuhuri will act as the out fall of the proposed drain.

The proposed drain from Shawnapuri culvert to Khodarkum via Sobujbag (Ch. 0-350m) is passed through the Kodarkum, Sobujbag and Swapnopuri residential area. The proposed drain starts from Kodarkum main road and continues up to Swapnopuri culvert (at package MGSP/CHO/W-2 drain and culvert point) via Sobujbag residential area. The storm and waste water finally carry to Matamuhuri River through Batakhali Khal so the Batakhali khal is temporary outfall and the River Matamuhuri is the final outfall for the proposed drain. In the subproject area, the drainage facility is inadequate and inappropriate. The existing earthen drain is not functioning properly due to its siltation and blockage by solid materials problem at the water passing mouth. As a result inadequate capacity of storm water carrying to outfall may causes temporary water logged condition for the subproject area with its influencing

zone. Moreover, excessive storm water due to heavy and continuous rainfall at wet season, backflow from the adjacent water bodies (Matamuhuri River and Batakhali Khal) due to tidal interactions may also causes delay discharge of water from the subproject area and creates drainage congestion and water logging in the subproject influence area. As a result, major environmental and public health hazard is occurred in the subproject area. That's why a well-designed RCC drain is essential for draining out the excessive storm water on priority basis for the community people.

The proposed drain from Ghonosam bazar to Sobhaniakum (Ch. 0-850m) is passed through the Ghonosam bazar and Sobhaniakum area. In the subproject area, the drainage facility is inadequate and inappropriate. There is no drain in the vicinity of the subproject area. Furthermore, this area is low laying area with comprising of man-made and natural water resources (i.e., ponds and natural low wet land, irrigational canal, ditch, seasonal agricultural land on both sides of the proposed subproject alignment) which carry the storm water to the wet land (Beel). The natural draining-out condition at normal circumstance is appropriate. Nonetheless, excessive storm water due to heavy and continuous rainfall at wet season, sometimes the wet land (Beel) water carrying capacity is exceeded and delay discharge of water, as a result temporary water logging phenomena is occurred in the subproject boundary which hampers the daily life of the local inhabitants and also negatively impacted on communication system. To reduce the drainage congestion and water logging problem a well-designed RCC drain is essential from Ghonosam bazar to Sobhaniakum on priority basis for the community people and the outfall for the proposed RCC drain is designed at Sobhaniakum culvert point. This Sobhaniakum is connected with the chora which finally goes to River Matamuhuri. This is one of the important drain network that will remove the drainage congestion and temporary water logging phenomenon from the Ghonosam bazar to Sobhaniakum area.

The proposed drain from Palakata Central Jame Mosque to Abu Salam's shop (Ch. 0-210m) is passed through the Palakata Central Jame Mosque and Eidgah area. In the subproject area, the drainage facility is inadequate and inappropriate. There is no drain in the vicinity of the subproject area. Furthermore, this area is low laying area with comprising of man-made and natural water resources (i.e., ponds and natural low wet land, seasonal agricultural land on both sides of the proposed subproject alignment) which carry the storm water to the wet land (Beel). The natural draining-out condition at normal circumstance is appropriate. Nonetheless, excessive storm water due to heavy and continuous rainfall at wet season, backflow from the adjacent water bodies (River Matamuhuri and Magh Khal), sometimes the wet land (Beel) water carrying capacity is exceeded and delay discharge of water, as a result temporary water logging phenomena is occurred in the subproject boundary which hampers the daily life of the local inhabitants and also negatively impacted on communication system.

To reduce the drainage congestion and water logging problem a well-designed RCC drain is essential from Palakata Central Jame Mosque to Abu Salam's shop on priority basis for the community people though the outfall for the proposed RCC drain is designed at the natural wet land (Beel). To connect with the natural canal (which will be used as primary outfall), construction of additional drain is needed. The Pourashava is committed to construct the additional drain (earthen drain) with appropriate design before construction of the proposed RCC drain and the storm water will finally reach the River Matamuhuri through this adequate and appropriate drain network. This is one of the important drain network that will remove the drainage congestion and temporary water logging phenomenon from the Palakata area.

The proposed drain at Bhoramuhuri Haji Para road (Ch. 0-360) starts from Bhoramuhuri Haji Para road and continues up to Grameen Bank at Siddiqua Filling station to Mashghat via Fultola Road (at MGSP/CHO/W-2 package road and drain sub project). The storm and waste water finally carry to Matamuhuri River through W2 package drain and Magh Khal so the W2 package drain will be the temporary outfall and the River Matamuhuri will act as final outfall for the proposed drain. In the subproject area, the drainage facility is inadequate and inappropriate and some segments it is absent. The existing earthen drain and damaged brick drain is not functioning properly due to its discontinuation and lack of proper outfall nature. Siltation and narrow in width and blockage by solid materials problem at the water passing mouth also makes them non-functioning drain. As a result inadequate capacity of storm water may causes temporary water logged condition for the subproject area with its influencing zone. Moreover, excessive storm water due to heavy and continuous rainfall at wet season, backflow from the adjacent water bodies may also causes delay discharge of water from the subproject area and creates drainage congestion and water logging in the subproject influence area. As a result, major environmental and public health hazard is occurred in the subproject area. That's why a well-designed RCC drain is essential for draining out the excessive storm water on priority basis for the community people. This is one of the important drain network that will remove the drainage congestion and temporary water logging phenomenon from the core area of the Pourashava.

Moreover, absent of the street light hampers the normal traffic operation and safety at night. Therefore, fixing of the street light is also needed for smooth traffic operation, pedestrian's safety and social safety net at night.

This subproject has significant benefit to the community people after completion. This is one of the important road that connects the rapidly growing Koraighona area to the central part of the municipality via Maghbazar area; Rajarbeel area to the central part of the municipality; Binamara area to the central part of the municipality and core area of the Pourashava which is the trade and commerce zone of Chakoria Pourashava. This is one of the important road and

drain that will fasten the progression of rapidly growing Chakoria Pourashava and also increases its services and governance strength.

The present situation of the subproject area is further elaborated in the following ***Photographs 2.2.1***.

Photographs 2.2.1 (a): Current Situation of the Subproject Site from Koraighona Hossain Chairman's house to Siraj Master house


Photographs 2.2.1 (b): Current Situation of the Subproject Site from Koraighona Kalu Maji house to Moghpara via Sonkholapara


Photographs 2.2.1 (c): Current Situation of the Subproject Site from Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house


Photographs 2.2.1 (d): Current Situation of the Subproject Site from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel

Photographs 2.2.1 (e): Current Situation of the Subproject Site at Chiringa Station para road

Photographs 2.2.1 (f): Current Situation of the Subproject Site from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house with Link road


Photographs 2.2.1 (g): Current Situation of the Subproject Site from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid


Photographs 2.2.1 (h): Current Situation of the Subproject Site from Shawnapuri culvert to Khodarkum via Sobujbag


Photographs 2.2.1 (i): Current Situation of the Subproject Site from Ghonosam bazar to Sobhaniakum


Photographs 2.2.1 (j): Current Situation of the Subproject Site from Palakata Central Jame Mosque to Abu Salam's shop

Photographs 2.2.1 (k): Current Situation of the Subproject Site at Bhoramuhuri Haji Para road

2.3 Justification of Selection of this Subproject

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

After completion, this subproject components (roads and drain with allied works including street light) will improve the transport facilities and improve the existing road and drain network of Chakoria Pourashava. The improved road will definitely have a positive impact of the business transaction and proceeds. Agriculture based industry as well as poultry are expected to develop after completion of the subproject. This will create employment opportunities for the local people. The new drain will reduce the drainage congestion and water logging problem. The box culvert will divert storm water from one side to another side (passing out the storm water to nearby low land and ditches). The road protective works will protect the road from erosion and subsidence. In addition, night time safety will be improved due to installation of the street light. As per information by the Chakoria Pourashava considering the ward population (Ward 01, 02, 04, 05, 06, 07, 08 and 09) about 64,449 people will be benefited directly and many others indirectly. Considering the significant potential benefits that will derive after completion, the local community demands and welcome this subproject.

2.4 Envisaged Subproject Activities and Implementation Process

The general activities of the subproject includes: construction of the semi-pucca site office, construction of the labor shed, site clearing and grubbing work, relocation of the electric poles and tree plantation work.

The specific activities for the subproject includes: site clearing and dismantling work, maintaining of the semi-pucca site office and installation of waste collection bins, road painting work.

The key activities of the ***RCC Drain with allied works*** includes:

i. Earth work in excavation of the foundation;
ii. Pumping and bailing out of water as per requirement;
iii. Lying of polythene sheet;
iv. Sand filling for the preparing foundation bed;
v. Plain cement concrete work in foundation;
vi. Manufacturing CC blocks;
vii. Fabrication of the ribbed or deformed bar;
viii. Reinforced cement concrete work.

The key activities for ***RCC Road*** includes:

i. Clearing and grubbing works;
ii. Earth work in box cutting;
iii. Earth filling work;
iv. Sand filling on the road bed;
v. Mechanical compaction;
vi. Plain cement concrete work in foundation;
vii. Manufacturing CC blocks;
viii. Fabrication of the ribbed or deformed bar;
ix. Reinforced cement concrete work.

The key activities for ***Street Lighting works*** includes:

i. Assembling, fitting, fixing, installation, testing and commissioning of the GI pole;
ii. Fitting and fixing energy meter ;
iii. Earthling the electrical installation;
iv. Fixing insulator;
v. Erection of tubular pole;
vi. Fixing of the overhead conductor;
vii. Fixing of the wire rack;
viii. Fixing and installation of the switch board;
ix. Providing, fitting and fixing of the water tight street light.

The materials and resources to be used for the key activities: Soil in earth work, sand, bricks, brick chips, stone chips, cement, concrete, reinforcement, diesel, electricity, water, GI poles and other associate accessories.

The major equipment to be used for the implementation of the subproject: hydraulic excavator, brick breaking machine, concrete mixer machine, steel cutter, mechanical vibrator machine, mechanical compaction machine, MS sheet, steel shutter, boulders, steel drum dump truck, water tanker, pump, diesel engine, ladder and light fixing equipment.

2.5 Category of the Subproject

Road and drain with allied works:

The environmental impacts due to the subproject intervention are mainly site specific, limited within the subproject boundary and significantly manageable through the appropriate mitigation measures.

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

In the Project EMF, RCC road and drain with allied works (RCC box culvert, road cross drain, and road protection wall works) are categorized as Orange A or Orange B depends on environmental impact. Hence, considering the anticipated environmental impacts and following project EMF, primarily RCC roads and drains with allied works can consider as Orange-B category as per ECR-97 [*ECR, 1997*]. According to the WB classification, it can classify as Category B.

For Street Light

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

Considering the environmental impacts, the street light can be considered as Green category as per ECR-97 [*ECR, 1997*]. According to the WB classification, it can be classified as Category C.

2.6 Subproject Schedule

The tentative schedule of construction of the subproject is:

(a) Subproject duration (months) : 09 months
(b) Tentative start date : May 06, 2019
(c) Tentative completion date : January 061, 2020

The daily construction hours will normally include regular working time. However, daily working hours may vary based on the on-site condition. The detailed work program will be prepared by the contractor with the assistance of the PIU. Then it will be shared with the PMU, LGED and DSM consultants. In addition, the detailed work program will also be shared with the Bank as per requirement.

3 BASELINE ANALYSIS OF THE ENVIRONMENTAL CONDITION

3.1 Physical Environment

Important Environmental and Infrastructural Features

During site visit, the environmental and infrastructural features within the subproject area were collected. Conditional survey has also been conducted for designing the subproject. Hence, survey data is also used for preparing the report. The major environmental and infrastructural features listed for the subproject within 100m of the both sides from the center line of the road at 100 m longitudinal intervals. The key findings of the site visit are given below.

Table 3.1.1 (a): Major Environmental and Infrastructural Features from Koraighona Hossain Chairman's house to Siraj Master house (Ch. 0 - 0+820m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Hossain Chairman's house to Siraj Master House (Ch. 0-820m)			
0-100	√		Boundary wall, pucca and semi-pucca structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, boundary wall, common planted trees, natural grown vegetation
100-200	√		Boundary wall, common planted trees, natural grown vegetation, agricultural land
		√	Boundary wall, semi-pucca structure for residence, common planted trees, natural grown vegetation
200-300	√		Common planted trees, natural grown vegetation, agricultural land, ditches, boundary wall
		√	Semi-pucca structure for residence, common planted trees, natural grown vegetation, ditches, ponds, boundary wall
300-400	√		Boundary wall, pucca and semi-pucca structure for residence common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, boundary wall, common planted trees, natural grown vegetation
400-500	√		Semi-pucca structure for residence, common planted trees, natural grown vegetation, mosque
		√	Semi-pucca structure for residence, common planted trees, natural grown vegetation, mosque, educational institution
500-600	√		Boundary wall, semi-pucca and pucca structure for residence, common planted trees, natural grown vegetation
		√	Common planted trees, natural grown vegetation, agricultural land
600-700	√		Boundary wall, semi-pucca and pucca structure for residence, common planted trees, natural grown vegetation
		√	Common planted trees, natural grown vegetation, agricultural land
700-820	√		Boundary wall, semi-pucca and pucca structure for residence, common planted trees, natural grown vegetation
		√	Common planted trees, natural grown vegetation, agricultural land

Table 3.1.1 (b): Major Environmental and Infrastructural Features from Koraighona Kalu Maji house to Maghpara via Sonkholapara (Ch. 0 - 1+000m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Kalu Maji house to Maghpara (Ch. 0-1000m)			
0-100	√		Semi-pucca and tin shed structure for residence common planted trees, natural grown vegetation, agricultural land
		√	Tin-shed and semi-pucca structure for residence, primary school, common planted trees, natural grown vegetation, pond
100-200	√		Semi-pucca and tin shed structure for residence common planted trees, natural grown vegetation, agricultural land
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond
200-300	√		Common planted trees, natural grown vegetation, agricultural land, ditches, cannel
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
300-400	√		Common planted trees, natural grown vegetation, agricultural land, cannel
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
400-500	√		Semi-pucca structure for residence, common planted trees, natural grown vegetation, agricultural land, ditches
		√	Semi-pucca structure for residence, common planted trees, natural grown vegetation, agricultural land
500-600	√		Semi-pucca and tin shed structure for residence common planted trees, natural grown vegetation, agricultural land
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond
600-700	√		Semi-pucca and tin shed structure for residence common planted trees, natural grown vegetation, agricultural land
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond
700-800	√		Common planted trees, natural grown vegetation, agricultural land
		√	Common planted trees, natural grown vegetation, agricultural land, cannel
800-900	√		Common planted trees, natural grown vegetation, agricultural land, cannel
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
900-1000	√		Common planted trees, natural grown vegetation, agricultural land, cannel
		√	Common planted trees, natural grown vegetation, agricultural land, ditches

Table 3.1.1 (c): Major Environmental and Infrastructural Features from Koraighona Omar house to Abdul Hakim house via Moulovi Monjur house (Ch. 0 - 0+350m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Koraighona Omar house to Abdul Hakim house (Ch. 0-820m)			
0-100	√		Agricultural land, pucca and semi-pucca structure for residence, common planted trees, natural grown vegetation, ditches
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation
100-200	√		Agricultural land, pucca and semi-pucca structure for residence, common planted trees, natural grown vegetation, ditches
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, agricultural land, ditches
200-350	√		Pucca and semi-pucca structure for residence, common planted trees, natural grown vegetation, ditches, boundary wall
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, agricultural land, ditches, boundary wall

Table 3.1.1 (d): Major Environmental and Infrastructural Features from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel (Ch. 0 - 1+250m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel (Ch. 0-1250m)			
0-100	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation, temple
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond
100-200	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation
200-300	√		Common planted trees, natural grown vegetation, agricultural land, ditches
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
300-400	√		Common planted trees, natural grown vegetation, agricultural land
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
400-500	√		Common planted trees, natural grown vegetation, agricultural land
		√	Common planted trees, natural grown vegetation, agricultural land, ditches
500-600	√		Common planted trees, natural grown vegetation, agricultural land, mosque
		√	Common planted trees, natural grown vegetation, agricultural land, cannel
600-700	√		Common planted trees, natural grown vegetation, agricultural land, ditches
		√	Common planted trees, natural grown vegetation, agricultural land, Rajarbeel
700-800	√		Common planted trees, natural grown vegetation, agricultural land, ditches
		√	Common planted trees, natural grown vegetation, agricultural land, Rajarbeel

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
800-900	√		Common planted trees, natural grown vegetation, agricultural land, ditches
		√	Common planted trees, natural grown vegetation, agricultural land, Rajarbeel, mosque
900-1000	√		Common planted trees, natural grown vegetation, agricultural land, ditches
		√	Common planted trees, natural grown vegetation, agricultural land, Rajarbeel
1000-1100	√		Common planted trees, natural grown vegetation, agricultural land, residential area, shops
		√	Common planted trees, natural grown vegetation, agricultural land, residential area, shops
1100-1250	√		Semi-pucca and tin shed structure for residence and shops, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond

Table 3.1.1 (e): Major Environmental and Infrastructural Features at Chiringa Station para road (Ch. 0 - 0+416m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Chiringa Station para road (Ch. 0-416m)			
0-100	√		Pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, ditches, drain
		√	Tin-shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation
100-200	√		Pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, ditches, drain
		√	Tin-shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, tin fence
200-300	√		Pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, ditches, boundary wall, tin fence
		√	Tin-shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, boundary wall, tin fence
300-416	√		Pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, ditches, boundary wall, tin fence
		√	Tin-shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, boundary wall, tin fence

Table 3.1.1 (f): Major Environmental and Infrastructural Features from Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house at Binamara Eddipara area (Ch. 0 - 0+600m) with link road (Ch. 0 - 0+222m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house (Ch. 0-600m)			
0-100	√		Semi-pucca, pucca and tin shed structure for residence, common planted trees, natural grown vegetation, madrasa
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
100-200	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall
200-300	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation
300-400	√		Semi-pucca, pucca and tin shed structure for residence, common planted trees, natural grown vegetation, mosque
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation
400-500	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation, boundary wall
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall
500-600	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall
Link road (Ch. 0-222m)			
0-100	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall
100-222	√		Semi-pucca and tin shed structure for residence, common planted trees, natural grown vegetation
		√	Tin-shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, boundary wall

Table 3.1.1 (g): Major Environmental and Infrastructural Features Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid (Ch. 0 - 0+775m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid (Ch. 0-775m)			
0-100	√		Boundary wall, pucca & semi-pucca structure for residence and agencies, Sub registry office, common planted trees, natural grown vegetation
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation
100-200	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation
200-300	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
300-400	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, Baitur Rahmat Jame Mosque
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land
400-500	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, pond, existing drain, Halkakara Khal
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, existing drain, pond
500-600	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, Halkakara Khal
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land
600-700	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, Halkakara Khal
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land
700-775	√		Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, Beribandh khal
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, agricultural land, Beribandh Road

Table 3.1.1 (h): Major Environmental and Infrastructural Features from Khodarkum to Shawnapuri culvert via Sobujbag (Ch. 0 - 0+360m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Khodarkum to Shawnapuri culvert via Sobujbag (Ch. 0-360m)			
0-100	√		Khodarkum, boundary wall, pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, Sobujbag R/A, culvert
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, Sobujbag R/A, MGSP RCC drain, low wet land
100-200	√		Pond, low wet land, tin-shed, katcha and semi-pucca structure for residence and madrasa, mosque, boundary wall, common planted trees, natural grown vegetation
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, boundary wall, common planted trees, natural grown vegetation, low wet land, ditch

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
200-360	√		Tin-shed, pucca and katcha structure for residence, shops, boundary wall, common planted trees, natural grown vegetation, ditches, Swapnopuri culvert and R/A
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, boundary wall, common planted trees, natural grown vegetation, low wet land, ditches, Swapnopuri culvert and R/A

Table 3.1.1 (i): Major Environmental and Infrastructural Features from Ghonosam bazar to Sobhaniakum (Ch. 0 - 0+850m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Ghonosam bazar to Sobhaniakum (Ch. 0-850m)			
0-100	√		Tin fence, tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, Ghonosam bazar, tin fence, common planted trees, natural grown vegetation, ditches, low-wet land and seasonal agricultural land
100-200	√		Tin fence, tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, Ghonosam bazar, tin fence, common planted trees, natural grown vegetation, ditches, low-wet land and seasonal agricultural land
200-300	√		Tin fence, tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches
		√	Tin fence, tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches, low-wet land and seasonal agricultural land
300-400	√		Tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches, bamboo fence
		√	Bamboo fence, tin shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, ditches
400-500	√		Bamboo fence, tin shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond, ditches, low-wet land and seasonal agricultural land
		√	Bamboo fence, common planted trees, natural grown vegetation, ditches, irrigation cannel, agricultural land
500-600	√		Bamboo fence, tin shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond, agricultural land
		√	Bamboo fence, common planted trees, natural grown vegetation, ditches, irrigation cannel, agricultural land
600-700	√		Bamboo fence, tin shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond, agricultural land, Sobhaniakum culvert
		√	Bamboo fence, common planted trees, natural grown vegetation, ditches, irrigation cannel, agricultural land
700-850	√		Tin fence, tin shed and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, pond, ditches
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, Ghonosam bazar, tin fence, common planted trees, natural grown vegetation, ditches, low-wet land and seasonal agricultural land

Table 3.1.1 (j): Major Environmental and Infrastructural Features from Palakata Central Jame Mosque to Abu Salam's shop (Ch. 0 - 0+210m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Palakata Central Jame Mosque to Abu Salam's shop (Ch. 0-210m)			
0-100	√		Tin fence, tin shed and semi-pucca structure for residence, common planted trees, natural grown vegetation, pond, ditches, low-wet land and seasonal agricultural land
		√	Palakata Central Jame mosque, Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, ditches, low-wet land and seasonal agricultural land
100-210	√		Pond, tin-shed, katcha, pucca and semi-pucca structure for residence and shops, tin fence, common planted trees, natural grown vegetation
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, tin fence, common planted trees, natural grown vegetation, ditches, low-wet land and seasonal agricultural land, pond

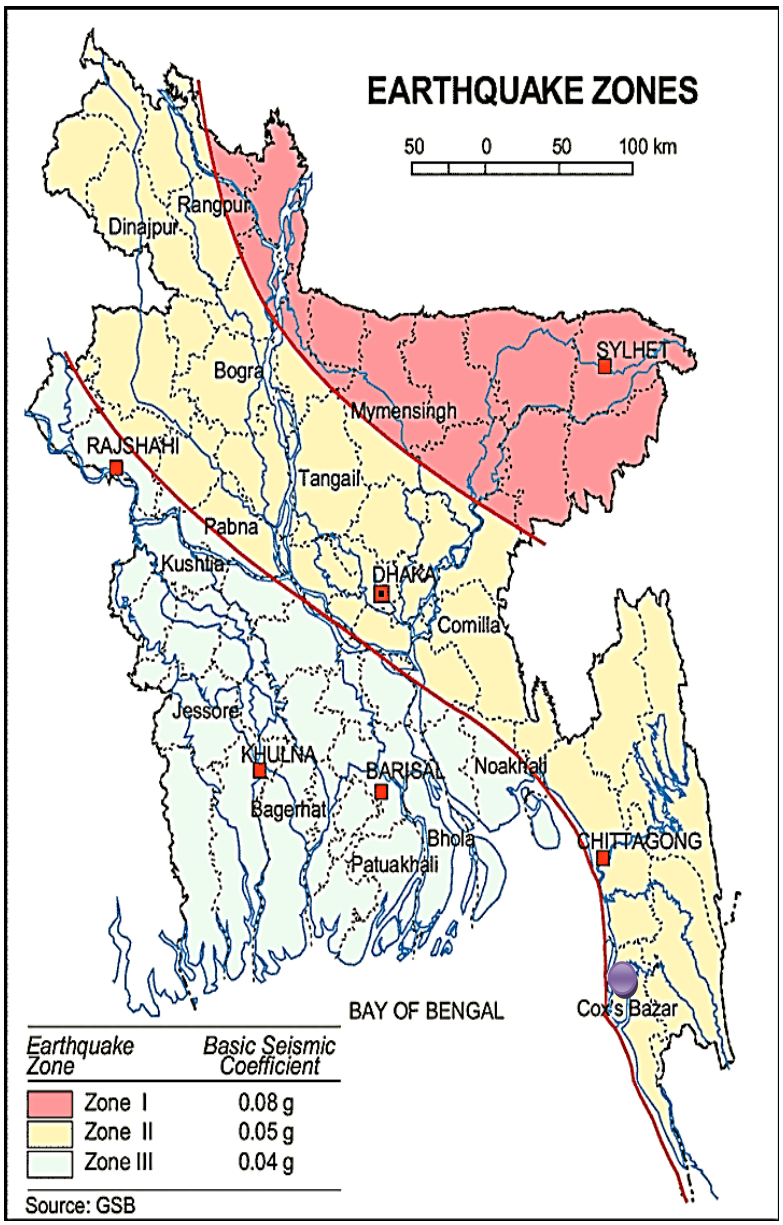
Table 3.1.1 (k): Major Environmental and Infrastructural Features at Bhoramuhuri Haji para road (Ch. 0 - 0+360m)

Chainage (m)	Left	Right	Major Environmental and Infrastructural Features
Bhoramuhuri Haji Para road (Ch. 0-360m)			
0-100	√		Boundary wall, pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, agricultural land, tin fence, ditches, existing earthen drain,
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, agricultural land, low wet land
100-200	√		Boundary wall, pucca and semi-pucca structure for residence and shops, common planted trees, natural grown vegetation, tin fence, pond, ditches
		√	Tin-shed, pucca and semi-pucca structure for residence, boundary wall, tin fence, common planted trees, natural grown vegetation, agricultural land, low wet land, Mondir, Mosque
200-360	√		Tin-shed, pucca and katcha structure for residence, shops, boundary wall, common planted trees, natural grown vegetation, ditches, Existing damage brick drain, W2 package drain, Grameen bank, ditches, pond
		√	Tin-shed, pucca and semi-pucca structure for residence, shops, boundary wall, common planted trees, natural grown vegetation, low wet land, ditches, Siddiqia Filling station to Mashghat road, pond, Mandir

Geology, Topography, and Soils

Geology in the Chakoria is composed of sandstones, alternating with bluish-grey shales and siltstones. These sediments are probably of fluviatile origin through some of the even-bedded siltstones and shales of considerable lateral extent of shallow marine beds. There are four main soils or physiographic units can be recognized, viz. I) The higher hill ranges occupy a narrow belt: the most common soils are strong brown, friable, silty clay loams and silty clays which grade into broken shale rock at 2-4 feet. All soils are strongly acid in reaction. II) The

lower hill ranges are developed in unconsolidated sands and clays. Soils are mainly deep red, friable, clay loams to clays. All the soils are strongly acidic and sandy soils are droughty. III) The coastal plains are underlain by heavy marine or tidal clays characterized by more sandy and silty deposit near the foot of the hills and along the course of rivers and streams which cross the plains. Near the coast, some of these soils becoming saline at the end of the dry seasons. IV) The tidal mangrove swamps are most extensive at the mouth of the Matamuhuri River, where they form the Chakoria Sundarban. Here the soils are grey clay flooded twice daily by saline water and unsuitable for agriculture. (*Chakoria Pourashava: Master Plan*). According to Geological Survey Bangladesh (*GSB, 1978*) the Pourashava area falls in medium intensity seismic zone (Zone-II).



The purple Circle denote Chakoria Pourashava

Figure 3.1.1: Location of Chakoria Pourashava in Earthquake Zoning map of Bangladesh

Climate and Meteorology

Considering the proximity to Chittagong, the climatic features, environment and other natural phenomenon of Chakoria Pourashava may be considered to be similar with the Chittagong district. The maximum temperature in the year reached between the last week of March and end of May. Temperature data is recorded at three stations named of Chittagong, Cox's Bazar and Rangamati. Chakoria is close to the Cox's Bazar. The average maximum temperature in the Cox's Bazar is 31.28°C in April and minimum is 22.0°C in January during 2006. The variation in the precipitation between the driest and wettest months is 401 mm. (*Chakoria Pourashava: Master Plan*).

The humidity is high throughout the year. March and April are the least humid months. Lowest average humidity is recorded 62% at Cox's Bazar. (*Chakoria Pourashava: Master Plan*).

Hydrology (Surface Water and Ground Water)

Hydrology of the Chakoria Pourashava assumes to be similar with the coastal plains of Chittagong presents a complicated interaction of fresh water flow from the upstream, the tides and tidal flows from the Bay of Bengal. Tropical Cyclones, storm surge and other meteorological effect are occurred from the sea that affects Chakoria Pourashava as well. Water bodies like Matamuhuri River, Khals (Batakhali Khal, Subhaniyakum Khal, Magh khal, Matamuhuri Badha khal, Jaliapara khal), ponds, seasonal springs, low wet land and ditches along the road alignment are the main source of surface water in the sub-project area. Groundwater is the main source of potable water in the subproject area. Local people typically use deep tube-well water for drinking and other domestic purposes.

Flooding, Water Logging and Drainage Pattern

Eastern side of the Pourashava comprising high land and gradually down towards the western side. Matamuhuri River is flowing beside the Chakoria Pourashava in north-east and north-west direction. Several khals act as the natural drainage system of the Pourashava. The mainland surrounding the Pourashava is generally high from the level of tide. As a result, most of the area is free from flood. But in rainy season, due to flash flood from hill and surface water run-off due to heavy rainfall, most of the areas of the Pourashava are goes under water. Water logging occurs in the rainy season mainly due to poor drainage system. (*Chakoria Pourashava: Master Plan*). Basically, the subproject area at Fultola to Ghonashym Bazar Bottola Road via Tarazghat is consisting of low elevated lands with lot of surface water bodies which goes under water in the rainy season and makes temporary water logging at influence area. Except this, no mentionable continuous river erosion has been found within this Pourashava. (*Chakoria Pourashava: Master Plan*).

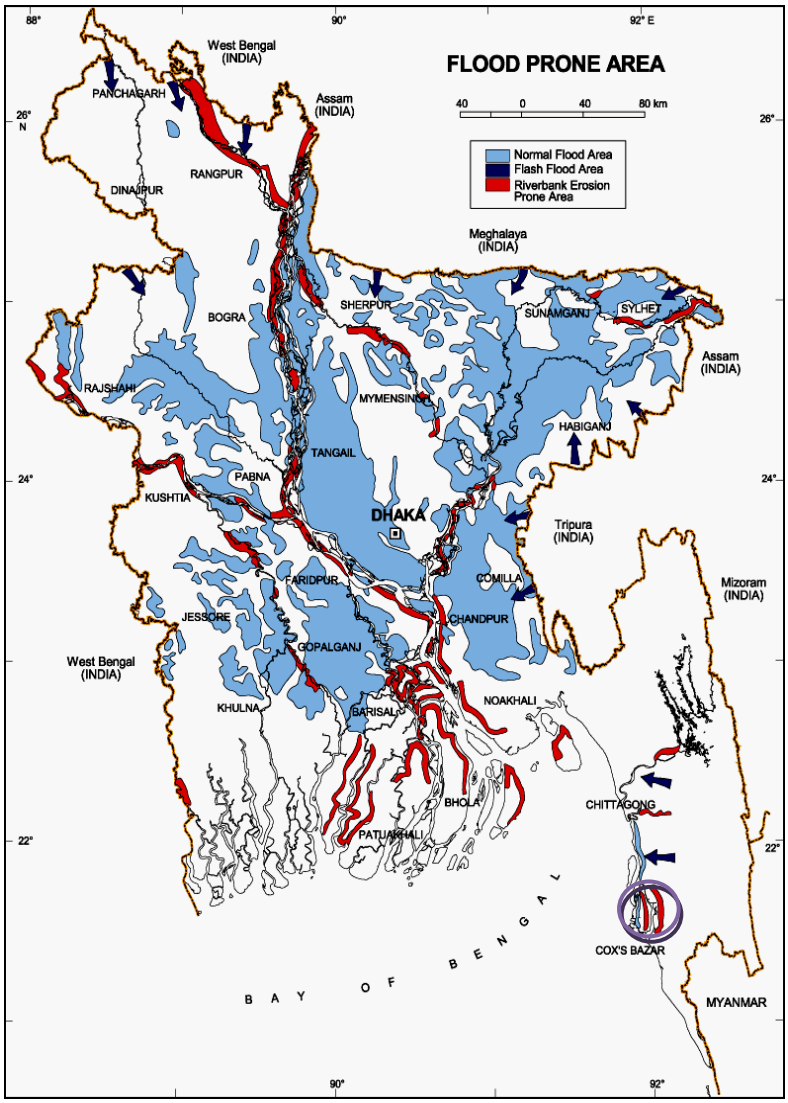


Figure 3.1.2: Location of Chakoria Pourashava in Flood Zone Map of Bangladesh (*BMD, 2012*)

Air Quality and Dust

As there are no major industries in subproject area as well as in the Chakoria Pourashava, the main sources of air pollution are vehicles movement and non-point sources such as open burning and black smoke emission from vehicles. During dry season the windblown dust also degrades the air quality.

Noise Level

Noise level data is not available. The major causes for noise in the subproject area are the vehicle movement (motor cycles, pick-up, mini-trucks, CNG rickshaw and auto-rickshaws), playing of loud-speaker and mass people gathering (for advertising of products and political, social and religious aspects) and local market. This is a common experience of the urban population that noise poses a threat to the ill / physically weak people health and nerves.

Sanitation

According to the Pourashava authority, most of the people in this area used sanitary latrines (about 86.9 percent households have been used sanitary toilets). There are about 10.9

percent have been used unsanitary latrines and the remaining 2.2 percent has no toilets particularly in the Ward 1 (*Chakoria Pourashava: Master Plan*).

Solid Waste Management

With the increase population and rapid urbanization, it is natural that generation of solid waste will also increase. If these wastes are not properly managed, it will have detrimental effects on the environmental quality. So, collection and management of solid waste is a great challenge for the Pourashava Authority. Presently, the Pourashava authority is trying to introduce proper waste management system. However, in reality a substantial amount of solid waste that are generated daily are not collected and disposed-off which eventually find their way into roadside; drains or canals or incidental spaces or in vacant plots in between settlements. Thus, it degrades quality of the surrounding environment. (*Chakoria Pourashava: Master Plan*).

3.2 Biotic Environment

Flora and Fauna

This subproject area is also full of natural vegetation (terrestrial and aquatic herbs, shrubs, bunches of bamboos and trees-common indigenous trees and planted fruit and wooden trees) and birds. In the subproject area, paddy is the main crop. Other seasonal crops and vegetables also cultivated in the agricultural land and homestead garden. The common species of trees (Acacia, Bamboo, Mango, Rain-tree, Mahogany, Pakoir, Amloki, Coconut, Betel nut, Jackfruit, Pulm, Kamranga, Banyan, Berry, Kadam, Guava, Chalta, Palm, Banana, Debdaru, Kodbel, Dumur, Tentul, Tula, Sofeda, Garjan, Segun etc.) are found in the subproject area. The natural water bodies (Matamuhuri River, Badha Khal, Chora, low wet lands, seasonal springs and ditches) are the worthy habitat for the aquatic animals. There are common local birds (Crow, Sparrow, Chil, Doel, Dove, etc) were found during the site visit.

3.3 Socio-economic and Socio-cultural Environment

Land Use Pattern, Status of Housing and Built-up Infrastructure

The subproject areas are mixed zone of urban and peri-urban area with residential houses and agricultural land. The road side infrastructures are mainly residential houses (pucca, semi-pucca, tin shed and katcha), shops (pucca, semi-pucca and katcha), bazar area, army cantonment area, educational and religious institutes.

Beneficiary Population

As per information by the Chakoria Pourashava considering the ward population with adjacent Unions Parishad of Chakoria Sadar Upazila, about 64,449 people will be benefited directly and many others indirectly.

Education

In the subproject area, literacy rate is higher (61.3%) than the average (51.8%) of country. The literacy rate for male (62.6%) is higher than female (59.8%). (*Population and Housing Census, 2011*).

Tribal Communities

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

Land Acquisition and Resettlement

Private land acquisition is not needed. For site clearing, few road side boundary wall and fencing need to be removed partially and or completely. The Pourashava Authority has consulted with the owners of these structures. The local people and owners of those structures have no objection regarding the implementation of the subproject. An agreement has been signed by the Pourashava and the local people regarding this issue. The local people agreed to remove their structures for their benefit. However, in case of any objection from the affected person, the DSM will investigate the actual situation. Then, measures will be taken as per rules.

Principal Livelihoods and Economic Activities

The subproject area is now inhabited by the mixed occupational people where major income comes from farm (agricultural activities) and non-farm activities such as small business, enterprises, transport vehicle ownership and operation.

Cultural Heritage and Protected Areas

Within the influence area of the subproject, no real historical sites were identified. Religious center (such as Mosques, temples), educational institutions and local bazar bring cultural values to the community people.

4 ENVIRONMENTAL SCREENING

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. The screening data and information designed for the BC road with allied works have been formulated and are shown in below. (*Environmental Assessment: Volume-1 and 2, 2013)*

(1) Potential environmental impact during construction phase:

(a) Ecological impacts:

➢ Felling of trees	Significant □√	Moderate □	Minor □	Number of trees	1861
➢ Clearing of vegetation	Significant □	Moderate □√	Minor □		
➢ Potential impact on species of aquatic (i.e., water) environment	Significant □	Moderate □	Minor □√		

Major trees to be felled down are: Mahogany, Coconut, Betel nut, Mango, Rain tree and Acacia. There is no tree to be felled down bring religious and heritage importance. However, the trees to be felled down have significant economic value, because most of them are medium in size considering length and diameter. Vegetation coverage is not similar in all sections of the road. However, clearing of the road side naturally grown vegetation (herbs and shrubs) have moderate level of ecological impacts. In addition, anticipated impact on species of aquatic environment is minor except throwing of the wastes materials in to the road side and influence area water bodies (ponds, ditches, Batakhali khal, Jaliapara khal, Magh khal, Badha Khal, Matamuhuri River and low wet lands) have impacts on the aquatic environment. Considering the overall situation, the ecological impact is considered as significant.

(b) Physicochemical impacts:

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

The subproject will have temporarily and localized negative impacts on noise and air quality during construction phase due to mobilization of the equipment, vehicles movement for the transportation of the materials, using of hydraulic excavator, brick breaking machine, mechanical compaction machine, concrete mixer machine and vibrator machine. The construction work will be performed section wise. Hence, it is anticipated that the impacts will be temporary, site specific and not significant. It should be noted that, homestead area, educational institutions, health care centers and religious centers may be significantly affected by generated noise and particular materials due to subproject activities, if measures are not taken. The generated construction wastes, un-suitable materials and solid wastes may degrade the adjacent water bodies if not properly collected and disposed and thrown into the road side water bodies. Improper collection and disposal of the generated wastes materials also may degrade the quality of the surrounding environment and degrade the landscape value. The anticipated water logging problem during construction period is insignificant because space is available all the section of the proposed road for draining-out the storm water. In addition, pumping facilities will be provided to drain-out the storm water if required.

(c) Socio-economic impacts:

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

During construction, the subproject will have localized and negligible impact on traffic congestion. These roads are moderately busy for traffic operation. The motorized and non-motorized vehicles are using this road regularly. However, the construction works will be performed at section wise. So, traffic movement due to road construction does not create any major problem for the community communication. On the other hand, the local people can use alternative roads at construction period which will continue the communication system. Furthermore, the construction work will follow simple procedure with commonly used equipment. Hence, anticipated impact on health and safety is moderate. However, using of the personal protective equipment by the workers will significantly reduce any occupational health and safety risks. There is no archeological and historical site within the influence area. Hence, the anticipated impact on socio-economic impacts due to subproject activities is insignificant. The overall subproject has significant positive impact by generating work opportunities for the local people and supplying of the construction materials, equipment, food and other necessary stuffs to the campsite.

(2) Potential environmental impact during operational phase:

(d) Ecological impacts:

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

The road component does not have any impact on the aquatic environment during operation. The waste water from the drain may degrade the water quality of the outfall if carries pollutants. Though, the drain is designed for storm water only. However, the storm water may carry washed-out materials, pollutants from any sources that may disturb the aquatic environment of the outfall. Hence, anticipated impact on species of aquatic environment due to drain component is considered as moderate. Furthermore, the culverts and road side palisading may be restricted free movement and disturb natural breeding of the aquatic species.

(e) Physicochemical impacts:

➢ Potential air quality	Improvement □	No-improvement □	Deterioration □√
➢ Potential 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 □	Minor □√

After completion, due to improve and newly develop road network, traffic volume may increase. Consequently, air quality and noise level may be degraded due to black smoke emission and hydraulic horn from the vehicles. The new road will minimize water stagnation on road surface and road slopes allow to passes the water to water shed which will may reduce the temporary drainage congestion and water logging problem. But, the new drain will minimize drainage congestion and water logging problem. RCC culverts will passes the water from one side to another side basically low elevated water shed (mainly the ditches, ponds, canals, Chora etc) which will may reduce the temporary drainage congestion and water logging problem. Thus, it will provide better environment to the community people. Though, the storm water to be discharged through the drain may degrade the water quality of the outfall if carry pollutants from any sources. Again, the covered drain will minimize spreading of the bad odor from the

drain. Thus, it will provide better environment to the community people. At operation phase the RCC road doesn't emits any pollutant substances to the adjacent water bodies.

(f) Socio-economic impacts:

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

After completion, this road will be enhanced and developed new road network for the Pourashava. The motorized and non-motorized vehicles can use this road for communicating and transshipment of agricultural goods (vegetables and crops). Road side shops and business facilities will be increased which will accelerate the work opportunity for the local people. Hence, this road will be an income generating source for the local inhabitants. The new road will minimize the frequency of the maintenance for three to five years after completion. Consequently, it will enhance safety traffic operation and pedestrians' movement. After completion, the drain will enhance the drainage network of the Pourashava and removing drainage congestion problem. Thus, it will reduce water logging problem in the subproject area. In addition, new drain prevents the accumulation of the stagnant water on the road surface. Consequently, it will enhance safety traffic operation and pedestrians' movement. Furthermore, fixing of the street light will also improve smooth traffic operation, pedestrian's safety and social safety net at night.

(3) Summary of Possible Environmental Impacts of the Subproject

From the overhead study, it seems that the subproject have significant impacts on ecology. Development of the RCC roads and drains with allied works (RCC box culverts, road cross drain and road protection wall works) including street light may temporary affect the roadside water bodies due to construction activities. The physicochemical components will be disturbed due to the subproject activities during the construction phase. The subproject activities may degrade the air and noise level to a limited extent. The inputs that may affect the environment will be mainly at construction phase and limited within the subproject boundary. Nevertheless the impacts will be temporary and localized and limited and fundamentally manageable through the appropriate mitigation measures. The generated solid wastes due to the subproject activities should be properly collected and disposed in a designated dumping site. The labor shed and stack yard should be located in a designated place. Likewise, there is significant adverse impact is anticipated at operational stage. The physic-chemical components like as air quality and noise level may be deteriorated due to vehicles emission and horns.

Furthermore, safety concern is an important issue for both the construction and operation phases that should be considered properly to avoid any potential safety risks. This subproject will have positive impacts in terms of the generation of the employment opportunities and business activities by supplying construction materials and equipment at construction phase and by providing extended business activities at operation phase.

5 SPECIFIC IMPACT, MITIGATION, AND ENHANCEMENT MEASURES

The likely impacts of the subproject are mainly caused by the activities required for the implementation of the subproject, and materials, resources and equipment to be used to perform the activities.

This section describes some specific impacts due to the subproject activities and their mitigation measures.

5.1 Dismantle Work, Site Clearing, Excavation Work and Earth Work

The road and drain improvement work with allied works including street lighting consists of dismantle of the existing road, site clearing work (clearing of the wastes materials generated due to dismantle work and removal of the unsuitable materials) and earth work (earth excavation, earth filling work, back filling etc.). These works lead dust blowing, improper disposal of the wastes, noise and vibration which may disturb the local people.

Mitigation Measures

- Proper care will be taken by the contractor during dismantle work, excavation work, earth work and disposal work to avoid any undue disturbances to the nearby people;
- Avoid loss of the topsoil for the earth filling work;
- Cover the exposed earth works with tarpaulin/fabric;
- Disposal of soil and construction wastes at the designated dump site at Zidda Bazar.

5.2 Tree Feeling, Clearing of the Vegetation and Ecological Impact

There are 1861 numbers of planted and naturally grown roadsides trees (Mahogany, Coconut, Betel nut, Mango, Rain tree and Acacia) will be felled down and roadside vegetation will be cleared due to implementation of this subproject.

Mitigation and Enhancement Measures

- Considering the space availability 2700 nos. of the local fruits, flowers, medicinal and ornamental trees will be planted to compensate the ecological imbalance to be caused due to felled down of the trees and to enhance the ecological condition in the subproject area;
- The trees will be planted at both sides of the subproject roads where space is available and anywhere Pourashava owned suitable places within the influence area of the subproject and the recommended trees are - Mango, Jam, Jackfruit, Kathbadam, Krisnachura, Polash, Jarul, Sonalu, Simul, Kadom, Satim, Neem, Arjun, Amloki, Tentul, Horitoki, Bohera, Mahogany, Shil Koroi, Rain Tree, Babla, Gamari, Segun, Garjan, Bannyan Tree, Palm Tree etc. (proposed sapling height is minimum 1m and comprising protection, fencing and conservation up to project defect liability period);
- Planting many trees will enhance the ecological condition of the area after their successful growth.

5.3 Pollution from the Construction Materials

Dumping of the construction spoils, including accidental leakage of the oil, grease, and fuel in equipment yards is a significant hazard. Both surface and groundwater might be polluted from these contaminants. Air pollution and dust may affect the nearby settlement which is generated from fine aggregate and vehicles. Even the people to be engaged for the construction activities 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;
- Fuels, lubricants, and other hazardous materials should store over raised platforms and not directly on the ground;
- Maintain adequate moisture content of soil and sand during transportation, compaction and handling;
- Carry the materials especially loose soil and sand with adequate cover;
- Disposal of soil and construction wastes at the designated dump site at Zidda Bazar.

5.4 Air Quality and Dust

During construction phase, air pollutants will be emitted from the equipment and construction vehicles are expected to remain low. Local residents, educational institutions and religious centers in the vicinity of the work sites will be temporarily disturbed by the limited dust pollution. The overall impacts, however, are expected to remain low.

Mitigation Measures

- Water should be sprayed at the work site and camp site area for dust control;
- Ensure sprinkle and cover stockpiles of the loose materials (e.g., fine aggregates);
- 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;
- Ensure that all subproject vehicles are in good operating condition.

5.5 Noise and Vibration

Noise and vibration caused by the equipment and movement of the construction vehicles may temporarily disturb nearby residents. In this subproject, sensitive areas like roadside residents, educational institutions and religious centers are likely to be affected by noise nuisance, though the impacts are anticipated to be limited.

Mitigation Measures

- Transportation of the construction materials have to be carried during the scheduled times, and mainly during the day in off-peak time;

- If applicable and needed, all powered mechanical equipment and machineries will be fitted with noise abating gear such as mufflers for effective sound reduction.

5.6 Water Quality

The water quality may deteriorate if the construction materials, sand, construction wastes, effluent from the work camps and food wastes are dumped in the adjacent water bodies like roadside Matamuhuri River, ditches, ponds, Jaliapara khal, Batakhali khal, Mtamuhuri Badha Khal, Magh Khal, Chora, low wet land, seasonal wetlands etc.

Mitigation Measures

- 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;
- Construction waste will dispose properly (not in water bodies or lowland), for which contractor will be responsible.
- Construction wastes will dispose properly at the designated dumping site at Zidda Bazar.

5.7 Occupational Health and Safety

The most important risks associated with the construction activities are listed below:

- Exposure to the sunlight- workers are being exposed to the sun for long hours;
- Exposure to the high temperature, and humidity for a long time resulting in dehydration;
- Contact with the hazardous substances and wastes pose risks of the infections and diseases;
- Risk of the poor air quality due to the dust;
- Risk of the collision (traffic);
- Risks from head loads for carrying soil, construction materials and construction equipment;
- Risks of the using of the machineries in motion;
- Risk associated to the sudden bad weather working conditions.

General Requirements for the Workers' Health and Safety

The key salient features of the general requirements for the workers' health and safety stated are presented in ***Table 5.7.1***.

Table 5.7.1: General Requirements for the Workers Health and Safety

Issues	Requirements
Health and Hygiene	• Cleanliness at the site premises and workers living places and at the Labor Shed; • Arrangement of the proper ventilation and temperature at the Labor Shed; • Protection against dust and furnace by using of the nose masks and covering of the head and body; • Proper disposal of the wastes and effluents; • Introduce waste bins for the solid waste management system.

Issues	Requirements
Safety and First Aid Box	• Using of the personal protective equipment (helmet, gloves, goggles, nose mask, safety boots); • Precautions during work on or near machineries in motion; • Head loads are prohibited; • First aid facilities should be provided and maintained; • The first aid kit should include adhesive bandages, regular strength pain medication, gauze, and low grade disinfectant.
Compensation for Accidents at Work	• 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).
Dust and Fumes	• For any dust, fumes, or other impurities likely to be injurious to the workers, effective measures shall be taken to prevent their accumulation and its inhalation by the workers.
Overcrowding	• No labor room should be overcrowded.
Latrines and Urinals	• Sufficient latrines shall be provided; • Latrines shall be maintained in clean and sanitary condition; • Latrines shall be adequately lighted and ventilated.
Disposal of Wastes and Effluents	• Proper disposal system for the solid waste and effluent is required; • Waste bins must be provided by the contractor at labor shed.

5.8 Impacts on Social Environment and Common Property Resources

Through comprehensive study, it is revealed that impacts are expected not to be severe and to be largely manageable. The following ***Table 5.8.1*** presents impacts on socio-economic environment and common property resources.

Table 5.8.1: Impacts on Social Environment and Common Property Resources

Social Components	Impacts on IECs	Impact Significance
Community Perception	The local community people welcome this subproject and there is no visible objection from them.	Significant (+ve)
Employment and Business Opportunity	Community feels happy because the construction works will create work opportunity for the local people for the skilled and non-skilled labor. The subproject will create business opportunity for the equipment and materials suppliers'.	Significant (+ve)
Community Order and Security	This subproject activity does not create any severe security problems to the local community and community people.	Minor (-ve)
Possible damage to existing infrastructure and facilities	Degradation of the existing road infrastructure by the construction equipment/vehicles used in this subproject.	Minor (-ve)
New infrastructure and facilities	Improvement of the existing road will increase municipality infrastructure facilities.	Moderate (+ve)
Labor Habitat	Most of the labors will stay at the Labor shed which will have impacts on the environment relates to the generation of the solid wastes, effluent, and water consumption.	Moderate (-ve)
Health Care	Workers may suffer from the dehydration problems, respiratory problem, and other health hazards.	Minor (-ve)
Accident	In case of road accidents by the vehicles to be used for the transportation may have serious negative impact.	Significant (-ve)

Mitigation Measures

- Conduct dissemination with the local community about the subproject details;
- Continue liaison with the community leaders in order to maintain the community support;
- Engage local contractor and local people as much as possible for positive perception of the local community;
- Follow traffic rules to avoid any accidents;
- Transportation and mobilization of the equipments and construction materials avoiding peak hours and scheduled time;
- Ensure first aid facilities and effective use of personal protective equipments where applicable.

5.9 Labor Influx and Anticipated Impacts

The labor force and associated goods and services required for the construction of infrastructure civil works under this subproject cannot be fully supplied locally. The migration to and temporary settlement of laborers in the subproject, referred to as labor influx, carries an array of potentially positive and negative impacts in terms of demands on public infrastructure, utilities, housing and sustainable resource management and the strain on social dynamics.

Labor influx effects on host communities include positive impacts such as:

- The subproject activities will generate work opportunities for the local people and supplying of the construction materials, equipment, food and other necessary stuffs to the campsite;
- Improved infrastructure and public service access and availability whereby subproject investment catalyzes larger allocation of resources to a region, stimulating the development or expansion of infrastructure and public services.

Critical negative social risks include:

- Increase in criminal activity and alcohol and drug abuse, domestic violence, political attachment and violence, smuggling and robbery etc;
- Increase in gender-based violence, including eve teasing, sexual harassment etc;
- Increases in communicable diseases, including respiratory problems, diarrheal diseases, vector-borne diseases (e.g., malaria), and sexually transmitted infections (e.g., HIV/AIDS, syphilis, gonorrhea, hepatitis B);
- Conflicts arising from increased demand on existing infrastructure, services, and utilities, including transportation, health, education, water and sanitation, waste management, public utilities and community, religious, and recreational facilities and loss of land for access routes.

The general environmental impacts of labor influx include pressure on the natural resources such as using of the water, electricity, other fuel for cooking, loss of land for the labor establishment, depletion of the water supply, sewage and waste water generation,

degradation of the air quality, waste generation, increased demands on the local energy and resources and noise pollution effects. The following safeguard measures are recommended to avoid any risk of labor influx:

- Inform local people about the subproject activities;
- Liaison with the community leaders in order to get community support;
- Engage local people as much as possible to minimize workers from outsiders;
- Monitor workers attitude and behavioral matter;
- Monitor the workers movement for avoiding any unexpected social activities (robbery, crime, political attachment and conflicts, drugs abuse);
- Inform and use local administration to get support if needed;
- Inform local utilities service providers (such as for new electricity connection REB or any other department);
- Ensure effective use of natural resources such as water, electricity, fuel, wood etc.

5.10 Impacts on Traffic Movement

The subproject roads are mainly used for the motorized and non-motorized vehicles. But these roads are moderately busy with the light traffic and pedestrian's movement and negligible impact on heavy traffic movement. Light motorized vehicles (Bike and electric Rickshaw-van, CNG rickshaw, motorcycle, mini-pick-up etc.) are using these roads. In addition, the alternative and connecting roads are adequate to diversify the traffic volume. Hence, during construction, the subproject will have negligible impact in traffic congestion. In addition, to minimize the impact subproject activities will be performed section wise.

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.

6 ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The purpose of the Environmental Management Plan (EMP) is to ensure that the activities are undertaken in a responsible and non-detrimental manner. The EMP will guide the environmentally sound construction of the subproject and ensure efficient lines of communication between the Project Management Unit (PMU, LGED), Project Implementation Unit (PIU) of Chakoria Pourashava, DSM, and the contractors.

6.1 Access to Information

The environmental assessment report should be translated into Bengali and disseminated locally. The copies of the report (both in English and Bengali) will be sent to all the concerned field offices of the LGED and Chakoria Pourashava. It will also be made available to the public. The final assessment report will also be uploaded in the LGED website and the World Bank website after approval.

6.2 Grievance Redress Mechanism

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

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

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

6.2.1 Grievance Redress Committee (GRC)

The discussions and negotiations will be conducted by the Project Implementation Unit (PIU) of Chakoria Pourashava and will involve the APs and Grievance Redress Committee (GRC) headed by the Pourashava Mayor. With the facilitation of the DSM, the Pourashava Mayor nominated the GRC members and included representative from the Government representatives, local NGO, and Civil Society. The GRC has been formed and established at Chakoria Pourashava. A complaints box has already been provided in the Pourashava Office.

The grievance response focal point is available at Pourashava Office for instant response to an aggrieved person. The Focal Point will collect written complaints or suggestions from the box, and produces them to the GRC for hearing and resolution. The GRC members are as follows.

Table 6.2.1.1: List of GRC committee members

Sl. No.	GRC Members Name	GRC Designation	Position
1	Alamgir Chowdhury	Chairman	Mayor, Chakoria Pourashava
2	Md. Mujibur Rahman	Member Secretary	Executive Engineer (Inc.), Chakoria Pourashava
3	Md. Mahbub-ul Karim	Member	Assistant Commissioner (Land), Chakoria
4	Md. Farid Uddin	Member	Head Master (inc.)
5	Kaji Maksudul Alam Mohit	Member	Executive, SARPV, Chakoria
6	Amir Rasid Dulal	Member	Local leader
7	Reseda Begum	Member	Mohila Councilor Ward No- 1,2,3
8	Rezaul Karim	Member	Councilor Ward No- 02
9	Md. Mujibur Rahaman	Focal Point	Assistant Engineer

6.2.2 Grievance Resolution Process

All complaints and suggestions will be received formally in the Chakoria Pourashava Office by the GRC Member Secretary. A sample Grievance Redress Form will be prepared and sent to Chakoria Pourashava.

An intake register will be maintained at the office of the Member Secretary. Member Secretary will record the details of the grievances in the intake register for documentation and ensure impartiality, fairness, and transparency. The intake register will have data and information columns including (i) Case no., (ii) Date of receipt, (iii) name, type of complaint, grievance, (iv) father's name, husband's name, (v) sex, (vi) complete address of the person raising the complaint, grievance, (vii) main objection (loss of land, property, or entitlement), (viii) detailed complaint story, (ix) expectation with documentary evidence and previous records of similar grievances, etc.

No GRC members are allowed to contact the aggrieved persons in advance. Rather, the concerned persons are informed to attend the formal hearings at an appointed date. The GRC committee will sit for hearing the complaints of the aggrieved persons. The GRC will record salient points presented by the aggrieved person and will examine documentary evidence submitted during informal hearings. A resolution register will be maintained by the Member Secretary at the Pourashava Office. The resolution register will contain (i) serial no., (ii) case no., (iii) name of complaint, (iv) complaint story and expectation, (v) date of hearing, (vi) date

of field investigation (if any), (vii) results of hearing and field investigation, (viii) decision of GRC, (ix) progress (pending, solved) and (x) agreement or commitments. Closing register will keep records such as, (i) serial no., (ii) case no., (iii) name of complaint, (iv) decision and response to complaints, (v) mode and medium of communication, (vi) date of closing, (vi) confirmation of complainant's satisfaction and (vii) management actions to avoid recurrence.

The GRC will decide within 30 days of receiving a complaint. There will also be an appeals procedure where, if a person is dissatisfied with the ruling of the GRC, he or she or a representative may attend their next meeting to present the case again. The committee will then reconsider the case in private, after which their decision is final. If the appellant is still not satisfied, then GRC will refer the complaint with the minutes of the hearings to the PD-MGSP, LGED for further review. If the case at this level is again found unacceptable by the aggrieved person/s, PD will advise the Pourashava to drop the subproject. Chakoria 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 Chakoria Pourashava.

6.3 Institutional Arrangement for Environmental Safeguard Compliance

In the institutional arrangement procedure, Project Director (PD), Team Leader (TL)/Deputy Team Leader will directly involve. The PD and TL/DTL would be supported by DSM Environmental Safeguard Specialist and Social Management Specialist. The Pourashava Officials, especially members of Infrastructure Improvement Section, would be responsible for supporting the construction supervision as well as environmental and social management with the facilitation of DSM consultants. The civil works contractors will implement the environmental mitigation measures.

The PMU, with the facilitation of Environmental Safeguard Specialist and Social Management Specialist will submit the monthly and quarterly progress reports on Environmental and Social Compliances to the World Bank.

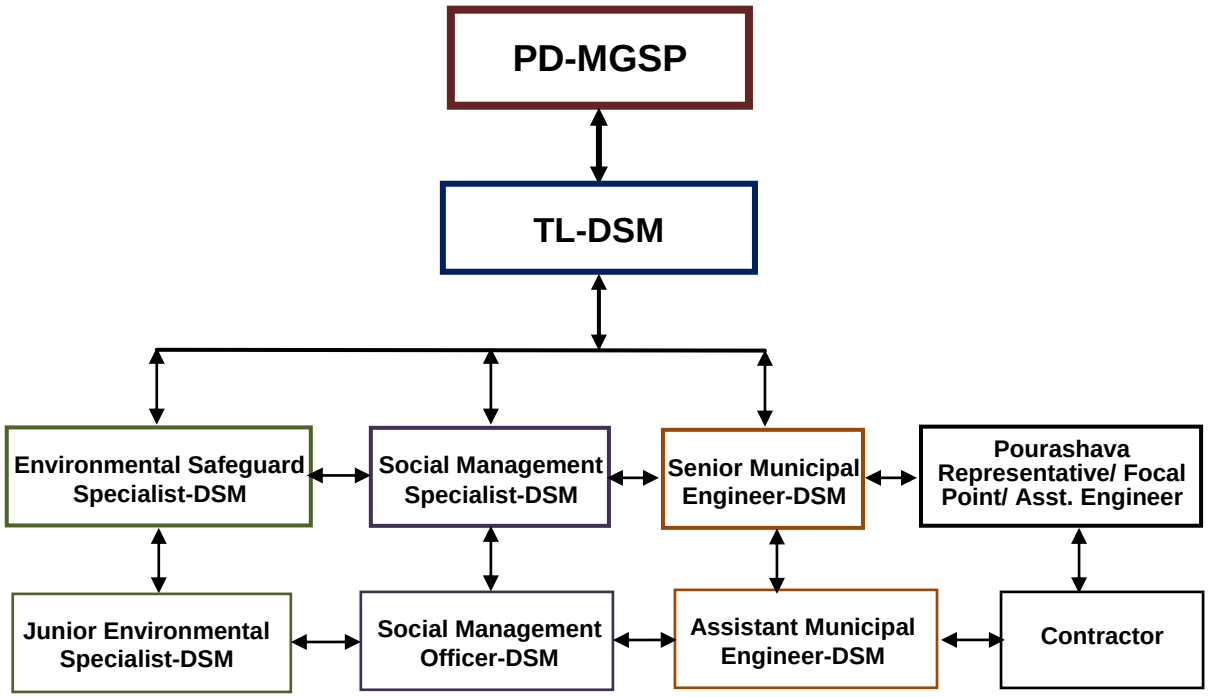


Figure 6.3.1: Environmental and Social Management Team (Tentative)

6.4 Capacity Building

A regional demonstration training program has already been conducted by PMU, LGED and DSM in Comilla City Corporation to build the capability of the PIUs concern and DSM field staffs. Participants from Chakoria Pourashava were attended. Under the demonstration training program, PMU and DSM organized an introductory course for preparing them on: (i) Environmental Screening, (ii) EMP Implementation, including environmental monitoring requirements related to mitigation measures; and (iii) taking immediate action to remedy unexpected adverse impacts or ineffective mitigation measures to be found during the course of the implementation.

A separate capacity building workshop should be conducted for the Chakoria Pourashava Officials, members of Infrastructure Improvement Section and DSM field staff. A detailed training manual has already been developed by the Environmental Safeguard Specialist and Social Management Specialist. Hence, the existing manual will be reviewed and modification will be done as per requirement.

6.5 Emergency Response and Disaster Management

Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular the preparedness, response and recovery to lessen the impact of disasters. Emergency Preparedness Planning (EPP) and Contingency Planning (CP) are the processes of disaster management plan for developing strategies, arrangements, and procedures to address the humanitarian needs of those adversely affected by the crisis. There are four main

types of disasters, namely: Natural Disasters, Environmental Emergencies, Complex Emergencies, and Pandemic Emergencies.

For MGSP activities, Chakoria Pourashava would identify the immediate needs, prioritize the tasks, and identify resource requirements to address the humanitarian needs of those adversely affected by the crisis.

6.6 Environmental Management Action Plan

The activity wise anticipated environmental impacts and corresponding mitigation measures have been outlined in ***Table 6.6.1*** and ***Table 6.6.2***.

Table 6.6.1: Anticipated Environmental Impacts during Construction Phase and Corresponding Mitigation and Enhancement Measures

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Construction and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may degrade quality of the adjacent water bodies and surrounding environment	• Construction of sanitary latrine considering 15 persons for one toilet at the labor shed and separate toilet for male and female; • Ensure provision of waste bins (introduce separate waste bins for organic and inorganic wastes); • Ensure wastes (solid wastes and other forms of wastes) disposal at the Zidda Bazar dumping site.	Contractor Monitoring- Primarily by Pourashava Secondarily by PMU, LGED and DSM
	Health of workers	• Conduct formal and unofficial discussion to increase awareness about hygiene practices among the workers; • Ensure availability and access to first-aid equipment and medical supplies for the workers.	
	Possible development of labor camp into permanent settlement	• Contractor to remove labor camp at the completion of contract.	
	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.	
General construction works	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.	Contractor Monitoring- Primarily by Pourashava Secondarily by PMU, LGED and DSM
	Air pollution	• Check regularly and ensure that all the subproject vehicles are in good operating condition; • Ensure contractor spray water on dry surfaces regularly to reduce dust generation; • Maintain adequate moisture content of the soil and sand used for transportation, ISG, bed preparation, compaction and backfilling; • Ensure contractor sprinkle and cover stockpiles of loose materials (e.g., fine aggregates); • Ensure contractor avoid use of equipment at site and far from the local residents, which produce significant amount of particulate matter.	
	Traffic congestion, effect on traffic and pedestrian safety	• Ensure schedule deliveries of materials/ equipment during off-peak hours; • Place traffic/ cautionary sign to avoid undue traffic congestion and accidents; • Inform the local people about the subproject activities.	

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
	Noise pollution	• In front of the road side sensitive infrastructures i.e., religious centers and educational institutions, construction work should be performed considering the prayer time and schooling time or holidays; • Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; • Regulate use of horns and avoid undue use of hydraulic horns in subproject vehicles.	Contractor Monitoring- Primarily by Pourashava Secondarily by PMU, LGED and DSM
	Water and soil pollution	• Prevent discharge of fuel, lubricants, chemicals and wastes into adjacent water bodies like ponds, Matamuhuri River, Badha Khal, ditches and seasonal springs.	
	Felling of trees, clearing of vegetation and ecological disturbances	• 2700 nos. of trees will be planted to compensate the felled down trees preferably local fruits, timber, medicinal and ornamental trees at both sides of the subproject roads under package - MGSP/CHO/2018-19/W-11, where space is available and any other Pourashava owned suitable places in and around the subproject influence area where space is available.	
	Accidents	• Conduct formal and informal discussion for creating awareness about the accidents; • Provide PPEs and ensure using of the personal protective equipment by the workers.	
	Spills and leaks of oil, toxic chemicals	• Proper handling of lubricating oil and fuel so that it does not fall on the soil and water body; • Collection, proper treatment and disposal of the spills.	
All construction works	Beneficial impact on employment generation	• Employ local people in the subproject activities as much as possible; • Give priority to poor people living within subproject area in subproject related works (e.g., excavation and other works, which do not require skilled manpower).	
	Possible complaints and suggestion from the local people and stakeholder about the subproject activities	• Use existing grievance registrar and complaints box that has been already delivered in the Pourashava;	
	General degradation of the environment	• Ensure environmental enhancement measures such as tree plantation and traffic/cautionary signs.	

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Environmental impact due to the key construction activities and corresponding mitigation measures for RCC roads, drains, box culverts, road cross drain and palisading			
Excavation/ Earth work/ Dismantle work	Generation of solid and construction wastes due to the dismantle works; Generation of loose soil due to the earth excavation work.	• Cover exposed earth works with fabric/tarpaulin; • Disposal of soil and construction wastes at Zidda Bazar dumping site.	Contractor Monitoring- Primarily by Pourashava Secondarily by PMU, LGED and DSM
	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; • Ensure bolly drive or similar protective works to stabilize the structure.	
	Accidents	• Carefully operate the hydraulic excavator; • Operate the hammer carefully for the dismantle work.	
	Air pollution	• Regular maintenance of the equipment to avoid black smoke emission.	
ISG/ Sand filling for roads & Back filling work for drains, palisading & culverts	Air and dust pollution affecting nearby settlements	• Maintain adequate moisture content of soil during transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.	
Cutting and welding of the reinforcement	Noise pollution due to rod cutter and welding machine if any	• Avoid using of rod cutter and wielding machine at night; • Avoid prolonged exposure to noise (produced by equipment) by workers.	
	Potential health and safety risks from rod cutter and welding machine if any	• Ensure use of the personal protective equipment's (helmet, goggles, gloves, safety boot); • Availability and access to first-aid equipment and medical supplies in case of any accidents.	
RCC (reinforcement 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.	
	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 and prayer time; • Inform local people about casting work and potential impacts.	

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Environmental impacts due to the key construction activities and corresponding mitigation measures for Street light			Contractor Monitoring- Primarily by Pourashava Secondarily by PMU, LGED and DSM
Setting up the pole and electrical connection	• Potential health and safety risks	• Inform the local authority to switch off power during connection; • Ensure use of the PPEs.	
Source of electricity and equipment	• Reduce of resource i.e. use of electricity	• Provision of renewable energy (solar panel electrification) and use of environmental friendly equipment (LED bulb rather than CFL bulb).	

Table 6.6.2: Anticipated Environmental Impacts during Operational Phase and Corresponding Mitigation and Enhancement Measures

Activity / Issues	Potentials Impacts	Proposed Mitigation and Enhancement Measures	Responsible Parties
Operation of the roads	- Increase in traffic speed and accidents; - Increased traffic congestion due to movement of increased number of vehicles; - Possible road damage due to movement of heavy vehicles, spillage of water to bitumen road surface.	• Better traffic management; • Avoid movement of heavy loaded vehicles that may exceed the load carrying capacity of the road; • Avoiding spillage of water on road from vehicles carrying fish/ fresh produce (through monitoring, creation of awareness).	Monitoring- Primarily by Pourashava Secondarily by PMU, LGED
	Increased air and noise pollution affecting surrounding areas	• Traffic management, increased vehicle inspection	
Operation of 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.	
	Possible backflow of water through drainage canal causing water logging	• Proper maintenance and cleaning of the drain and outfall (khals/canals, lowland ditches) on regular basis.	
	Possible degradation of the water quality	• Raising awareness among the beneficiaries, "Do not through solid waste, plastics and sanitary waste into the water body".	
Operation of RCC box culverts	Blockage of the water passing passage due to disposal of solid waste/ debris	• Creation of awareness; stop throwing of the wastes materials in to the water bodies by the community people; • Regular maintenance / cleaning at both sides of the culverts and beneath the culverts.	
Operation and maintenance for street light	Accident due to collapse of the arms, electric bulbs and poles;	• Monthly checking and maintenance of the arms, switch box, electric bulbs; if needed; • Provision of automatic shut-down the switch, lamps during thunder storm and other natural disasters.	
	Traffic congestion, traffic problems for maintenance works;	• Schedule deliveries of materials/ equipment during off-peak hours;	
	Beneficial impact on employment generation for maintenance works.	• Engage local people for the maintenance activities.	

6.7 Environmental Monitoring Plan

Environmental Monitoring Plan for this subproject will help to evaluate the extent and severity of environmental impacts against the predicted impact and the performance of environmental protection measures. The following **Table 6.7.1** has been recommended for the key environmental indicators.

Table 6.7.1: Matrix Table of Monitoring Plan (Visual observation during construction phase)

Monitored Parameter/ Issues	Monitoring method/ Key aspects	Location of monitoring	Period & Monitoring Frequency
Safety orientation & training of workers	Frequency of training and orientation of workers for safety	Sub-project site	• Once in a month • Reporting: Once in a month
Personal Protective Equipment and safety equipment	Ensure every single person involved in the activities wear and use safety equipment	Sub-project site	• Daily • Reporting: Once in a month
Worker's health	Monitoring process of worker's health	Sub-project site	• Daily • Reporting: Once in a month
Sanitation & drinking water facility to the workers	Availability of safe drinking water and sanitation to the workers	Sub-project site	• Daily • Reporting: Once in a month
Incident record & reporting	Documented record of all incident, accident and its remedial process	Sub-project site	• Daily • Reporting: Once in a month
Site security	Isolation of site from general access	Sub-project site	• Daily • Reporting: Once in a month
Bulletin/ announcement boards/ prohibition signs	Visible in good condition or not	Sub-project site	• Daily • Reporting: Once in a month
Equipment /vehicles	-Switched-off diesel engines when not in use; - Search any possible leakage; - Fuelling.	Sub-project site	• Daily • Reporting: Once in a month
Dust	Dust is visible or not	Sub-project site	• Daily • Reporting: Once in a month
Oil waste generation and disposal	Quantity of oily waste, storage and disposal	Sub-project site	• Daily • Reporting: Once in a week
Solid waste generation	Quantity of solid wastes and disposal	Sub-project site	• Daily • Reporting: Once in a month
Drainage facilities	Provision of open /closed surface drainage if needed	Sub-project site	• Monthly • Reporting: Once in a month
Gender equity	No discrimination regarding payment	Sub-project site	• Once in a month • Reporting: Once in a month
Child labor	No child will be engaged in the activities	Sub-project site	• Daily • Reporting: Once in a month
Handling of hazardous materials	Fuelling, storage, operation	Sub-project site	• Daily • Reporting: Once in a month

In addition, a comprehensive Environmental Compliance Monitoring checklist has been prepared that is enclosed in ***Appendix-I***.

6.8 Cost of Environmental Enhancement Works in BOQ

Considering the environmental impacts and their mitigation measures for this subproject, several items are included in the BOQ for environmental management. The estimated cost for environmental management budget is elaborated in ***Table 6.8.1***.

Table 6.8.1: Environmental Measurement Budget

Item No.	Description of the Works	Unit	Qty	Unit Rate (BDT)	Amount (BDT)
eme-1	Dust suppression measures by water spraying throughout the construction period in and around the subproject sites, uncovered aggregates and loose materials such as stockpiles of the sand, excavated earth etc.	LS	–	–	25,000.00
eme-5	Prevention of the spillage and leakage of the polluting materials (Detailed procedure will be given in the EMP)	LS	–	–	5,000.00
eme-6	Campsite wastes disposal facility during the construction period (collection, transportation, and dumping of the wastes at Zidda Bazar dumping site: 2 nos (1 no. for the organic wastes and 1 no. for the inorganic wastes disposal facility)	Nos.	2.00	20,000.00	40,000.00
eme-7	Campsite water supply facilities: Preferably 1 no. of tube well at the labor campsite (Depending on the site condition, DSM consultant will assist the contractor for selecting the option)	Nos.	1.00	20,000.00	20,000.00
eme-8	Campsite sanitation facilities: 2 nos. of the toilets preferably sanitary toilets at the labor campsite (1 no. for women and 1 no. for men)	Nos.	2.00	20,000.00	40,000.00
eme-9	a) Providing safety gear packages like hand gloves, spectacles for eye protection, ear plug, helmets, masks, visible jacket, safety shoes for at least 35 persons (25 workers and 10 visitors)	Set	35.00	3,000.00	105,000.00
	b) One first aid box with necessary accessories (contractor is responsible for providing necessary medicines, saline as per requirement during construction period)	Set	1.00	2,500.00	2,500.00
eme-11	Tree plantation to compensate the felled down trees and enhance the ecological condition in the subproject area-preferably local fruits, flowers, medicinal and ornamental trees - Mango, Jam, Jackfruit, Kathbadam, Krisnachura, Polash, Jarul, Sonalu, Simul, Kadom, Satim, Neem, Arjun, Amloki, Tentul, Horitoki, Bohera, Mahogany, Shil Koroi, Rain Tree, Babla, Gamari, Segun, Garjan, Bannyan Tree, Palm Tree (including protection, fencing and conservation during project defect liability period): Preferably at both sides of the subproject roads where space is available and any other Pourashava owned suitable places in and arround the subproject influence area where space is available-2700 nos. of the trees (Tree plantation detailed will be given in the EMP)	Nos.	2700.00	750.00	2,025,000.00
eme-14	Cautionary signs-16 nos. (Detailed specifications will be given in the EMP)	Nos.	16.00	2,500.00	40,000.00
	Total				**2,302,500.00**

After approval to revise the cost estimate has lengthy complex procedure. Hence, as per project EMF, PMU suggestion and experience from other LGED projects, adequate budget has been allocated for the environmental management for the mitigation and enhancement measures.

For this subproject, there is no provision of the analytical monitoring because air, noise and waste water quality data from the previous subprojects (MGSP/CHO/2016-2017/W2 & MGSP/CHO/2018-2019/W10) can be used as a baseline data to evaluate the impacts.

Plenty of space is available for the tree plantation. Hence, to compensate the felled down trees and to enhance the ecological condition, adequate budget for tree plantation is also included. The budget for labor shed and site office construction is included in the civil works items. Therefore, it is not included in the environmental budget. It should be noted that the contractor will be paid as per actual work done.

6.9 Environmental Codes of Practice

- ECoP-1 (Overall Environmental Protection): Contractor shall take all steps to protect environment and avoid causing all types of public nuisances during implementation;
- ECoP-3 (Labor shed Management): Contractor shall maintain the work camp and construction sites in clean and tidy conditions and shall ensure standard facilities;
- ECop-4 (Workforce Environment): Contractor shall engage local people as much as possible where applicable and ensure prohibition of the child labor (less than 18 years) and aged labor (more than 65 years) in heavy works;
- ECoP-5 (Waste Management): Contractor shall be responsible for the safe transportation and disposal of the wastes generated due to the subproject activities;
- ECoP- 6 (Workers Health and Safety): Contractor shall be responsible for providing personal protective equipment and first aid facilities as per requirements;
- ECoP-7 (Compensation for Accidents): Contractor shall bear medical treatment costs for any accidents. If any severe 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);
- ECoP-8 (Implementation of the Mitigation Measures): Contractor shall responsible for the implementation of the mitigation measures mentioned in the EMP;
- ECoP-9 (Spill Prevention, Fuels and Hazardous Substances Management): Contractor shall take preventive measures for spill prevention and fuels and hazardous substances management;
- ECoP-10 (Restoration of the Facilities): The contractor on completion of the contract shall remove the equipment, surplus materials, and rubbish and temporary structures of all types and shall leave sites in clean condition to the satisfaction of Pourashava and local people.

7 PUBLIC CONSULTATION AND PARTICIPATION

7.1 Methodology

In the context of formulating the Environmental Assessment (EA), participatory public consultation was conducted in the subproject site. The Pourashava Mayor, Officials, Engineers and local individuals as well as LGED and Consultant participants participated. Informal Focus Group Discussions (FGD) and a formal CIP were conducted involving the participants. In addition, walk-through informal group consultations and individual interviews were also held. The local communities were informed about subproject interferences including their benefits. Suggestions made by the participants were listed and incorporated in the EMP accordingly.

7.2 Issues Raised by the Participants

The participants raised the issues related to the infrastructure development of Chakoria Pourashava. They emphasized on the subproject selection for the future development and also discussed about the procedure for the quality construction work. In the FGD, the participants discussed the requirements for the future infrastructure development through a list of the subprojects. As per the participants' opinion, the major environmental problems in the Chakoria Pourashava are related to drainage system, sanitation, road communication system, solid waste management, water pollution and land pollution. They have also stated that water logging in the low lying areas within the Pourashava area is another major problem.

7.3 Feedback, Suggestions and Recommendations of the Participants

The participants were presented with feedback, suggestions, and recommendations listed below:

- The FGD results confirmed that an improved communication network, drainage facility, solid waste management, water treatment plant and water supplying system, sewerage treatment plant and sanitation facilities, recreational facilities, health and sports facilities and educational institutions are needed for future development of Chakoria Pourashava;
- Local people also believed that the importance of the area would be elevated and various economic activities would be started in the area after the subproject implementation;
- Local people also showed strong expectation for the increased opportunities for employment for unskilled or semi-skilled labor in the construction work;
- Most of the participants stated that the number of subproject that have been selected for each financial year is insufficient;
- The participants stated that the public water supply facilities, sanitation facilities and access road is not adequate;
- The participants also addressed the solid waste management issue to reduce environmental and public health hazards.

8 CONCLUSIONS AND RECOMMENDATIONS

The subproject intervention has significant impact due to chop-down trees. However, to compensate the felled down trees and to enhance the ecological condition, tree plantation is included in the subproject area. The adverse impacts on the physicochemical components will be localized and limited within the subproject boundary. It is also anticipated that the adverse impacts are largely manageable if proper mitigation, compensation and enhancement measures will be entirely implemented. In fact, the anticipated impacts due to the subproject activities are relatively minor in comparison to the significant benefits that will derive due to the implementation of the subproject.

A few key recommendations are outlined below:

- EMP should be available in the site during construction phase;
- Regular field visit by PMU, DSM and Pourashava is needed for the effective implementation of the EMP;
- Equipment should be checked by the Pourashava engineer and DSM consultant prior to work;
- To minimize occupational health and safety risks, it is highly recommended to adapt mechanical system where appropriate;
- Contractor will ensure availability of the PPEs to the workers;
- First aid box with relevant medicine should be available at site;
- The contractor is responsible for the proper disposal of the generated wastes materials from the subproject sites and campsite;
- Inform the local inhabitants about the subproject activities and safety measures would be taken for the pedestrian and traffic movement;
- Contractor will monitor behavioral matter of the workers to avoid any undue risks related to labor influx;
- Proper maintenance is needed for the planted trees by the contractor during project defect liability period.

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

9 REFERENCES

1. Chakoria Pourashava Master Plan: 2011-2031 Urban Area Plan
2. Population and housing census, 2011, National Volume-II: Union Statistics.
3. GoB (1997), Environmental Conservation Rules 1997.
4. Environmental Assessment Volume 1: Overall Environmental Assessment [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.
5. Environmental Assessment Volume 2: Environmental Management Framework (EMF) [Draft Final Report], September 2013. Municipal Governance and Services Project (MGSP), Local Government Engineering Department (LGED) and Bangladesh Municipal Development Fund (BMDF), Ministry of Local Government, Rural Development and Cooperatives, Government of the People's Republic of Bangladesh.
6. Geological Survey of Bangladesh, 1978. Earthquake Zoning Map.
7. Bangladesh Meteorological Department, Flood zoning Map, 2012.

APPENDIX

Appendix - I: Environmental Monitoring Checklist

Local Government Engineering Department

Municipal Governance and Services Project (MGSP)

Environmental Compliance Monitoring Form

Part A: General Subproject Information

Subproject Name	a) Road improvement work from Koraighona Hossain Chairman's house to Siraj Master house Ch.0+00 to 0+820m b) Road improvement work from Koraighona Kalu Maji house to Moghpara via Sonkholapara Ch.0+00 to 1+000m c) Road from Kahariaghona Omar house to Abdul Hakim house via Moulovi Monjur house Ch.0+00 to 0+350m d) Road improvement work from Abbas Master's house to Balagul Mobin Madrasa via Rajarbeel Ch.0+00 to 1+250m e) Improvement of Chiringa Station para road Ch.0+00 to 0+416m f) Construction of RCC road from Binamara Eddipara Mostak Ahmed's shop to Nurul Kabir's (Abbas Khalifa) house Ch.0+00 to 0+600m and Link Ch. 0+00 to 0+222m g) Road and drain from Sub Register office to Halkakara beri bundh via Baitur Rahmat Jame mosjid Ch.0+00 to 0+775m h) Construction of RCC drain from Shawnapuri culvert to Khodarkum via Sobujbag Ch.0+00 to 0+360m i) Drain and cross drain from Ghonosam bazar to Sobhaniakum Ch.0+00 to 0+850m j) Construction of RCC drain from Palakata Central Jame Mosque to Abu Salam's shop Ch.0+00 to 0+210m k) Construction of Bhoramuhuri Haji Para road side RCC drain Ch.0+00 to 0+360m
Package No.	MGSP/CHO/2018-19/W-11
ULB Name	Chakoria Pourashava
Approved Estimated Cost in BDT	
Contract Amount in BDT	
Contractor Name	
Date of Commencement	
Target Date of Completion	
Physical Progress (%)	
Financial Progress (%)	
Person Responsible (PIU) (Name, Designation &Phone) for the Overall Subproject Management	

Person Responsible (DSM) (Name, Designation &Phone) for the Overall Subproject Management	
Form Completed by (Name, Designation &Phone)	
Overall Environmental Description of the Subproject	

Part B: Design, Preparation, and Legal Requirements

Environmental Concerns (PMU, PIU & DSM) (Name, Designation & Phone)	PMU-	
	PIU-	
	DSM-	
Subproject Category	DoE-BD-	WB-
Environmental Clearance Received?	Yes	No
EA Required?	Yes	No
EA Prepared and Delivered?	Yes	No
EMP Prepared & Delivered Separately?	Yes	No
Items and Cost of EMP Implementation Included in the Contract?	Yes	No
EMP Included in the Procurement Documents?	Yes	No
Inspection Schedule / Last Inspection / Monitoring by PMU Environmental Concerns	Date-	
	Key findings-	
Inspection Schedule / Last Inspection / Monitoring by PIU Environmental Concerns	Date-	
	Key findings-	
Inspection Schedule / Last Inspection / Monitoring by DSM Environmental Safeguard Specialist / Jr. Environmental Specialist	Date-	
	Key findings-	

Part C: Key Environmental Impacts

The Subproject Results in any of the following Impacts?	Yes	No	NA	If yes, is the impact (give observation)		
				Significant	Moderate	Minor
Felling of the trees						
Clearing of the vegetation that increase the risk of increased soil degradation or erosion						
Disturbance of the terrestrial and or aquatic specifies						
Noise pollution						
Air pollution						
Adverse effects on the quantity or quality of the surface water or groundwater						
Production or increase the production of the solid waste						
Drainage congestion						
Water logging that increases the risk of the water related diseases						
Traffic congestion						
Public safety						

Part D: Work Place Environment and Gender Equity

The Subproject Results in any of the following Impacts?	Yes	No	NA	Observations
Does the contractor pay to the workers regularly?				
Is there any discrepancy between the male and female workers regarding the wages or salary for the same works?				
Is the contractor complying with the GOB labor law concerning the hiring of the workers?				
Does the contractor engage women labors and does the project have suitable works for them?				
Does the contractor engage child labor (less than 18 years) and aged people (more than 65 years old)?				
Does the contractor force to the workers for the completion of the works?				
Do the workers involve with the political activities, crime, drugs addiction and other forms of unwanted activities?				
Are construction camps adequately equipped with water supply, sanitary toilets, washing facilities and facilities for waste collection and storage?				
Has separate sanitation facilities been provided for women at work camps and the construction site? Do the laborers load heavy items on their heads or shoulders?				
Has the contractor undertaken an awareness program for the sexually transmitted diseases especially for HIV-AIDS and other infectious diseases like TB?				

The Subproject Results in any of the following Impacts?	Yes	No	NA	Observations
Are first aid kits readily available for the workers at the job site along with the instructions for use?				
Are supervisors or other site personnel trained in the basic first aid emergency response measures?				
Has the contractor provided necessary safety equipment to the workers and training for use?				

Part E: Potential Impacts, Mitigation Measures, and Monitoring Indicator Mentioned in the EMP

Activity/ Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Monitoring Method	Monitoring Frequency	Implementation Status (Yes/ No / NA)	Impact significance if not implemented				Remarks
						Major	Moderate	Minor	No	
Construction and operation of labor shed for the workers (Workforce and labor shed management)	Generation of sewage and solid waste may degrade quality of the adjacent water bodies and surrounding environment	• Construction of sanitary latrine considering 15 persons for one toilet at the labor shed and separate toilet for male and female; • Ensure provision of waste bins (introduce separate waste bins for organic and inorganic wastes); • Ensure wastes (solid wastes and other forms of wastes) disposal at the Zidda Bazar dumping site.								
	Health of workers	• Conduct formal and unofficial discussion to increase awareness about hygiene practices among the workers; • Ensure availability and access to first-aid equipment and medical supplies for the workers.								
	Possible development of labor camp into permanent settlement	• Contractor to remove labor camp at the completion of contract.								
	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.								
General construction works	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.								

Activity/ Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Monitoring Method	Monitoring Frequency	Implementation Status (Yes/ No / NA)	Impact significance if not implemented				Remarks
						Major	Moderate	Minor	No	
	Air pollution	• Check regularly and ensure that all the subproject vehicles are in good operating condition; • Ensure contractor spray water on dry surfaces regularly to reduce dust generation; • Maintain adequate moisture content of the soil and sand used for transportation, ISG, bed preparation, compaction and backfilling; • Ensure contractor sprinkle and cover stockpiles of loose materials (e.g., fine aggregates); • Ensure contractor avoid use of equipment at site and far from the local residents, which produce significant amount of particulate matter.								
	Traffic congestion, effect on traffic and pedestrian safety	• Ensure schedule deliveries of materials/ equipment during off-peak hours; • Place traffic/ cautionary sign to avoid undue traffic congestion and accidents; • Inform the local people about the subproject activities.								
	Noise pollution	• In front of the road side sensitive infrastructures i.e., religious centers and educational institutions, construction work should be performed considering the prayer time and schooling time or holidays; • Check and maintenance the equipment properly; • Avoid using of construction equipment producing excessive noise at night; • Regulate use of horns and avoid undue								

Activity/ Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Monitoring Method	Monitoring Frequency	Implementation Status (Yes/ No / NA)	Impact significance if not implemented				Remarks
						Major	Moderate	Minor	No	
		use of hydraulic horns in subproject vehicles.								
	Water and soil pollution	• Prevent discharge of fuel, lubricants, chemicals and wastes into adjacent water bodies like ponds, Matamuhuri River, Badha Khal, ditches and seasonal springs.								
	Felling of trees, clearing of vegetation and ecological disturbances	• 2700 nos. of trees will be planted to compensate the felled down trees preferably local fruits, timber, medicinal and ornamental trees at both sides of the subproject roads under package - MGSP/CHO/2018-19/W-11, where space is available and any other Pourashava owned suitable places in and around the subproject influence area where space is available.								
	Accidents	• Conduct formal and informal discussion for creating awareness about the accidents; • Provide PPEs and ensure using of the personal protective equipment by the workers.								
	Spills and leaks of oil, toxic chemicals	• Proper handling of lubricating oil and fuel so that it does not fall on the soil and water body; • Collection, proper treatment and disposal of the spills.								
All construction works	Beneficial impact on employment generation	• Employ local people in the subproject activities as much as possible; • Give priority to poor people living within subproject area in subproject related works (e.g., excavation and other works, which do not require skilled manpower).								

Activity/ Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Monitoring Method	Monitoring Frequency	Implementation Status (Yes/ No / NA)	Impact significance if not implemented				Remarks
						Major	Moderate	Minor	No	
	Possible complaints and suggestion from the local people and stakeholder about the subproject activities General degradation of the environment	• Use existing grievance registrar and complaints box that has been already delivered in the Pourashava; • Ensure environmental enhancement measures such as tree plantation and traffic/cautionary signs.								
For RCC roads, drains, box culverts, road cross drain and palisading										
Excavation/ Earth work/ Dismantle work	Generation of solid and construction wastes due to the dismantle works; Generation of loose soil due to the earth excavation work.	• Cover exposed earth works with fabric/tarpaulin; • Disposal of soil and construction wastes at Zidda Bazar dumping site.								
	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; • Ensure bolly drive or similar protective works to stabilize the structure.								
	Accidents	• Carefully operate the hydraulic excavator; • Operate the hammer carefully for the dismantle work.								
	Air pollution	• Regular maintenance of the equipment to avoid black smoke emission.								
ISG/ Sand filling for roads & Back filling work for drains, palisading & culverts	Air and dust pollution affecting nearby settlements	• Maintain adequate moisture content of soil during transportation, compaction and handling; • Carry the materials especially loose soil and sand with adequate cover.								

Activity/ Issues	Potential Impacts	Proposed Mitigation and Enhancement Measures	Monitoring Method	Monitoring Frequency	Implementation Status (Yes/ No / NA)	Impact significance if not implemented				Remarks
						Major	Moderate	Minor	No	
Cutting and welding of the reinforcement	Noise pollution due to rod cutter and welding machine if any	• Avoid using of rod cutter and wielding machine at night; • Avoid prolonged exposure to noise (produced by equipment) by workers.								
	Potential health and safety risks from rod cutter and welding machine if any	• Ensure use of the personal protective equipment's (helmet, goggles, gloves, safety boot); • Availability and access to first-aid equipment and medical supplies in case of any accidents.								
RCC (reinforcement 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.								
	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 and prayer time; • Inform local people about casting work and potential impacts.								
For Street Light										
Setting up the pole and electrical connection	Potential health and safety risks	• Inform the local authority to switch off power during connection; • Ensure use of the PPEs.								
Source of electricity and equipment	Reduce of resource i.e. use of electricity	• Provision of renewable energy (solar panel electrification) and use of environmental friendly equipment (LED bulb rather than CFL bulb).								

Prepared by- **Signature-** **Date-**

Copies to 1. PIU
2. SME
3. AME
4. Jr. ES