Power Grid Company of Bangladesh Power Cell, Power Division Ministry of Power, Energy and Mineral Resources Government of the People's Republic of Bangladesh

Environmental Impact Assessment (EIA) for the Feasibility Study of Enhancement and Strengthening of Power Network in Eastern Region (ESPNER) of Bangladesh



Draft Final Report (Appendices)

Prepared by: Power Grid Corporation of India Limited (PGCIL)

October 2017

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ABBREVIATIONS

AIS	Air Insulated Switchgear
BMD	Bangladesh Meteorological Department
BWDB	Bangladesh Water Development Board
BNBC	Bangladesh National Building Code
BRTA	Bangladesh Road Transport Authority
BIWTA	Bangladesh Inland Water Transport Authority
СНТ	Chittagong Hill Tracts
DC	Double Circuits
DOE	Department of Environment
DPHE	Department of Public Health Engineering
DOF	Department of Fisheries
ECC	Environmental Clearance Certificate
ECR	Environmental Conservation Rules
ECOP	Environmental Code of Practice
EHS	Environmental Health & Safety
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ESMF	Environmental and Social Management Framework
EQS	Environmental Quality Standards
EPA	Environmental Protected Area
ESU	Environmental & Social Unit
FD	Forest Department
FGD	Focus Group Discussions
GOB	Government of Bangladesh
IDA	International Development Association
IEE	Initial Environmental Examination
LGED	Local Government of Engineering Department
LILO	Loop-In- Loop-Out
MOEF	Ministry of Environment and Forest
MOPEMR	Ministry of Power, Energy and Mineral Resources
OP	Operational Policy
OHS	Occupational Health & Safety
PAPs	Project Affected Persons
PDB	Power Development Board
PC	Power Cell
PCB	Polychlorinated Biphenyl
PBS	Palli Bidduyt Shamiti
PGCB	Power Grid Company of Bangladesh
PIU	Project Implementation Unit
PWD	Public Works Datum
REB	Rural Electrification Board
RHD	Roads and Highways Department
RAP	Resettlement Action Plan
SMP	Social Management Plan
SPIA	Subproject Influence Area
SS	Substation
TL	Transmission Line
TOR	Terms of Reference

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APPENDICES

Appendix A: Approved Terms of Reference (TOR) by DoE

Government of the People's Republic of Bangladesh Department of Environment Head Office, E-16 Agargaon Dhaka-1207 www.doe.gov.bd

Memo No: 22.02.0000.018.72.27.17. **406**

Date: 05/09/2017

Subject: Approval of Terms of Reference (TOR) for Environmental Impact Assessment (EIA) of Enhancement and Strengthening of Power Transmission Network in Eastern Region.

Ref: Your Application dated 27/07/2017.

With reference to your letter dated 27/07/2017 for the subject mentioned above, the Department of Environment hereby gives approval of Terms of Reference (TOR) for Environmental Impact Assessment (EIA) of Enhancement and Strengthening of Power Transmission Network in Eastern Region, Power Grid Company of Bangladesh Ltd. subject to fulfilling the following terms and conditions.

- I. The Project Authority shall submit a comprehensive Environmental Impact Assessment (EIA) considering the overall activity of the said project in accordance with the TOR and time schedule submitted to the Department of Environment (DOE) and additional suggestions provided herein.
- II. The EIA report should be prepared in accordance with following indicative outlines:
 - 1. Executive summary
 - 2. Introduction: (Background, brief description, scope of study, methodology, limitation, EIA team, references)
 - 3. Legislative, regulation and policy consideration (covering the potential legal, administrative, planning and policy framework within which the EIA will be prepared)
 - 4. The Project (Location detail and concise description of the project/interventions and relevant activities)
 - 5. Baseline Environmental Condition should include, inter alia, following:
 - Physical Environment: Geology, Topology, Geomorphology, Soils, Meteorology, Hydrology, Seabed Morphology and Seismic activity.
 - Biological Environment: Habitats, Aquatic life and fisheries, Terrestrial Habitats and Fauna
 - Environment Quality: Air, Water, Soil and Sediment Quality and Noise
 - Socio-economic environment should include, inter alia, following:
 - Population: Demographic profile and ethnic composition
 - Settlement and housing
 - Traffic and transport
 - Public utilities: water supply, sanitation and solid waste
 - · Economy and employment: employment structure and cultural issues in employment
 - Fisheries: fishing activities, fishing communities, commercial important species, fishing resources, commercial factors
 - 7. Identification and Evaluation of Potential Impacts (identification and assessment

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positive and negative impacts likely to result from the proposed project)

8. Management Plan/Procedures:

For each significant major impact, proposed mitigation measures will be set out for incorporation into project design or procedures and those which are not mitigable, will be identified as residual impacts. Both technical and financial plans shall be incorporated for proposed mitigation measures..

An outline of the Environmental Management Plan shall be developed for the project.

In Environmental Monitoring Plan, a detail technical and financial proposal shall be included for developing an in-house environmental monitoring system to be operated by the proponent's own resources (equipments and expertise).

- Consultation with Stakeholders/Public Consultation (ensures that consultation with interested parties and the general public will take place and their views taken into account in the planning and execution of the project)
- 10. Beneficial Impacts (summarize the benefits of the project to the Bangladesh nation, people and local community and the enhancement potentials)
- 11. Emergency Response Plan & disaster Impact Assessment
- 12. Conclusion and Recommendations
- III. Without approval of EIA report by the Department of Environment, The Project Authority shall not be able to open L/C in favor of importable machineries.
- IV. Without obtaining Environmental Clearance, The Project Authority shall not be able to start the physical activity of the project.
- V. The project authority shall submit the EIA along with a filled-in application for Environmental Clearance in prescribed form, the applicable fee in a treasury Chalan, the applicable VAT on clearance fee in a separate treasury Chalan, the No Objection Certificates (NOC) from local authority, NOC from forest department (if it is required in case of cutting any forested plant, private or public) and NOCs from other relevant agencies for operational activity etc. to the Chittagong Regional Office of DOE in Chittagong with a copy to the Head Office of DoE in Dhaka.

Just 09.2017

(Syed Nazmul Ahsan) Director (Environmental Clearance) Phone # 02-8181673

Chief Engineer(P&D) Power Grid Company of Bangladesh Ltd. IEB Bhabon (New), 3rd & 4th Floor, 8/A Ramna, Dhaka-1000.

Copy Forwarded to :

1) PS to Secretary, Ministry of Environment and Forest, Bangladesh Secretariat, Dhaka.

- 2) Director, Department of Environment, Chittagong Regional Office, Chittagong.
- 3) Deputy Director/ Office-in Charge, Department of Environment, Comilla District Office, Comilla.
- 4) Deputy Director/ Office-in Charge, Department of Environment, Noakhali District Office, Noakhali.
- 5) Assistant Director, Office of the Director General, Department of Environment, Head Office, Dhaka.

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Appendix B: Description and Environmental Screening of Substation Subprojects

Form 1a: Sub-project Description: Substation (SS)

Form 1a.1: Bashurhat Substation (SS), Feni

- (1) Name of Substation: The name of the proposed substation is Bashurhat Substation, Bashurhat, Daganbhuiyan, Feni
- (2) Location of Substation: The proposed substation area is located in Sekandarpur Mouza, UZ: Daganbhuiyan, District: Feni.
- (3) Local PBS/PGCB Office: .Feni.
- (4) Owner-ship of Sub-project Land :
 - (a) Government owned (acre):
 - (b) Private land (need acquisition) (acre): 2 acre
 - (c) Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain two cropped agricultural land. It is flood free high land. The area is surrounded agricultural lands and scattered homesteads at north and east side. At south side, there is paved road (Dagon Bhuiyan-Shebarhat) and at west side, a big perennial pond is located.
- (6) Brief Description of Environment within Sub-project Influence Area (1km SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Ponds
 - Flora: Major road side and homestead trees such as medium and small sizes of shegun, meheguni, shilkoroi, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibian is mainly common frog.
 - Historical/Culturally Important Sites: A mosque is located at about 100m distance at east side.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.1.1 below.

- (7) Key Activities of Sub-project:
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, 90m long access road with adequate size of box culvert on khal from existing paved road to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,

- Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
- Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of Site		SPIA (up to 1 km)				
(50m)	North Side	East Side	South Side	West Side		
Plain topography; two cropped (mainly rice and rabi crops) agricultural land; flood free high land.	Agricultural lands with homestead trees; water bodies such as ponds, khal, and primary school at 0.8km.	Paved road; settlements; Two cropped agricultural lands; shallow ponds; (seasonal), and a mosque at about 100m distance.	A wide paved road; agricultural lands, settlements, small trees, seasonal ponds.	Agricultural lands with homestead trees; water body such as perennial pond, primary school at 0.9km.		

Table 1a.1.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the SS

Photo on Substation Area



Form 1a.2: Chandina Substation (SS), Debidwar, Comilla

- (1) Name of Substation: The name of the proposed substation is Chandina Substation (SS), Debidwar, Comilla
- (2) Location of Substation: The proposed substation area is located in Asora Mouza, UZ: Debidwar, District: Comilla.
- (3) Local PBS/PGCB Office: Comilla.
- (4) Owner-ship of Sub-project Land :
 - (a) Government owned (acre):
 - (b) Private land (need acquisition) (acre): 2 acre
 - (c) Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain three cropped agricultural land. It is flooded medium low land. The area is surrounded agricultural lands and scattered homesteads at north, west and east side. At south side, there is paved road (Dhaka-Chittagong Highway) and borrow pit khal.
- (6) Brief Description of Environment within Sub-project Influence Area (within 1km of SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Yes (given in Table)
 - Flora: Major road side and homestead trees such as medium and small sizes of shegun, meheguni, shilkoroi, mango, boroi, coconut, eucleptus etc.
 - Fauna: Avians mainly sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibian is mainly common frog.
 - Historical/Culturally Important Sites: No.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table1a.2.1 below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, 350 m long access road with adequate size of box culvert on khal from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

Table 1a.2.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the Subproject

IEFs with	nin ROW of	SPIA (up to 1 km)			
Site	(50m)	North Side	East Side	South Side	West Side
Plain	topography;	Agricultural	Agricultural	A four lane highway	Agricultural lands
three	cropped	lands with	lands with	and khal, agricultural	with homestead
(mainly	paddy and	scattered	homestead trees;	lands, settlements,	trees; water bodies
rabi	crops)	homestead	water bodies	small trees, ponds.	such as ponds.
agricultur	al land;	trees; water	such as ponds.		
flooded, r	medium low	bodies such as			
land.		ponds.			

Photo on Substation Area



Form 1a.3: Chowmuhoni Substation (SS), Begumganj, Noakhali

- Name of Substation: The name of the proposed substation is Chowmuhoni Substation (SS),
 UZ: Begumganj, Noakhali
- (2) Location of Substation: The proposed substation area is located in Nazirpur Mouza, UZ: Chowmuhoni Substation (SS), UZ: Begumganj, Noakhali.
- (3) Local PBS/PGCB Office: Noakhali
- (4) Owner-ship of Sub-project Land :
 - (a) Government owned (acre):
 - (b) Private land (need acquisition) (acre): 5 acre
 - (c) Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain three cropped agricultural land. It is flooded medium high land. The area is surrounded agricultural lands and scattered homesteads at north, west and east side. At south side at about 500m distance, there is paved road (Laxmipur-Chowmuhini Highway).
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Yes (given in Table)
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, shilkoroi, mango, boroi, coconut, eucleptus etc.
 - Fauna: Avians mainly shalik, sparrow, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table1a.3.1 below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 500m access road with adequate size of box culvert from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

Table 1a.3.1: Important Environmental Features ((IEFs) within ROW (50m) & SPIA (1km) of the Subpro	oject
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IEFs within ROW of	SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side	
Plain topography; three cropped (mainly paddy and rabi crops) agricultural land; flooded medium high	Agricultural lands with scattered homestead trees; water bodies such as	Agricultural lands with homestead trees; water bodies such as ponds.	A double lane highway, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds.	

Photo on Substation Area



Form 1a.4: Kachua Substation (SS), Kachua, Chandpur

- (1) Name of Substation: The name of the proposed substation is Kachua Substation (SS), UZ: Kachua, Chandpur
- (2) Location of Substation: The proposed substation area is located in UZ: Kachua, Chandpur.
- (3) Local PBS/PGCB Office: Chandpur.
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acre
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain three cropped agricultural land. It is flooded medium low land. The area is surrounded agricultural lands and scattered homesteads at north and west side. At south and east side, at about 170m distance, there is paved road (Haziganj-Kachua Highway). At south side, a seasonal water body (ditch) is located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Ponds
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: A mosque at 200m distance at east side.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.4.1below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 170 m access road with adequate size of box culvert from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

Table 1a.4.1:	Important Environmental	Features	(IEFs) within ROW	(50m) & SPI	A (1km) of the SS
10010 1011111	iniportant Environmental	i catal co	(1213) 111111101		

IEFs within ROW of	f SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side	
Plain topography; three cropped (mainly paddy and rabi crops) agricultural land; flooded medium low land.	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead trees; water bodies such as ponds & a mosque at 200m distance	A double lane highway, agricultural lands, settlements along with trees, seasonal ponds and al ditch.	Agricultural lands with homestead trees; water bodies such as ponds.	

Photo on Substation Area



Form 1a.5: Korerhat Substation, Mirsarai, Chittagong

- (1) Name of Substation: The name of the proposed substation is Korerhat Substation, Mirsarai, Chittagong
- (2) Location of Substation: The proposed substation area is located in Baria Mouza, UZ: Korerhat Substation, Mirsarai, Chittagong
- (3) Local PBS/PGCB Office: Chittagong
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 24.73 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain two cropped agricultural land. It is flood free high land. The area is surrounded agricultural lands and scattered homesteads with trees at north and west side. At east side, at about 130m distance, there is paved road (Korerhat-Dagonbhyia Highway) and at south side, an earthen road is located at about 120m distance. A small seanal khal crosses the SS.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Ponds.
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, , mango, boroi, coconut, eucleptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: A mosque is located at about 90 m distance at north-east corner side.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.5.1 below.

- (7) Key Activities of Sub-project (Details are in Chapter 3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 90m access road with adequate size of box culvert from existing highway to SS. Also box drain for the khal, crosses the SS is to be required.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW

electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of	SPIA (up to 1 km)			
Site (50m)	North Side	East Side	South Side	West Side
Plain topography; two cropped (mainly paddy and rabi crops) agricultural land; flood free high land. A khal crosses the SS area	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead trees; water bodies such as ponds & a highwau and a mosque at 90m distance.	An earth road , agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds

Table 1a.5.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the Subproject

Form 1a.6: Kosba Substation, Kosba, Brahmanbari (Brahmanbaria)

- (1) Name of Substation: The name of the proposed substation is Kosba Substation, Kosba, Brahmanbaria.
- (2) Location of Substation: The proposed substation area is located in Kaliara Mouza, UZ: Kosba, Dist.: Brahmanbaria.
- (3) Local PBS/PGCB Office: Brahmanbaria
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain three cropped agricultural land. It is flooded medium low land. The area is surrounded agricultural lands and scattered homesteads with trees at north, south and west side. At east side, at about 170m distance, there is paved road (Kuti- B.Bari road) and a seasonal khal are located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Ponds and khal
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucleptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.6.1below.

- (7) Key Activities of Sub-project (Details are in Chapter-2):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 130m access road with adequate size of box culvert from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

Table 1a.6.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1
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IEFs within ROW of	SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side	
Plain topography;	Agricultural	Agricultural	An earth road,	Agricultural lands	
two cropped (mainly	lands with	lands with	agricultural lands,	with homestead	
paddy and rabi crops)	scattered	homestead	settlements along with	trees; water bodies	
agricultural land;	homestead	trees; water	trees, seasonal ponds.	such as ponds	
flood free high land.	trees; water	bodies such as			
A khal crosses the SS	bodies such as	ponds & khal			
area	ponds.	and a highway.			

Form 1a.7: Laksham Substation, Laksham, Comilla

- (1) Name of Substation: The name of the proposed substation is Laksham Substation, Laksham, Comilla
- (2) Location of Substation: The proposed substation area is located is Laksham Substation, UZ: Laksham, District: Comilla.
- (3) Local PBS/PGCB Office: Comilla
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 2 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain three cropped agricultural land. It is flooded medium high land. The area is surrounded agricultural lands and scattered homesteads with trees at north, south and west side. At east side, at about 200m distance, there is paved road (Laksham-Monohorganj road) and a railway line at about 90m distance is located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: Ponds
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.7.11below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 200m access road with adequate size of box culvert from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of		SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side		
Plain topography; three cropped (mainly paddy, jute and rabi crops) agricultural land; flood free high land.	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead trees; water bodies such as ponds, and a paved road, railway line. .and saw mill at 170m distance.	An earth road, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds		

Table 1a.8.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the Subproject

Form 1a.8: Lakshmipur Substation, Lakshmipur

- (1) Name of Substation: The name of the proposed substation is Lakshmipur Substation, Lakshmipur
- (2) Location of Substation: The proposed substation area is located is in Atiatalai, Lakshmipur, Distance:_Lakshmipur
- (3) Local PBS/PGCB Office: Lakshmipur
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain two cropped agricultural land. It is flood free high land. The area is surrounded agricultural lands and homestead with trees at north side at north, south and east side. At west side, at about 150m distance, there is paved road (Jokshin-Jugirhat road) and a seasonal small khal at about 80m distance are located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: No
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.8.11below.

- (7) Key Activities of Sub-project (Details are in Chapter-2):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 150m access road with adequate size of box culvert on the khal from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of		SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side		
Plain topography; three cropped (mainly paddy, jute and rabi crops) agricultural land; flood free high land.	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead trees; water bodies such as ponds, and a paved road, railway lineand saw mill at 170m distance.	An earth road, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds		

Table 1a.8.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the SS

Form 1a.9: Maijdee Substation, Noakhali

- (1) Name of Substation: The name of the proposed substation is Maijdee Substation, Noakhali,
- (2) Location of Substation: The proposed substation area is located is Maijdee, Dist.: Noakhali
- (3) Local PBS/PGCB Office: .Noakhali
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain land. It is flooded and medium high land. The area is surrounded agricultural lands and homestead with trees at north side at north, south and east side. At west side, at about 150m distance, there is paved road (Jokshin-Jugirhat road) and a seasonal khal at about 70m distance are located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: No
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.9.11below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 150m access road with adequate size of box culvert on the khal from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

Table 1a.9.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the SS

IEFs within ROW of	SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side	
Plain topography; three cropped (mainly paddy, jute and rabi crops) agricultural land; flood free high land.	Agricultural lands with scattered homestead trees; water bodies such as	Agricultural lands with homestead trees; water bodies such as ponds, and a paved road.	An earth road, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds. A TL has passed at west side of SS at about	
0	ponds.			85m from SS.	

Photo on Substation Area



Form 1a.10: Muradnagar Substation, Comilla

- (1) Name of Substation: The name of the proposed substation is Muradnagar Substation, Comilla
- (2) Location of Substation: The proposed substation area is located is UZ: Muradnagar, Dist.: Comilla
- (3) Local PBS/PGCB Office: .Comilla,
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain land. It is flooded and medium high land. The area is surrounded agricultural lands and homestead with trees at north, west and east side. At south side, at about 170m distance, there is narrow paved road and at north side there is TL is located.
- (6) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: No
 - Flora: Major road side and homestead trees such as medium and small sizes of meheguni, mango, boroi, coconut, eucalyptus etc.
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: No
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.10.11below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room, about 150m access road with adequate size of box culvert on the khal from existing highway to SS.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of	SPIA (up to 1 km)				
Site (50m)	North Side	East Side	South Side	West Side	
Plain topography; three cropped (mainly paddy, jute and rabi crops) agricultural land; flood free high land.	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead, trees; water bodies such as ponds.	A paved road, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds	

Form 1a.11: New Mooring (Anandobazar) Substation, Chittagong

- (1) Name of Substation: The name of the proposed substation is New Mooring Substation, Chittagong.
- (2) Location of Substation: The proposed substation area is located in Mouza: Madha Halishahar, Thana: Bandar, District: Chittagong.
- (3) The latitude and longitude are 22°55′36.6″ and 91°33′16.4″ respectively
- (4) Local PBS/PGCB Office: Nearby DOE Office, Chittagong City.
- (5) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 2 acres
 - c. Partly Private /Partly Government owned :
- (6) Brief Description of Proposed of Substation Site: The substation area mainly is plain two cropped agricultural land. Once it is located within coastal embankment (CCORRP), it is flood free. Only during intensive rainfall the substation area is submerged at the water depth about 0.5m. The area is surrounded by paved road along with shops and settlement at north, east and south side. At west side there is under construction tin shed godown and at east side, a TL is crossed over the substation area. At North West corner of the substation area, CTG central waste dumping site is located at about 250m distance. Noted that Chittagong City Outer Ring Road Project (CCORRP) (under construction) is located at about 500m distance from the substation site.
- (7) Brief Description of Environment within Sub-project Influence Area (SPIA):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: No
 - Flora: Major road side and homestead trees such as medium and small sizes of shegun, meheguni, shilkoroi, mango, boroi, coconut, eucalyptus and jhaw
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians are mainly common frog.
 - Historical/Culturally Important Sites: A mosque & shool at about 400m distance at east and south side.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.11.1 below.

- (8) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room.
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and

- Testing and commissioning of substation.
- (9) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of Site	te SPIA (up to 1 km)				
(50m)	North Side	East Side	South Side	West Side	
Plain topography; two cropped (mainly rice and vegetable) agricultural land; flood free; during intensive rainfall water depth is about 0.5m.	Narrow paved road; small shops ; CTG central waste dumping site at north west corner; road side and homestead small to medium size trees;	Paved road; dense II small shops and settlements; A TL over the substation area; Two cropped agricultural lands; shallow ponds ;(seasonal), a mosque and school at about 400m distance.	A very narrow paved road; dense shops and settlements, small trees, seasonal ponds and a mosque	Under construction tin shed godown; Chittagong City Outer Ring Road Project (CCORRP) at about 500m and bay of bengal at about 1km distance; medium to small size trees and ponds.	

Table 1a.11.1: Important Environmenta	l Features (IEFs) within ROW	(50m) & SPIA (1km)	of the Subproject
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Photo on Substation Area



Form 1a.12: Patiya Substation, Chittagong

- (1) Name of Substation: The name of the proposed substation is <u>Patiya</u> Substation, Chittagong.
- (2) Location of Substation: The proposed substation area is located in Allai Mouza, UZ Patiya, District: Chittagong
- (3) Local PBS/PGCB Office: Chittagong City.
- (4) Owner-ship of Sub-project Land :
 - a. Government owned (acre):
 - b. Private land (need acquisition) (acre): 5 acres
 - c. Partly Private /Partly Government owned :
- (5) Brief Description of Proposed of Substation Site: The substation area mainly is plain agricultural land. It is flood free and high land. The area is surrounded agricultural lands and homestead with trees at north, west and south side. At east side, at about 170m distance, there is paved road (Patiya-Chowdhury Bazar) is located.
- (6) Brief Description of Environment within Sub-project Influence Area (within 1km)):
 - Human settlement: Scattered human settlements are within the SPIA.
 - Tribal People: No
 - Water body: No
 - Flora: Major road side and homestead trees such as medium and small sizes of shegun, meheguni, shilkoroi, mango, boroi, coconut, eucleptus and jhaw
 - Fauna: Avians mainly shalik, sparrow, kingstork, dove and crow. Mammals mainly fox,, mouse, grew musk shrew and squirrel. Reptiles mainly stripped keel back, bengal monitor, common house lizard and snakes. Amphibians mainly common frog.
 - Historical/Culturally Important Sites: No.
 - Transports such as trucks, buses, microbus, sedan cars, taxi, vans, motorbikes etc. move frequently move on the adjacent paved roads.

Details of environmental features within SPIA are given in Table 1a.12.1 below.

- (7) Key Activities of Sub-project (Details are in Chapter-3):
 - Land acquisition,
 - Earth works (carrying ,filling, compaction and boundary slope protection by top soils & grass), internal drains;
 - Mobilization of construction materials & equipment,
 - Civil works such as design and construction of control room building, boundary walls, guard room,
 - Installation of electrical equipment transformer, laying of power cables and control cables,
 - Construction of terminal structures for strengthening 132KV and expand the 230 kV transmission system; and
 - Testing and commissioning of substation.
- (8) Potential Benefit from Sub-project: To meet the growing electricity demand and meet the goal of universal access of electricity by 2021, GOB has taken a plan to add >11,000MW electricity to nation grid by the 2021. In this regard, this new substation will play important role in the national economy.

IEFs within ROW of	SPIA (up to 1 km)					
Site (50m)	North Side	East Side	South Side	West Side		
Plain topography; two cropped (mainly paddy, and rabi crops) agricultural land; flood free high land.	Agricultural lands with scattered homestead trees; water bodies such as ponds.	Agricultural lands with homestead, trees; water bodies such as ponds , a paved road, mosque at about 200m distance.	A paved road, agricultural lands, settlements along with trees, seasonal ponds.	Agricultural lands with homestead trees; water bodies such as ponds		

Table 1a.12.1: Important Environmental Features (IEFs) within ROW (50m) & SPIA (1km) of the
Subproject

Form 2a: Environmental/Social Screening: Substation Subprojects

Name of Substation	:	132/33 kV GIS Substation at Basurhat
Location of Substation	:	The proposed substation area is located in UZ: Daganbhuiyan,
		District: Feni.
Local REB/PBS/PGCB office	:	Feni

Form 2a.1: Bashurhat Substation (SS), Feni

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts: Number of tress 136 • Felling of trees Significant□ Moderate□√ Minor 🗆 Significant□ Moderate□√ • Clearing of vegetation Minor 🗆 • Potential impact on aquatic (i.e., water) Significant□ Moderate□ Minor □V habitat (esp. if power line is to be constructed over river/wetland) • Presence of forest, protected area, key biodiversity area along the route of Yes \Box No ⊡√ power line

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □ √	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate ⊡√	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🛛
Water pollution	Significant 🗆	Moderate ⊡√	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:Traffic congestion	Very likely 🗆	Likely 🗆	Unlikely □V
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
Social impacts related to acquisition	on of land, tribal	people:	

	 Acquisition of private land needed 	Yes ⊡√	No 🗆
	(2) Amount of private land to be acquired:		2 acre
	(3) Presence of tribal population in project surrounding areas	Yes 🗆	No ⊡√
\triangleright	Assessment of social impacts		

• Loss of land	Significant 🗆	Moderate 🗆	Insignificant □V
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □√
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

:

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project
 - According to ECR 1997,DOE : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.2: Chandina Substation (SS), Debidwar, Comilla

Name of Substation	:	132/33 kV GIS Substation at Chandina
Location of Substation	:	The proposed substation area is located in UZ: Debidwar,
		District: Comilla.
Local REB/PBS/PGCB office	:	Comilla

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

		Number of ti	ress 420
• Felling of trees	Significant□	Moderate⊡√	Minor 🗆
 Clearing of vegetation 	Significant□	Moderate⊡√	Minor 🗆

 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Significant□	Moderate□	Minor ⊡√
 Presence of forest, protected area, key biodiversity area along the route of y power line 	∕es □	No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □√	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🗆
Water pollution	Significant 🗆	Moderate □√	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □√	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion 	Very likely □	Likely □V	Unlikely 🗆
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisiti (1) Acquisition of private land needed (2) Amount of private land to be acquired (3) Presence of tribal population in project Assessment of social impacts 	ion of land, tribal I: ct surrounding are	people: Yes □v eas Yes □	/ No □ 2 acre No ⊡V
 Loss of land 	Significant 🗌	ivioderate 🗌	insignificant $\Box v$

- Loss of Income Significant □ Moderate □ Insignificant □V
- Impact on tribal people (if applicable) Significant
 Moderate
 Insignificant
- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□

:

According to WB classification : Category B

4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.3: Chowmuhoni Substation (SS), Begumganj, Noakhali

Name of Substation	:	230/132 kV GIS Substation at Chowmuhoni
Location of Substation	:	The proposed substation area is located in UZ: Chowmuhoni
		Substation (SS), UZ: Begumganj, Noakhali
Local REB/PBS/PGCB office	:	Noakhali

✓ Potential Environmental Impact during Construction Phase:

> Ecological impacts:

			Number of	tress 0
 Felling of trees 		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □√	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □√	Unlikely 🛛

Water pollutionPollution from solid/ construction waste	Significant □	Moderate □	Insignificant □V
	Significant □	Moderate □V	Insignificant □
 General Socio-economic impacts: Traffic congestion Health and safety Impact on archaeological and historical 	Very likely □ Significant □ Significant □	Likely □V Moderate □V Moderate □	Unlikely Insignificant Insignificant V
 Employment generation Social impacts related to acquisiti Acquisition of private land needed Amount of private land to be acquired Presence of tribal population in project Assessment of social impacts Loss of land 	Significant □	Moderate □V	Insignificant □
	on of land, tribal	people:	No □
	:	Yes □v	5 acre
	t surrounding are	eas Yes □	No □√
	Significant □	Moderate □V	Insignificant □

- Loss of Income Significant □ Moderate □V Insignificant □
- Impact on tribal people (if applicable) Significant
 Moderate
 Insignificant
- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

:

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.

3) Category of sub-project

- − According to ECR 1997 : Green \Box / Orange A \Box / Orange B \Box / Red ⊠ / Not Listed \Box
- According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.4: Kachua Substation (SS), Kachua, Chandpur

Name of Substation	:	230/132 kV GIS Substation at Kachua
Location of Substation	:	The proposed substation area is located in UZ: Kachua, Chandpur.
Local REB/PBS/PGCB office	:	Chandpur

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

			Number o	of tress 0
 Felling of trees 		Significant□	Moderate□	Minor □No
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate 🗆	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely 🗆	Unlikely 🗆
Water pollution	Significant 🗆	Moderate 🗆	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate 🗆	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion 	Very likely 🗆	Likely 🗆	Unlikely ⊓v
Health and safety	, , Significant □	, Moderate√	, Insignificant □
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisiti (1) Acquisition of private land needed (2) Amount of private land to be acquired (3) Presence of tribal population in project Assessment of social impacts 	on of land, tribal : t surrounding are	people: Yes □v eas Yes □	′ No □ 5 acre No ⊡√
• Loss of land	Significant 🗆	Moderate □V	Insignificant 🗆
Loss of Income	Significant 🗆	Moderate □V	Insignificant 🗆
• Impact on tribal people (if applicable)

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :
 - Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
 - Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project :
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.5: Korerhat Substation, Mirsarai, Chittagong
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Name of Substation	:	400/230 kV GIS Substation at Korerhat
Location of Substation	:	The proposed substation area is located in UZ: Korerhat
		Substation, Mirsarai, Chittagong
Local REB/PBS/PGCB office	:	Chittagong

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

		Number	of tress 2,945
• Felling of trees	Significant⊡√	Moderate□	Minor 🗆
 Clearing of vegetation 	Significant⊡V	Moderate□	Minor 🗆
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Significant□	Moderate□	Minor ⊡√

Presence of forest, protected area, key biodiversity area along the route of Yes □ power line

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

No ⊡√

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □√	Unlikely 🛛
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:			
 Traffic congestion 	Very likely 🗆	Likely □V	Unlikely 🛛
Health and safety	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆

Social impacts related to acqu	uisition of land, tribal	people:	
 Acquisition of private land needed 	l	Yes ⊡√	No 🗆
(2) Amount of private land to be acqu	iired:	2	4.73 acres
(3) Presence of tribal population in pr	oject surrounding are	eas Yes 🗆	No ⊡√
Assessment of social impacts			
 Loss of land 	Significant □V	Moderate 🗆	Insignificant 🗆
Loss of Income	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :
 - Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
 - Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.

- 3) Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□

- According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.6: Kosba Substation, Kosba, Brahmanbari (Brahmanbaria)

Name of Substation	:	132/33 kV GIS Substation at Kosba
Location of Substation	:	The proposed substation area is located is Kosba Substation,
		UZ: Kosba, Dist.: Brahmanbaria
Local REB/PBS/PGCB office	:	Brahmanbaria

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

			Number	of tress 0
• Felling of trees	Signif	ficant□	Moderate□	Minor □No
 Clearing of vegetation 	Signif	ficant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Signif	ficant□	Moderate□	Minor ⊡V
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate ⊡V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □√	Unlikely 🛛
Water pollution	Significant 🗆	Moderate 🗆	Insignificant 🗆 v
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆

General Socio-economic impacts:Traffic congestion	Very likely 🗆	Likely 🗆	Unlikely ⊡V
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisition (1) Acquisition of private land needed (2) Amount of private land to be acquired: (3) Presence of tribal population in project Assessment of social impacts 	n of land, tribal surrounding are	people: Yes □√ as Yes □	No □ 5 acre No □V
• Loss of land	Significant 🗆	Moderate □V	Insignificant 🗆
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □√
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.7: Laksham Substation, Laksham, Comilla

Name of Substation	:	132/33 kV GIS Substation at Laksham
Location of Substation	:	The proposed substation area is located is Laksham Substation, UZ: Laksham, District: Comilla.
Local REB/PBS/PGCB office	:	Comilla

Potential Environmental Impact during Construction Phase:

Ecological impacts:

			Number o	of tress 0
 Felling of trees 		Significant□	Moderate□	Minor ⊡No
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:				
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆	
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆	
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🗆	
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V	
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆	
 General Socio-economic impacts: Traffic congestion Health and safety Impact on archaeological and historical Employment generation 	Very likely □ Significant □ Significant □ Significant □	Likely □ Moderate □V Moderate □ Moderate □V	Unlikely □V Insignificant □ Insignificant □V Insignificant □	
 Social impacts related to acquisiti (1) Acquisition of private land needed (2) Amount of private land to be acquired (3) Presence of tribal population in project Assessment of social impacts Loss of land 	on of land, tribal : t surrounding are Significant □	people: Yes □√ eas Yes □ Moderate □	No □ 2 acre No □√ Insignificant □V	
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □√	

• Impact on tribal people (if applicable)

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :
 - Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
 - Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project :
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.8: Lakshmipur Substation, Lakshmipur

Name of Substation	:	132/33 kV GIS Substation at Laxmipur
Location of Substation	:	The proposed substation area is located is Lakshmipur,
		Distance: Lakshmipur
Local REB/PBS/PGCB office	:	Lakshmipur

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

		Numbe	r of tress 0
• Felling of trees	Significant□	Moderate□	Minor □No
 Clearing of vegetation 	Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Significant□	Moderate□	Minor ⊡V

 Presence of forest, protected area, key biodiversity area along the route of Yes □ power line

No ⊡√

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Significant 🗆	Moderate □V	Insignificant 🗆
Significant 🗆	Moderate □√	Insignificant 🗆
Very likely 🗆	Likely □√	Unlikely 🛛
Significant 🗆	Moderate 🗆	Insignificant □V
Significant 🗆	Moderate □V	Insignificant 🗆
Varulikalu		
very likely 🗋	Likely 🛛 V	
Significant 🗆	Moderate □V	Insignificant 🗆
Significant 🗆	Moderate 🗆	Insignificant □V
Significant 🗆	Moderate □V	Insignificant 🗆
	Significant Signi	Significant Moderate Very likely Significant Moderate Very likely Moderate Significant Moderate Very likely Likely Very likely Moderate Very Noderate Noderate Very Noderate Noderate Very Noderate Noderate Very Noderate Noderate Very Noderate Nodera

Social impacts related to acquis	sition of land, tribal	people:	
(1) Acquisition of private land needed		Yes ⊡√	No 🗆
(2) Amount of private land to be acquir	ed:		5 acre
(3) Presence of tribal population in pro	ject surrounding are	as Yes 🗆	No ⊡√
Assessment of social impacts			
 Loss of land 	Significant 🗆	Moderate □V	Insignificant 🗆
Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :
 - Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
 - Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.

- 3) Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□

- According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.9: Maijdee Substation, Noakhali

Name of Substation	:	132/33 kV GIS Substation at Maijdee
Location of Substation	:	The proposed substation area is located is Maijdee, Dist.:
		Noakhali
Local REB/PBS/PGCB office	:	Noakhali

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:
- Number of tress 0 • Felling of trees Significant□ Moderate□ Minor □No Significant□ Moderate□ Clearing of vegetation Minor □√ Potential impact on aquatic (i.e., water) Significant□ Moderate□ Minor □V habitat (esp. if power line is to be constructed over river/wetland) Presence of forest, protected area, key biodiversity area along the route of $_{\rm Yes\,\square}$ No ⊡√ power line

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate ⊡V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🛛
Water pollution	Significant 🗆	Moderate 🗆	Insignificant 🗆 v
Pollution from solid/ construction waste	Significant 🗆	Moderate □V	Insignificant 🗆

General Socio-economic impacts:Traffic congestion	Very likely 🗆	Likely □V	Unlikely 🛛
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □√
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisitio (1) Acquisition of private land needed (2) Amount of private land to be acquired: (3) Presence of tribal population in project Assessment of social impacts 	n of land, tribal surrounding are	people: Yes □V as Yes □	No □ 5 acre No □V
• Loss of land	Significant 🗆	Moderate □V	Insignificant 🗆
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □√
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.10: Muradnagar Substation, Comilla

Name of Substation	••	132/33 kV GIS Substation at Muradnagar
Location of Substation	••	The proposed substation area is located is UZ: Muradnagar,

	Dist.: Comilla
Local REB/PBS/PGCB office	 Comilla

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

			Number	of tress 0
• Felling of trees		Significant□	Moderate□	Minor ⊡No
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡V
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate ⊡V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate ⊡√	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □√	Unlikely 🗆
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □√
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:			
• Traffic congestion	Very likely 🗆	Likely □√	Unlikely 🛛
Health and safety	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □√
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisiti (1) Acquisition of private land needed (2) Amount of private land to be acquired (3) Presence of tribal population in projec Assessment of social impacts 	on of land, tribal : t surrounding are	people: Yes □V eas Yes □	No □ 5 acre No □√
• Loss of land	Significant 🗆	Moderate □V	Insignificant 🗆
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate	Insignificant 🗆

1) Potential Environmental Impact during Operational Phase:

- No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.11: New Mooring (Anandobazar) Substation, Chittagong

Name of Substation	••	132/33 kV GIS Substation at New Mooring (Anand Bazaar)
Location of Substation	•••	The proposed substation area is located at JL. 1, Mouza:
		Madha Halishahar, Thana: Bandar, District: Chittagong
Local REB/PBS/PGCB office	:	Chittagong

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

	Number	of tress 0
Significant□	Moderate□	Minor □No
Significant□	Moderate□	Minor ⊡√
Significant□	Moderate□	Minor ⊡V
ן	No ⊡√	
	Significant□ Significant□ Significant□	Significant Moderate Significant Moderate Significant Moderate

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as

outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🗆
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □√
Pollution from solid/ construction waste	Significant 🗆	Moderate □V	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion 	Very likely 🗆		
Health and safety	Significant 🗌	Moderate 🗆 V	Insignificant 🗌
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Social impacts related to acquisiti (1) Acquisition of private land needed (2) Amount of private land to be acquired (3) Presence of tribal population in project Assessment of social impacts 	on of land, tribal : t surrounding are	people: Yes □√ eas Yes □	No □ 2 acre No □V
• Loss of land	Significant 🗆	Moderate 🗆	Insignificant ⊡V
• Loss of Income	Significant 🗆	Moderate 🗆	Insignificant ⊡√
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

1) Potential Environmental Impact during Operational Phase:

- No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

:

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project
 - − According to ECR 1997 : Green / Orange A / Orange B / Red / Not Listed
 - According to WB classification : Category B

4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Form 2a.12: Pati	ya Substation,	Chittagong

Name of Substation	•••	132/33 kV GIS Substation at Patiya
Location of Substation	:	The proposed substation area is located at UZ Patiya, District:
		Chittagong
Local REB/PBS/PGCB office	:	Chittagong

Potential Environmental Impact during Construction Phase:

> Ecological impacts:

			Number o	of tress 0
 Felling of trees 		Significant□	Moderate□	Minor □No
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □√
 Drainage congestion/water logging 	Very likely 🗆	Likely □V	Unlikely 🛛
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:			
 Traffic congestion 	Very likely 🗆	Likely □V	Unlikely 🗆
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆

Social impacts related to acquis	sition of land, tribal	people:	
(1) Acquisition of private land needed		Yes ⊡√	No 🗆
(2) Amount of private land to be acquir	ed:		5 acre
(3) Presence of tribal population in pro	ject surrounding are	as Yes 🗆	No ⊡√
Assessment of social impacts			
Loss of land	Significant 🗆	Moderate □V	Insignificant 🗆
Loss of Income	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- 1) Potential Environmental Impact during Operational Phase:
 - No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
 - Potential impacts: landscape, blockage of surface drain during rainfall, crop production loss, tree replantation, disruption of boat communication during monsoon, occupational H&S & security.
- 2) Summary of possible environmental/social impacts of the subproject :

- Environmental Impacts: Drainage congestion/flooding, tree felling, vegetation clearance, water, air, noise & waste pollutions.
- Social Impacts: LA, income loss, agriculture production loss, disruption of boat communication, traffic congestions/ road accidents, OH&S.
- 3) Category of sub-project
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- 4) Proposed mitigation measure

The above mentioned environmental & social impacts can be eliminated or reduced by taking appropriate mitigation measures as mentioned in EMP Report.

5) Overall Comments:

Considering the above impacts along with mitigation measures, this Site-1 is environmentally sound & sustainable & therefore is recommended for construction.

Appendix C: Description and Environmental Screening of Transmission Line Subprojects

Form 1b: Sub-project Description: Transmission Line (TL)

Form 1b.1: Chowmuhoni – Kachua 230 kV TL

- (1) Name of TL Subproject: Chowmuhoni Kachua 230 kV Double Circuit TL
- (2) (a) Total Length (km) : 50.96 km(b) Type of Line: Double circuit line

(c) Start/End Point: Started at Chowmohuni substation, UZ: Chowmohuni, Dt:Noakhali and ended at Kachua substation, UZ: Kachua, Dist.: Chandpur.

- (3) Local REB/PBS/PGCB office: PGCB Office, Noakhali & Chandpur
- (4) Layout of proposed TL: Shown in the attached map below (Figure 1b.1.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporarily use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 149.72 acre land for construction of 152 towers.

©Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m) :
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 30 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 32 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 10 perenial ponds at various locations;
 - TL is passed over the 3 homestead gardens at various locations;
 - TL is passed over the 10 perennial ponds at various locations;
 - TL is passed over the 11kv power line at 6 locations;
 - Flora: 2836 trees remained within the ROW (Table 1b.1.1);
 - Fauna: Mammals: Khekshial, Ram Kutta, Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area.

Details are given in Table 1b.1.2 below.

- (7) Key activities of sub-project:
 - Route survey and analysis of alternative routes for finalizing alignment of TL;
 - Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
 - Construction of TL including erection of the towers;
 - Clearing of ROW by cutting/trimming trees where necessary;
 - Stringing of conductor and earth wire after fixing clamps, insulators; and
 - Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Table 1b.1.1: Trees within the ROW (52m) of Subproject: Chowmuhoni – Kachua 230 kV Double Circuit TL

TREE NAME	LARGE	MEDIUM	SMALL	PLANT

Akashmoni	23	45	107	
Amra Tree	11	3	1	
Arjun	2			
Ata			4	
Bamboo	590	212	147	
Banana	52		5	
Belgium		10	10	
Boroi			2	
Bot Tree			1	
Chambbol	8	1	2	
Coconut	69	36	49	
Gab	2	5		
Guava	1	4	12	
Jackfruit		3	17	
Jamrul		2		
Jhaw Tree	1			
Kadam	7	4		
Kamranga			1	
Khejur	3	1		
Kodom	5	10	2	5
Koroi	79	125	8	
Lumbu tree	5	6	4	
Mango	58	52	69	0
Mehogoni	30	46	90	20
Neem			3	
Nut Tree	34	7	22	
Plum tree	6			
Rain Tree	12	31	18	
Rain Tree Koroi	116	72	33	
Raj Koroi	21	20		
Shal			2	
Shil koroi	14	2		
Shimul	4			
Sishu		2		
Sky Tree	10	22		
Supari	211	51	30	
Tal	10	12	3	
Tetul	1			
Sub Total	1385	784	642	25
	2836			

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
0+000-6+000	 Crossing over the seasonal khal at Ch 0+500; Crossing over the pond at Ch0+500 Crossing over the garden at Ch 1+200 Crossing over the paved road at Ch 5+000 and 5+650 Passing over the agricultural lands 	 Factory at about 250m far away Scattered homesteads along with trees Ponds Agricultural lands A mosque at 30m far away at Ch 0+050 	 Scattered homesteads along with trees Ponds Agricultural lands A homestead garden at 25m far away at Ch 2+850 	
6+000-15+121	 Crossing over the seasonal khal at Ch 9+250, 10+150,, 10+400, 10+800, 12+000 Crossing over the pond at Ch0+500 Crossing over the garden at Ch 11+100 Crossing over the paved road at Ch 6+850, 7+200, 7+050, 8+250, 9+750, 10+400 & 12+000, 12+150, 12+500, 12+150, 13+500, 14+750, 15+120 Passing over the agricultural lands 11kv line at ch 15+110 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands A homestead garden at 5m far away at Ch 11+250; 40m far at ch 12+000 	
15+121-18+121	 Crossing over the seasonal khal at Ch 16+700; Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
18+121-24+121	 Crossing over the seasonal khal at Ch 18+250, 18+500, 19+100,19+620, 19+850, 21+200, 22+000, 22+500, ; Crossing over the pond at Ch18+500 Crossing over the paved road at Ch 19+700, 21+650, 22+500 Passing over the agricultural lands 11kv line at ch 18+250,19+650, 132kv at ch 20+100 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Two gardens at about 30 m far away at Ch 23+650 23+200 , 	
24+121-30+121	 Crossing over the seasonal khal at Ch 24+650;29+200 Crossing over the pond at Ch25+700, 27+00 Crossing over the paved road at Ch 24+500 Passing over the agricultural lands 11kv line at ch 27+120, 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Agricultural lands Ponds A brick field At 60m far away at ch 25+000 	

Table 1b.1.2: IEFs within ROW and SPIA of Subproject: Chowmuhoni – Kachua 230 kV TL;

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
30+000-36+121	 Crossing over the seasonal khal at Ch 30+800, +500; Crossing over the pond at Ch33+120, 34+150 Crossing over the paved road at Ch 30+825, 30+400,33+650, 35+250 Passing over the agricultural lands Crossing over the garden at Ch 35+000 11kv line at ch 41+500 	 Scattered homesteads along with trees Ponds Agricultural lands A brick field at about 30m `1322222at ch 33+150 	 Scattered homesteads along with trees Ponds Agricultural lands 	
36+121-42+121	 Crossing over the seasonal khal at Ch 36+900;41+500, & a big khal (about 60 wide) at ch 42+000 Crossing over the paved road at Ch 37+900, 38+300 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
42+121-48+121	 Crossing over the seasonal khal at Ch42+450,43+200, 44+200, 46+900, 47+650, ; Crossing over the pond at Ch 45+900 Crossing over the paved road at Ch 44+200, 44+750 Passing over the agricultural lands 11kv line at ch 46+800 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
48+121-50+960	 Crossing over the seasonal khal at Ch 47+250, 47+700 Crossing over the paved road at Ch 50+350 and 50+960 Passing over the agricultural lands 33kv TL at Ch 47+250, ch 48+250 at ht 12.38m from GL. 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	

Source: Field Survey during 2017.



Figure 1b.1.1: Layout of the proposed 132 kV Chowmuhoni – Kachua double circuit TL.

Form 1b.2: Kachua-Gazaria 230 kV TL

- (1) Name of Power Line Subproject: Kachua-Gazaria 230 kV TL ;
- (2) (a) Total Length (km) : 45.61 km
 - (b) Type of Line: Multi circuit TL

(c) Start/End Point: Started at Kachua substation, UZ: Kachua, Dt: Chandpur and ended Gazaria substation, UZ: Gazaria, Dist.: Munshiganj.

- (3) Local REB/PBS/PGCB office: PGCB Office, Munshiganj & Chandpur
- (4) Layout of proposed Power Line: Shown in the attached map below (Figure 1b.2.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporarily use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 132 acre land for construction of towers.(c) Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m):
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 38 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 16 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 3 perennial ponds at various locations;
 - TL is passed over the 11kv power line at 2 locations;

- Flora: 2544 trees remained within the ROW (Table 1b.2.1);
- Fauna: Mammals: Khekshial, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki,; Amphibians: Kuno bang, Sona Bang, Shushuk, tortile; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil species were listed as reported by the local people in the subproject area. Details are given in Table-1b.2.2 below.
- (7) Key activities of sub-project:
 - Route survey and analysis of alternative routes for finalizing alignment of TL;
 - Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
 - Construction of TL including erection of the towers;
 - Clearing of ROW by cutting/trimming trees where necessary;
 - Stringing of conductor and earth wire after fixing clamps, insulators; and
 - Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akashmoni	26	28	2	
Amra Tree		1		
Arjun	2			
Bamboo	707	135		0
Bel	2			
Belgium	12	70		0
Bhynian tree	1			0
Bonna	1			
Bot Tree	4	1		
Chaiton	1			
Chambbol	8	35	2	
Coconut	82	20	53	0
Gab	1			
Guava			3	
Jackfruit	13	5	21	
Jambura	1			
Jamgas	2			
Jiggly tree	2	2		0
Kadam	1			
Khamrangga		1		0
Khejur	2			
Kodom	22	12		0
Koroi	32	44	32	0
Kul Borai	1			
Latim gas	1	1		
Mango	58	68	52	1
Medda	1			

Table 1b.2.1: Trees within the ROW (52m) of Subproject: Kachua-Gazaria 230 kV TL;

Mehogoni	26	186	126	0
Neem	2			
Nut Tree	53	5		0
Plum tree	1	1		0
Rain Tree	8	4		
Rain Tree Koroi	141	97	30	0
Shimul			1	
Sky Tree	4	60	49	0
Supari	70	40	21	
Tal	30	15	2	
Sub Total	1318	831	394	1
	2544			

Table 1b.2.2: IEFs within ROW and SPIA of Subproject: Kachua –Gajaria 230 kV TL;

Chainage	Major Features of the ROW	Major Features of the SPIA	
(Location)	(50m)	Left Side Right Side	
0+000-6+000	 Crossing over the seasonal khal at Ch 1+900;4+350,4+580,5+950,5+750. Crossing over the paved road at Ch 2+900 and 4+580, 5+750, 5+950, Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with trees Ponds Agricultural lands 	
6+000-12+000	 Crossing over the seasonal khal at Ch 7+000, 7+950,, 8+750, 9+750, 10+400 Crossing over the pond at Ch8+280 Crossing over the paved road at Ch 7+150, 8+250, Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with trees Ponds Agricultural lands 	
12+000-18+000	 Crossing over the seasonal khal at Ch 12+500;13+100,14+200,14+750,15+200,15 +700 Crossing over the paved road at Ch 14+000, 17+800, Passing over the agricultural lands 11kv line at ch 17+950 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with trees Ponds Agricultural lands 	
18+000-24+000	 Crossing over the seasonal khal at Ch 19+000, 22+600, 22+950, ; Crossing over the paved road at Ch 18+100, 23+000 Passing over the agricultural lands 33kv line at ch 18+600, ht=11.26m, 11kv at 22+500, ht=10.22m 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with trees Ponds Agricultural lands 	
24+000-30+000	 Crossing over the seasonal khal at Ch 24+600;25+000,26+200,27+750,27+950,28 +500,29+300 Crossing over the paved road at Ch 25+800 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with trees Agricultural lands Ponds 	
30+000-36+000	 Crossing over the pond at Ch35+250, Crossing over the >1km wideMeghna-Gumti River at Ch 33+500 . Crossing over the paved road at Ch 	 Scattered Scattered homesteads along with trees Ponds 	

Chainage	Chainage Major Features of the ROW		ures of the SPIA
(Location)	(50m)	Left Side	Right Side
	30+200, 33+500, 34+250 Passing over the agricultural lands	PondsAgricultural lands	 Agricultural lands
36+000-45+618	 Crossing over the seasonal khal at Ch 36+750; 36+900, 37+850,40+250,40+600,40+950,41+800,42 +900,43+500,44+300 Crossing over the parennial pond at Ch 37+000, Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds & khals, Agricultural lands Homestead garden 	 Scattered homesteads along with trees Ponds Agricultural lands

Source: Field Survey during 2017.



Figure 1b.2.1: Layout of the proposed 230 kV Kachua-Gazaria TL.

Form 1b.3: Kachua-Laksham 132 kV Transmission Line

- (1) Name of TL Subproject: Kachua-Laksham 132 kV TL
- (2) (a) Total Length (km) : 31.097 km
 - (b) Type of Line: Double circuit line

(c) Start/End Point: Started at Kachua substation, UZ: Kachua Dt: Chandpur and ended at Laksham substation, UZ: Laksham, Dist.: Comilla.

(3) Local REB/PBS/PGCB office: PGCB Office, Comilla & Chandpur

- (4) Layout of proposed TL: Shown in the attached map below (Figure 1b.3.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporarily use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 101.46 acre land for construction of 103 towers.

(c)Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m):
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 15 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 15 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 4 perennial ponds at various locations;
 - TL is passed over about 200 m wide Dakatia River at ch 24+100;
 - TL is passed over the 11kv power line at 2 locations & 33kv at 2 locations;
 - Flora: 2990 trees remained within the ROW (Table 1b.3.1);
 - Fauna: Mammals: Khekshial,, Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area. Details are given in Table-1b.3.2 below.

(7) Key activities of sub-project

- Route survey and analysis of alternative routes for finalizing alignment of TL;
- Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
- Construction of TL including erection of the towers;
- Clearing of ROW by cutting/trimming trees where necessary;
- Stringing of conductor and earth wire after fixing clamps, insulators; and
- Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Table 1b.3.1: Trees within the ROW (52m) of Subproject: Kachua-Laksham 132 kV TL;

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akashmoni	15	102	319	
Bamboo	520	185	120	0
Banana	10	20		
Barry		2		
Belgium	28	45	533	

TREE NAME	LARGE	MEDIUM	SMALL	PLANT	
Bot Tree	2				
Bunyan tree			1		
Coconut	65	5	27	0	
Date Tree	1				
Daua	1				
Deat tree	3		5	0	
Eucalyptus		64	5		
Gamari			10		
Guava		5			
Jackfruit	16	8	54	0	
Jam Tree	2	2			
Jambura		1			
Jamgas			2		
Kadam		4		0	
Kath Tree	15	50			
Khejur	4				
Klikter	4				
Kodom	15	6	9	0	
Koroi	53	35	7	0	
Lombu tree		2	5		
Mango	65	51	70	0	
Medda		8			
Mehogoni	18	47	191	12	
Naisra		2			
Nut Tree	1				
Plum tree	12	4	3	0	
Rain Tree	3	19	6	0	
Rain Tree Koroi	10	8			
Raj Koroi	3	8			
Shimul		1		0	
Sky Tree		20	20	0	
Supari	6	7			
Tal	5		1		
Tula	1	1		0	
Sub Total	878	712	1388	12	
Total 2990					

Table 1b.3.2: IEFs within ROW and SPIA of Kachua-Laksham 132 kV TL

Chainage	Major Features of the ROW	Major Features of the SPIA	
(Location)	(50m)	Left Side	Right Side
0+000-6+000	 Crossing over the seasonal khal at Ch 1+200;1+500,5+200,5+600, 5+950 Crossing over the paved road at Ch 0+250 and 1+300, 1+600, Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
6+000-12+000	 Crossing over the seasonal khal at Ch 8+800, Crossing over the paved road at Ch 6+150, 6+800, 10+900, Passing over the agricultural lands 11kv line at ch 10+520 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands

Chainage	Major Features of the ROW	Major Featur	es of the SPIA
(Location)	(50m)	Left Side	Right Side
	• <i>,</i> 10+850		
12+000-18+000	 Crossing over the seasonal khal at Ch 12+750, 13+600, 14+500 Crossing over the Comilla – Chandpur Highway at Ch 12+050, Crossing over the paved road at Ch 15+300,, Passing over the agricultural land 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
18+000-24+000	 Crossing over the seasonal khal at Ch 19+650, 20+200, 23+400, Crossing over the pond at Ch 21+850 Crossing over the paved road at Ch 17+850, 19+650, 20+000, 23+400 Passing over the agricultural lands 33kv line at ch 18+050, 19+650, 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
24+000-30+000	 Crossing over the seasonal khal at Ch 24+850;26+850,27+800,29+000 Crossing over the pond at Ch24+200, 25+400 Crossing over the paved road at Ch 24+500 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Agricultural lands Ponds
30+000-31+097	 Crossing over the pond at Ch30+300 Crossing over the paved road at Ch 30+200 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands

Source: Field Survey during 2017.



Figure 1b.3.1: Layout of the proposed 132 kV Kachua-Laksham TL.

Form 1b.4: Chowmuhoni – Maijdee 230 kV Double Circuit TL

- (1) Name of TL Subproject: Chowmuhoni Maijdee 230 kV Double Circuit TL
- (2) (a) Total Length (km): 20.351km
 (b) Type of Line: Double circuit line
 (c) Start/End Point: Started at Chowmohuni substation, UZ: Chowmohuni, Dist: Noakhali and ended at Maidee substation, , UZ: Chowmohuni, Dist: Noakhali
 (2) Legel DED (DEC Dec Africae DEC Dec Africae Nearbhali
- (3) Local REB/PBS/PGCB office: PGCB Office, Noakhali
- (4) Layout of proposed TL: Shown in the attached map below (Figure 1b.4.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporary use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 63.04 acre land for construction of 64 towers.(c) Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m):
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 6 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 6 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 5 perennial ponds at various locations;
 - TL is passed over the 3 homestead gardens at various locations;
 - TL is passed over the 11kv power line at 14 locations & 33kv at one location.
 - Flora: 1795 trees remained within the ROW (Table 1b.4.1);
 - Fauna: Mammals: Khekshial, Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area. Details are given in Table-1b.4.2 below.

(7) Key activities of sub-project

- Route survey and analysis of alternative routes for finalizing alignment of TL;
- Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
- Construction of TL including erection of the towers;
- Clearing of ROW by cutting/trimming trees where necessary;
- Stringing of conductor and earth wire after fixing clamps, insulators; and
- Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Table 1b.4.1: Trees within the ROW (52m) of Subproject: Chowmuhoni – Maijdee 230 kV Double Circuit TL;

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akashmoni	8	31	12	
Amra Tree			8	
Bamboo	550	50		
Banana	10			
Belgium		8	8	
Bot Koroi	4	5		
Bot Tree	1			
Coconut	74	30		
Eucalyptus		5		
Garjon		2		
Jackfruit	13	6	5	
Jhaw Tree	9			
Kodom	19	1	4	
Koroi	51	61	25	
Lombu tree			5	
Mango	122	59	8	15
Mehogoni	25	29	35	
Nut	63	5	5	
Plum tree	3			
Rain Tree		19		
Rain Tree Koroi	96	44		
Raj Koroi	3	6		
Segun	1		8	
Shimul	1			
Sishu		2		
Sky Tree	5	2		
Supari	170	18	30	
Tal	10		2	4
Sub Total	1238	383	155	19
	1795			

Table 1b.4.2: IEFs within ROW and SPIA of Subproject: Chowmuhoni – Maijdee 230 kV Double Circuit TL

Chainage	Major Features of the ROW	Major Features of the SPIA	
(Location)	(50m)	Left Side	Right Side
0+000-6+000	 Crossing over the seasonal khal at Ch 3+750; 4+800,4+980 Crossing over the perennial pond at Ch0+200,5+100 Crossing over the paved road at Ch 0+150 and 5+650 Passing over the agricultural lands Crossing over the 11Kv TL at Ch 1+480, 1+850 (ht=9.2m) 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
6+000-12+000	 Crossing over the seasonal khal at Ch 8+700 Crossing over the paved road at Ch 10+100, 9+400, 12+750, 	 Scattered homesteads along with trees Ponds 	 Scattered homesteads along with trees Ponds

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
	 Passing over the agricultural lands 11kv line at ch 7+350, 8+000,9+000, 9+500, 10+950, 11+900 (ht=9.2m) Crossing over the H/S garden at Ch 7+100 	 Agricultural lands 	 Agricultural lands 	
12+000-18+000	 Crossing over the pond at Ch12+400 Crossing over the paved road at Ch 12+750, 16+800, Passing over the agricultural lands 11kv line at ch 12+750,13+300, 13+500 14+250,14+980,17+850 (ht=10.5m) & 33kv at ch 12+350 (ht=10.2m) 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
18+000- 20+352	 Crossing over the seasonal khal at Ch 18+850, 20+180, ; Crossing over the H/S garden at ch 18+350, 19+200 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	

Source: Field Survey during 2017.



Figure 1b.4.1: Layout of the proposed 132 kV Chowmuhoni – Maijdee 230 kV Double Circuit TL.

Form 1b.5: Comilla –Chandina 132 KV DC TL

- (1) Name of TL Subproject: Comilla Chandina 132 KV DC TL
- (2) (a) Total Length (km) : 9.83 km
 - (b) Type of Line: Double circuit line

(c) Start/End Point: Started at Comilla (North) substation Dist.: Comilla and ended at Chandina substation, UZ: Chandina, Dist.: Comilla.

- (3) Local REB/PBS/PGCB office: PGCB Office, Comilla
- (4) Layout of proposed TL: Shown in the attached map below (Figure 1b.5.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporary use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 33.49 acre land for construction of 34 towers.

©Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m):
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 1 khal (canal) ,
 - TL is passed over the 8 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 11kv power line at 4 locations and 33KV at 2 locations.
 - Flora: No trees remained within the ROW;
 - Fauna: Mammals: Khekshial, Ram Kutta, Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area.

Details are given in Table-1b.5.2 below.

:

- (7) Key activities of sub-project
 - Route survey and analysis of alternative routes for finalizing alignment of TL;
 - Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
 - Construction of TL including erection of the towers;
 - Clearing of ROW by cutting/trimming trees where necessary;
 - Stringing of conductor and earth wire after fixing clamps, insulators; and
 - Checking, testing and commissioning of transmission lines.

(8) Potential benefit from sub-project :

- Access to electricity in the urban areas including rural areas;
- Meeting growing electricity demand; and
- Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
0+000-6+000	 Crossing over the paved road at Ch 0+100 (Sylhet-Comilla Highway) ,0+500 and 1+500,, 1+900, 3+100, 5+500 Passing over the agricultural lands Crossing over 11KV TL at Ch 5+900 (ht=9.22m) and 33KV TL at 4+100 (10.36m). 	 Factory at about 250m far away Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands A homestead garden at 25m far away at Ch 2+850 	
6+000-9.833	 Crossing over the seasonal khal at Ch 7+000, Crossing over the paved road at Ch 6+750, 8+600, Passing over the agricultural lands 11kv line at ch 6+350, 8+500and 33kv TL at ch 7+000 (10.27). 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	

Table 1b.5.1: IEFs within ROW and SPIA of Subproject: Comilla – Chandina 132 KV DC TL.

Source: Field Survey during 2017.



Figure 1b.5.1: Layout of the proposed Subproject: Comilla – Chandina 132 KV DC TL.

Form 1b.6: Sub-project Description: Chowmuhoni – Laxmipur 132 kV Double Circuit TL

- (1) Name of TL Subproject: Chowmuhoni Laxmipur 132 kV Double Circuit TL;
- (2) (a) Total Length (km) : 27.082 km
 - (b) Type of Line: Double circuit line

(c) Start/End Point: Started at Chowmohuni substation, UZ: Chowmohuni, Dist:Noakhali and ended at Laxmipur substation, Dist.: Laxmipur

- (3) Local REB/PBS/PGCB office: PGCB Office, Noakhali & Laxmipur
- (4) Layout of proposed Power Line: Shown in the attached map below (Figure 1b.6.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need temporary use/acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 94.56 acre land for construction of 96 towers.

©Partly private/partly government owned: No

- (6) Brief information of environment along the proposed TL ROW (50m):
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 12 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 10 paved roads at various locations on which various road transports are moved;;
 - TL is passed over the 7 perennial ponds at various locations;
 - TL is passed over the 4 homestead(H/S) gardens at various locations;
 - TL is passed over the 11kv power line at 6 locations and 33kv TL at 7 locations;
 - Flora: 1740 trees remained within the ROW (Table-1b.6.1);
 - Fauna: Mammals: Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area. Details are given in Table-1b.6.2 below.
- (7) Key activities of sub-project:
 - Route survey and analysis of alternative routes for finalizing alignment of TL;
 - Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
 - Construction of TL including erection of the towers;
 - Clearing of ROW by cutting/trimming trees where necessary;
 - Stringing of conductor and earth wire after fixing clamps, insulators; and
 - Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Table 1b.6.1: Trees within the ROW (52m) of Subproject: Chowmuhoni – Laxmipur 132 kV Double Circuit TL

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akashmoni	8	31	12	
Amra Tree			8	

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Bamboo	532	15		
Banana	10			
Belgium		8	8	
Bot Koroi	4	5		
Bot Tree	1			
Coconut	74	50		
Eucalyptus		5		
Garjon		22		
Jackfruit	13	6	5	
Jhaw Tree	9			
Kodom	19	1	4	
Koroi	51	61	25	
Lombu tree			5	
Mango	86	44	8	
Mehogoni	43	29	15	
Nut	63	5	5	
Nut Tree	3	5	5	
Plum tree	3			
Rain Tree		19		
Rain Tree Koroi	96	44		
Raj Koroi	3	6		
Segun	1		8	
Shimul	1			
Sishu		2		
Sky Tree	5	2		
Supari	156	50	15	10
Tal	10		2	4
Sub Total	1191	410	125	14
Total 1				1740

Table 1b.6.2: IEFs within ROW and SPIA of Subproject: Chowmuhoni – Laxmipur 132 kV Double Circuit TL

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
0+000-6+000	 Crossing over the seasonal khal at Ch 5+300; Crossing over the pond at Ch0+350, 0+450, 4+100,4+450 Crossing over the H/S garden at Ch1+250 Crossing over the paved road at Ch 1+100,2+200, 3+750, 4+950 Passing over the agricultural lands Crossing over the 11KV TL at Ch 0+250; 2+980, 5+850 (ht=9.5m) and 33KV TL at ch 4+950 (ht=11.28m) 	 Factory at about 250m far away Scattered homesteads along with trees Ponds Agricultural lands A mosque at 30m far away at Ch 0+050 	 Scattered homesteads along with trees Ponds Agricultural lands A homestead garden at 25m far away at Ch 2+850 	
6+000-12+000	 Crossing over the seasonal khal at Ch 8+850, 11+950 	 Scattered homesteads along 	 Scattered homesteads along 	
	 Crossing over the paved road at Ch 6+550, 7+900, 10+950. 	with treesPonds	with treesPonds	

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
	 Passing over the agricultural lands 11kv TL at ch 6+080 & 33KV TL at ch 7+550, 9+750 	 Agricultural lands 	 Agricultural lands A homestead garden at 5m far away at Ch 11+250; 40m far at ch 12+000 	
12+00-18+000	 Crossing over the seasonal khal at Ch 13+500, 14+300, Crossing over the pond at Ch15+050, Crossing over the H/S garden at ch 16+850 Passing over the agricultural lands Crossing over the seasonal 11KV TL at Ch 17+840, & 33kv TL at ch 17+500, 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
18+000-24+000	 Crossing over the seasonal khal at Ch 18+600, 20+500, 21+250, 22+350, 23+850, ; Crossing over the pond at Ch21+750 Crossing over the paved road at Ch 19+000, 21+650, 22+500 Crossing over the H/S garden at Ch22+100 Passing over the agricultural lands 11kv line at ch 23+850 & 33KV at ch 22+850 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with various trees Ponds Agricultural lands 	
24+000-27+082	 Crossing over the paved road at Ch 25+000 Passing over the agricultural lands 33kv line at ch 25+300, 25+800 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Agricultural lands Ponds 	

Source: Field Survey during 2017.



Figure 1b.1: Layout of the proposed: Chowmuhoni – Laxmipur 132 kV Double Circuit TL.

Form 1b.7: Sub-project Description: Muradnagar – Kosba 132 KV DC TL

- (1) Name of Power Line Subproject: Muradnagar Kosba 132 KV DC TL;
- (2) (a) Total Length (km) : 21.90 km
 - (b) Type of Line: Double circuit line

(c) Start/End Point: Started at Muradnagar substation, UZ: Muradnagar, Dt: Comilla and ended at Kosba substation, UZ: Kosba, Dist.: Brahmanbaria.

- (3) Local REB/PBS/PGCB office: PGCB Office, Comilla & Brahmanbaria.
- (4) Layout of proposed Power Line: Shown in the attached map below (Figure 1b.7.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 68.95 acre land for construction of 70 towers.

- (c) Partly private/partly government owned: No
- (6) Brief information of environment along the proposed TL ROW (50m) :
 - Information on IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 14 khals (canals) at various locations;
 - TL is passed over the 13paved roads at various locations on which various road transports are moved;
 - TL is passed over the 4 perenial ponds at various locations;

- TL is passed over the 11kv power line at one location & 33KV at one location;
- Flora: 337 trees remained within the ROW (Table-1b.7.1);
- Fauna: Mammals: Khekshial, Ram Kutta, Badur, Kathbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, , Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Machranga, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area. Details are given in Table-1b.7.2 below.
- (7) Key activities of sub-project
 - Route survey and analysis of alternative routes for finalizing alignment of TL;

- Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
- Construction of TL including erection of the towers;
- Clearing of ROW by cutting/trimming trees where necessary;
- Stringing of conductor and earth wire after fixing clamps, insulators; and
- Checking, testing and commissioning of transmission lines.
- (8) Potential benefit from sub-project :
 - Access to electricity in the urban areas including rural areas;
 - Meeting growing electricity demand; and
 - Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akhasmoni		1		
Bamboo	63	53		
Chambbol			2	
Coconut	6			
Daua	2			
Dumur	1	2		
Eucalyptus			2	
Gab		8	7	
Iron Tree		7	10	
Jackfruit		1	1	
Khejur	1			
Koroi	7	22		
Maddah		2		
Mango	5	6	8	
Medda	1	1		
Mehogoni		50	11	
Nut Tree	3			
Plum tree	1			
Raj Koroi		1		
Sky Tree		19	28	
Tal	4	1		
Sub Total	94	174	69	0
Total				337

Table 1b.7.1: Trees within the ROW (52m) of Subproject: Muradnagar – Kosba 132 KV DC TL;

Chainage	Major Features of the ROW	Major Features of the SPIA		
(Location)	(50m)	Left Side	Right Side	
0+000-6+000	 Crossing over the seasonal khal at Ch 3+050;4+250 Crossing over the pond at Ch0+500, 4+200 Crossing over the paved road at Ch 0+200 and 1+350 Crossing over the 11KV TL at Ch 4+650 & 5+100 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with various trees Ponds Agricultural lands 	
6+000-12+000	 Crossing over the seasonal khal at Ch 6+750, 8+850, 9+800, 10+250, 11+350 Crossing over the paved road at Ch 6+650, Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
12+000-18+000	 Crossing over the seasonal khal at Ch 14+250; 15+400, 17+000, 17+100 Crossing over the road at ch 13+150, 15+200 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	
18+000-21+906	 Crossing over the seasonal khal at Ch 18+100, 21+300, 21+906, Crossing over the pond at Ch19+250 Crossing over the paved road at Ch 18+700, 19+050, 19+200 Passing over the agricultural lands 33 ky TL at ch 20+700 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	

Table 1b.7.2: IEFs within ROW and SPIA of Subproject: Muradnagar – Kosba 132 KV DC TL

Source: Field Survey during 2017.



Figure 1b.7.1: Layout of the proposed Muradnagar – Kosba 132 KV DC TL
Form 1b.8: Sub-project Description: Korerhat- Chowmuhoni 230KV Multi Circuit (MC) TL

- (1) Name of TL Subproject: Korerhat- Chowmuhoni MC TL
- (2) (a) Total Length (km) : 53.023 km
 (b) Type of Line: Multi circuit line
 (c) Start/End Point: Started at Korerhat substation, UZ: Mirsarai, Dt: CTG and ended at Chowmuhoni substation, UZ: Chowmuhoni , Dist.: Noakhali.
- (3) Local REB/PBS/PGCB office: PGCB Office, Noakhali & CTG.
- (4) Layout of proposed TL: Shown in the attached map below (Figure 1b.8.1).
- (5) Ownership of sub-project land:
 - (a)Government owned: No

(b)Private land (need acquisition) (acre): Yes, the route is located on the private agricultural lands and temporarily needs 160.56 acre land for construction of 163 towers.

(c) Partly private/partly government owned: No

- (6) Informatio Brief information of environment along the proposed TL ROW (50m) :
 - IEFs, human settlement, industrial/commercial establishments, tribal people, water body, flora, fauna, historical or culturally important sites, ecologically sensitive areas, traffic:
 - TL is passed over the 30 khals (canals) at various locations of which one is big perennial khal (60m wide);
 - TL is passed over the 32 paved roads at various locations on which various road transports are moved;
 - TL is passed over the 10 perennial ponds at various locations;
 - TL is passed over the 3 homestead gardens at various locations;
 - TL is passed over the 11kv power line at 6 locations;
 - Flora: 8010 trees remained within the ROW Table-1b.8.1;
 - Fauna: Mammals: Khekshial, Khatbiral, Nengti Indur, Metho Indur, Beji, Chika; Reptiles: Dora shap, Gui Shap, Tiktiki, Sabuj Roktochosha, Roktochosha; Amphibians: Kuno bang, Sona Bang; and Birds: Gughu, Paira, Jongla Ghugu, Kani bok, Doyel, Charai, Babui, Shalik, Tuntuni, Pankaori and Gangchil) species were listed as reported by the local people in the subproject area. Details are given in Table-1b.8.2 below.

(9) Key activities of sub-project

- Route survey and analysis of alternative routes for finalizing alignment of TL;
- Mobilization of material and equipment, including procurement of towers components, conductor and line materials;
- Construction of TL including erection of the towers;
- Clearing of ROW by cutting/trimming trees where necessary;

5

- Stringing of conductor and earth wire after fixing clamps, insulators; and
- Checking, testing and commissioning of transmission lines.

(10) **Potential benefit from sub-project :**

- Access to electricity in the urban areas including rural areas;
- Meeting growing electricity demand; and
- Meet the vision of the GOB is to provide access to affordable and reliable electricity to all by 2021.

Table 1b.8.1: Trees within the ROW (52m) of Subproject: Korerhat- Chowmuhoni 230KV MC TL;

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Akashmoni	167	253	258	0
Amra Tree	9	9	1	0
Ata			1	0
Badam		1		
Bamboo	2054	172	38	0
Banana	19	15	10	
Barai tree	1		5	0
Belgeum	1	9	6	
Belgium	16	152	29	500
Bonshai	1			
Bot Koroi		3		
Chambbol	7	1		
Chaprash			10	
Coconut	283	109	25	0
Custard Apple		1		
Date tree	1			
Deuwa	5	3	4	
Eucalyptus		9	30	0
Gab	27	18	2	
Gamari		6		0
Gorion			3	
Guava	1			
Jackfruit	30	37	32	0
Jambura	2		2	
Jamgas	1			
Jamrul		1		
Jhaw Tree	7	2	15	0
Jolpai	1			
Kath Tree		100		
Keora	4	2		
Kodom	48	15	1	
kori		3		
Koroi	339	154	41	0
Krishno Chura	3			
Latua	1			
Lemon	1			
Litchi Tree		1		
Lombu tree		10	8	0
Mango	172	77	70	29
Mehogoni	115	352	107	0
Mondol gas	1	10		
Neem	22			
Nut	152	20	33	
Nut tree	148	138	30	5
Pitraj	21			
Plum tree	27	8	1	0
Rain Tree	23	17	8	1
Rain Tree Koroi	104	72	6	
Raj Koroi	10	15		
Rona		4		
Saten	2			
Segun		6	66	0
Shal		8	7	

TREE NAME	LARGE	MEDIUM	SMALL	PLANT
Shil koroi	16	14		
Shimul	12			
Shiris	2			
Sishu		1	1	0
Sresti koroi	2	5		
Supari	848	42		
Tal	40	4		
Sub Total	4746	1879	850	535
			Total	8010

Table 1b.8.2: IEFs within ROW and SPIA of Subproject: Korerhat- Chowmuhoni 230KV MC TL

Chainage	Major Features of the ROW	Major Features of the SPIA
(Location)	(50m)	Left Side Right Side
0+000-6+000	 Crossing over the seasonal khal at Ch 2+850; 4+900; 5+150; 5+050; Crossing over the 300m wide Feni river at Ch 2+850; Crossing over the paved road at Ch 0+150 and 0+750 Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Scattered homesteads along with dense trees Ponds Agricultural lands
6+000-12+000	 Crossing over the seasonal khal at Ch 8+250, 11+050,, Crossing over the 80m wide Muhuri River at Ch 7+000, Crossing over the Rly. at Ch 8+400, Crossing over the paved road at Ch 6+750, 7+000, 7+250, 7+800, 8+350, 8+950, 9+200, 9+400, 10+400, 11+000 (Dhaka-CTG Highway), Passing over the agricultural lands 11kv line at ch 6+150, 9+450, 10+050, 10+750, 10+850, 111+200 and 132kv TL at ch 10+400, and 230kv at ch 10+500 	 Scattered homesteads along with dense trees Ponds Agricultural lands A graveyard at L/S at ch 10+000 Scattered homesteads along with dense trees Ponds Agricultural lands Agricultural lands Agricultural lands
12+000- 18+000	 Crossing over the seasonal khal at Ch 14+950; 15+400; 16+850 & Silonia river (seasonal) at 13+650; Crossing over the paved road at Ch 13+800, 14+000; 14+200; 16+150;16+250,17+650 Crossing over the H/S garden at Ch 15+000; 11kv line at ch 16+150, 16+650 (ht=9.2m) Passing over the agricultural lands 	 Scattered homesteads along with dense trees Ponds Agricultural lands Scattered homesteads along with dese trees Ponds Agricultural lands
18+000- 24+000	 Crossing over the seasonal khal at Ch 19+400, 22+500, Crossing over the pond at Ch18+500 Crossing over the paved road at Ch 21+250, 23+500, Passing over the agricultural lands 11kv line at ch 23+150, 23+600, Crossing over the seasonal khal at Ch 	 Scattered Scattered homesteads along with along with dense trees Ponds Agricultural lands Scattered
30+000	 Crossing over the seasonal kharat Ch 26+600;27+000, 27+950 Crossing over the pond at Ch28+100, 29+550 Crossing over the paved road at Ch 24+500, 	 Scattered Scattered homesteads along with trees Ponds Agricultural lands

Chainage	Major Features of the ROW	Major Featu	res of the SPIA
(Location)	(50m)	Left Side	Right Side
	 24+850 (Noakhali-feni highway), 25+850, 28+050, 29+000 Passing over the agricultural lands 11kv line at ch 24+250,24+850, 28+850 and 132 kv at ch 29+6000, 33kv at 26+200 	lands	 Ponds
30+000- 36+000	 Crossing over the seasonal khal at Ch 30+550, 31+400;31+850,32+600, 35+700. Crossing over the paved road at Ch 30+150, 30+800,30+900, 32+200, 33+450,34+000, 34+150, 34+800, 35+250 Passing over the agricultural lands 11kv line at ch 32+950 (ht=9.4m) 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
36+000- 42+000	 Crossing over the seasonal khal at Ch 36+200;36+650, 40+050& a big khal (about 60 wide) at ch 42+000 Crossing over the paved road at Ch 37+050, 37+050,37+750,38+850,40+050,41+500 11kv line at ch 37+800,40+300,40+900,41+500, 42+750, 43+000,43+750 (ht=9.4m) Passing over the agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
42+000- 48+000	 Crossing over the seasonal khal at Ch46+800,47+600,; Crossing over the paved road at Ch 45+050, 46+800,47+600, Passing over the agricultural lands 11kv line at ch 47+400 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands
48+000- 53+360	 Crossing over the seasonal khal at Ch 48+500, 50+700 Crossing over the pond at Ch 51+550. Crossing over the paved road at Ch 48+300, 49+000, 50+700 Crossing over the railway line at Ch 49+900 Passing over the agricultural lands 33kv TL at Ch 49+800 (ht=10.6). 	 Scattered homesteads along with trees Ponds Agricultural lands 	 Scattered homesteads along with trees Ponds Agricultural lands Mosque and school at R/S at 20m and 40m distance at ch 48+300 & 49+250 respectively.

Source: Field Survey during 2017..

Form 2b: Environmental/Social Screening: Transmission Line (TL)

Name of Power Line Subproject	:	Chowmuhoni – Kachua 230 kV Double Circuit TL
Total Length (km)	:	50.96 km
Type of Line	:	230 kV double circuits
Start/ End Point	:	Started at Chowmohuni substation, UZ: Chowmohuni, Dist: Noakhali and ended at Kachua substation, UZ: Kachua, Dist.: Chandpur.
Local PGCB office	:	PGCB, Noakhali & Chandpur

Form 2b.1: Chowmuhoni – Kachua 230 kV TL

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts	
Ecological impacts	۰.

			Numb	er of tress 2836
 Felling of trees 	Sig	gnificant□	Moderate□	Minor ⊡√
 Clearing of vegetation 	Sig	gnificant□	Moderate⊡√	Minor 🗆
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Sig	gnificant□	Moderate⊡√	Minor 🗆
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate 🗆	Insignificant □V
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate □ √	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion 	Verv likelv 🗆	Likelv 🗆	Unlikely ⊡v
Health and safety	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Chowmuhoni – Kachua 230 kV Double Circuit TL.

:	Kachua-Gazaria 230 kV TL
:	45.61 km
:	230 kV double circuits
	Started at Kachua substation, UZ: Kachua, Dt: Chandpur and
•	ended Gazaria substation, UZ: Gazaria, Dist.: Munshiganj.
:	PGCB, Munshiganj & Chandpur
	: : : :

Form 2b.2: Kachua-Gazaria 230 kV TL

Potential Environmental Impact during Construction Phase:

Ecological impacts:

0 1			Number	of tress 2544
 Felling of trees 		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate⊡√	Minor 🗆
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate⊡√	Minor 🗆
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □√
Water pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □√	Insignificant 🗆
General Socio-economic impacts:			
 Traffic congestion 	Very likely 🗆	Likely 🗆	Unlikely □V
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant ⊡V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆

• Impact on tribal people (if applicable)

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- Summary of Possible environmental/social impacts of the subproject:
 - > No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □ / Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Kachua-Gazaria 230 kV TL.

Form 2b.3: Kachua-Laksham 132 kV Transmission Line

Name of Power Line Subproject	:	Kachua-Laksham 132 kV Transmission Line
Total Length (km)	•••	31.097 km
Type of Line	•••	132 kV double circuits
Start/ End Point		Started at Kachua substation, UZ: Kachua Dt: Chandpur and
	•	ended at Laksham substation, UZ: Laksham, Dist.: Comilla.
Local PGCB office	•••	PGCB, Comilla & Chandpur

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

			Numbe	er of tress 2990
• Felling of trees		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate⊡√	Minor 🗆
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡V
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:

Noise pollution	Significant 🗆	Moderate □√	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □√	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion 	Very likely 🗆	Likely 🗆	Unlikely □V
Health and safety	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - ➢ No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Kachua-Laksham 132 kV Transmission Line.

Name of Power Line Subproject	:	Chowmuhoni – Maijdee 230 kV Double Circuit Transmission
Total Length (km)	:	20.351 km
Type of Line	:	230 kV double circuits
Start/ End Point		Started at Chowmohuni substation, UZ: Chowmohuni, Dist:
	:	Noakhali and ended at Maidee substation, , UZ: Chowmohuni,
		Dist: Noakhali.
Local PGCB office	:	PGCB, Noakhali

Form 2b.4: Chowmuhoni – Maijdee 230 kV Double Circuit TL

✓ Potential Environmental Impact during Construction Phase:

\triangleright	Ecological impacts:
-	Leological impacts.

		Number of tr	ess 1/95
 Felling of trees 	Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 	Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 	Significant□	Moderate□	Minor ⊡√
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆	No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate 🗆	Insignificant □V
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
 General Socio-economic impacts: 	Very likely 🗆	Likely D	
• Trainc congestion			
 Health and safety 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - > No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - − According to ECR 1997 : Green \Box / Orange A \Box / Orange B \Box / Red \Box / Not Listed \Box
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Chowmuhoni – Maijdee 230 kV Double Circuit Transmission Line.

Name of Power Line Subproject	•••	Comilla – Chandina 132 KV Double Circuit Transmission Line
Total Length (km)	•••	9.83 km
Type of Line	•••	132 kV double circuits
Start/ End Point		Started at Comilla (North) substation Dist.: Comilla and ended
	•	at Chandina substation, UZ: Chandina, Dist.: Comilla.
Local PGCB office	:	PGCB, Comilla

Form 2b.5: Comilla – Chandina 132 KV Double Circuit TL

✓ Potential Environmental Impact during Construction Phase:

> Ecological impacts:

			Number of	tress No
 Felling of trees 		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate 🗆	Insignificant □V
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:Traffic congestion	Very likely 🗆	Likely 🗆	Unlikely □V
 Health and safety 	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - ➢ No house is located within ROW; and
 - > No tribal people live within ROW.
- ✓ Category of sub-project:
 - − According to ECR 1997 : Green / Orange A / Orange B / Red / Not Listed
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Comilla – Chandina 132 KV Double Circuit Transmission Line.

Form 2b.6: Chowmuhoni – Laxmipur 132 kV Double Circuit TL

Name of Power Line Subproject	•	Chowmuhoni – Laxmipur 132 kV Double Circuit Transmission
	•	Line
Total Length (km)	•••	27.082 km
Type of Line	:	132 kV double circuits
Start/ End Point		Started at Chowmohuni substation, UZ: Chowmohuni, Dist:
	÷	Noakhali and ended at Laxmipur substation, Dist.: Laxmipur
Local PGCB office	:	PGCB, Noakhali and Laxmipur

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

			Numbei	r of tress 1740
• Felling of trees		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate⊡√	Minor 🗆
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate⊡√	Minor 🗆
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡√	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

4 7 4 0

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate □√	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:			
 Traffic congestion 	Very likely 🗆	Likely 🗆	Unlikely □V
 Health and safety 	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - ▶ No house is located within ROW; and
 - No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Chowmuhoni – Laxmipur 132 kV Double Circuit Transmission Line.

Name of Power Line Subproject	:	Muradnagar – Kosba 132 KV Double Circuit Transmission Line
Total Length (km)	:	21.90 km
Type of Line	:	132 kV double circuits
Start/ End Point	:	Started at Muradnagar substation, UZ: Muradnagar, Dt: Comilla and ended at Kosba substation, UZ: Kosba, Dist.: Brahmanbaria.
Local PGCB office	:	PGCB, Comilla & Brahmanbaria.

Form 2b.7: Muradnagar – Kosba 132 KV Double Circuit TL

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

Number of tress 337

• Felling of trees		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate⊡√	Minor 🗆
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate ⊡√	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:			
 Traffic congestion 	Very likely 🗆	Likely 🗆	Unlikely □V
Health and safety	Significant 🗆	Moderate 🗆	Insignificant □V
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - − According to ECR 1997 : Green \Box / Orange A \Box / Orange B \Box / Red ⊠ / Not Listed \Box
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Muradnagar – Kosba 132 kV Double Circuit Transmission Line.

Name of Power Line Subproject	:	Korerhat- Chowmuhoni 230KV Multi Circuit Transmission Line
Total Length (km)	:	53.023 km
Type of Line	:	230 kV multi circuits
Start/ End Point	:	Started at Korerhat substation, UZ: Mirsarai, Dt: Chittagong and ended at Chowmuhoni substation, UZ: Chowmuhoni, Dist.: Noakhali.
Local PGCB office	:	PGCB, Noakhali & Chittagong.

Form 2b.8: Korerhat- Chowmuhoni 230KV Multi Circuit (MC) TL

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

			Numbe	r of tress 8010
 Felling of trees 		Significant□	Moderate⊡√	Minor 🗆
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor 🗆
• Presence of forest, protected area, key biodiversity area along the route of power line	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution	Significant 🗆	Moderate □V	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate □V	Insignificant 🗆
Water pollution	Significant 🗆	Moderate □V	Insignificant 🗆
 Pollution from solid/ construction waste 	Significant 🗆	Moderate □V	Insignificant 🗆
General Socio-economic impacts:Traffic congestion	Very likely 🗆	Likely □√	Unlikely 🛛
Health and safety	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on archaeological and historical 	Significant 🗆	Moderate 🗆	Insignificant □V
 Employment generation 	Significant 🗆	Moderate □V	Insignificant 🗆
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate	Insignificant 🗆

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - ➢ No house is located within ROW; and
 - > No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

✓ Overall Comments:

Considering the alternative analysis of 3 locations the above Route is selected and found as environmentally friendly; therefore, this route is recommended for the construction of Korerhat-Chowmuhoni 230KV Multi Circuit Transmission Line.

Appendix D: Description and Environmental Screening of the LILO Line Subprojects

Form 1C: Sub-project Description: Lilo Line

The IEFs within ROW and SPIA of Lilo Line Subprojects are presented in the following tabular form:

Table 1C.1: IEFs within ROW and SPIA of Lilo Line Subprojects

Lilo Line	Chainage	Major Features of the	Major Features of the SPIA		
	(Location)	ROW (50m)	Left Side	Right Side	
1.Lilo of 132 KV DC Feni- Chowmuhani, L=2.915km,	0+000-2+915	The proposed lilo line is passing over the agricultural lands, trees, roads and seasonal ponds & khals	 Various trees Ponds Agricultural lands 	Various trees Ponds Agricultural lands	
2.Lilo of 230 KV DC Karerhat – Comilla, L=5.735	0+000-5+191	The proposed lilo line is passing over the agricultural lands, trees, roads including Dhaka- CTG highway and Railway Line and seasonal and perennial ponds and khals.	 Various trees Ponds Agricultural lands 	Various trees Ponds Agricultural lands	
3. Lilo of 132 KV DC Karerhat- Hathazari-Feni	0+000-3+327	The proposed lilo line is passing over the agricultural lands, trees, roads including Rangamati-Bariorhat Highway and seasonal khals	 Various trees Ponds Agricultural lands 	Various trees Ponds Agricultural lands	
4.Lilo of 132 KV DC Dohazari- Shikalbaha	0+000-0+750	The proposed lilo line is passing over the agricultural lands,ponds, khal and road	 Various trees Agricultural lands Ponds 	Various trees Agricultural Iands Ponds	
5.Lilo of 132 KV DC Halishahar- Kulshi	0+000-1+105	The proposed lilo line is passing over the agricultural lands, and road	 Various trees Agricultural lands Factory at 180m distance from the Lilo line. 	Various trees Agricultural lands	
6.Lilo of 400 KV DC Korerhat- BSRM	0+000-11+850	The proposed lilo line is passing over the agricultural lands, and homesteads, roads at ch 0+090, 2+250, , 5+250, 5+800, Railway line at 11+750, khal at 1+450, 7+500,10+650,Garden at 2+250, H/S garden at ch 1+850, 132kv TL at ch 3+600, pocket hills with small to medium size forest trees (not densely) from ch 3+450	 Agricultural lands Ponds Hills, H/S garden Homestead 	Agricultural lands Ponds Hills, H/S garden Homestead	

Lilo Line	Chainage	Major Features of the	Major Features	of the SPIA
	(Location)	ROW (50m)	Left Side	Right Side
		- 11+700		
7.Lilo of 132 KV DC Modhunaghat- Meghnaghat	000-0+775	The proposed lilo line is passing over the agricultural lands., road	Agricultural landspond	 Agricultural lands pond
8.Lilo of 400 KV DC Comilla(N)- Daudkandi)	0+000-0+424	The proposed lilo line is passing over the agricultural lands and homestead	 Agricultural lands 	 Agricultural lands

Source: Field Survey during 2017.

All Lilo lines (as mentioned above in Appendix-D) have more or less same environmental impacts except Lilo line of 400 KV DC Korerhat-BSRM and therefore screening of impacts has been done for for the 8 Lilo lines in the following same table (applicable for 8 Lilo lines except the Lilo of 400 KV DC Korerhat-BSRM).

Form 2C.1: 8 Lilo lines except the Lilo of 400 KV DC Korerhat-BSRM

Name of Power Line Subproject	:	Line.Lilo of 400 KV DC Korerhat-BSRM
Total Length (km)	:	11.850 km
Type of Line		400 kV DC
Start/ End Point		Started at Korerhat substation, UZ: Mirsarai, Dist: Chittagong
	·	and ended at BSRM substation, UZ: Mirsarai, Dist: Chittagong
Local PGCB office		PGCB, Chittagong.

- ✓ Potential Environmental Impact during Construction Phase:
 - Ecological impacts:

			Number of t	tress:
 Felling/Trimming of trees 		Significant□	Moderate□	Minor ⊡√
 Clearing of vegetation 		Significant□	Moderate□	Minor ⊡√
 Potential impact on aquatic (i.e., water) habitat (esp. if power line is to be constructed over river/wetland) 		Significant□	Moderate□	Minor ⊡√
 Presence of forest, protected area, key biodiversity area along the route of power line 	Yes 🗆		No ⊡V	

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:

Noise pollution	Significant 🗆	Moderate □√	Insignificant 🗆
• Air pollution	Significant 🗆	Moderate 🗆	Insignificant □V
Water pollution	Significant 🗆	Moderate 🗆	Insignificant □V
 Pollution from solid/ construction waste 	Significant 🗆	Moderate 🗆	Insignificant □V
 General Socio-economic impacts: Traffic congestion Health and safety Impact on archaeological and historical Employment generation 	Very likely □ Significant □ Significant □	Likely □V Moderate □V Moderate □	Unlikely □ Insignificant □ Insignificant □√
 Employment generation 	Significant 🗆	Moderate 🗆	Insignificant $\Box V$
 Impact on tribal people (if applicable) 	Significant 🗆	Moderate 🗆	Insignificant □ Not applicable.

 Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.

- ✓ Summary of Possible environmental/social impacts of the subproject:
 - ➢ No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

Name of Power Line Subproject	:	Line.Lilo of 400 KV DC Korerhat-BSRM
Total Length (km)	•••	11.850 km
Type of Line	•••	400 kV DC
Start/ End Point		Started at Korerhat substation, UZ: Mirsarai, Dist: Chittagong
	•	and ended at BSRM substation, UZ: Mirsarai, Dist: Chittagong
Local PGCB office	:	PGCB, Chittagong.

Form 2C.2: Lilo Line of 400 KV DC Korerhat-BSRM

✓ Potential Environmental Impact during Construction Phase:

Ecological impacts:

		Number	of tress:
 Felling/Trimming of trees 	Significant□	Moderate⊡√	Minor 🗆
 Clearing of vegetation 	Significant□	Moderate⊡√	Minor 🗆
 Potential impact on aquatic (i.e., water) 	Significant□	Moderate□	Minor ⊡√

habitat (esp. if power line is to be constructed over river/wetland)

Presence of forest, protected area, key Yes □V (pocket of hilly biodiversity area along the route of power line
 Yes □V (pocket of hilly area with not densely No □ forest trees)

Note: If answer to the above question is "Yes", then a detail analysis of alternative routes would be carried out to identify possible route(s) that would eliminate/reduce risk to biodiversity, vegetation, and habitat. If it is not possible to completely avoid such sensitive areas, then possible impact on biodiversity must be addressed as outlined in the ESMF.

Physicochemical impacts:			
Noise pollution Si	ignificant 🗆	Moderate □V	Insignificant 🗆
• Air pollution Si	ignificant 🗆	Moderate 🗆	Insignificant □√
• Water pollution Si	ignificant 🗆	Moderate 🗆	Insignificant □√
• Pollution from solid/ construction waste Si	ignificant 🗆	Moderate □ √	Insignificant 🗆
 General Socio-economic impacts: Traffic congestion Health and safety Impact on archaeological and historical Employment generation Impact on tribal people (if applicable) 	Very likely □ Significant □ Significant □ Significant □ Significant □	Likely □√ Moderate □√ Moderate □√ Moderate □√	Unlikely Insignificant Insignificant Insignificant Insignificant Not applicable.

- Potential Environmental Impact during Operational Phase: No significant adverse impact anticipated that cannot be addressed by routine O&M activities, and no such impacts are expected that could potentially affect nature of subsequent ESA.
- ✓ Summary of Possible environmental/social impacts of the subproject:
 - > No house is located within ROW; and
 - ➢ No tribal people live within ROW.
- ✓ Category of sub-project:
 - According to ECR 1997 : Green□ / Orange A □/ Orange B□ / Red⊠ / Not Listed□
 - According to WB classification : Category B
- Proposed mitigation measures

Incorporated in EMP.

Appendix E: Test Results of Surface Water Quality

Ref: EQMS / Surface Water / 26082017 / 003

	EQMS Environmental Laboratory
	Test Results of Surface Water Quality Analysis
Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 230 kV Multi Circuit Transmission
	Line from Chowmuhoni to Korerhat
Sampling Location	: SW1- Feni River (22°57'16.6"N 91°32'47.3"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 26th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	veie.

Parameter	GPS 22°57'16.6"N 91°32'47.3"E	Unit	Concentration Present	Bangladesh Standards
Ammonia (NH3)		mg/l	0.26	0.50
Dissolved Oxygen (DO)		mg/l	6.4	5 or more
Chemical Oxygen Demand (COD)	-	mg/1	3.2	4.0
Biological Oxygen Demand (BOD)5 days		mg/1	<2	2
Potassium	-	mg/l	3	12

Collected by:

TLOSSA **Toffazzal Hossain Field Enumerator**

EQMS Consulting Limited

Analyzed by: file

Tauhidul Hasan Consultant EQMS Consulting Limited



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Ref: EQMS / Surface Water/27082017/006

	EQMS Environmental Laboratory
	Test Results of Surface Water Quality Analysis
Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	:Construction of 132/33 kV GIS Substation at Maijdee,
	Noakhali Sadar, Noakhali.
Sampling Location	: SW1- Canel (22°48'02.0"N 91°04'57.1"E)
Sample Collector	: Collected by EQMS Personnel(Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	:4thSeptember, 2017 -
Description of Analy	vsis:

Parameter	GPS 22°48'02.0"N 91°04'57.1"E	Unit	Concentration Present	Bangladesh Standards
pH		mg/l	6.86	6.5-8.5
Ammonia (NH3)		mg/l	0.41	0.50
Dissolved Oxygen (DO)	-	mg/1	5.7	5 or more
Chemical Oxygen Demand (COD)	-	mg/l	2.8	4.0
Biological Oxygen Demand (BOD)5 days	-	mg/l	<2	2
Potassium		mg/l	1	12

Collected by:

7 Cossi Toffazzal Hossain

Field Enumerator EQMS Consulting Limited

Analyzed by: Malile.

Tauhidul Hasan Consultant EQMS Consulting Limited

Lim hecked by: SW

Iqubal Kazi Execu Director

EQMS Consulting Limited

EQMS Consulting Limited



Ref: EQMS / Surface Water/27082017/009

EQMS Environmental Laboratory Test Results of Surface Water Quality Analysis

	·····
Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Basurhar,
	Daganbhuiyan, Feni
Sampling Location	: SW1- Pond (22°56'31.10"N 91°16'25.10"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

Parameter	GPS 22°56'31.10"N 91°16'25.10"E	Unit	Concentration Present	Bangladesh Standards
Ammonia (NH3)		mg/l	0.26	0.50
Dissolved Oxygen (DO)	-	mg/l	6.4	5 or more
Chemical Oxygen Demand (COD)	-	mg/1	2.6	4.0
Biological Oxygen Demand (BOD)5 days	-	mg/1	<2	2
Potassium		mg/l	3.9	12

Collected by:

Thester **Toffazzal Hossain**

Field Enumerator EQMS Consulting Limited

Analyzed by: er

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Tauhidul Hasan Consultant EQMS Consulting Limited

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Executive Director ting Limited EQMS Cons

EQMS Consulting Limited



Ref: EQMS / Surface Water/28082017/012

EQMS Environmental Laboratory Test Results of Surface Water Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Chandina,
	Debidwar, Comilla.
Sampling Location	: SW1- Pond (23°29'13.06"N 91° 1'14.19"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 28th August, 2017
Date of Analysis	: 4 th September, 2017
Description of Analy	vsis:

Parameter	GPS 23°29'13.06"N 91° 1'14.19"E	Unit	Concentration Present	Bangladesh Standards
Ammonia (NH3)		mg/l	0.17	0.50
Dissolved Oxygen (DO)	-	mg/l	6.2	5 or more
Chemical Oxygen Demand (COD)	-	mg/1	2.1	4.0
Biological Oxygen Demand (BOD)5 days	-	mg/1	<2	2
Potassium	-	mg/l	2.7	12

Collected by:

Trosson **Toffazzal Hossain**

Field Enumerator EQMS Consulting Limited

Analyzed by: This

Tauhidul Hasan Consultant EQMS Consulting Limited



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EQMS Consulting Limited



Ref: EQMS / Surface Water/28082017/014

EQMS Environmental Laboratory Test Results of Surface Water Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 230 kV Multi Circuit Transmission Line from
	Gazaria to Kachua
Sampling Location	: SW1- Meghna - Gomti River (23°30'19.65"N 90°41'31.30"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 28th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

Parameter	GPS 23°30'19.65"N 90°41'31.30"E	Unit	Concentration Present	Bangladesh Standards
Ammonia (NH3)		mg/l	0.11	0.50
Dissolved Oxygen (DO)	-	mg/1	6.5	5 or more
Chemical Oxygen Demand (COD)		mg/1	2.3	4.0
Biological Oxygen Demand (BOD)5 days	-	mg/1	<1	2
Potassium	-	mg/l	2	12

Collected by:

Those **Toffazzal Hossain**

Field Enumerator EQMS Consulting Limited

Analyzed by: Tarke

Tauhidul Hasan Consultant EQMS Consulting Limited SWO Kazilfamed Iqubal Executive Director EQMS Consulting Limited

EQMS Consulting Limited

Appendix F: Test Results of Groundwater Quality

Ref: EQMS / Ground Water / 26082017 / 002

	EQMS Environmental Laboratory
	Test Results of Ground Water Quality Analysis
Project Name	: Enhancement and Strengthening of power network in Eastern region of PGCB Project.
Sub-project Name	: Construction of 230 kV Multi Circuit Transmission Line from Chowmuhoni to Korerhat
Sampling Location	: GW1- Hossain Ali House (22°57'24.95"N 91°32'40.13"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 26th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

....

Parameter	GPS	Unit	Concentration	Bangladesh	
	22°57'24.95"N 91°32'40.13"E		Present	Standards	
pH	-		5.88	6.5-8.5	
Fe	-	mg/1	0.03	0.3-1	
Arsenic	-	mg/1	0.001	0.05	
Mn	-	mg/1	0.7	0.10	
Total Coliform	-	n/100 ml	0	Nil	
Faecal Coliform		n/100 ml	0	Nil	
Chlorine	-	mg/l	0.01	0.02	

Collected by:

cos **Toffazzal Hossain**

Field Enumerator EQMS Consulting Limited

Joule Tauhidul Hasan

Analyzed by:

Consultant EQMS Consulting Limited SV Checked by: Kaz ed Iqubal Exec utive Director

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Ref: EQMS / Ground Water/27082017/005

EQMS Environmental Laboratory Test Results of Ground Water Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Maijdee,
	Noakhali Sadar, Noakhali.
Sampling Location	: GW1- Mofius Mia House (22°48'03.2"N 91°04'56.5"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

Parameter	GPS	Unit	Concentration	Bangladesh	
	22°48'03.2"N 91°04'56.5"E		Present	Standards	
pН			6.57	6.5-8.5	
Fe		mg/l	0.01	0.3-1	
Arsenic	-	mg/1	<0.03	0.05	
Mn	-	mg/1	0.7	0.10	
Total Coliform	-	n/100 ml	0	Nil	
Faecal Coliform	-	n/100 ml	0	Nil	
Chlorine	-	mg/l	0.01	0.02	

Collected by:

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Toffazzal Hossain Field Enumerator EQMS Consulting Limited Analyzed by:

Tauhidul Hasan Consultant EQMS Consulting Limited



EQMS Consulting Limited



Ref: EQMS / Ground Water / 27082017 / 008

EQMS Environmental Laboratory Test Results of Ground Water Quality Analysis

	- , ,
Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Basurhar,
	Daganbhuiyan, Feni
Sampling Location	: GW1- Shatota Filling Station (22°56'29.55"N 91°16'23.46"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:
the second se	

Parameter	GPS	Unit	Concentration	Bangladesh Standards	
	22°56'29.55"N 91°16'23.46"E		Present		
pН			6.60	6.5-8.5	
Fe	-	mg/l	0.06	0.3-1	
Arsenic	-	mg/1	0.001	0.05	
Mn	-	mg/1	0.7	0.10	
Total Coliform		n/100 ml	0	Nil	
FaecalColiform		n/100 ml	0	Nil	
Chlorine		mg/l	<0.02	0.02	

Collected by:

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Toffazzal Hossain Field Enumerator EQMS Consulting Limited Analyzed by:

Tauhidul Hasan Consultant EQMS Consulting Limited



EQMS Consulting Limited



Ref: EQMS / Ground Water/28082017/011

EQMS Environmental Laboratory Test Results of Ground Water Quality Analysis

The second se	
Description of Analy	vsis:
Date of Analysis	: 4th September, 2017
Sampling Date	: 28th August, 2017
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Location	: GW1- Shahid Dilar House (23°29'09.3"N 91°01'15.6"E)
	Debidwar, Comilla.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Chandina,
	Region of PGCB Project.
Project Name	: Enhancement and Strengthening of power network in Eastern
	· · · · · · · · · · · · · · · · · · ·

GPS	Unit	Concentration	Bangladesh
23°29'09.3"N 91°01'15.6"E		Present	Standards
		6.50	6.5-8.5
-	mg/l	0.02	0.3-1
-	mg/1	<0.05	0.05
-	mg/l	0.6	0.10
-	n/100 ml	0	Nil
-	n/100 ml	0	Nil
	mg/1	0.06	0.02
	GPS 23°29'09.3"N 91°01'15.6"E	GPS Unit 23°29'09.3"N 91°01'15.6"E mg/1 mg/1 mg/1 mg/1 mg/1 mg/1 mg/1 mg/1 mg/1	GPS Unit Concentration Present 23°29'09.3"N 91°01'15.6"E - 6.50 mg/1 0.02 mg/1 <0.05

Collected by:

Trassion **Toffazzal Hossain**

Field Enumerator EQMS Consulting Limited Analyzed by: Julic

Tauhidul Hasan Consultant EQMS Consulting Limited



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EQMS Consulting Limited



Ref: EQMS / Ground Water/28082017/013

EQMS Environmental Laboratory Test Results of Ground Water Quality Analysis

Parameter	GPS	Unit	Concentration	Bang
Description of Analy	ysis:			
Date of Analysis	: 4th September, 201	7		
Sampling Date	: 28th August, 2017			
Sample Collector	: Collected by EQMS	S Personnel (Toff	azal Hossain)	
Sampling Location	: GW1- Kader Mia H	House (23°30'26.9	1"N 90°41'31.32"E)	
Sub-project Name	: Construction of 23 Gazaria to Kachua	0 kV Multi Circu	it Transmission Line f	rom
	Region of PGCB Pro	oject.		
Project Name	: Enhancement and	Strengthening of	power network in Ea	stern

Parameter	GPS	Unit	Concentration	Bangladesh Standards	
	23°30'26.91"N 90°41'31.32"E		Present		
pН	-		6.70	6.5-8.5	
Fe	-	mg/l	0.06	0.3-1	
Arsenic		mg/l	<0.01	0.05	
Mn	=	mg/1 0.5		0.10	
Total Coliform	-	n/100 ml	0	Nil	
Faecal Coliform		n/100 ml	0	Nil	
Chlorine	-	mg/l	<0.01	0.02	

Collected by:

Trassmi **Toffazzal Hossain**

Toffazzal Hossain Field Enumerator EQMS Consulting Limited

Analyzed by: Talile .

Tauhidul Hasan Consultant EQMS Consulting Limited



EQMS Consulting Limited

Appendix G: Test Results of Ambient Air Quality Monitoring

Ref: EQMS / Ambient Air/26082017/001

	EQMS Environmental Laboratory
	Test Results of Ambient Air Quality Analysis
Project Name	: Enhancement and Strengthening of power network in Eastern Region of PGCB Project.
Sub-project Name	: Construction of 230 kV Multi Circuit Transmission Line from Chowmuhoni to Korerhat
Sampling Location	: 22°57'20.23"N 91°32'46.83"E
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 26th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:



Location	GPS	Ambient Air Pollutants Concentration in µg/m ³				со
		PM10	PM2.5	SO ₂	NOx	(ppm)
In Front of Project Area	22°57'20.23"N 91°32'46.83"E	67.20	16.26	5.10	11.29	<1
Duration (hr)		24	24	24	24	1
ECR, 1997 Stan	dard (Schedule-2)	150	65	365	100	9
Method of Ana	lysis	Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

Note:

*Regular Checkup and calibration of the equipment's are done by the manufacturers and EQMS personnel to avoid any error

Legend:

Collected by:

Toffazzal Hossain

Field Enumerator

EQMS Consulting Limited

- 1. PM10 Particulate Matter of a diameter of 10 micron or less
- 2. PM2.5 Particulate Matter of a diameter of 2.5 micron or less
- 3. SO2 Sulphur Di-Oxide
- 4. NOx Oxides of Nitrogen
- 5. CO Carbon monoxide
- Analyzed by: Gulue Tauhidul Hasan Consultant IS Consulting Limited Checked by: Kazi Fathed Iqubal Executive Director EQMS Consulting Limited

Consultant EQMS Consulting Limited EQMS Consulting Limited

Flat # C1, House # 76, Road # 5, Block # F, Banani, Dhaka-1213, Bangladesh.

Phone: +88-029873282, Mobile: +88-01911702074, E-mail: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com



Ref: EQMS / Ambient Air/27082017/004

EQMS Environmental Laboratory Test Results of Ambient Air Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Maijdee,
	Noakhali Sadar, Noakhali.
Sampling Location	: 22°48'02.1"N 91°04'57.2"E
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

Location	GPS	Am Cor	co			
		PM10	PM2.5	SO ₂	NOx	(ppm)
In Front of Project Area	22°48'02.1"N 91°04'57.2"E	62.25	18.28	4.16	12.29	<2
Duration (hr)		24	24	24	24	1
ECR, 1997 Standard (Schedule-2)		150	65	365	100	9
Method of Analysis		Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

Note:

*Regular Checkup and calibration of the equipment's are done by the manufacturers and EQMS personnel to avoid any error

Legend:

- 1. PM10 Particulate Matter of a diameter of 10 micron or less
- 2. PM2.5 Particulate Matter of a diameter of 2.5 micron or less
- 3. SO2 Sulphur Di-Oxide
- 4. NOx Oxides of Nitrogen
- 5. CO Carbon monoxide

Collected by:

Tus

Toffazzal Hossain Field Enumerator EQMS Consulting Limited

Analyzed by: Talil

Tauhidul Hasan Consultant EQMS Consulting Limited WO3 Checked by:

Kazi Farhed Iqubal Executive Director EQMS Consulting Limited

EQMS Consulting Limited



Ref: EQMS / Ambient Air/27082017/007

EQMS Environmental Laboratory Test Results of Ambient Air Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Basurhar,
	Daganbhuiyan, Feni
Sampling Location	: 22°56'31.18"N 91°16'24.45"E
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 27th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	vsis:

Location	GPS	Ambient	co			
		PM10	PM2.5	SO ₂	NOx	(ppm)
In Front of Project Area	22°56'31.18"N 91°16'24.45"E	59.29	14.19	4.41	11.73	<1
Duration (hr)		24	24	24	24	1
ECR, 1997 Standard (Schedule-2)		150	65	365	100	9
Method of Analysis		Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

Note:

*Regular Checkup and calibration of the equipment's are done by the manufacturers and EQMS personnel to avoid any error

Legend:

- 1. PM10 Particulate Matter of a diameter of 10 micron or less
- 2. PM2.5 Particulate Matter of a diameter of 2.5 micron or less
- 3. SO2 Sulphur Di-Oxide
- 4. NOx Oxides of Nitrogen
- 5. CO Carbon monoxide

Collected by:

Tasso **Toffazzal Hossain**

Toffazzal Hossain Field Enumerator EQMS Consulting Limited

Analyzed by: Taule

Tauhidul Hasan Consultant EQMS Consulting Limited Kazi Fached Iqubal Executive Director EQMS Consulting Limited

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Phone: +88-029873282, Mobile: +88-01911702074, E-mail: info@eqmsbd.com, eqmsbd@gmail.com, Web: www.eqmsbd.com



Ref: EQMS / Ambient Air/28082017/010

EQMS Environmental Laboratory Test Results of Ambient Air Quality Analysis

Project Name	: Enhancement and Strengthening of power network in Eastern
	Region of PGCB Project.
Sub-project Name	: Construction of 132/33 kV GIS Substation at Chandina,
	Debidwar, Comilla.
Sampling Location	: AQ1 Project Area (23°29'10.5"N 91°01'10.8"E)
Sample Collector	: Collected by EQMS Personnel (Toffazal Hossain)
Sampling Date	: 28th August, 2017
Date of Analysis	: 4th September, 2017
Description of Analy	ysis:

Location	GPS	Ambient	со			
		PM ₁₀	PM2.5	SO ₂	NOx	(ppm)
In Front of Project Area	23°29'10.5"N 91°01'10.8"E	73.22	26.12	7.10	13.36	<1
Duration (hr)		24	24	24	24	1
ECR, 1997 Standard (Schedule-2)		150	65	365	100	9
Method of Analysis		Gravimetric	Gravimetric	West-Geake	Jacob &Hochheiser	CO Meter

Note:

*Regular Checkup and calibration of the equipment's are done by the manufacturers and EQMS personnel to avoid any error

Legend:

- 1. PM10 Particulate Matter of a diameter of 10 micron or less
- 2. PM2.5 Particulate Matter of a diameter of 2.5 micron or less
- 3. SO2 Sulphur Di-Oxide
- 4. NOx Oxides of Nitrogen
- 5. CO Carbon monoxide

Collected by:

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Toffazzal Hossain Field Enumerator EQMS Consulting Limited

Analyzed by: 1

Tauhidul Hasan Consultant EQMS Consulting Limited



EQMS Consulting Limited

Appendix H: List of Participants for Stakeholder Consultations

Stakeholder Consultations in Chittagong

	<u>List of</u>	Participants f	or the Staken	older lonsuito
64	No		A	
dd	ress 37 Ward, North	-Midle f	falislahan	Chi Hagon
ate	2808/2017.		Time	1:00-13:00
PS	S Location			
L 0.	Participant's Name & AddrenAge	Occupation	Telephone No.	Signature
1	Mohanmad Zchiv Aland 38	Town Planne	r, 0171625584	2 Zelah
2	Zahangir Aloren 34	War Secre	my 1575605	854 April
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Stakeholder Consultation at Chandina, Comilla

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ate	28.08.17 .			Time_)	1.00 am
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1	Delwar Henson Bhon	-36	Servie holdore	01714662404	Deres B
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3	Jaman	47	Buriness	01836215000	9 mm
4	Abdul Malek	21			(2) Sol Da
5	NVIZ Islam	52	Servic		15 0
6	Rotigul Islam	38	Former	01739061187	
7	md. Rafiq	47	Business	01824480305	621404120
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Stakeholder Consultation at Gazaria, Munshiganj

		List of	Participants	for Stakeholder Co	nsultations
	No. 05				
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Date	28.08.17			Time	2.00pm
GPS	Location $N-2330'4$	7.3	, E-90°	41'26.4"	
NO.	Participant's Name	Age	Occupation	Telephone No.	Signature
1	Md Ali Akbor	48	holder	01812303632	10 20 fos 17
2	Faruk	42	former		
3	Bassu Momber	62	Business		-1 6 (3) 3 51
4	Md Dulal miah	51	1)	,	-m
5	Kashmin	47	Business	01715863549	Colume '
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Stakeholder Consultation at Korerhat, Chittagong

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PS	Location N-22°55'	36.6	", E- 91	3391 8.4"	
	Participant's Name	Age	Occupation	Telephone No.	Signature
	Md. Zahirul Alem	52	Business	01875-147199	Call: all an owned
2	Md Nutur Dram	32	Driver	01825025950	Md. Nurel Som
3	Md. Jamal Uddin	58	Farmer		DI aM
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5	md. Salim	32	Business	0 1925147114	(त्राः (अभिमारिदिन
3	Md. Aileb Ali	45	former		
7	David Iskam	40	Farmer		0
8	Bappy chandra	30	Service	01765809000	21/2 6-2300
9	Shapon Knimera	28	Painterc	01925018829	HER BEMA
0	Nural Afserz	62	former?		
1	Mir Hossain	42	farmer		
12	Amir Ali	55	Farmer	0188147207	2
13	Rub-el	25	Business	01917380577	20200 202203
14	Md. Jewel	32	Business	0184257758	& Thurs
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Stakeholder Consultation at East Charurea, Noakhali

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1	Sojib	26	Driver	01849272621	STETO
2	Md. NWT Ali	60	Former		
3	Md. Sobujuddin	37	Businers	01865677602	5739
4	Md. Shohogh	43	Former	01836064611	(5112751
5	Md. Bela Hossam	55	Faremere	01823710997	Renter
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# Stakeholder Consultation at Basurhat, Daganbhuiyan, Feni

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	No. 03				
Add	ress Barhurchat,				
Date GPS	e 27.08.17 Location N-22°56'	31.4	", E - 91°1	Time <u>4</u> . 6'24:8''	30 PM
SL No.	Participant's Name	Age	Occupation	Telephone No.	Signature
1	Md. Rafiquel Islam	52	Driver	01818089327	ON:2221 20
2	Waded Attmed	45	Business	01845119566	Wt Sundar 2
3	ABdul Motaleb	33	Businers		6-H:C5/707 (01
4	Shahid	22	Business	01843174716	- 29/29
5	Abdul Soban	37	Service Holder	01703068374	(2792)7
6	Shadad	42	Business	01873666653	
7	Abul Kastern	48	11	01818687826	
8	Md. Manik	24	11	01874271534	
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Facilitated By	G. M. Hasan		
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# **Appendix I: Tree Plantation Plan**

#### 1.0 Objectives

The objective of the tree plantation program is to compensate for the loss of trees due to the implementation of the proposed ESPNER project of PGCB. About 3,501 number (only for the construction of substation subprojects) of various trees of different sizes will be cut down due to construction of the 12 substation subprojects under this project. Since for the construction of transmission as well as the LILO line, no trees will be cut but only trimming of the branches of the trees. The proposed Tree Plantation Plan (TPP) will plant a total number of 7002≈7000 trees for the compensation of tree loses due to acquisition of land for the construction of 12 substation subprojects.

The following areas have been identified for development of plantation sites in the project areas:

- Both side slopes of the constructed access road to the substation sites;
- Surrounding the affected cultural sites within SPIA; and
- In any private land specially around the ponds within SPIA after consultation with the land owners.

#### 2.0 Selection of Tree Species

The species for the propsed TPP have been selected based on the statistics of the lost vegetation and suitability for the intended purpose. This was done in consultation with the concerned officials of the Forest Department (FD) and PGCB officers. The main considerations for the selection of the tree species for the proposed project has been on protection of the habitat for biotic species, improved aesthetics and ecological conservation as well as commercial benefits. Accordingly, the list of tree species proposed to be planted is as follows:

On the slope of access road embankment, cultural areas and in private land:

- Fruit Trees: Date Tree(Phoenix sylvestris), Black berry (Syzygium cumini), Olive (Elaeocarpus floribundus), Palm tree (Borossus flabelliformis)
- Timber Trees: Garjan (Dipterocarpus turbinatus), Shal (Shorea robusta), Shilkoroi (Albzia procera), Akasmoni (Acacia auricoliformis), Kat badam (Terminalia calappa), Mehogani (Swietenia mahagoni), Arjun (Terminaliaarjuna), Epil–epil (Leucaenaleuco cephala) and Raintree ((Samania saman),
- Fuel Trees: Epil–epil (Leucaena leucocephala), Raintree (Samania saman) Koromcha, Radhachura and Krishnochura (Delonix regia),
- Medicine Trees: Neem (Azarlirachla indica), Arjun (Teominalia arjunna), Bel (Aegle marmelos) and Bohera (Terminalia belliricha).

## 3.0 Tree Plantation Regime

According to the prevailing practice in Bangladesh, the FD has recommended to plant minimum 2 trees for each tree felled for the implementation of the project. Total available area for the tree plantation on the side slopes of total approximately 2000 m long and average 2 m height access road embankment will be 2000x2.83x2= 11,320 m². Since the cultural and sensitive location and the private land is yet not selected so the actual land area cannot be identified now.

Under the proposed tree plantation plan:

- timber tree species will cover 60% of the total trees, so total trees 4200
- fruit tree species will cover 20% of the total trees, so total trees 1400
- medicine tree species will cover 10% of the total trees, so total trees 700 and
- Fuel tree species will cover the rest 10% of the total trees, so total trees 700.

The estimated land area under each category of trees and the number of trees are given in Table 1.

Tree Species	Spacing of Tree Species (m)	Total Area (m²)	No. of Trees
Trees on the both si			
Timber (60%)	2.0	6792	1698
Fruit (20%)	2.0	2264	566
Fuel (10%)	2.0	1132	283
Medicine (10%)	2.0	1132	283
Sub-Total:		11320	2830
Trees surrounding t	he nearby cultural sites and ponds	(total area =16680 m2):	
Timber (60%)	2.0	10008	2502
Fruit (20%)	2.0	3336	834
Fuel (10%)	2.0	1668	417
Medicine (10%)	2.0	1668	417
Sub-Total		16680	4170
		Total:	7000

## Table 1: Estimated land area and quantities of trees to be planted

#### 4.0 Institutional Arrangements

The Forest Department (FD) is generally responsible for plantation of all the government owned sites for tree plantation. It is a common practice in Bangladesh that the FD performs the task by themselves. However, the FD will be encouraged to involve the PAPs, especially vulnerable poor and women, in the plantation program. The FD will provide all technical and other supports in planning and developing the plantations.

Nurseries of the FD in project districts can be used for raising the suitable saplings of the tree species for the project areas as mentioned above. There are a number of private sector nurseries in the project district which may be also contacted for raising saplings as well. The FD will also assist the PAPs in developing the tree plantation surrounding their housing space in all possible ways. The Environmental Officer of Project Implementation Unit (PIU), PGCB will be responsible for overall coordination (with the FD, PAPs, and destitute women), implementation and supervision of the program. It is recommended that PGCB should start dialogue with the FD for the tree plantation development program in the pre-construction stage, so that setting up of nurseries for the trees can be done in the early stages of the project.

The tasks of the FD are as follows:

• Training of the local people particularly the PAPs on tree plantation and maintenance;

- Preparation of the tree plantation programs in accordance with this plan and get them approved by the FD and ESU of PIU under PGCB;
- Development of nurseries for raising seedlings;
- Procurement of seedlings of approved species and / or FD nurseries;
- Plantation of seedlings after preparation of the land with fertilizers and installing fences for the protection of saplings;
- Maintenance of the saplings by employing adequate number of the trained PAPs;
- Distribution of saplings among the PAPs settled in and outside of the RA;
- Assist FD and PIU-ESU in procurement and distribution of saplings and other inputs to the PAPs and conduct sample trace studies on the effectiveness of the program in plantation.

## 5.0 Budget

The budget for the proposed tree plantation development plan is given in Table 2. The budget also includes maintenance for first 2 years of plantation to ensure that all planted saplings will survive and provision for an additional plantation. The plantation on the both side slopes of access road embankments, surrounding the nearby affected cultural site and pond areas within SPIA will be taken up after completion of construction work. The budget also includes procurement and development of all facilities required to establish a nursery such as, collection of suitable soils, decomposing cow dung, procurement of fertilizers etc. The budget also includes measures required for maintenance of plantation, such as watering, weeding, fertilizer application, replacing of dead saplings (if any) etc. for first 2 years. Total approx. budget for tree plantation is BDT 0.7 million.

## Table 2: Cost estimates for the tree plantation plan

Tree Plantation Area (sq.m)	Rate (BDT)	Quantity (Nos.)	Amount (BDT)
Total area to be required = 28000	100.00	7000	700,000
Total:			700,000

# Appendix J: Environmental Code of Practice (ECOP)

The Environmental Code of Practice (ECOP) is a guideline for eliminate or reducing environment impacts/risks due to construction of the subprojects under Enhancement and Strengthening of Power Network in Eastern Region of PGCB (construction of substations, and Transmission Lines). The relevant ECOP of the Project are as follows:

## ECOP 1.0: Planning and Design Phases of a Project

#### <u>1.1 General</u>

This ECOP details the factors to be considered during project preparation to avoid/address environmental concerns through modifications in project design and incorporation of mitigation measures.

## <u>1.2 Compliance to Legal Requirements</u>

The bid document shall include the various applicable clearances pertaining to environmental management and shall contain the necessary procedures for compliance of the same.

## ECOP 2.0: Route Selection

## 2.1 Selection and Finalization of Alignment/Project Location

- Adequate consultations with the communities to identify the concerns and preferences need to be taken up during selection of the alignment of the River Crossing Towers.
- Alignment shall conform to the natural topography as far as possible to avoid excessive cut and fill.
- Special care should be taken to align the routes along the hillside, which is stable and where cutting on hillside causes least disturbance.
- Consultations with the local communities are to be conducted to obtain their suggestions and incorporate their concerns to address the potential environmental impacts.
- Selection of site for substations should be done in consultation with the local communities addressing the environmental as well as social issues so as to cause least possible adverse impacts.
- In case of flood prone areas and/or areas with very flat slopes, hydrological surveys have to be conducted before alignment finalization.

## ECOP 3.0: Tower/Pole Erection

## <u>3.1 General</u>

Erection of poles/towers for installation of 33kV/132kV power transmission lines of the PGCB involves:

- i. Informing the local community about the installation schedule;
- ii. Marking and clearance of the designated locations for installation/replacement of SPC poles/Steel tower. Scope of this ECoP includes only the measures to address environmental concerns expected during the Pole erection process.

## 3.2 Pole/Tower Erection Activities by PGCB

- Informing the community and local city/village councils about the likely schedule of erection;
- After obtaining the consent of the community PGCB shall be responsible to stake out the designated locations.

## 3.3 Pole/Tower Erection Activities by the Contractor

- The contractor shall submit the schedules and methods of operations for various items during the Pole/Tower erection operations to the PGCB for approval.
- The clearance of sites shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures:
  - To minimize the adverse impact on flora and vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed.
  - In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit.
  - The disposal of wastes shall be in accordance with the provisions of ECOP 11.0, "Waste Management".

#### **River Crossing Towers**

- All regulatory clearances shall be obtained before actual start of work. River Crossing Towers are very high electric towers specially designed to cross large rivers. Tower construction for river crossing will require proper protective measures against bank collapse. Sheet-Piling or Shore protection measures should be ensured while laying the foundation of the tower near the river bank or in the river bed. Pre-cast piles should be driven in with extreme care so as to expose the workers to the least possible danger.
- Foundation should be checked for damages or uneven settlement following construction.
- Proper safety measures should be ensured prior to river crossing jobs.
- The work plans should be submitted by the contractor/engineer prior to commencement of the erection work. The work plan should provide detailed steps of foundation works in the river. River traffic movement should not be obstructed t any stage.
- Proper protective measures should be adopted to prevent or minimize river water pollution.
- Using of vibratory hammer for pile work is preferable to reduce impact on aquatic habitat
- Installation of underwater enclosures to minimize sound.
- Use signage and construct fender( if necessary) to prevent collision with vessel

## ECOP 4.0: Overhead Power Cable Installation

## <u>4.1 General</u>

Installation of 33kV/132kV power distribution/transmission lines of the PGCB involves:

- i. Informing the local community about the installation schedule;
- ii. Marking and clearance of the designated routes for installation/rehabilitation of overhead power lines. Scope of this ECOP includes only the measures to address environmental concerns expected during the power cable installation process.

## 4.2 Overhead Distribution/Transmission Cable Installation Activities by PGCB

- Informing the community and local city/village councils about the likely schedule of installation;
- After obtaining the consent of the community PGCB shall be responsible to stake out the designated route.

## 4.3 Overhead Distribution/Transmission Cable Installation Activities by the Contractor

- The contractor shall submit the schedules and methods of operations for various items during the overhead power cable installation/rehabilitation operations to the PGCB for approval.
- The clearance of sites shall involve the removal of all materials such as trees, bushes and rubbish. Towards this end, the Contractor shall adopt the following measures:
  - To minimize the adverse impact on flora and vegetation, only ground cover/shrubs that impinge directly on the permanent works, if any, shall be removed.
  - The disposal of wastes shall be in accordance with the provisions of ECOP 11.0, "Waste Management".
  - All regulatory clearances shall be obtained before actual start of work.

## ECOP 5.0: Installation of Transformers on H-Pole

## <u>5.1 General</u>

Installation of Transformers on H-Poles along the route:

- i. Informing the local community about the installation schedule;
- ii. Marking and clearance of the designated locations for installation of transformers on Hpoles Scope of this ECOP includes only the measures to address environmental concerns expected during the power cable installation process.

#### 5.2 Activities Involved in Transformer Installation on H-Pole by PGCB

- Informing the community and local city/village councils about the likely schedule of installation;
- After obtaining the consent of the community PGCB shall be responsible to stake out the designated locations.

#### 5.3 Activities Involved in Transformer Installation on H-Pole by the Contractor

- The contractor shall submit the schedules and methods of operations for various items during the installation operations of the transformers on H-Pole to the PGCB for approval.
- The clearance of sites shall involve the removal of all materials such as trees, bushes and rubbish. Towards this end, the Contractor shall adopt the following measures:
  - To minimize the adverse impact on flora and vegetation, only ground cover/shrubs that impinge directly on the permanent works, if any, shall be removed.
  - The disposal of wastes shall be in accordance with the provisions of ECOP 7.0, "Waste Management".

• All regulatory clearances shall be obtained before actual start of work.

## **ECOP 6.0: Site Preparation for Substations**

## <u>6.1 General</u>

The preparation of site for construction of electrical substations involves:

- i. Marking and clearance of the required project area of all encroachments by the PGCB prior to mobilization of Contractor;
- ii. Informing the local community about construction schedule; and
- iii. Site preparation by the contractor prior to commencement of construction. Scope of this ECOP includes only the measures to address environmental concerns expected during the site preparation.

## 6.2 Site Preparation Activities by the PGCB

- Informing the community and local village councils about the likely schedule of construction
- After obtaining the consent of the community the PGCB shall be responsible to stake out the substation locations and boundary.

## 6.3 Site Preparation Activities by the Contractor

- The contractor shall submit the schedules and methods of operations for various items during the construction operations to the PGCB for approval.
- The clearance of site shall involve the removal of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, part of topsoil and rubbish. Towards this end, the Contractor shall adopt the following measures:
  - To minimize the adverse impact on flora and vegetation, only ground cover/shrubs that impinge directly on the permanent works shall be removed.
  - In locations where erosion or sedimentation is likely to be a problem, clearing and grubbing operations should be so scheduled and performed that grading operations and permanent erosion and sedimentation control features can follow immediately, if the project conditions permit.
  - The disposal of wastes shall be in accordance with the provisions of ECOP 11.0, "Waste Management".
  - All regulatory clearances shall be obtained before actual start of work.

## ECOP 7.0: Construction Camps

#### 7.1 General

This ECOP provides guidelines on the selection, development, maintenance and restoration of construction camp sites in order to avoid or to mitigate against significant adverse environmental effects, both transient and permanent.

#### 7.2 Construction Camp Location

During planning of the works consideration shall be given to the location of construction camps for the field implementation of the project. Construction camps and areas identified that may be suitable for the development of such camps shall be selected in consultation with the Engineer of the PGCB. Areas which are not suitable for reasons such as environmental, cultural or social sensitivity shall also be identified. Wherever possible, construction camps shall be planned in areas that will have minimal adverse environmental effects. In identifying such areas particular care shall be taken to evaluate the adverse effects on water, noise and air pollution, which, although transient, will preclude the use of some areas as construction camp sites. The contractor shall consult with the local community in selecting the location of the construction camp. It should be ideally in a distant location from the community so that the regular day-to-day activities of the communities are not disturbed due to the construction camps.

Construction camp sites shall be located such that permanent adverse environmental effects can be avoided or mitigated against and transient adverse environmental effects are minimized. Camp sites shall not be located in areas identified during the planning stage as unsuitable for such use. The site or sites shall be selected such that mitigation measures stipulated in this ECOP can be implemented with reasonable facility.

## 7.3 Private Land

Where construction camps are to be located on land outside the road reserve the contractor shall obtain the approval of the landowner to establish the camp site on such land and pay agreed compensation as per the Resettlement and Rehabilitation Framework. Environmental protection measures established by this ECoP shall apply to all land regardless of ownership.

#### 7.4 Construction Camp Facilities

The construction camp shall be provided with the following minimum facilities:

- A perimeter security fence at least 1.5m in height constructed from appropriate materials.
- Ablution block with a minimum of one water closet toilet or Pota-cabin, one urinal and one shower for personnel engaged either permanently or temporarily on the project. Pota-cabins or separate toilet and wash facilities shall be provided for male and female employees.
- A sickbay and first aid station.
- Areas for the storage of fuel or lubricants and for a maintenance workshop. Such an area shall be bounded and have a compacted/impervious floor to prevent the escape of accidental spillage of fuel and or lubricants from the site. Surface water drainage from bounded areas shall be discharged through purpose designed and constructed oil traps. Empty fuel or oil drums may not be stored on site.
- Storm water drainage system to discharge all surface run off from the camp site to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention for storm water flow from the whole site that will be generated by a 20 year return period rainfall having a duration of at least 15 minutes. The run-off coefficient to be used in the calculation of the silt pond volume shall be 0.9. Silt ponds shall be maintained in an efficient condition for use throughout the construction period with trapped silt and soil particles being regularly removed and transported and placed in waste material disposal areas as per ECOP 11.0.
- All discharge from the silt retention pond shall be channeled to discharge to natural water via a grassed swale at least 10 meters in length with suitable longitudinal gradient.
- All camp facilities shall be maintained in a safe clean and or appropriate condition throughout the construction period.

#### 7.4.1 Construction Camp Development Plan

A development plan of the construction camp shall be prepared describing the following:

- Perimeter fence and lockable gates
- Workshop
- Accommodation
- Ablutions
- Water supply
- Wastewater disposal system
- Bounded fuel storage area
- Proposed power supply
- Proposed all weather-surfaced areas.

## 7.5 Site Restoration

At the completion of the construction work, all construction camp facilities shall be dismantled and removed from the site and the whole site restored to a similar condition to that prior to the commencement of the works or to a condition agreed to with the owner of the land. All oil or fuel contaminated soil shall be removed from the site and transported and buried in waste soil disposal areas.

## ECOP 8.0: Topsoil Salvage, Storage and Replacement

#### <u>8.1 General</u>

Loss of topsoil will be a long-term impact along the process of construction of substations, installation or rehabilitation of the overhead power cables by the PGCB due to,

- i. Site clearance and excavation for temporary road, substation, protective embankment, etc.
- ii. Development of borrow areas

iii. Temporary construction activities as material storage locations, diversion routes, etc.

Scope of this ECoP includes removal, conservation and replacement of topsoil.

#### 8.2 Pre-construction Stage

The arrangements for temporary usage of land, borrowing of earth and materials by the Contractor with the land owner shall include the conservation/preservation of topsoil.

#### 8.3 Construction Stage

- The stockpiles for storing the topsoil shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and the height of the pile is restricted to 2m.
- In cases where the topsoil has to be preserved for more than a month, the stockpile is to be stabilized within 7 days. The stabilization shall be carried out through temporary seeding. It consists of planting rapid-growing annual grasses or small grains, to provide initial, temporary cover for erosion control.
- After spreading the topsoil on disturbed areas, it must be ensured that topsoil is seeded, and mulched within 30 days of final grading.
- During construction, if erosion occurs from stockpiles due to their location in small drainage paths, the sediment-laden runoff should be prevented from entering nearby watercourses.
- The Contractor shall preserve the stockpile material for later use on slopes or shoulders.

#### 8.4 Post-construction Stage

- The topsoil shall be re-laid on the area after taking the borrow earth to maintain fertility of the agricultural field, finishing it to the required levels and satisfaction of the farmer.
- All temporary arrangements made for stockpile preservation and erosion control are to be removed after reusing the stockpile material.

#### ECOP 9.0: Borrow Areas

#### <u>9.1 General</u>

In general transmission line will pass over the agricultural land, low lying area. A high level temporary access may be required for tower foundation or mobilization of equipment and vehicles. Embankment or filling material, if needed, is to be procured from borrow areas designated for the purpose. The scope of this ECOP extends to measures that need to be incorporated during borrow area identification, material extraction and rehabilitation with regard to environment management.

## 9.2 Pre-construction Stage

The contractor shall identify the borrow area locations in consultation with the owners, after assessing the suitability of the material. The suitable sites shall be selected and finalized in consultation with PGCB.

#### 9.3 Construction Stage

The contractor should adopt the following precautionary measures to minimize any adverse impacts on the environment:

- i. Borrow pits situated less than 0.5 km (if unavoidable) from villages and settlements should not be dug for more than 30 cm after removing 15cm of topsoil and should be drained.
- ii. The Contractor shall maintain erosion and drainage control in the vicinity of all borrow pits and make sure that surface drains do not affect the adjacent land or future reclamation.
- iii. In case the borrow pit is on agricultural land, the depth of borrow pits shall not exceed 45 cm and may be dug out to a depth of not more than 30 cm after stripping the 15 cm top soil aside.
- iv. In case of riverside, borrow pit should be located not less than 15m from the toe of the bank, distance depending on the magnitude and duration of flood to be withstood.

#### 9.4 Post-construction Stage

It needs to be ensured that all reclamation has been carried out in accordance with the restoration plan. Certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that "the land is restored to his satisfaction". The final payment shall be made after the verification by the PGCB.

## ECOP 10.0: Slope Stability and Erosion Control

#### <u>10.1 General</u>

- Stability of slopes is a major concern in hill areas and locations of high embankment.
- Soil erosion is consequent to high runoff on hill slopes, high wind velocities cause erosion of embankments made up of cohesion-less sandy soils.
- Embankments made up of silty and sandy soils are eroded, in the absence of vegetative cover, when the slopes are steep, say more than 20 degrees.
- Erosion control is provided to prevent soil damage done by moving water.
- The scope of this ECoP includes measures to minimize the adverse environmental impacts on slope stability and soil erosion due to the construction of embankments. The adverse environmental impact can be:
  - i. damage to adjacent land,
  - ii. silting of ponds and lakes disturbing the aquatic habitat
  - iii. erosion of rich and top fertile top layer of soil
  - iv. contamination of surface water bodies and
  - v. reduction in road formation width due to erosion of shoulders/berms.

#### 10.2 Pre-construction Stage

- Interceptor ditches are constructed in hill areas to protect the road bench and hillside slope from erosion due to heavy rainfall and runoff.
- Interceptor ditches are very effective in the areas of high intensity rainfall and where the slopes are exposed.

## 10.3 Construction Stage

- The vegetative cover should be planted in the region where the soil has the capacity to support the plantation and at locations where meteorological conditions favors vegetative growth.
- On side slopes in hills, immediately after cutting is completed and debris is removed, vegetative growth has to be initiated by planting fast growing species of grass.
- In regions of intensive rainfall, locations of steep slopes, regions of high soil erosion potential and regions of short growing seasons, erosion control matting should be provided.
- Adequacy of drainage for erosion control

## 10.4 Post-construction Stage

All the exposed slopes shall preferably be covered with vegetation using grasses, bushes etc. Locally available species possessing the properties of (i) good growth (ii) dense ground cover and (iii) deep root shall be used for stabilization.

## ECOP 11.0: Waste Management

#### <u>11.1 General</u>

This code of practice describes procedures for handling, reuse and disposal of waste materials during construction of the substations, rehabilitation of the existing substations/transmission or distribution lines. The waste materials generated can be classified into

- i. Construction Waste;
- ii. Domestic waste;
- iii. Discarded conductors from rehabilitated power lines; and
- iv. Discarded switchboxes, bus-bars, transformers, etc. from rehabilitated substations.

#### 11.2 Pre-construction Stage

- The contractor shall identify the activities during construction that have the potential to generate waste and work out measures for the same in the construction schedule.
- The Contractor shall educate his workforce on issues related to disposal of waste, the location
  of disposal site as well as the specific requirement for the management of these sites.

#### 11.3 Construction Stage

- The contractor shall either re-use or dispose the waste generated during construction depending upon the nature of waste.
- The contractor shall dispose off wastes that could not be re-used safely.
- The waste management practices adopted by the Contractor shall be reviewed by PGCB during the progress of construction.
- Discarded conductors resulting from the rehabilitation of power lines should be recycled under the guidance PGCB.
- Discarded transformers should be properly disposed of as per the guidelines of PGCB so as to minimize environmental pollution.
- The old transformers may contain hazardous chemicals such as PCB which should be handled as per the national/international Hazardous Waste Management guidelines. However, the more recent transformers do not contain such hazardous oil. Therefore, such non-hazardous oil should be discarded following the waste disposal guidelines as stipulated in ECR '97. Therefore, during the substation rehabilitation process the old transformers containing PCB should be discarded following available technologies; namely, super critical oxidation, electrochemical oxidation, solvated electron technology, chemical reduction method, dehalogenation process, and thermal desorption using pyrolysis, catalyzed dehalogination and vitrification.

 The waste generated from the discarded switchgears, bus-bars, etc. following the rehabilitation process should be handled as per the guidelines for E-waste management specified in ECR '97.

## <u>11.4 Post-construction Stage</u>

- After decommissioning of construction sites, the Contractor shall hand over the site after clearing the site of all debris/wastes to the PGCB.
- In case of disposal of wastes on private land, certificate of Completion of Reclamation is to be obtained by the Contractor from the landowner that "the land is restored to his satisfaction".

## ECOP 12.0: Water Bodies

#### <u>12.1 General</u>

Water bodies may be impacted when the infrastructure development project activities are adjacent to it or the runoff to the water body is affected by change of drainage pattern due to construction of embankment. The following activities are likely to have an adverse impact on the ecology of the area:

- i. Earth moving
- ii. Removal of vegetation
- iii. Waste disposal from construction works

#### <u>12.2 Pre-Construction Stage</u>

When there is interruption to regular activities of the inhabitants near water body due to construction or rehabilitation work, following are the Contractor's responsibilities:

- i. Restriction on use of water during construction, if any, should be intimated to the community in advance.
- ii. Alternate access to the water body is to be provided in case there is interruption to use of exiting access.
- iii. If the water body affected is a drinking water source for a habitation, alternate sources of water are to be provided to the users during the period for which its use is affected.

#### 12.3 Construction Stage

- It should be ensured by the contractor that the runoff from construction site entering the water body is generally free from sediments.
- Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated.
- Cutting of embankment reduces the water retention capacity and also weakens it, hence:
  - i. The contractor should ensure that the decrease in water retention should not lead to flooding of the construction site and surroundings causing submergence and interruption to construction activities.
  - ii. Any perceived risks of embankment failure and consequent loss/damage to the property shall be assessed and the contractor should undertake necessary precautions as provision of toe protection, erosion protection, sealing of cracks in embankments. Failure to do so and consequences arising out of embankment failure shall be the responsibility of the contractor. The PGCB shall monitor regularly whether safe construction practices near water bodies are being followed.
- Alternate drain inlets and outlets shall be provided in the event of closure of existing drainage channels of the water body.
- Movement of workforce shall be restricted around the water body, and no waste from construction sites shall be disposed into it.

## 12.4 Post-construction Stage

- The zones of the water body have to be left clean and tidy with the completion of construction.
- Engineers of PGCB will check if drainage channels of adequate capacity have been provided for the impacted water body.

## ECOP 13.0: Water Qualities

#### <u>13.1 General</u>

- Construction of the substations, small-scale access road construction and small-scale embankment construction may affect the aquatic environment, by lowering or raising water levels, and decreasing water quality.
- Deterioration of water quality and disturbance of aquatic environment by lowering or rising of water levels.

#### <u>13.2 Pre-construction Stage</u>

Following measures are to be undertaken by the contractor prior to the commencement of construction:

- Base line data of the water quality is necessary.
- In addition, the availability of enough water during the lean season needs to be assessed as part of the baseline data collection.

#### 13.3 Construction Phase

- Improper disposal of solid and liquid waste including excreta generate from sites will pollute the water quality and proper prevention measure should be taken.
- Wastewater and toxic chemicals disposal, sanitation/latrines may have positive cumulative effects on human health, but if not properly implemented may affect ground and surface and ground water quality; the contractor should give proper attention on it during construction stage.
- Protect water bodies from sediment loads by silt screen or bubble curtains or other barriers.

#### 13.4 Post-construction Phase

Inspection of water quality shall be done regularly.

## ECOP 14.0: Drainage

#### <u>14.1 General</u>

 Drainage is designed for temporary access roads to direct surface or subsurface flow away to a safe outfall without damage to the structure, adjoining property or agricultural fields.

#### 14.2 Pre-construction Stage

- Following measures are to be undertaken by the contractor prior to the commencement of construction:
  - i. The downstream as well as upstream user shall be informed one month in advance
  - ii. The contractor shall schedule the activities based on the nature of flow in the stream while constructing the substations and access roads.
  - iii. The contractor should inform the concerned departments about the scheduling of work. This shall form part of the overall scheduling of the civil works to be approved by PGCB.

- iv. All the safety/warning signs are to be installed by the contractor before start of construction
- In case of utilization of water from the stream, for the construction, the contractor has to take the consent from the concerned department.

## 14.3 Construction Phase

- Temporary drainage at construction site shall be provided at the earliest to ensure proper compaction
- In hill areas sub-surface drains, if required, shall be provided immediately after cutting the slopes and forming the roadbed (sub grade).
- Safety devises and flood warning signs to be erected while working over streams and canals.

## 14.4 Post-construction Phase

- Inspection and cleaning of drain shall be done regularly to remove any debris or vegetative growth that may interrupt the flow.
- Temporary structures constructed during construction shall be removed before handing over to ensure free flow through the channels.

## ECOP 15.0: Electromagnetic Field

## <u>15.1 General</u>

Electromagnetic Field during the rehabilitation of the existing transmission or distribution lines may be a cause of concern. Thus, appropriate protective measures should be adopted during the implementation phase.

Electric and magnetic fields (EMF) are invisible lines of force emitted by and surrounding any electrical device (e.g. power lines and electrical equipment). Electric fields are produced by voltage and increase in strength as the voltage increases. Electric field strength is measured in volts per meter (V/m). Magnetic fields result from the flow of electric current and increase in strength as the current increases. Magnetic fields are measured in units of gauss (G) or tesla (T), where 1T equals 10,000G. Electric fields are shielded by materials that conduct electricity, and other materials, such as trees and building materials. Magnetic fields pass through most materials and are difficult to shield. Both electric and magnetic fields decrease rapidly with distance. Power frequency EMF typically has a frequency in the range of 50 – 60 Hertz (Hz), and is considered Extremely Low Frequency (ELF). Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern. Recommendations applicable to the management of EMF exposures include: Evaluating potential exposure to the public against the reference levels developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Average and peak exposure levels should remain below the ICNIRP recommendation for General Public Exposure. Considering siting new facilities so as to avoid or minimize exposure to the public. Installation of transmission lines or other high voltage equipment above or adjacent to residential properties or other locations intended for highly frequent human occupancy, (e.g. schools or offices), should be avoided;

If EMF levels are confirmed or expected to be above the recommended exposure limits, application of engineering techniques should be considered to reduce the EMF produced by power lines, substations, or transformers. Examples of these techniques include:

• Shielding with specific metal alloys

- Burying transmission lines
- Increasing height of transmission towers
- Modifications to size, spacing, and configuration of conductors

## 15.2 Post Construction

- During the Post-construction phase, PGCB should monitor the EMF around the substations and under the Distribution/Transmission lines on a regular basis.
- Construction of residential buildings and/or small households should only be allowed ensuring the safe distance as specified in the Code.

## ECOP 16.0: Public Health and Safety

## <u> 16.1 General</u>

The safety and health of the public is impacted due to the hazards created during the construction period. This code of practice describes the measures that need to be taken to mitigate the impacts.

#### 16.2 Pre-construction Phase

- In order to incorporate public health and safety concerns, PGCB and the Contractor shall disseminate the following information to the community:
  - i. Location of project activities,
  - ii. Borrow areas,
  - iii. Extent of work
  - iv. Time of construction
  - v. Involvement of local labors in the construction
  - vi. Health issues exposure to dust, communicable diseases etc.

#### 16.3 Construction Phase

- The Contractor shall schedule the construction activities , such as:
  - i. Sowing of crops
  - ii. Harvesting
  - iii. Local hindrances such as festivals, etc.
  - iv. Availability of labor during particular periods
- Proper safety/warning signs are to be installed by the contractor to inform the public of potential health and safety hazard situations during the construction phase in the vicinity of the project.
- The PGCB shall carry out periodic inspections in order to ensure that all the measures are being undertaken as per this ECOP.

#### 16.3 Post-construction Phase

The construction site shall be cleaned of all debris, scrap materials and machinery on completion of construction for the safety of public and users. During operation phase (especially during reglar maintenance) following issues should be addressed:

- Regular patrolling along the power lines to identify the need for regular and immediate maintenance operation.
- Inspection immediately after a major storm/rainfall event
- Regular cutting and trimming of trees around power lines.
- Provision for shutting down of line in case of snapping of line.
- Regular monitoring of power lines to prevent electricity pilferage especially when Axially Bundled Cables (ABC) is used which may lead to accident.

- No temporary/permanent shops underneath the H-pole to be allowed
- No Dumpster to be allowed underneath the H-Pole.

## ECOP 17.0: Material Storage, Transport and Handling

## <u>17.1 General</u>

Activities related to materials storage, handling, and transfer that are considered to potentially have negative environmental effects include:

- Transportation, storage, handling and of construction materials;
- Storage, handling, and transfer of petroleum, oil, and lubricant (POL) products;
- Application of asphaltic concrete and asphalt binder;
- Storage and handling of hazardous materials other than POL products; and
- Storage and application of transformer oil.

Some materials used during implementation of projects may have potentially hazardous effects on the environment if not properly stored and handled.

#### 17.2 Transportation, Handling and Storage of Cement and Aggregates

- The Contractor shall be responsible for ensuring that all trucks and carriers are clean and dry prior to loading them with cement or aggregates. All trucks and carriers for transporting cement/aggregates shall be equipped with weather proof closures on all openings.
- All cement/aggregates that will be brought to the site shall be kept free from contact with deleterious matter.
- All cement/aggregates shall be placed on impervious mat spread over the storage area to prevent direct contamination of top soil in the storage area. Stockpiling of cement/aggregates should be limited to minimum space and should be covered with weatherproof closures.
- Stockpiles shall be built up in horizontal or gently sloping layers. Overlap of different materials shall be prevented by suitable walls of ample distance between stockpiles.
- The Engineer shall approve the site for the storage of all aggregates.
- The Engineer shall approve the methods of handling aggregates and the equipment used.

<u>17.3 Environmental Concerns</u> with Materials used for Construction and Maintenance of Infrastructure Development Projects. Concerns are related to accidental releases into the environment, such as spills, refueling losses, and leakage from equipment that could result in contamination of soil, groundwater, or surface waters.

Groundwater may transport the contaminants off-site to down-gradient aquifers or water supplies, or discharge them into surface waters. Therefore, release of potential contaminants on the ground surface could have significant environmental impacts that could ruin groundwater (well supplies).

#### 17.3.1 Petroleum, Oil, Lubricants and Transformer Oil

The toxic effect of a petroleum product in the aquatic environment varies considerably due to the different chemical composition of each petroleum product. The toxicity of petroleum products is related largely to its solubility in water. Petroleum pollution from accidental spills may affect aquatic birds, fish and vegetation. The effect of oil on birds' feathers (loss of insulation) is an important cause of death. Oil polluting the water may also be toxic to birds if they ingest it. Plants in marshes or in wetlands (haor, baor, ponds and others) and steams may die off for short periods. Long-term impacts of spilled petroleum products are associated with the portion, which sinks and becomes incorporated into bottom sediments. This causes the petroleum products to degrade very slowly and they may persist for many years.

Petroleum products can stick to the gills of fish and interfere with normal respiration. Under relatively mild pollution, fish may produce mucus as a defensive mechanism to remove the oil. However, in heavy pollution, this mechanism is inefficient and the oil tends to accumulate on the gills and smother the fish. Petroleum products contain soluble materials, which can be ingested by fish. The flavor of the fish flesh may, therefore, become tainted, or if ingested in enough quantity, may become lethal. Groundwater sources contaminated with petroleum products may have potentially toxic effects on consumers.

## 17.3.2 Asphalt Products

Environmental concerns with tack asphalt binder, and asphaltic concrete are also related to the hydrocarbon components, which are toxic to aquatic life, wildlife, and humans. As mentioned above, if these materials sink to the bottom, they may destroy the fish's source of food supply and smother the eggs or emerging fry.

#### 17.3.3 Other Hazardous Materials

The following hazardous materials are likely to be generated in construction, rehabilitation or maintenance activities of substation and power lines and have potential environmental concerns:

- Paints;
- Solvents;
- Transformer Oil; and
- Fresh concrete and admixtures.

Paint materials, which are lead – or oil-based, may affect aquatic life if significant amounts enter a watercourse. Specific concern exists with lead, as this compound may have a direct toxic effect on young fish. Toxins can accumulate over time in aquatic fish, bugs, and plants. Upon consumption by animals such as birds and small mammals, some metals could be transferred to the consumer and affect their health.

Some solvents used for cleaning purposes may contain components, which are toxic to aquatic life, wildlife, and humans. If solvents enter a watercourse/water supply, and significant concentrations occur in the water, this could be harmful to users.

Concrete, which is typically made up of aggregates, cement, water, and possibly admixtures, is very alkaline because of its calcium (lime) content. If concrete enters a watercourse in significant amounts, the pH of the water may be affected locally over the short-term. If the pH of the receiving water is altered, this may cause physiological stress in fish, which may result in death.

When a power line (Transmission and/or Distribution) is re-conductored the old conductors are discarded. Recylcing of these metal conductors should be practiced to reduce waste generation.

The old transformers contained transformer oil which is hazardous to the human and environment.

## 17.4 Storage, Transport and Handling of POL Products

Care must be taken with the storage, transfer, handling of POL products to prevent potential environmental damage. All empty containers and drums shall be returned to the maintenance depot. It shall be ensured that all drums and containers are closed and not tipped over and all waste oil, lubricants, and solvents shall be stored in closed containers.

## 17.4.1 Storage

Any container, drum, or tank that is dented, cracked, or rusted will probably eventually leak. Make sure all containers, drums, and tanks that are used for storage are in good condition. Check for leakage regularly to identify potential problems before they occur.

The proper storage of materials will greatly reduce the risk of accidental spills or discharges into the environment.

For temporary outdoor storage, put containers and drums in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area should preferably slope or drain to a safe

collection area in the event of a spill. Tanks should have appropriate secondary containment (i.e. double-walled or surrounded by a dyke) that will collect spilled material in case of a leak. Permanent storage areas for containers or drums should be on an impermeable floor that slopes to a safe collection area in the event of a spill or leak.

#### 17.4.2 Transport and Handling

At all times when products are being handled or transported, care must be taken to prevent any product from being spilled, misplaced, or lost and possibly entering and contaminating the soil or a natural waterway. When equipment and vehicle maintenance or repair is required in the field, it should be undertaken at least 30 m away from any watercourse. Minimize the potential for entry of hydraulic fluids or oil into a watercourse by using sorbent materials to collect spilled petroleum products. Return all used sorbent materials to the appropriate storage yards for safe disposal.

Return all diesel or fuel used to wash asphalt emulsion pumps to the maintenance depot for safe storage or disposal. Also return all solvents used to wash spray-painting or other equipment to the appropriate storage yards for safe disposal.

Wash equipment in maintenance areas equipped with oil/water separators so that any petroleum products can be removed prior to discharge of the wastewater. Oil/water separators are only effective if they are properly maintained. At sites without oil/water separators, minimize the amount of wash water used and wash in areas where the potential for entry of wash water into a waterway is minimized by proper grading or curbing.

Tankers should not be washed near watercourses. Wash out should be done in places where proper grading or curbing minimizes the potential for entry of wash water into a waterway. Re-fuelling or servicing of equipment and vehicles to be done at least 30 m away from any watercourse. Re-fuelling over liner material with an absorbent pad (e.g. sand bed) will help to contain potential spills. If re-fuelling is done from a bulk tanker, the hose/nozzle assembly should be replaced to its proper position upon completion.

#### 17.5 Spills and Spill Cleanup

Quick action in the event of a spill of hazardous materials is important in order to prevent environmental damage.

Things to do when a spill occurs:

- 1. Identify the material Involved and make a quick assessment:
  - How extensive is the spill?
  - Are there any watercourses nearby?
  - Are the watercourses down gradient from the spill?
  - Are there drainage systems down gradient from the spill, which lead to a nearby watercourse?
- 2. Stop the flow of product, if it can be done safely.
- 3. Notify the Engineer and Authorities immediately.
- 4. Control and contain spilled product until expert help arrives, if it can be done safely.

#### 17.5.1 How to Control and Contain a Spill

When a limited oil spill occurs on level land, scoop up the affected soil and dispose at a site approved by the Engineer and the Department of Environment. When an extensive oil spill occurs on level land, dig sump hole and pump excess oil into a temporary container. The remaining contaminated soil must be scooped up and disposed of at a site approved by the Engineer and the Department of Environment.

When an extensive spill occurs on a slope or hillside, a trench can be dug downhill from the spill to intercept the spilt material.

Should petroleum products reach a watercourse, several temporary spill containment measures can be sued to help stop the spreading of products.

## 17.6 Storage and Handling of Dangerous Materials

Workers may be at risk from exposure to dust particles or toxic fumes from chemicals used in road works and materials testing.

Specific measures to reduce risks include limiting time of exposure to dust particles, chemicals and noise; enhancing safety and inspection procedures; and improving materials safe handling.

## ECOP 18.0: Vegetation Management

## <u> 18.1 General</u>

- Besides improving aesthetics and ecology of the area, the vegetation provide fuel wood, act as noise barriers, provide visual screen for sensitive areas and also generate revenue by sale of its produce.
- This code of practice elaborates on the approach towards planting trees. Emphasis has been laid on a greater involvement of communities in planting and maintenance of trees.

## 18.2 Project Planning and Design Phase

- During alignment of transmission line finalization, due consideration shall be given to minimize the loss of existing tree cover
- Tree felling, if unavoidable, shall be done only after compensatory plantation of at least two saplings for every tree cut is done.
- The species shall be identified in consultation with officials of forest department/local community, giving due importance to local flora, preferably same species as cut. It is recommended to plant mixed species in case of both avenue or cluster plantation.
- Design of plantation of fruit bearing trees and other suitable trees.
- It should be ensured that plantation is carried out only in areas where water can be made available during dry seasons and the plant can be protected during the initial stages of their growth.

#### 18.3 Post-construction Phase

 During the operational phase regular trimming of trees along the route, PGCB personnel may become essential to prevent accidents due to over-growth onto the power lines. However, his activity should be conducted with minimal damage to the existing vegetation.

The project proponents would take up the planting of fruit bearing and other suitable trees, on both sides of the roads or other infrastructure development projects location from their own funds.

## ECOP 19.0: Natural Habitats

#### <u> 19.1 General</u>

- The activities associated with construction a transmission line through or along the edge of Natural habitat areas may destroy and degrade the habitat. The activities can have impacts on the number, health, and survival of interior Native Plant and animal species, many of which are rare.
- The code of practice envisages measures to be undertaken during implementation of the proposed subprojects by the PGCB near natural habitats. These measures shall be undertaken in addition to the measures laid down in the other ECOP.
- As per the World Bank OP 4.04, the conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. A precautionary approach to natural resource management to ensure

opportunities for environmentally sustainable development has been adopted for the project.

## 19.2 Main features of the Bank's Natural Habitats Policy (OP 4.04)

The policy on natural habitats contains two major provisions with respect to biodiversity conservation and EA. Firstly, it prohibits Bank involvement in projects, which involve significant conversion or degradation of critical natural habitats. These include: existing protected areas and adjoining or linked areas or resources (such as water sources) on which the protected areas depend; and sites identified as meriting protection. Secondly, where natural habitats out-side protected areas are within a project's area of influence, the project must not convert them significantly unless:

- There are no feasible alternatives
- The EA demonstrates that benefits substantially outweigh the costs
- Mitigation measures acceptable to the Bank are implemented, which would normally include support for one or more compensatory protected areas that are ecologically similar to, and no smaller than, the natural habitats adversely affected by the project

#### 19.3 Project Planning and Design

Proper line route selection, appropriate timing of operations and proper construction and maintenance of the development of the transmission line can ensure that terrestrial, riparian and aquatic habitat values and fish and wildlife populations are protected from the adverse impacts. Following issues should be considered in Project Planning and Design stage.

- A detailed inventory of ecological features along the proposed rural road shall be prepared with the help of experts and the nature and type of impact on natural habitats shall be identified.
- Avoid concentrations of wildlife, areas of high value wildlife habitat and/or rare plant communities, when determining locations and routes for transmission line. A biologist or ecologist specialized in the discipline of concerns must be retained to identified and asses such areas of concern.
- In areas of continuous high value habitat, consider not developing the project or determine an alternative routing, if feasible.
- Adjusting pole placement and span length to minimize the impacts;

#### <u>19.4 Pre-construction Phase</u>

- Contractor in consultation with local expert or any other concerned authority shall prepare a schedule of construction within the natural habitat. Due consideration shall be given to the time of migration, time of crossing, breeding habits and any other special phenomena taking place in the area for the concerned flora or fauna.
- No Construction Camps, Stockyards, Concrete Batching or Hot Mix Plants shall be located within the natural habitat or within 500m from its boundary.

#### <u>19.5 Construction Phase</u>

- Collection of any kind of construction material from within the natural habitat shall be strictly prohibited.
- In the event that concentrations of wildlife species are present in the proposed construction area, consider re-scheduling construction and maintenance activities until such time when the numbers of animals present are reduced or absent from the worksite.

- When removing vegetation from right of ways, workspaces etc., featheredge the cut to ensure that line of site and cover (both security and thermal protection) issues are addressed.
- No water resources within the natural habitat shall be disturbed.
- During construction, prevent human disturbance and ecosystem impacts on sensitive areas adjacent to projects by using temporary fencing or flag off area to restrict travel to construction zones, right of ways and workspaces.
- Disposal of construction waste within the natural habitat shall be strictly prohibited.

## 19.6 Post-construction Phase

- The infrastructure development projects near the natural habitat shall be declared as a silence zone.
- Allowing tree and shrub species that reach heights of 12 to 15 feet to grow within the ROW, which may control to trespassing and vandalism;
- Compensatory tree plantation within the project area shall be done.
- The PGCB must ensure maintenance of drainage structure as per ECOP 14.0.

## ECOP 20.0: Occupational Health and Safety¹

Most occupational health and safety issues during the construction, operation, maintenance, and decommissioning of electric power distribution projects are common to those of large industrial facilities, and their prevention and control is discussed in the General EHS Guidelines. These impacts include, among others, exposure to physical hazards from use of heavy equipment and cranes; trip and fall hazards; exposure to dust and noise; falling objects; work in confined spaces; exposure to hazardous materials; and exposure to electrical hazards from the use of tools and machinery.

Occupational health and safety hazards specific to electric power transmission and distribution projects primarily include:

- Live power lines
- Working at height
- Electric and magnetic fields.

#### Live Power Lines

Workers may be exposed to occupational hazards from contact with live power lines during construction, maintenance, and operation activities. Prevention and control measures associated with live power lines include:

- Only allowing trained and certified workers to install, maintain, or repair electrical equipment;
- Deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines;
- Ensuring that live-wire work is conducted by trained workers with strict adherence to specific safety and insulation standards. Qualified or trained employees working on transmission or distribution systems should be able to achieve the following:
  - $\checkmark$  Distinguish live parts from other parts of the electrical system
  - ✓ Determine the voltage of live parts
  - ✓ Understand the minimum approach distances outlined for specific live line voltages
  - Ensure proper use of special safety equipment and procedures when working near or on exposed energized parts of an electrical system

¹ IFC Environmental.Health and Safety Guidelines for Electric Power Transmission and Distribution

- Workers should not approach an exposed energized or conductive part even if properly trained unless:
  - ✓ The worker is properly insulated from the energized part with gloves or other approved insulation; or,
  - ✓ The energized part is properly insulated from the worker and any other conductive object; or,
  - ✓ The worker is properly isolated and insulated from any other conductive object (liveline work).
- Where maintenance and operation is required within minimum setback distances, specific training, safety measures, personal safety devices, and other precautions should be defined in a health and safety plan.
- Workers not directly associated with power transmission and distribution activities who are operating around power lines or power substations should adhere to local legislation, standards, and guidelines relating to minimum approach distances for excavations, tools, vehicles, pruning, and other activities;
- Minimum hot stick distances may only be reduced provided that the distance remaining is greater than the distance between the energized part and a grounded surface.

## Working at height on poles and structures

Workers may be exposed to occupational hazards when working at elevation during construction, maintenance, and operation activities. Prevention and control measures for working at height include:

- Testing structures for integrity prior to undertaking work;
- Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others;
- Establishment of criteria for use of 100 percent fall protection (typically when working over 2 meters above the working surface, but sometimes extended to 7 meters, depending on the activity). The fall protection system should be appropriate for the tower structure and necessary movements, including ascent, descent, and moving from point to point;
- Installation of fixtures on tower components to facilitate the use of fall protection systems;
- Provision of an adequate work-positioning device system for workers. Connectors on positioning systems should be compatible with the tower components to which they are attached;
- Hoisting equipment should be properly rated and maintained and hoist operators properly trained;
- Safety belts should be of not less than 16 millimeters (mm) (5/8 inch) two-in-one nylon or material of equivalent strength. Rope safety belts should be replaced before signs of aging or fraying of fibers become evident;
- When operating power tools at height, workers should use a second (backup) safety strap;
- Signs and other obstructions should be removed from poles or structures prior to undertaking work;
- An approved tool bag should be used for raising or lowering tools or materials to workers on structures.

## Electric and magnetic fields

Electric and magnetic fields (EMF) are described earlier. Electric utility workers typically have a higher exposure to EMF than the general public due to working in proximity to electric power lines. Occupational EMF exposure should be prevented or minimized through the preparation and implementation of an EMF safety program including the following components:

- Identification of potential exposure levels in the workplace, including surveys of exposure levels in new projects and the use of personal monitors during working activities; A 1994 study estimated the average exposure of electrical workers (including jobs in electric utilities and other industries) in Los Angeles, California to be 9.6 milligauss (mG), compared to 1.7 mG for workers in other fields (S. J. London et al., 1994). 35 Although detailed studies of workplace exposure to EMF in the United States, Canada, France, England, and several Northern European countries have found no conclusive link or correlation between typical occupational EMF exposure and adverse health effects, some studies have identified a possible association between occupational exposure to EMF and cancer, such as brain cancer (U.S. National Institute of Environmental Health Sciences 2002) indicating there is evidence to warrant limited concern.
- Training of workers in the identification of occupational EMF levels and hazards;
- Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure, limiting access to properly trained workers;
- Implementation of action plans to address potential or confirmed exposure levels that exceed reference occupational exposure levels developed by international organizations such as the International Commission on Non-Ionizing Radiation Protection (ICNIRP), and the Institute of Electrical and Electronics Engineers (IEEE). Personal exposure monitoring equipment should be set to warn of exposure levels that are below occupational exposure reference levels (e.g. 50 percent). Action plans to address occupational exposure may include limiting exposure time through work rotation, increasing the distance between the source and the worker, when feasible, or the use of shielding materials.

## ECOP 21.0: Community Health and Safety

Community health and safety impacts during the construction and decommissioning of transmission and distribution power lines are common and in addition to occupational health and safety standards code of practices, the operation of live power distribution lines and substations may generate the following industry-specific impacts:

- Electrocution
- Electromagnetic interference
- Visual amenity
- Noise and Ozone
- Aircraft Navigation Safety

#### **Electrocution**

Hazards most directly related to power transmission and distribution lines and facilities occur as a result of electrocution from direct contact with high-voltage electricity or from contact with tools, vehicles, ladders, or other devices that are in contact with high-voltage electricity. Recommended techniques to prevent these hazards include:

- Use of signs, barriers (e.g. locks on doors, use of gates, use of steel posts surrounding transmission towers, particularly in urban areas), and education / public outreach to prevent public contact with potentially dangerous equipment;
- Grounding conducting objects (e.g. fences or other metallic structures) installed near power lines, to prevent shock.

#### Electromagnetic Interference

The corona of overhead transmission line conductors and high frequency currents of overhead transmission lines may result in the creation of radio noise. Typically, transmission line rights-of way and conductor bundles are created to ensure radio reception at the outside limits remains normal.

However, periods of rain, sleet or freezing rain sharply increases the streaming corona on conductors and may affect radio reception in residential areas near transmission lines.

#### <u>Visual Amenity</u>

Power transmission and distribution are necessary to transport energy from power facilities to residential communities, but may be visually intrusive and undesirable to local residents. To mitigate the visual impact of power distribution projects, the following mitigation measures should be implemented:

- Extensive public consultation during the planning of power line and power line right-of-way locations;
- Accurate assessment of changes in property values due to power line proximity;
- Siting power lines, and designing substations, with due consideration to landscape views and important
- environmental and community features;
- Location of high-voltage transmission and distribution lines in less populated areas, where possible;
- Burying transmission or distribution lines when power must be transported through dense residential or commercial areas.

#### Noise and Ozone

Noise in the form of buzzing or humming can often be heard around transformers or high voltage power lines producing corona. Ozone, a colorless gas with a pungent odor, may also be produced. Neither the noise nor ozone produced by power distribution lines or transformers carries any known health risks. The acoustic noise produced by transmission lines is greater with high voltage power lines (400-800 kilo volts [kV]) and even greater with ultra-high voltage lines (1000 kV and higher). Noise from transmission lines reaches its maximum during periods of precipitation, including rain, sleet, snow or hail, or as the result of fog. The sound of rain typically masks the increase in noise produced by the transmission lines, but during other forms of precipitation (e.g. snow and sleet) and fog, the noise from overhead power lines can be troubling to nearby residents. Measures to mitigate this impact may be addressed during project planning stages to locate rights-of-way away from human receptors, to the extent possible. Use of noise barriers or noise canceling acoustic devices should be considered as necessary.

#### Aircraft Navigation Safety

Power transmission towers, if located near an airport or known flight paths, can impact aircraft safety directly through collision or indirectly through radar interference. Aircraft collision impacts may be mitigated by:

- Avoiding the siting of transmission lines and towers close to airports and outside of known flight path envelopes;
- Consultation with regulatory air traffic authorities prior to installation;
- Adherence to regional or national air traffic safety regulations;
- Use of buried lines when installation is required in flight sensitive areas.

## Appendix K: Monitoring Checklist for Environmental Activities during Construction

	a. <u>Substation Subprojects</u>	
CONTRACT NO & LOCATION:		
CONTRACTOR NAME:		

MONITORING DATE: ,

Potential Environmental Complies Follow up **Proposed Mitigation measures** Issue Reason Action (Yes / No) needed Impacts Drainage congestion & Drainage congestion should not be occurred due to Drainage Congestions & flooding due to earth filling of subproject activities (such as earth work, stockpiling of materials etc.) Flooding substation sites and access roads above HFL. Proper compensation to the PAPs for damaging of standing crops (if any) due to subproject activities should be done in time. Engage flagman (Guard) for traffic management. Traffic Vehicles used for material Congestions/ transport will have impacts on Road safety measures (signage, marking, signals traffic congestion & road **Road Accident** etc.) are provided properly at the entry & exit accident location of the access road. Engage experienced drivers for all construction vehicles. Control traffic congestion and interruption of public traffic. Hazards from construction traffic due loading and unloading construction materials.

FINISH: ,

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reaso	n	Follow up needed	Action
Air pollution/Dust Generation	Air pollution by construction vehicles, equipment, asphalt plant and dust generated from	Construction equipment will be maintained to a good standard and idling of engines will be discouraged.					
	earthworks, and material stockpiling.	Equipment & vehicles causing excessive pollution (e.g., visible smoke) will be banned from construction sites.		-			
		All vehicles used for material transport should be properly covered.					
		Construction materials will be stored away from the residential areas and will be properly covered.		-			
		Asphalt plants will be located about minimum 500m away from the settlements to avoid direct impact of emissions on local settlements.					
		Dust suppression measures should be adopted like spraying of water twice daily for dust generating sources.		-			
Noise pollution	Noise and vibrations from	Construction workers to be provided with ear-plugs.		-			
	construction activities	Noise inspection will be done before construction equipment enter into construction site. All equipment shall fulfill the noise control requirements of the project. Special attention shall be taken to regular maintenance of construction equipment for their best working condition.					
		Construction is taking place at <500 m from the houses or within 150m of cultural sites such as school, mosque, health center, construction will be stopped from 21:00 to 06:00. (<50dB for residential areas). Noise should be maintained to DOE (Department of					
Soil pollution	Soil pollution / disruption from construction activities	Proper disposal of solid and liquid wastes from the construction sites and labour camps					

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason	Follow up needed	Action
		Proper storage and handling of construction materials and chemicals				
		Rain cuts, fills, erosion of slopes of boundary & access road side slopes				
		Monitoring by testing of river sand prior to start earth filling				
Pollution due to Waste	Impacts on local environment	Collection of solid waste should be in separate waste bin at source				
		Organic waste should be dump in the earth hole for composting or dump in the nearest designated dumping area of municipality				
Community H&S	Impacts on health and safety of the local community	Construction camp should be min. 500m far from the houses & cultural sites				
		Construction camp should be bounded by temporary wall.				
		Local community should not be disturbed by the workers				
Occupational health & safety (H&S)	Impacts on health and safety of workers	Engage a Health, Safety and Environmental Manager (EHSM) to monitor workers' health, safety and hygiene for entire construction period				
		Provide PPE (helmet, safety shoes, hand gloves etc.) to all construction workers & ensure to use these PPE.				
		Provide "First Aide Box" including all necessary medicines & equipment in site offices & camps.				
		Proper treatment of workers in case of accident during works at the site.				
		Provide safe drinking water (DW) for workers. DW quality should be confirmed by testing of pH, Mn, As, Fe, Cl, TC, FC.				
		Place signboard with mentioning "Safety First" at all working sites in Bangla & English languages.				
		Make sure that there is good drainage at all				

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason		Follow up needed	Action
		construction camps (especially labor camps).					
		Provide adequate sanitation at construction sites. According to BNBC 1 no. of toilet for 10 persons at construction site/camp.					
		Provide temporary security boundary wall (by tin or other) surrounding the labor camp.					

## b. <u>Transmission Line/Lilo Line Subprojects</u>

CONTRACT NO & LOCATION:		
MONITOR(S) NAME:		
CONTRACTOR NAME:		
CONTRACTOR NAME:		

MONITORING DATE: ______ START: _____, FINISH: ______,

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason	ı	Follow up needed	Action
Drainage Congestions & Flooding	Drainage congestion & flooding due to earth filling of substation sites and access roads above HFL.	Drainage congestion should not be occurred due to subproject activities (such as earth work, stockpiling of materials etc.) Proper compensation to the PAPs for damaging of					
		standing crops (if any) due to subproject activities should be done in time.					
Traffic Congestions/	Vehicles used for material transport will have impacts on	Engage flagman (Guard) for traffic management.					
Road Accident	ad Accident traffic congestion & road accident	Road safety measures (signage, marking, signals etc.) are provided properly at the entry & exit location of the access road.					
		Engage experienced drivers for all construction vehicles.					
		Control traffic congestion and interruption of public traffic.					
	Hazards from construction traffic due loading and unloading construction materials.						
Air pollution/Dust	Air pollution by construction vehicles, equipment, asphalt	Construction equipment will be maintained to a good standard and idling of engines will be					

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason	Follow up needed	Action
Generation p e st	plant and dust generated from earthworks, and material stockpiling.	discouraged.				
		Equipment & vehicles causing excessive pollution (e.g., visible smoke) will be banned from construction sites.				
		All vehicles used for material transport should be properly covered.				
		Construction materials will be stored away from the residential areas and will be properly covered.				
		Asphalt plants will be located about minimum 500m away from the settlements to avoid direct impact of emissions on local settlements.				
		Dust suppression measures should be adopted like spraying of water twice daily for dust generating sources.				
Noise pollution	Noise and vibrations from construction activities	Construction workers to be provided with ear-plugs.				
		Noise inspection will be done before construction equipment enter into construction site. All equipment shall fulfill the noise control requirements of the project. Special attention shall be taken to regular maintenance of construction equipment for their best working condition.				
		Construction is taking place at <500 m from the houses or within 150m of cultural sites such as school, mosque, health center, construction will be stopped from 21:00 to 06:00. (<50dB for residential areas).				
		Noise should be maintained to DOE (Department of Environment) noise.				
Soil pollution	Soil pollution / disruption from construction activities	Proper disposal of solid and liquid wastes from the construction sites and labour camps				
		Proper storage and handling of construction materials and chemicals				

Issue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason	Follow up needed	Action
		Rain cuts, fills, erosion of slopes of boundary & access road side slopes				
		Monitoring by testing of river sand prior to start earth filling				
Pollution due to Waste	Impacts on local environment	Collection of solid waste should be in separate waste bin at source				
		Organic waste should be dump in the earth hole for composting or dump in the nearest designated dumping area of municipality				
Community H&S	Impacts on health and safety of the local community	Construction camp should be min. 500m far from the houses & cultural sites				
		Construction camp should be bounded by temporary wall.				
		Local community should not be disturbed by the workers				
Occupational health & safety (H&S)	Impacts on health and safety of workers	Engage a Health, Safety and Environmental Manager (EHSM) to monitor workers' health, safety and hygiene for entire construction period				
		Provide PPE (helmet, safety shoes, hand gloves etc.) to all construction workers & ensure to use these PPE.				
		Provide "First Aide Box" including all necessary medicines & equipment in site offices & camps.				
		Proper treatment of workers in case of accident during works at the site.				
		Provide safe drinking water (DW) for workers. DW quality should be confirmed by testing of pH, Mn, As, Fe, Cl, TC, FC.				
		Place signboard with mentioning "Safety First" at all working sites in Bangla & English languages.				
		Make sure that there is good drainage at all construction camps (especially labor camps).				
		Provide adequate sanitation at construction sites.				

lssue	Potential Environmental Impacts	Proposed Mitigation measures	Complies (Yes / No)	Reason		Follow up needed	Action
		According to BNBC 1 no. of toilet for 10 persons at construction site/camp.					
		Provide temporary security boundary wall (by tin or other) surrounding the labor camp.					