Status of EIA/SIA study:

Sl. No.	Package/ Name of the work	Consultant engaged for the study	Timeline for the study	Present Stage	Issues/ Remarks
1.	Construction of Multipurpose Cyclone Shelters (MPCS) in three coastal Districts i.e. Purba Medinipur, North 24 Parganas, South 24 Parganas of West Bengal	Institute of Environmental Studies & Wetland Management (IESWM)		Completed, September, 2014	--
a	Package 1 (Basanti, South 24 Parganas)	do		Completed, September, 2014	--
b	Package 2 (Sagar, South 24 Parganas)	do		Completed, September, 2014	--
c	Package 3 (Kakdwip, South 24 Parganas)	do		Completed, September, 2014	--
d	Package 4 (Namkhana, South 24 Parganas)	do		Completed, September, 2014	--
e	Package 5 (Patharpratima, South 24 Parganas)	do		Completed, September, 2014	--
f	Package 6 (Kultali, South 24 Parganas)	do		Completed, September, 2014	--
g	Package 6 (Mathurapur II, South 24 Parganas)	do		Completed, September, 2014	--
h	Package 7 (Desapran & Ramnagar I, Purba Medinipur)	do		Completed, September, 2014	--
i	Package 8 (Contai-I, Purba Medinipur)	do		Completed, September, 2014	--
j	Package 9 (Khejuri II & Ramnagar II, Purba Medinipur)	do		Completed, September, 2014	--
k	Package 10 (Hasnabad & Minakhan, North 24 Parganas)	do		Completed, September, 2014	--
l	Package 11 (Gosaba & Kultali South 24 Parganas)	do		Completed, September, 2014	--
m	Package 12 (Sandeshkhali II, North 24 Parganas)	do		Completed, September, 2014	--
n	Package 13 (Hingalganj & Hasnabad, North 24 Parganas)	do		Completed, September, 2014	--
o	Package 14 (Sandeshkhali I, North 24 Parganas)	do		Completed, September, 2014	--

2.	Underground cabling of existing overhead electrification network in Digha-Shankarpur area of West Bengal	West Bengal State Electricity Distribution Co. Ltd. Executed by Indian Institute of Social Welfare & Business Management		Completed September, 2016	--
a	Package 1 (33KV HT line)	do	Initiated on November, 2015	Completed September, 2016 Revised December, 2016	--
b	Package 2 (11KV LT line)	do	Initiated on November, 2015	Completed September, 2016 Revised December, 2016	--

WEST BENGAL STATE ELECTRICITY COMPANY LIMITED

ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENTAL MANAGEMENT PLAN FOR UG CABLING NETWORK AT DIGHA-SHANKARPUR AREA

UNDER WORLD BANK PROJECT - NCRMP-II

IISWBM

Executed by

DEPARTMENT OF ENVIRONMENT MANAGEMENT
INDIAN INSTITUTE OF SOCIAL WELFARE
& BUSINESS MANAGEMENT, KOLKATA

DEPARTMENT OF DISASTER MANAGEMENT
GOVERNMENT OF WEST BENGAL

ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN FOR UNDERGROUND ELECTRICAL CABLING NETWORK AT DIGHA-SANKARPUR AREA

Under World Bank Project - NCRMP-II

WBSEDCL

WEST BENGAL STATE ELECTRICITY
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September, 2016

[Version 1.4 Dated 20.12.2016]

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LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
AAQM	Ambient Air Quality Monitoring
APR	Annual Progress Report
AQSP	Air Quality Surveillance Program
BIS	Burea of Indian Standards
CCC	Customer Care Centre
COI	Corridor of Impact
CPCB	Central Pollution Control Board
CPCR	Central Plant Cold Recycling
CRM	Customer Reltionship Management
CRZ	Coastal Regulation Zone
DoDM	Department of Disaster Management
DPR	Detailed Project Report
DPR	Daily Progress Report
DSDA	Digha Sankarpur Development Authority
DTR	Digital Transformer Ratiometer
EC	Environmental Clearance
EHS	Environment Health & Safety
EIA	Environment Impact Assessment
EMP	Environment Management Plan
EPC	Engineering Procurement Construction
ESIA	Environmental and Social Impact Assessment
ESMF	Environmental and Social Management Framework
ESSO	Environmental and Social Safeguards Officer
FRLS	Fire Resistant Low Smoke
GoWB	Government of West Bengal
GP	Gram Panchayat
GPR	Ground Penetrating Radar
GRC	Greivance Redressal Cell
GRM	Grievance Redressal Mechanism
GRS	Greivance Redressal Service
HDD	Horizontal Direct Drilling
HDPE	High Density Polyethylene
HQ	Head Quarter
HT	High Tension
IISWBM	Indian Institute of Social Welfare and Business Management
IMD	Indian Meteorological Department

ABBREVIATION	DESCRIPTION
KVA	Kilo Volt Amperes
L&MV	Low & Medium Volt
LT	Low Tension
MoEF&CC	Ministry of Environment, Forest & Climate Change
MoRTH	Ministry of Road Transport & Highways
MPR	Monthly Progress Report
MT	Micro-tunnel
NAAQS	National Ambient Air Quality Standard
NCRMP	National Cyclone Risk Mitigation Project
NHAI	National Highways Authority of India
OACR	Operational Area Commencement Report
OACR	Operational Area Closing Report
OH	Over Head
OHSAS	Occupational Health Safety Assessment Series
ONSEP	Onsite Emergency Plan
PAPs	Project Affected Persons
PCR	Project Completion Report
PIA	Project Implemetation Authority
PIU	Project Implementation Unit
PMC	Project Management Consultation
PPE	Personal Protective Equipment
RAP	Resettlement Action Plan
RGRO	Regional Grievance Redressal Officer
RMC	Ready Mix Plant
RMU	Ring Main Unit
SCADA	Supervisory Control and Data Acquistion
SCM	Safety Compliance Management
SER	South Eastern Railways
SHAI	State Highway Authority of India
SIA	Social Impact Assessment
SMP	Social Management Plan
UG	Under Ground
UTs	Union Territories
WB	World Bank
WBPCB	West Bengal Pollution Control Board
WBSEDCL	West Bengal State Electricty Distribution Company Limited
WPR	Weekly Progress Report
WSMP	Worksite Safety Management Plan
XLPE	Cross (X) Linked Polyethylene

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

1.0 INTRODUCTION

The Government of India has initiated the National Cyclone Risk Mitigation Project (NCRMP) with a view to address cyclone risks in the country. The overall objective of the Project is to undertake suitable structural and nonstructural measures to mitigate the effects of cyclones and other hydro meteorological hazards in the coastal States/UTs of India. In order to reduce the vulnerability to the frequently occurring coastal disasters, a new project namely National Cyclone Mitigation Project (NCRMP)-II, India aided by World Bank has been launched.

The Department of Disaster Management (DoDM), Government of West Bengal (GoWB), is the front end department of the GoWB to oversee and implement rescue and remedy operations caused by disasters including cyclones and promote disaster preventive systems and practices in the State. As part of the mandate DoDM is collaborated with WBSEDCL to implement World Bank assisted NCRMP II project that includes building resilient electrical network in Digha-Sankarpur area.

The Environmental and Social Impact Assessment (ESIA) study has also been carried to ensure the implementation of UG cable project in compliance with the environmental and social management framework under NCRMP-II as well as in compliance with the environmental and social safeguards requirements of the World Bank. WBSEDCL has set out the following objectives of the ESIA studies:

- To conduct an ESIA of proposed UG cable project by collecting required data, conducting necessary field investigations and primary surveys and assessing environmental, social, health and safety impacts;

- To recommend suitable mitigation measures; both for environmental and social impacts based on the detailed ESIA.

- To identify and recommend suitable measures for the disposal of various unserviceable materials generated due to the project such as electrical cables, transformers, electric poles, soil and other waste or recyclable/reusable materials.

- To submit compliance report after completion of UG cable works of entire project.

WBSEDCL appointed M/s Deecon, Kolkata for undertaking detailed survey of route plan for conversion of 33 kV, 11 kV and L&MV overhead distribution system with service connection into underground system considering 11 kV ring main control chain link and L&MV interconnecting arrangements in coastal area under Digha-Shankarpur Development Authority, District Purba Medinipur, West Bengal.

WBSEDCL delineated Indian Institute of Social Welfare and Business Management (A Constituent Institute of University of Calcutta, Kolkata, West Bengal) to carry out ESIA study of the proposed UG cable project in accordance with the set out scope of work and Terms of Reference (ToR).

2.0 PROJECT DESCRIPTION

The National Cyclone Mitigation Project-II at Digha, Purba Medinipur constitutes a large multi-sector engagement on risk and vulnerability reduction, with assistance for restoring and improving rural connectivity, public services and livelihood opportunities in targeted area of West Bengal, and increase the capacity of the State Entities to respond promptly and effectively to an eligible crisis or emergency. The prime objectives of the proposed project include:

- Restore, improve, and enhance resilience of public services, environmental facilities, and livelihoods in Targeted Communities, and to respond promptly and effectively to an eligible crisis or emergency.

- Conversion of overhead electrical distribution network i.e from 33 KV level to service mains into under ground cable network maintaining service reliability& quality.

The scope of work mainly involves construction of underground cable network of 2X6.7 km 33 kV lines, 44 km of 11 kV lines and 95 km. L&MV OH lines including replacement of existing 273 nos. DTR with higher capacity of 171 DTR. Detail of proposed UG cabling network is presented in Table 1. Total cost for UG cabling net work for Digha-Sankarpur area is approx Rs. 98 Crore.

TABLE 1: DETAIL OF PROPOSED UNDERGROUND DISTRIBUTION NETWORK

SL No.	EXISTING OH NETWORK DETAILS COVERD UNDER THE PROJECT			Unit	Quantity
1	From RAMNAGAR 33/11 kV				
	Two Nos. DIGHA 33 kV FEEDERS:			Km	13.4
2	Total **5 nos existing 11 KV Feeders** to be converted into **10 nos Feeder**			Km	44
3	Regrouping of Existing DTR by 160,315,630 KVA				
	315 KVA	160 KVA	25 KVA	Nos	273
	250 KVA	100 KVA	10 KVA		
	200 KVA	63 KVA			
4	Total LT Network against all Dist. Transformers			Km	95
5	Consumers			No	6419 Nos. approx
	a) HT Consumer			No	52
	b) LT Consumer (Three Phase)			No	450 (282 no 3 phase commercial)
	c) LT Consumer (Single Phase)			No	5917

The most notable and anticipated benefits of proposed UG cable project to Digha-Sankarpur and its residents are hereunder:

- UG cable network is safer to public lives and property, particularly of people belonging to lower economic strata of society during calamities/disasters/thunders /lightening instances

- Areas covered under UG cable project is expected to practically remain unaffected in future from power disruptions and associated implications during or after cyclone/high winds or natural calamities/inclement weather conditions, hence resilient to natural disasters, the main project development objective of UG cable project component under NCRMP II.

- Resilient underground electrical cable network will help to retain/restore water, sewerage and sanitation services across city during or after calamities/cyclones.
- Resilient underground electrical cable network will help state administration to restore other damaged infrastructure during natural calamities with least down time.
- Conserve state's resources in re-construction of damaged electrical network during every calamity. During Aila, the state government had incurred significant cost for restoration of damaged power distribution system in Digha-Sankarpur alone.
- Digha-Sankarpur being an important tourist destination besides commercial hub in East-Medinipur District of West Bengal, stands vulnerable to natural calamities, will essentially need such resilient electrical distribution network, thus aid in State's economic growth and enable to become attractive and destination to investors.
- Will help in improving aesthetics of the city through conversion of all over ground power distribution network into resilient underground infrastructure. All overhead power distribution infrastructures will be dismantled, after commissioning of the UG cable project.
- The present UG cable project will concurrently enable to up-rate distribution network to future demands by at least 10 years by installing the XLPE cables, which are far superior to the conventional overhead conductors, thus will avoid upgrading/uprating of existing OH network.
- Trefoil configuration of underground cables in UG cable project will enable to improve current distribution, reduce sheath losses, minimize magnetic field around conductor and reduce heat-up of cables, all of which will further improve efficiency of underground cable network
- Underground cables do not require any dedicated corridor to be kept permanently clear as in case of an overhead line for safety, maintenance and repair.
- Underground cables will vacate space over ground, which improves aesthetics, higher public acceptance, convey environmental benefits and as well spurt an increase in property values. Thus, underground cables have a potential to induce knock-on effect" - that all other local communities might want "their" network put underground.
- Underground cables do not create obstacles over ground like in case of over head lines. Also, underground cables pose no hazard to avifauna and low flying aircraft.
- Underground cables are not affected by momentary interruptions, occurring from lightning, crow faults and falling of tree branches on overhead lines, which de-energize and then re-energize the circuit moment later, a most common feature in over head lines.
- Typically, outrages in underground cable network are about half of their equivalent overhead networks. Also, operating and maintenance costs are estimated to be around one tenth of the cost of overhead network. Thus, advantage of underground network is of fewer interruptions and lower maintenance costs.
- Underground cables will have no pilferage, whereas overhead cables have scope for pilferage/power thefts, which can lead to safety hazards and accidents at times.

3.0 REGULATORY & LEGAL FRAMEWORK

The environmental regulations of Government of India as well as West Bengal State, which are relevant to relevant to proposed UG cable project are presented in Table 2.

TABLE 2: ENVIRONMENTAL REGULATIONS RELEVANT TO PROPOSED UG CABLE PROJECT AT DIGHA SHANKARPUR AREA

Sl. No	Environmental and Other Regulations	Relevance to UG Cable Project	Regulatory Clearances Required, if any	Authority
1	EIA Notification, 14th Sept 2006 and subsequent amendments	This notification is NOT applicable as UG cabling project is not listed in the Schedule of the notification and therefore out of the purview of notification	NONE	MoEF, GoI and SEIAA, GoWB
2	Coastal Regulation Zone (CRZ) Notification, 2011 and Subsequent amendments	The area of UG cable project falls partly inside CRZ 1A, CRZ 1B and CRZ III area as per CRZ notification, 2011. However, laying of underground cables under UG cable route will be confined to the existing city roads and will not ingress into beach areas (shoreline) along coastline.	CRZ clearance is required for UG cable project as it partly falls inside CRZ 1A, 1B and III area. However, the UG cabling work will be confined on existing paved road	WBCRZMA, Government of West Bengal and MoEF&CC, Government of India
3	The Forest (Conservation) Act. 1980 with amendments made in 1988 and subsequent amendments thereof	This Act is NOT applicable as the alignment of cable routes of proposed UG cable project is along existing city roads, which are under jurisdiction of DSDA and does not pass through forest areas or require diversion of forest land for laying of UG cables (non-forest purposes).	NONE	Principal Chief Conservator of Forests, Forest Department, Government of West Bengal
4	Wild Life Protection Act 1972	This act is NOT applicable as the alignment of cable routes under UG cable project is along existing city roads, which are under jurisdiction of DSDA and does not pass through forest areas, national parks, sanctuaries or known wildlife crossing points.	NONE	Chief Wildlife Warden, Government of West Bengal
5	Air (Prevention and Control of Pollution) Act, 1981	This act would be applicable for construction phase to manage ambient air quality at work camp sites if hot mix plants, macadam mix plants and concrete batch mix plants etc for road restoration work would be required to be used.	Consent for Establish (CFE) may be obtained prior to establishing work camp sites. Consent for Operate (CFO) may be obtained prior to commencement of operations at work camp sites	WBPCB, Government of West Bengal

6	Water Prevention and Control of Pollution) Act,1974	This act would be applicable for construction phase to manage to manage liquid waste discharges at work camp sites with hot mix plants, macadam mix plants and concrete batch mix plants etc if required to be used.	Consent for Establish (CFE) may be obtained prior to establishing work camp sites. Consent for Operate (CFO) may be obtained prior to commencement of operations at work camp sites	WBPCB, Government of West Bengal
7	Noise Pollution (Regulation and Control Act), 2000	This act will be applicable for all construction equipment/plant and machinery including vehicles deployed for implementation of UG cable project for regulation of ambient noise levels	NONE but noise levels are to be regulated during construction and maintenance of proposed UG cable project in conformity with permissible standards	WBPCB, Government of West Bengal
8	e-Waste (Management) Rules, 2015	This rule shall not be applicable as the area of UG cable project involves only decommissioning and/or shifting of electrical utilities from overhead to underground and does not involve dismantling of electrical equipment into its components.	NONE	West Bengal Pollution Control Board
9	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	This act is not applicable as the area of UG cable project does not have any ancient monuments and archeological sites protected under the Act.	NONE	National Monument Authority, constituted under the Act
10	Public Liability and Insurance Act 1991	To protect damage to the public life and/or property as a result of negligence/accidents during implementation of UG cable project	NONE. However, Project operations are to be insured to cover damage to the public life and/or property due to accidents/negligence during implementation of UG cable project	Insurance Regulatory and Development Authority of India
11	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989	This act will be applicable for all construction equipment/plant and machinery including vehicles deployed during implementation of UG cable project	NONE but vehicular emissions are to be regulated by project proponent in conformity with permissible levels/emission norms	State Transport Authority/Motor Vehicles Department
12	Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	To ensure safety and welfare measures for workers employed at building and other construction sites. The UG project is covered under Other construction category	NONE. Safety and welfare measures for work force employed at construction sites are to be regulated in conformity with the Act	West Bengal Building and Other Construction Workers' Welfare Board

13	The West Bengal Trees (Protection and Conservation in Non Forest Areas) Act 2006 And Rules, 2007	This act is not applicable to UG cable project. The cable routes will be aligned to bypass trees of all types and sizes. Therefore, no tree felling/cutting is required for implementation of UG cable project within the project area. The water requirements of the project area, will be met from ground water sources, through existing tube wells and entire DSDA is under safe category for ground water extraction by CGWB.	NONE	Chief Conservator of Forests, Forest Department, Government of West Bengal
14	Indian Electricity Rules, 1956 and amendments thereof and BIS 1255;1983 and amendments thereof	This stipulates all technical and safety requirements during cable laying, testing and operation of the UG cable project	NONE	Central Electricity Board and Govt. of West Bengal
15	Hazardous Waste (Management, Handling and Transboundary Movement) Rules,2008 and amendments thereof	The rules will be applicable to oils/lube wastes from construction equipments /machinery during construction phase (cable laying) and discarded/waste transformer oils during decommissioning phase of existing overhead infrastructure. The rule include storage, handling, transportation procedures and requirements for safe disposal of all hazardous wastes.	NONE	WBPCB
16	Solid Waste Management Rules, 2016	This rules are applicable to all forms/types of solid waste generated at operational areas and work camp sites under UG cable project	NONE	WBPCB

The safeguard policies of the World Bank relevant to proposed UG cable project are presented in Table 3.

TABLE 3: RELEVANT AND APPLICABILITY OF WB SAFEGUARD POLICIES FOR UG CABLING PROJECT AT DIGHA-SHANKARPUR AREA

S.No	World Bank Safe Guard Policy	Policy Objective	Policy Applicability to UG Project	Policy Triggered Or Not
1	Environmental Assessment (OP/BP 4.01)	Overall governing policy intended to ensure Bank-financed projects are environmentally sound and Sustainable	All potential impacts due to UG cable project are to be assessed and necessary mitigation measures are to be incorporated	Triggered

2	Natural Habitats (OP/BP 4.04)	Policy is intended to prohibit Bank financing of projects that degrade or convert critical habitats and supports projects that affect non-critical habitats only if no alternatives are available and if acceptable mitigation measures are in place.	UG cable routes will be along existing urban/rural roads, which are under the jurisdiction of DSDA and does not pass through forest areas/national parks/ sanctuaries or known wildlife crossing points.	Not Triggered
3	Forests (OP/BP 4.36)	Policy is intended to support sustainable and conservation-oriented forest management, harness potential of forests to reduce poverty in a sustainable manner, integrate forests into sustainable economic development, and protect vital local and global environmental services and values of forests.	UG cable routes will not pass through or involve in any Activity in forests/plantation areas.	Not Triggered
4	Physical Cultural Resources (OP/BP 4.11)	Policy is intended to ensure that projects identify and inventory cultural resources that are potentially affected by the project. Projects should include mitigation measures, when there are adverse impacts on physical cultural resources	The UG cable routes will be along urban/rural roads and will be aligned to avoid/bypass all cultural property resources (CPR) and therefore does NOT warrant shifting or affect CPRs.	Not Triggered

4.0 BASELINE ENVIRONMENTAL STATUS

The baseline data of the study area for various environmental attributes, such as air, noise, water, soil, ecology, socio-economy, etc. has been generated by Environmental Management Department, IISWBM in association with Good Earth Enviro Care, Kolkata (WBPCB and NABL accredited laboratory). The present report incorporates the monitored data in and around the proposed UG cable network project and "Geoenvironmental, Geohydrological and Geotechnical Appraisal of Purba Medinipur, West Bengal" by Geological Survey of India and secondary data collected from the various other sources. The baseline data generation was supplemented with field observations, surveys and interaction with the community and project personnel.

After a review of trench excavation methods and assessment of minimum operational requirement, it was proposed to take a 1.25-1.5 meter wide corridor as 'operational area or Corridor of Impact' along the footpath, which are to be opened up for cable laying operations in 500 meter long segments. The likely environmental impact viz., air quality, noise level, land, ecology, etc. of underground cabling work would be insignificant and confined to primarily construction zone only i.e. COI. Whereas, the impact on air qulaty and noise level may slightly extend beyond COI and the project's area of influence could be upto maximum 50 m across the cable trench. Accordingly, during base line environmental monitoring, the likely impact on ambient air quality, ambient noise level, land, ecology and the livelihood of people within COI was identified and assessed.

An attempt has been made to assess the existing ambient air quality status in and around the proposed UG cable network project area by selecting 3 AAQMS. $PM_{2.5}$ concentrations at the proposed UG cable network project area was recorded in the range of 10.6-16.6 $\mu g/m^3$ during the month of November, 2016. In general, the concentration of $PM_{2.5}$ in and around the proposed UG cable network project area was found to be within the permissible limit of NAAQS i.e. 60 $\mu g/m^3$. The PM_{10} concentration at the proposed UG cable network project area varied from 13.00-77.30 $\mu g/m^3$. In general, the concentration of PM_{10} in and around the proposed UG cable network project area was found to be within the permissible limit of NAAQS i.e. 100 $\mu g/m^3$. The SO_2 and NO_2 concentration at the proposed UG cable network project area varied from 8.0-9.1 and 12.43-26.90 $\mu g/m^3$ respectively. The concentration of SO_2 as well as NO_2 in and around the proposed UG cable network project area was found to be well within the permissible limit of NAAQS i.e. 80 $\mu g/m^3$.

The background ambient noise levels were monitored at different locations covering the entire cross-section area of proposed project. Noise levels were recorded at selected locations for 24 hours to assess L_{eq} (day) and L_{eq} (night) within the project area.It reveals that the average ambient noise level during day time ranges between 50.17 to 72.33 dB(A) in the project area. It reveals that the mean minimum noise level was found within the National Ambient Noise Standard i.e. 50 dB(A) in the project area. Whereas the average noise level were recorded slightly above 50 dB(A) due to local activities.

Water quality was monitored at different locations covering the entire cross-section area of proposed project. Water samples have been collected from several locations for ground water as well as for surface water. The analysis of collected water samples has been carried out in laboratory as per the methods described in APHA, 2005.

The ecological environment primarily covers all living forms such as flora and fauna including microorganisms found in the transmission line corridor. The Digha-Shankarpur area is a prominent tourist town and sea beach resort in Kanthi coastal plains of East Midnapore district, directly adjoining the Bay of Bengal. The geomorphic and physiographic features of Digha includes i) beach and runnel (channel) topography in the onshore regions, ii) dunes and sand flats and, iii) tidal creeks, silt flat and marshy lands in the eastern and western parts of the Digha township.

According to the Land cover distribution of ecological resources maximum area (2.31 sqkm) is covered by vegetation. Forests in Digha are around 348.35 Ha and in Shankarpur are around 225.02 ha. Almost equal percentage is covered next by, water body, plantation and Intertidal area.

Department Of Disaster Management, Nabanna, West Bengal Secretariat, Howrah, West Bengal**,** has requested Institute of Remote Sensing (IRS), Anna University an agency authorized by MoEF, Government of India *t*o demarcate HTL, LTL and CRZ for the Sea/Bay/tidal influenced water bodies and ecologically sensitive areas on 1:4,000 scale in the vicinity of their proposed underground cabling network project site in Digha-Sankarpur Area, Purba Medinipur District, West Bengal.The proposed underground High Tension Lines, Low Tension Lines and Transformers falls partly inside CRZ 1A, CRZ 1B and CRZ III area as per CRZ notification, 2011.

5.0 ENVIRONMENTAL IMPACT & MITIGATION MEASURES

This chapter presents both negative and positive impacts associated with the proposed construction of 33/11kV HT and LT Underground Distribution Cable Line in Digha Sankarpur Area. The assessment of environmental, social and health impacts has been undertaken across the three phases namely: Pre-construction Phase, Construction Phase and Operation & Maintainence Phase of proposed project. This section also summarizes mitigation measures for minimization of potential negative impact of proposed UG cable network in Digha-Sankarpur area under World Bank project NCRMP II.

6.0 ANALYSIS OF ALTERNATIVES

This chapter presents an analysis of alternatives considered in the project preparation to avoid or minimize both environmental and social impacts that would be inevitable, if technically optimal cable route alignment is followed. An analysis of various alternatives has been carried out prior to arriving at the technically best fit option with minimal environmental and social impacts.

The main issues along the operational area/COI along underground cable routes are the physical obstacles like unauthorized ramps/steps of private and/or government buildings, which have been extended on to roads for ease of access, existing over ground poles (telecom/ electricity/street light) and road side trees among others. The other issues are disruptions to underground public utilities like water supply, sanitary and drainage connections across cable route corridor, safety to pedestrians as well as road users apart from work force, who are directly involved for cable laying operations.

The route alignments considered in the UG cabling project is flexible and therefore this factor has been used to avoid most of the above mentioned obstacles within the operational area/corridor of impact (COI), while finalizing the cable route corridor.

The ‘with’ and ‘without’ project scenarios were analyzed, the “with” project scenario, with its minor adverse impacts is more acceptable than the “without” project scenario which would mean an aggravation of the existing problems. Potential benefits of the proposed UG cabling project are substantial and farreaching in order to achieve all-round development of the State economy and progress for its people.

7.0 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

The public consultation process for the proposed UG cabling network in Digha Shankarpur area was conducted during the early stage of ESIA. In compliance with this requirement, public consultation was carried out covering entire cross section of project area. All the issues discussed in meeting were validated and information was provided to the groups about the details of the project. The public participation is an important issue for the proposed projects. The purpose of the Public Consultation is (i) to disclose information about Project (ii) discuss with the stakeholders on potential environmental issues that may arise from construction and operation of the project (iii) to take note of any objection or any comments or suggestions of the people on route/site selection (iv) to ascertain that the people’s reaction and the related issues are covered and addressed in the social assessment report.

The public consultation was also undertaken in all the three GPs namely, Padima I, Padima II and Talgachari II with people representatives (GP Pradhan/Up-Pradhan/Members, etc.) as well as affected people (commercial/ residential structures) attending the consultaion meeting. The several environmental, social, health and safety issues related to proposed under ground cabling network raised and suggestions made by the villagers as well as people representative at concerned 3 GPs of project area.

One separate multi-stakeholder consultation was conducted to disclose the draft ESMF and to get views and suggestions from public on the "Possible Environmental and Social Impacts of the proposed Underground Cable Project. Total 60 participants attended (37 as per attendance list rest have not signed) the workshop which includes local residents including women, Hotel Association Representatives, Fisheries Association, stakeholders from Cable TV Association, Social Activists, Public Representatives, BSNL, Traffic Police etc. besides Government officials from DSDA and Disaster Management Department, Government of West Bengal. The following apprehensions and suggestions have been expressed by the participants during the meeting:

- What are the additional advantages of UG Cabling over existing system?
- Up to which level the underground cables are laid i.e. main roads, main streets or sub-lanes?
- Whether ESIA is completed or will be taken up now?
- What about the cables belonging to DSDA which were recently laid on existing electrical supports for developing street lighting system?
- What is the time limit for restoration of roads after completion of UG cable works?
- The UG Cable project is to be completed in shortest possible time without any delays.
- Works are to be taken up in night time so that disturbance to public and traffic will be less.
- What are the financial impacts of the Project? Is it a grant or loan?
- Whether there will be impact of the UG Cable Project on consumers by increasing electricity tariff?
- Whether any expenditure will be recovered from local residents due to UG Cable project?
- Whether consumers have to modify their internal house wiring due to UG Cable Project?
- The UG Cable Project works shall be carried out with qualitative workmanship so that excavations do not recur in future.
- The existing Cable TV network should also be made underground since the poles will be removed after proposed UG Cabling network.

- What are the precautions being considered for UG Cable network in case of earth quakes?

- Whether consumers have to change their supply from single phase to three phase due to UG Cable Project?

- A Liaison Officer to be appointed to each area during execution of the Project to attend the grievances of the public.

- Better planning is to be done in consultation with stakeholders and traffic police to minimize the problems encountered during execution.

The various issues, apart from the above raised were also responded, which were largely related to timely implementation of the works, restoration of roads and public safety issues. One of the other main issues, raised was tariff implication for the users as a result of this project. The audience was given satisfactory replies to all issues and WBSEDCL has assured that there will not be any increase in the tariff as a result of this project.

8.0 ENVIRONMENTAL MANAGEMENT PLAN

This chapter presents a environmental management plan (EMP), which includes measures for avoiding or mitigating environmental impacts, anticipated during construction, operation and maintenance of the UG cable project in Digha-Sankarpur area.

An environmental monitoring plan has been evolved to address the potential impacts identified in the EIA. The environmental monitoring program considered the scope to meet specific needs of the project implementation schedule. The detail environmental monitoring plan for proposed UG Cablling Network at Digha-Sankarpur area under World Bank project NCRMP-II including parameters, frequency, and responsibility and reporting requirement is presented in this section

The implementation of many of the measures included in EMP largely constitutes good construction practices and therefore, they are considered as incidental to works. However, some measures are considered as additional requirement to mitigate or avoid environmental, health and safety concerns during the implementation of /UG cable project. Adequate cost provisions have been included for such measures, which are considered as additional requirement whereas measures which are incidental to work deem to have been included in the quoted tender/bid price by the contractor. It is estimated to be INR 90.87 lakhs.

The EMP will be integrated in the contract/bidding documents as mandatory contractual obligations. Thus, the EPC contractor is expected to be fully conversant with the EMP requirements of UG cable project and accordingly make required provisions for implementing the EMP at the bidding stage itself.

9.0 INSTITUTIONAL ARRANGEMENTS & GRIEVANCE REDRESSAL MECHANISM

This chapter summarizes an institutional arrangement for EMP implementation supervision along with a grievance redressal mechanism for the UG cable project at Digha-Sankarpur area.

The Department of Disaster Management, Government of West Bengal has entrusted WBSEDCL as PIU to implement UG cable project at Digha-Sankarpur area under World Bank Project NCRMP-II. Within the PIU, the EMP implementation supervision is proposed to be carried out through a two tier system. At tier 1, PIU will designate One Environmental cum Social Safeguards Specialist. This functionary will be the team leader for overseeing the implementation of EMP as well as RAP at field level through the second tier positions.

The second tier position for field level supervision of EMP will comprise one Environmental, Health and Safety (EHS) officer. This officer will be designated to supervise EMP implementation. The EPC contractor will also designate one EHS Officer, who will be primarily responsible for implementation of EMP at field level. The field level EHS officers at tier 2 level will report to the team leader at tier 1 level.

The 3-tire Grievance Redressal Mechanism is already in place at WBSEDCL.

1st tier at Customer Care Centre (CCC) Level: At CCC level, any consumer can lodge the complaint at either through WBSEDCL web portal (wbsedcl.in) or docket his complain at toll free number or lodge the complaint directly at CCC. For grievance redressal, there is one dedicated person at junior manager position at CCC level to look after the grievance. It is the responsibility of Station Manager to redress the same within one month.

2nd tier at Regional Level: If the consumer is not satisfied at CCC level, then he can go to the next tier i.e. Regional Grievance Redressal Officer (RGRO). RGRO is designated Officer at the rank of Divisionl Engineer. If grievance is not settled even at this tier, then consumer may move to the next tier.

3rd tier at Corporate Level: At this level, grievance is looked after by Customer Reltionship Management (CRM) Cell. Chief Engineer of CRM Cell is the Chief Grievance Redressal Officer of the WBSEDCL. Normally, such grievances are addressed by hearing (at all three levels) followed by reasoned order. The Grievance Redressal procedure at WBSEDCL is presented in Annexure 9.1.

WBSEDCL through its PIU for UG cable project will establish a robust and responsive grievance redress mechanism to handle all types grievances within in a reasonable time frame and in a responsible way. The absence of a responsive grievance mechanism could trigger public resentment, despite the benefits, that the project can usher on society.

The PIU will be primarily responsible for implementing the grievance redress mechanism (GRM), the contractor will also be severally and jointly responsible to receive and resolve complaints in a time-bound and effective manner and in close co-ordination with PIU.

The PIU-EHS, the field level in-charge for EMP implementation and supervision will establish a procedure for receiving grievances both online (through WBSEDCL's web site) and offline at respective operational areas. WBSEDCL will widely publicize and extend its present online compliant registration system as well as 24x7 call centre number 1912(displayed on barricades at operational areas) to receive complaints/grievances related to UG cable project. The GRM will include procedure for recording/documenting key information, and evaluating and responding to the complaints as per time frame stipulated in GRM. All concerns received/raised through the GRM are to be addressed earnestly, transparently and in a time bound manner, without retribution to the grieved/affected person(s).

The PIU and contractor periodically will inform the general public along the cable route alignments, which have been opened up for cable laying on the available grievance redress procedure(s), whom to contact and when, where and how to file a grievance, time likely to be taken to redress minor and major grievances, etc.

The type and number of grievances received, resolved and outcomes are to be displayed /disclosed at PIU and included in the periodic progress reports and documented for the entire project implementation phase.

The affected/impacted persons who are not satisfied with the mechanism given above have the option to avail general legal environment consisting of court of law to address their grievance as per legal environmental and social frame work. These options will be disclosed to the concerned people and all the stake holders during the public consultation process.

In addition to seeking to resolve their grievances through the GRM established at the government level, "communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project such as this operation may also submit complaints to the Grievance Redressal Service (GRS) established by the World Bank. The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may also submit their complaint to the WB's independent Inspection Panel, after having brought the complaint to the World Bank's attention through its GRS. Information on how to submit complaints to the World Bank's Grievance Redressal Service is available at http://www.worldbank.org/GRS. Information on how to submit complaints to the World Bank Inspection Panel is available at www.inspectionpanel.org.

CHAPTER 1

INTRODUCTION

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INTRODUCTION

1.1 BACKGROUND

On May 25, 2009, a strong tropical cyclonic storm **"Aila"** lashed the coast of West Bengal causing destruction not only in the coastal blocks but also far inland. At the time of landfall, the highest sustained surface wind speed associated with the cyclone was about 120 km/h caused surge caused a storm surge of 3 m above sea levels.

West Bengal covers 350 Km coastline of about 7516 km long coastline in India. The frequency of cyclones in the Bay of Bengal is about 5.5% of the total cyclone formation in world's water. Coastline areas are potentially affected as storm surges and climate change induced sea level rise become more pronounced. Hazard events are set to grow in frequency and intensity.

The Government of India has initiated the National Cyclone Risk Mitigation Project (NCRMP) with a view to address cyclone risks in the country. The overall objective of the Project is to undertake suitable structural and nonstructural measures to mitigate the effects of cyclones and other hydro meteorological hazards in the coastal States/UTs of India.

The State of West Bengal has been identified as Category I among identified 13 cyclones prone States and Union Territories (UTs) based on the frequency of occurrence of cyclones & its vulnerability, size of population and the existing institutional mechanism for disaster management.

In order to reduce the vulnerability to the frequently occurring coastal disasters, a new project namely National Cyclone Mitigation Project (NCRMP)-II, India aided by World Bank has been launched.

The Department of Disaster Management (DoDM), Government of West Bengal (GoWB), is the front end department of the GoWB to oversee and implement rescue and remedy operations caused by disasters including cyclones and promote disaster preventive systems and practices in the State. As part of the mandate DoDM is collaborated with WBSEDCL to implement World Bank assisted NCRMP II project that includes building resilient electrical network in Digha.

1.2 NEED OF ESIA

WBSEDCL desired to conduct an Environmental and Social Impact Assessment (ESIA) of the UG cable project, covering entire cross section area of conversion of overhead 33 kV, 11 kV HT along with LT into UG cable network in Digha-Sankarpur area.

The ESIA study is aimed at effective assessment of the likely environmental and social impacts and their management through efficient and appropriate management measures, in order to protect or enhance the quality of the environment and social settings within the UG cable project influence area and also facilitate implementation of UG cable project in an environmentally and socially sustainable manner.

The ESIA study has also been carried to ensure the implementation of UG cable project in compliance with the environmental and social management framework under NCRMP-II as well as in compliance with the environmental and social safeguards requirements of the World Bank.

1.3 OBJECTIVES OF ESIA

WBSEDCL has set out the following objectives of the ESIA studies:

- To conduct an Environmental and Social Impact Assessment (ESIA) of proposed UG cable project by collecting required data, conducting necessary field investigations and primary surveys and assessing environmental, social, health and safety impacts;
- To recommend suitable mitigation measures; both for environmental and social impacts based on the detailed ESIA.
- To identify and recommend suitable measures for the disposal of various unserviceable materials generated due to the project such as electrical cables, transformers, electric poles, soil and other waste or recyclable/reusable materials.
- To submit compliance report after completion of UG cable works of entire project.

1.4 SCOPE OF ESIA

The scope of the ESIA studies includes:

- Preparation of transect walk strip plans (based on strip plans provided by WBSEDCL) with all features along the UG cable alignment to be marked on the plans.
- Develop a detailed strip plan of the proposed underground cable alignment providing various features that are located along alignment and its immediate vicinity, at least double the width of the trench
- Preparation of environmental and socio-economical profile of the project (corridor of impact), through primary and secondary information (comprising demographic, socioeconomic, physical, biological and ecological environmental features, etc).
- Conduct a socio-economic survey of the households along the alignment duly covering all indicators for the present and future evaluation and assessment.
- Preparation a questionnaire or instruments for the ESIA study and share the same with World Bank for review.
- Based on the strip plan and field visits, develop an inventory of impacts of both temporary and permanent structures, trees and other environmental sensitive receptors such as schools, religious places and other common property resources and any other issues, which may be affected, while laying the underground cable network and during operation and maintenance.

- Identification of various other issues such as disposal of excess excavated earth, waste, disposal/ reuse of old overhead electric cables, dismantling/ disposal of electrical poles, disposal of excess transformers (if any), disposal of transformer oil (if any), etc.

- Assessment of the health and safety impacts of laying the underground cable network, both during construction and operation phase of the project.

- For all the impacts/ issues identified above, recommend elimination or mitigation/management measures to be implemented by the project implementation agencies and the construction contractors, in line with the Environmental and Social Management Framework (ESMF) of NCRMP-II.

- Study & inclusion of measures and plans mitigating temporary/ permanent impacts to the structures and communities along the cable alignment and prepare site specific EMP to mitigate environmental impacts, RAP (if there are resettlement/ rehabilitation issues) and/or Social Management Plan (SMP) for mitigating social impacts and community engagement.

- Identify various regulatory clearances that may be required for the project, such as CRZ clearances, tree cutting permissions, "no objections" from state / national agencies, utility agencies, etc.

- Preparation of a monitoring plan with reference to ESIA.

- A grievance redressal mechanism (GRC) is to be developed in accordance with the ESMF under NCRMP-II and as per World Bank guidelines.

- Conduct formal stakeholder public consultations (minimum of three), to understand the impacts anticipated by the communities and also to explain measures proposed under project to implement to mitigate such impacts. These public consultations are to be conducted with the communities for information dissemination and their feedback. At least one such consultation will be carried with women in each community. The World Bank and the WBSEDCL need to be informed before conducting these consultations for possible participation.

- Finalize EMP and RAP/SMP for implementation incorporating comments received from WBSEDCL and the World Bank.

1.5 ENGAGEMENT & MOBILIZATION OF CONSULTANTS FOR ESIA STUDY

WBSEDCL appointed M/s Deecon, Kolkata for undertaking detailed survey of route plan for conversion of 33 kV, 11 kV and L&MV overhead distribution system with service connection into underground system considering 11 kV ring main control chain link and L&MV interconnecting arrangements in coastal area under Digha-Shankarpur Development Authority, District Purba Medinipur, West Bengal.

WBSEDCL delineated Indian Institute of Social Welfare and Business Management (A Constituent Institute of University of Calcutta, Kolkata, West Bengal) to carry out ESIA

study of the proposed UG cable project in accordance with the set out scope of work and Terms of Reference (ToR).

A kick-off meeting was held on 30th November, 2015 at the chamber of Chief Engineer (Distribution), WBSEDCL, HQ, Salt Lake, Kolkata to discuss the modalities for initiating the Environmental & Social Impact Assessment Study for proposed Underground Electrical Cabling Network (33/11 kV HT & LT Lines) at Digha-Sankarpur Area under World Bank Project NCRMP-II and logistic support required for the same under the guidance of Chief Engineer (Distribution) and Addl. Chief Engineer (Distribution), WBSEDCL, HQ with project team members of IISWBM. During the meeting, preliminary route map/layout of Old Digha (Thana), New Digha, Shankarpur and Mohana Feeder along with brief information about the proposed underground cabling network was provided to IISWBM team members. Subsequently, following issues were discussed and resolved to initiate the Environmental and Social Impact Assessment Study.

Initially, Chief Engineer (Distribution) and Addl. Chief Engineer (Distribution), WBSEDCL, HQ explained the salient features of proposed underground electrical cabling network (33/11 kV HT & LT Lines) at Digha-Sankarpur Area under World Bank Project NCRMP-II with objectives and coverage of proposed study to be undertaken by IISWBM and mentioned that the study should consider all the major environmental and social issues in line with World Bank guidelines as well as regulatory norms of Central and State Government.

Accordingly, various parameters included in the draft field data cum analysis sheet along with the screening questionnaire/formats submitted by IISWBM for Environmental and Social Impact Assessment for formulation of environmental and social impact mitigation and development plan have been discussed.

Addl. Chief Engineer (Distribution), WBSEDCL mentioned that the proposed field data cum analysis sheets and screening questionnaire may be used for pilot survey and on the basis of pilot survey, additional parameters to address the local people needs may be included, if required. Accordingly, it was resolved that the suggestions made during discussion as well as the observation recorded during the pilot survey would be incorporated in the proposed screening questionnaires/formats and the same would be subsequently used for the field survey.

Addl. Chief Engineer (Distribution), WBSEDCL, HQ along with Dean, IISWBM had a meeting with Principal Secretary and Joint Secretary, Department of Disaster Management, Government of West Bengal at Nabanna on 3rd December, 2015 and had detailed discussion with Principal Secretary and Joint Secretary of DODM, GoWB to finalize the modalities for initiating the field study for ESIA. During the discussion, Principal Secretary mentioned that field work has to be commenced positively from next week and initially on the basis of screening of Environmental and Social issues related to proposed underground cabling network preliminary report to be submitted by IISWBM before the proposed visit of World Bank team in the 2nd week of January, 2016. He ensured all the technical as well as logistic support will be provided to IISWBM team for the purpose.

Joint Secretary, DODM, GoWB, mentioned that as the proposed project activities will not have significant environmental and social impact, the detailed study may not be required however, on the basis of initial Environmental and Social Impact Evaluation the need of the same would be explored.

IISWBM team members along with Addl. Chief Engineer (Distribution) and other executives of WBSEDCL, HQ visited the project site on 8th December, 2015. Initially, the detailed meeting was conducted at Digha Sub-Station to take the stock of present status of various feeders (11 and 33 kV HT & LT) layout survey being conducted by M/s Deecon. During the meeting, it was resolved that as the field survey for all the three feeders of Old Digha (thana) and three feeders of New Digha have been already completed and the layout plan of the same is ready accordingly, the Environmental and Social Impact Assessment Screening Study can be initiated for these feeders immediately. Subsequently, representative of M/s Deecon handed over the drawing of above-mentioned feeders to IISWBM for the purpose.

Accordingly, IISWBM team along with representative of M/s Deecon visited the select area of Old Digha (thana)/New Digha feeder on 8th December, 2015 to understand the field condition and initiating the Environmental and Social Impact Assessment Study from 9th December, 2015.

IISWBM team members along with Addl. Chief Engineer (Distribution) and other executives of WBSEDCL, HQ and Deecon had meeting with Executive Officer, DSDA on 8th December, 2015. Initially, Dean, IISWBM appraised EO, DSDA regarding the purpose of visit and various technical as well as logistic support required from DSDA during the field survey for the Environmental and Social Impact Assessment Study. During the meeting, EO, DSDA mentioned that the social impact precisely in terms of displacement of the people would likely to be almost nil as for the proposed underground cabling network primarily road pavement would be used and no private land would be required for the purpose. However, during the discussion it was resolved that if there is any encroachers (thela cart/gumti/other temporary structures) which need to be displaced during the construction work, they would be taken care by DSDA as DSDA has already initiated a major project for rehabilitation of all the hawkers in the DSDA area. It was also resolved that debris likely to be generated during the construction work would be disposed of in the designated disposal site of DSDA. EO, DSDA also ensured to create public awareness among various stakeholders regarding the proposed project activities along with their suggestions to be considered for minimizing environmental and social impact, if any.

As resolved, IISWBM initiated the field survey for screening of Environmental and Social Impact Assessment of proposed underground electrical cabling network in Digha Shankarpur area from 9th December, 2015.

As discussed in earlier section, the field survey was commenced from 8th December, 2015. The series of public consultation meeting conducted involving Pradhan/Up-Pradhan/member of Gram Panchayets along with the local people to identify the likely environmental and social issues as well as their suggestions for tackling the same in the entire cross-sectional area of the proposed project.

The public consultation intimation letters were issued to Pradhan/Up-Pradhan with request to organize public consultation on predecided date and time involving local people. The local people participated in the public consultation were enlisted and their endorsement regarding their presence during public consultation were taken. During the public consultation, various environmental and social issues were identified along with their suggestions for mitigating the same were documented. Assessment of the existing basic amenities and infrastructural facilities along with the need for strengthening the same in the concerned villages was also undertaken.

1.6 CONSTRAINTS OF DATA BASE

The Consultants have the following observations on the drawings of route plan for conversion of 33 kV, 11 kV and L&MV overhead distribution system with service connection into underground system considering 11 kV ring main control chain link and L&MV interconnecting arrangements in coastal area under Digha-Shankarpur Development Authority, District Purba Medinipur, West Bengal:

- The alignment of cable routes indicated in the DPR are deemed to have been finalized after due consideration of several factors like most optimal length, analysis of alternatives, minimum obstacles among other influencing factors. Therefore, UG cable routes as proposed in the DPR drawings is considered as final for assessment of the likely environmental and social impacts.

- Drawings does not provide information of the underground utilities along as well as across the proposed UG cable routes. Understandably, no Ground Penetrating Radar (GPR) surveys have been conducted under this component of NCRMP-II, which could have otherwise provided information about the pre-existing underground utilities along and across the proposed cable routes.

- The route maps show only the road and proposed cable alignments and does not contain information on existing utilities along cable routes like drains, obstacles among others, which are along cable routes, although this is one of the obligations of WBSEDCL to provide such information to Consultants under this assignment.

- WBSEDCL has informed that it has no other information about the existing underground utilities along or across the proposed UG cable routes.

1.7 STRUCTURE OF REPORT

The ESIA for UG cable network project for Digha-Shankarpur area has been structured into two standalone volumes as hereunder:

i. **Volume I -** Environmental Impact Assessment and Environment Management Plan (EIA & EMP)

ii. **Volume II -** Social Impact Assessment and Resettlement Action Plan (SIA & RAP)

This report presents the **Volume I - Environmental Impact Assessment** and Environment Management Plan **(**EIA & EMP**)** Report has been structured into **9 Chapters** as hereunder.

Executive Summary

Chapter 1 - Introduction: This chapter describes background of project and its components; need/requirement, objectives and scope of ESIA studies; and structure of the ESIA report.

Chapter 2 - Project Description: This chapter summarizes the UG cable project design and proposed configurations for laying of underground cables under the resilient electrical network component of NCRMP-II.

Chapter 3 - Environmental Regulatory Framework: This chapter describes the applicable environmental policies and regulations of Government of India, Govt. of West Bengal and the World Bank Policies, which are applicable to the UG electrical cabling project.

Chapter 4 - Existing Environmental Profile: This chapter describes baseline environmental profile of the project area, within which the UG cable project will be implemented. The baseline environmental conditions of the project area have been assessed based on both secondary data base and supplemented by primary investigations wherever required.

Chapter 5 - Environmental Impacts: This chapter identifies and evaluates the anticipated environmental impacts due to the proposed UG cable project. The Chapter also includes suggested mitigation measures in order to avoid/minimize the likely impacts during preconstruction, construction and operation phases of UG cable project.

Chapter 6 - Analysis of Alternatives: This chapter describes the alternatives considered in the project design in order to minimize and/or avoid the potential environmental as well as social impacts due the implementation of UG cable project.

Chapter 7 - Public Consultations and Information Disclosure: This chapter provides information on the public consultations carried out along underground cable routes as well as multi stakeholder consultations. The chapter summarizes the various issues/concerns raised by general public at large and how the same has been addressed in EMP.

Chapter 8 - Environmental Management Plan: This chapter describes an Environmental Management Plan (EMP) in order to minimize and/or avoid the impacts of the UG cable project. The chapter also includes budgetary provisions as required for implementing the EMP and its supervision by PIU.

Chapter 9 - Institutional Arrangement for EMP Implementation Supervision & GRM:
This chapter provides a suggested institutional arrangement for EMP implementation supervision and monitoring mechanism during UG cable project implementation phase. This chapter also include a responsive grievance redress mechanism, given the nature of this project, which will be implemented within city limits and along busy roads/commercial areas and residential areas and therefore its potential to disrupt public utilities, water, sanitary utilities, impact upon street vendors/squatters among others and trigger public resentment, despite the benefits, that the project can usher on society.

P 1: Discussion with World Bank, WBSEDCL & DSDA Executives for Execution of ESIA Study








CHAPTER 2
PROJECT DESCRIPTION

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PROJECT DESCRIPTION

2.1 INTRODUCTION

On May 25, 2009, a strong tropical cyclonic storm **"Aila"** lashed the coast of West Bengal causing destruction not only in the coastal blocks but also far inland. At the time of landfall, the highest sustained surface wind speed associated with the cyclone was about 120 km/h caused surge caused a storm surge of 3 m above sea levels.

West Bengal covers 350 Km coastline of about 7516 km long coastline in India. The frequency of cyclones in the Bay of Bengal is about 5.5% of the total cyclone formation in world's water. Coastline areas are potentially affected as storm surges and climate change induced sea level rise become more pronounced. Hazard events are set to grow in frequency and intensity.

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The State of West Bengal has been identified as Category I among identified 13 cyclones prone States and Union Territories (UTs) based on the frequency of occurrence of cyclones & its vulnerability, size of population and the existing institutional mechanism for disaster management.

In order to reduce the vulnerability to the frequently occurring coastal disasters, a new project namely National Cyclone Mitigation Project (NCRMP)-II, India aided by World Bank has been launched.

The Department of Disaster Management (DoDM), Government of West Bengal (GoWB), is the front end department of the GoWB to oversee and implement rescue and remedy operations caused by disasters including cyclones and promote disaster preventive systems and practices in the State. As part of the mandate DoDM is collaborated with WBSEDCL to implement World Bank assisted NCRMP II project that includes building resilient electrical network in Digha

2.2 SALIENT FEATURES OF THE PROJECT

The National Cyclone Mitigation Project-II at Digha, Purba Medinipur constitutes a large multi-sector engagement on risk and vulnerability reduction, with assistance for restoring and improving rural connectivity, public services and livelihood opportunities in targeted area of West Bengal, and increase the capacity of the State Entities to respond promptly and effectively to an eligible crisis or emergency.

The prime objectives of the proposed project include:

- Restore, improve, and enhance resilience of public services, environmental facilities, and livelihoods in Targeted Communities, and to respond promptly and effectively to an eligible crisis or emergency.

- Conversion of overhead electrical distribution network i.e from 33 KV level to service mains into under ground cable network maintaining service reliability& quality.

The scope of work mainly involves conversion of overhead distribution system into underground cabling, service connections for strengthening it into a balanced distribution system.

2.2.1 General Description of Project

The brief description of project is presented in Table 2.1.

TABLE 2.1: SALIENT FEATURES OF THE PROJECT

Project area	**34** Sq. km within Digha-Sankarpur Development area.
Location	Site- Digha-Sankarpur, District-Purba Medinipur, State- West Bengal
Access to the Project	Nearest Rail Station: Digha, S.E Rly. Nearest National Highway from Digha: NH-116B at Contai = 32 Km.; NH-41 at Nandakumar = 72 Km.; NH-6 at Mecheda = 100 Km, Road Distance: From Tamluk (District Head Quarter) = 90 Km. & from Kolkata (State Capital) = 170 Km.
Type of Project	Underground Cabling of HT & LT Electrical Network at Digha-Sankarpur Area
Scope Of Work	Construction of Underground Cable network of 2X6.7 Ckt. Km. 33 kV lines, 44 Km of 11 kV lines and 95 Km. L&MV OH lines including replacement of existing 273 nos. DTR with higher capacity of 171 DTR.
Cost of Project	Rs. 98 Cr (Approx.)
Completion Time	24 Months
Role of Project Implementation Authority (PIA)	1. The work will be executed on turnkey basis through open tender and under direct supervision of WBSEDCL under guidance of Department of Disaster Management (DODM), Govt. of W.B, the Project Implementation Entity (PIE) 2. WBSEDCL will keep liaison with local district authority during implementation and execution of the project 3. WBSEDCL will obtain necessary statutory clearances viz Railway, NHAI, DoE, etc for the project from the respective authority.

Project Location

The proposed UG cabling network project site i.e. Digha-Shankarpur Area lies in the Southwestern corner of Purba Medinipur District. It is a coastal tract adjoining Bay of Bengal in the south and bordering Orissa in the west. This area in Purba Medinipur district of West Bengal is a potential tourism site in India extending from 87°29'21.05"E to 87°37'30"E longitude and 21°36'28.43" N to 21°41'59.52"N latitude (Figure 2.1).

Connectivity of Digha-Sankarpur Area

By Road: Digha is connected to Kolkata via SH-4, NH-41 and then NH-6. The alternative access to Digha is to travel along NH-6 up to Kharagpur and take the road to Digha via Egra and Depal (SH-5). Tourists from other parts of the State like Bardhaman, Durgapur, Asansol, Bankura, Birbhum and Purulia and beyond come to Kharagpur by State Highways and major roads making Kharagpur (falling in Paschim Medinipur district) an important hub for visitors to Digha in Purba Medinipur district.

By Rail: With the opening of railway line between Tamluk and Digha under South-Eastern railway division, this planning area now has a railway station namely Digha linking it by rail to Kolkata and Kharagpur and therefrom to the Southern, northern and western parts of India.

By Air: Netaji Subhas Chandra Bose International Airport (Dum Dum) near Kolkata is the nearest airport for this Planning Area. The airport is about 200 kms. by road from Digha.

2.2.2 Benefits of Underground Cable Network

The following benefits can be achieved from proposed underground cabling of HT & LT Electrical net work for Digha - Sankarpur area:

Direct benefits:

a. Reduce vulnerability to natural disasters like cyclones;

b. Early restoration of whole Distribution Network;

c. Reduction in system outage& enhanced reliability;

d. Improvement of voltage profile

Indirect benefits:

a. Saving on account of improved voltage regulation & reduction in power loss;

b. Lower maintenance cost;

c. Ensures safety i.e. Less susceptibility to fatal accident & electrical hazards;

d. Can absorb emergency power loads.

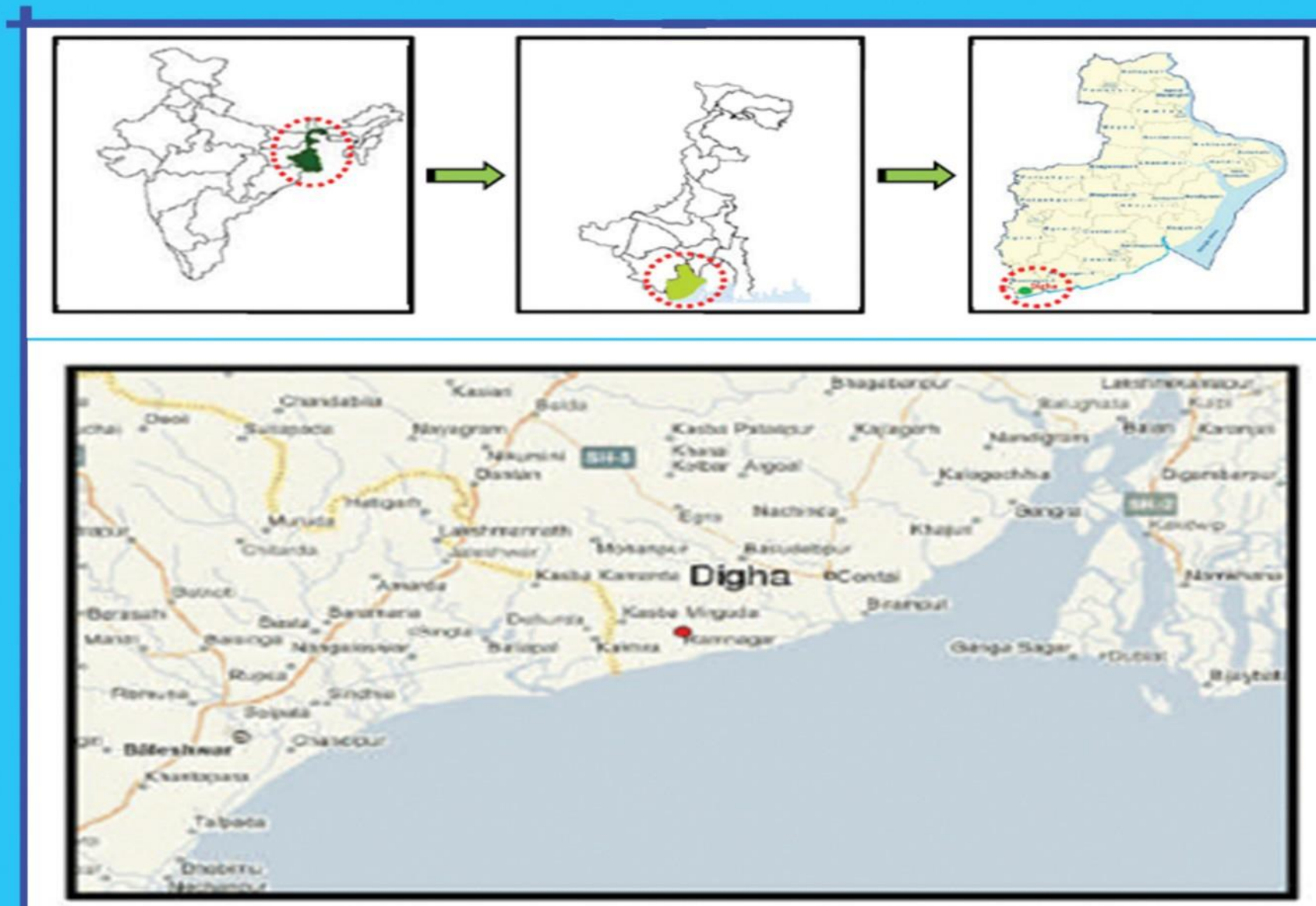


FIGURE 2.1: LOCATION OF DIGHA-SANKARPUR AREA

Direct beneficiaries - coastal inhabitants covered under this package

Indirect beneficiaries - Member of the public excluding the coastal residents, business community and other government stake holders such as Tourists, Tour Operators, Industries & Institutions surrounding Digha etc.

Some Important parameters of Digha- Sankarpur:

Population as per Census Report (2011)	30,000 (Approx)
No. of Hotels	Govt. Sector - 34 , Pvt. Sector - 450
No. of Tourist Visits/yr.	26 Lakhs (approx)
Tourist Amenities and Infrastructure	Science Centre, Marine Aquarium, Amarabati Park, Toy Train, Hospitals - 02, Bus Terminus, Fish Harbour, Railway Station
Industry & Institutions	Primary School - 23; Higher Secondary & High Schools - 04, Fish Processing units - 03; Ice Plants - 12,Bulk Industrial Consumers- 51 Nos
Market	11 (Eleven) (03 nos. with all facilities and 08 nos. street corners).
Important Commodities Exporter	Sea Fish, Cashew nut, Betel leaves, Mats and other handicrafts, Sea shell,

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

2.2.3 UG Network vs OH Network

- Presently the distribution system is overhead and laid as radial system. Project has been conceived for conversion of existing overhead system to U/G cabling in Digha-Sankarpur. The Proposed U/G distribution network for this package has been re-configured as **ring main system with (N-2)/(N-1) and (N-1) contingency for 11 KV & LT respectively**. The proposed U/G cable shall be XLPE insulated, Aluminium conductor laid directly in buried trench with brick cover.

- Advantages of underground lines include aesthetics, higher public acceptance, fewer interruptions and lower maintenance costs. Failure rates of overhead lines and underground cables vary widely, but typically underground cable outage rates are very minimal in comparison to their equivalent overhead line types.

Primary advantage of U/G Network most often cited can be divided into four areas:

- **Potentially-Reduced Maintenance and Operating Costs**

  Lower storm restoration cost

  No tree trimming cost

  Practically nil interruptions/breakdown restoration cost

Reduction of power thefts

Revenues enhancement by sale of energy for the period of interruption/ breakdown.

- **Enhance Resiliency**

  Less susceptible to the impacts of severe weather conditions.

  Less damage during severe weather

  Very fewer momentary interruptions

- **Improves Safety**

  Lessens electrical accidents to public

  Lessens vehicle accidents

  Emit no electric field in air & lower magnetic field than an overhead line thus protect environmental ecosystem

- **Improves Aesthetic View**

  Require a narrower band of land to install without disturbing actual scenic beauty of the area.

2.2.4 Selection of Optimum Route

For selection of optimum route based on detailed survey, following points has been taken into consideration:

- The route of the distribution line does not involve any human resettlement & rehabilitation.
- Any monument of cultural or historical importance is not getting affected.
- The route does not create any threat to the survival of any community
- It does not affect any public utility services like Playground, School, Other establishments, etc.
- It does not affect any Sanctuaries, National Park, etc.
- It does not infringe with areas of natural resources.

Figure 2.2-2.5 present proposed feeder wise 33/11 Kv UG cable route plan for Digha Sankarpur area.

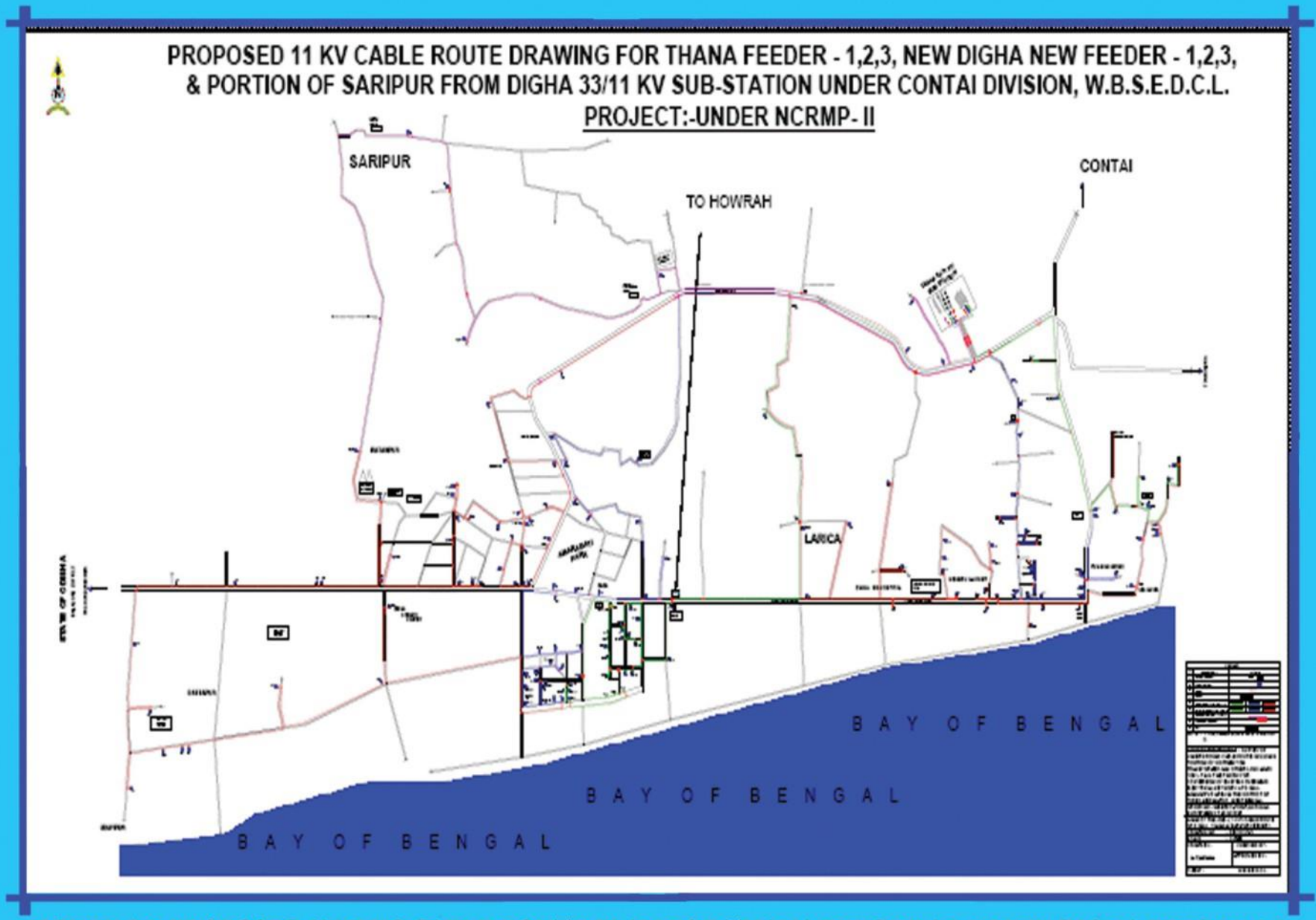


FIGURE 2.2: PROPOSED 11 kV UG CABLE ROUTE PLAN FOR THANA FEEDER 1-3 & NEW DIGHA FEEDER 1-3

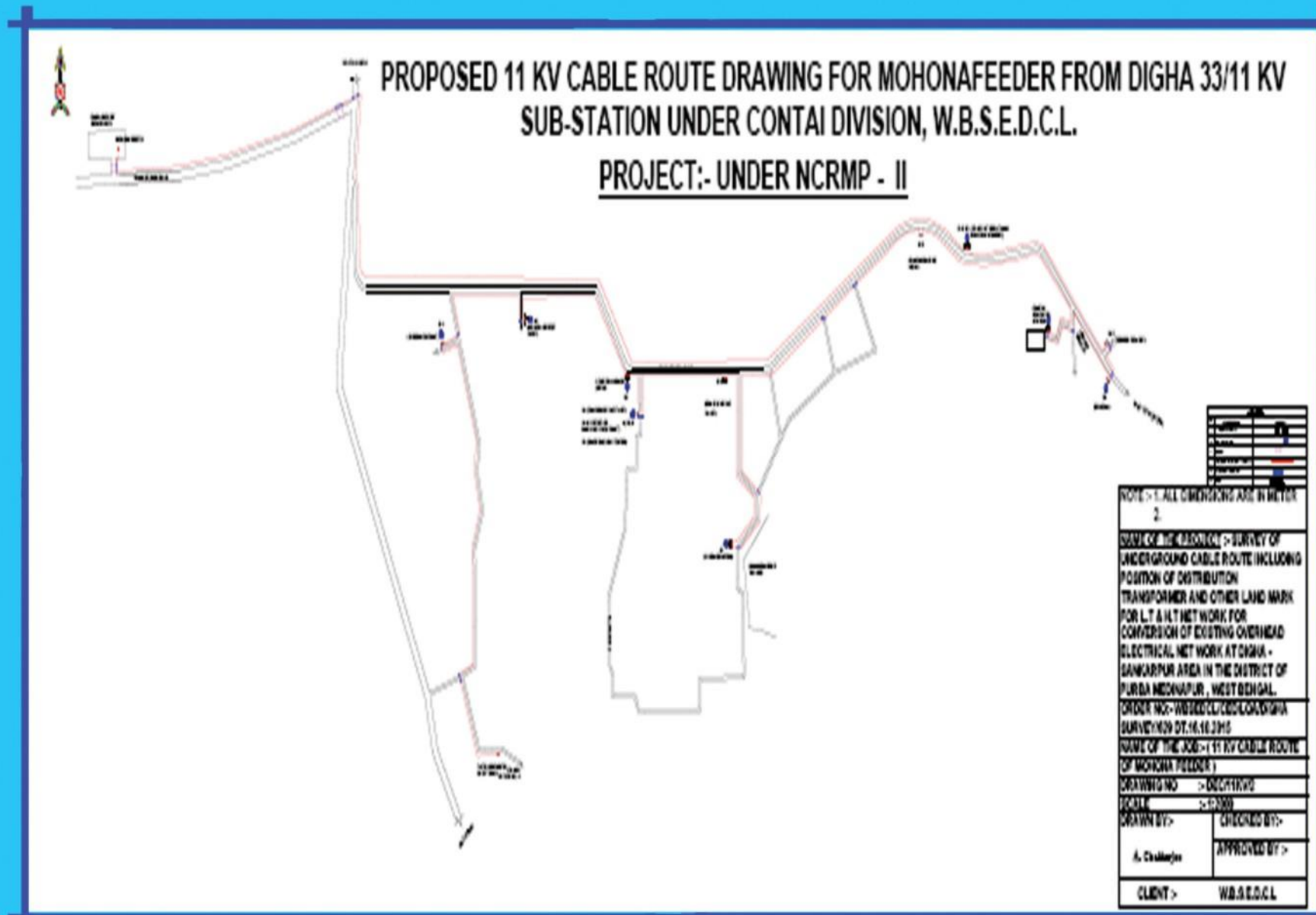


FIGURE 2.3: PROPOSED 11 kV UG CABLE ROUTE PLAN FOR MOHONA FEEDER

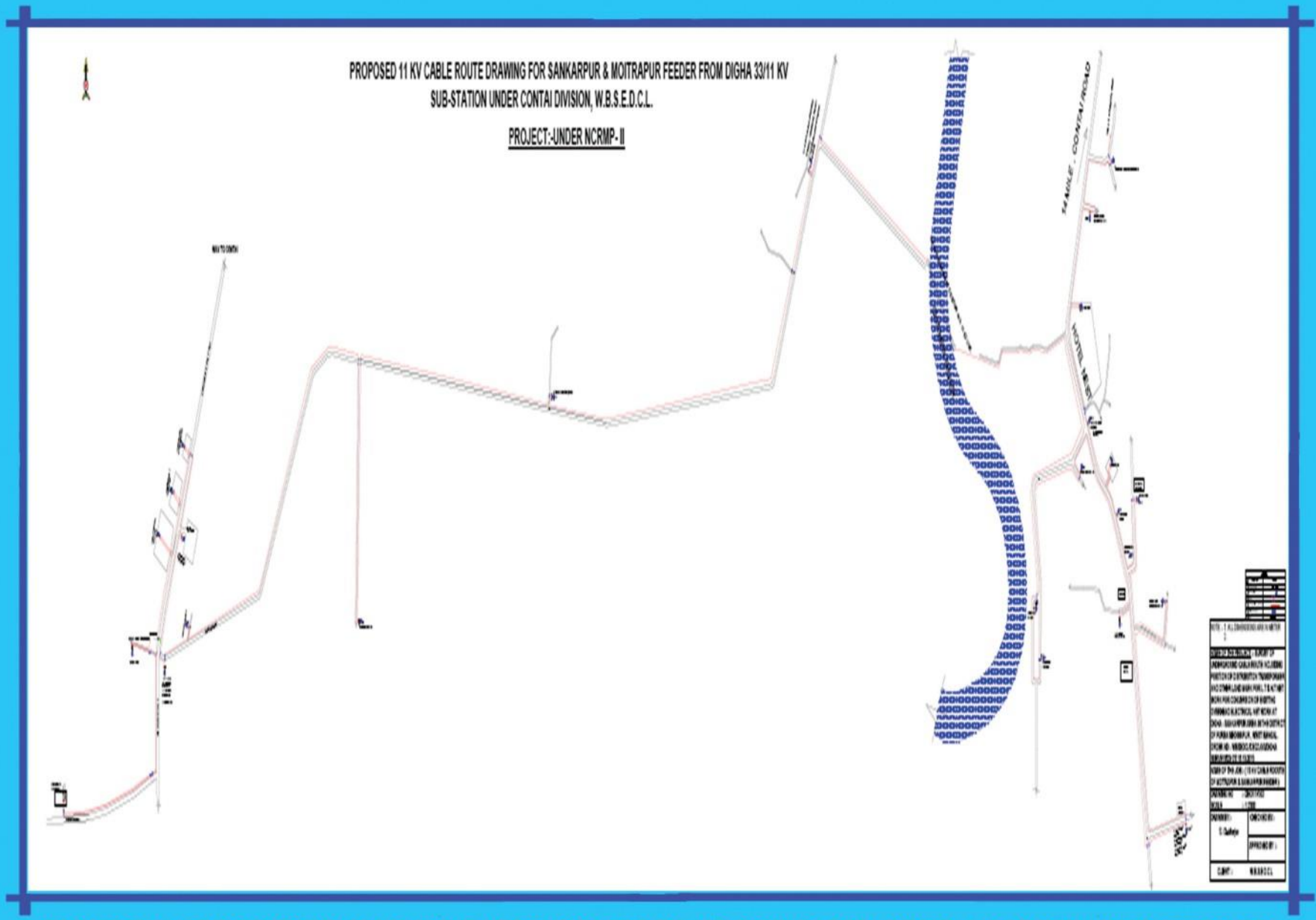


FIGURE 2.4: PROPOSED 11 kV UG CABLE ROUTE PLAN FOR SANKARPUR & MOITRAPUR FEEDER

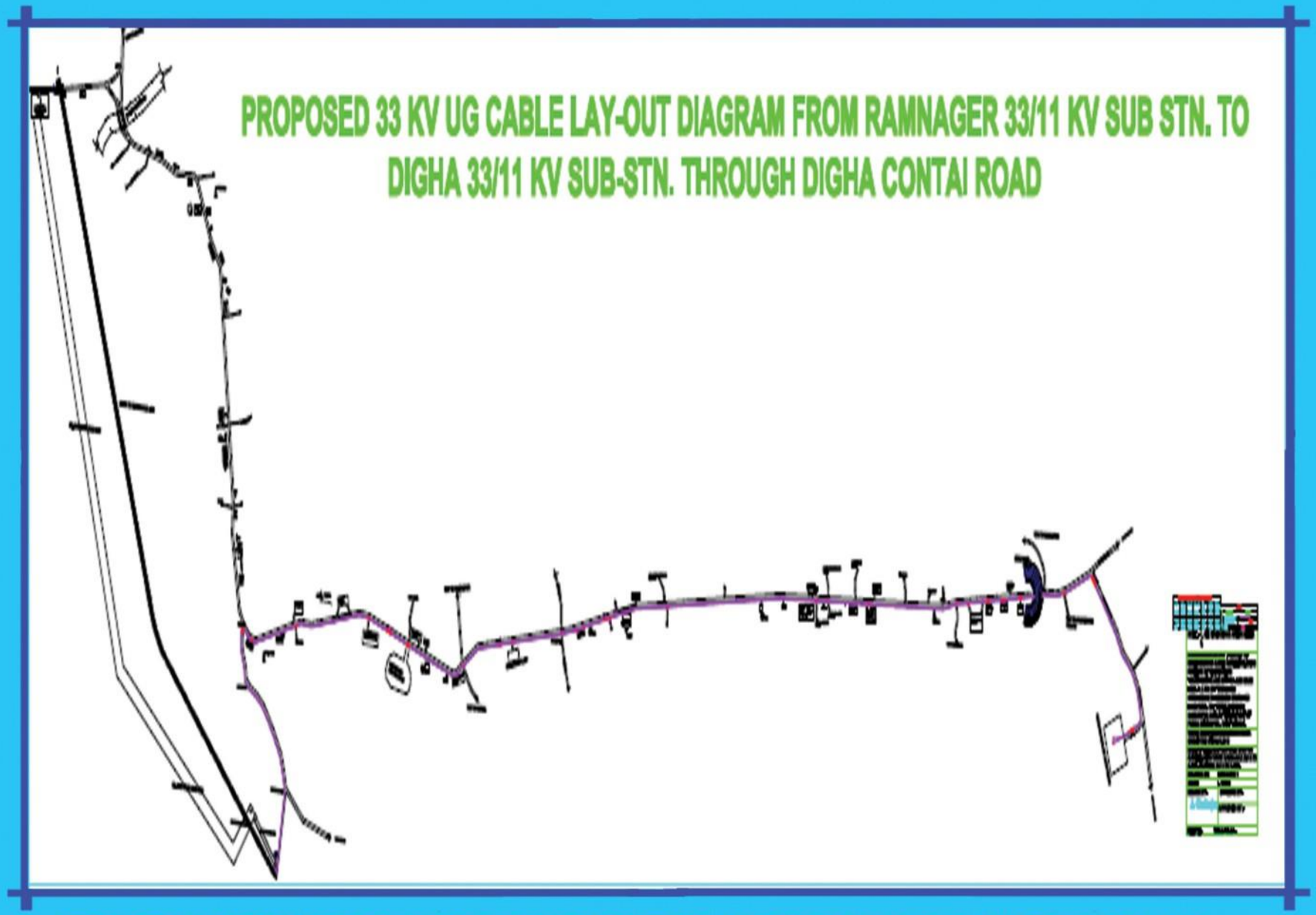


FIGURE 2.5: PROPOSED 33 kV UG CABLE ROUTE PLAN FOR RAMNAGAR S/S TO DIGHA S/S


Dalmia


Tulip


HOTEL BLUEVIEW HOTEL

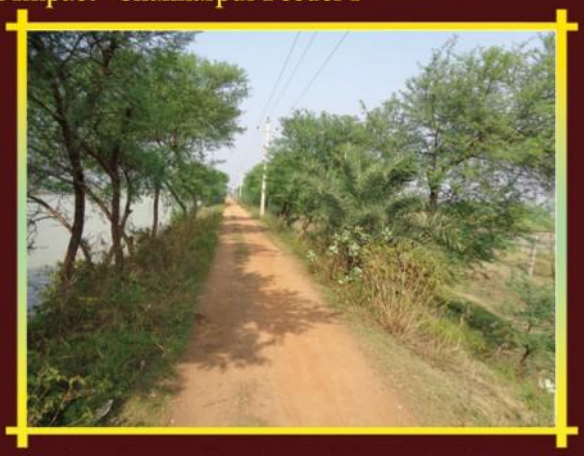

RAJEET


BUS STOP


HOTEL
RAJEET


DIGHA
MOHONA COASTAL THANA


সর্ব শিক্ষা অভিযান



2.3 PROJECT COMPONENT

2.3.1 Electrical Distribution Network Options Analysis

The distribution network of the project area of Digha-Sankarpur which has been proposed for underground cabling has been planned on following options:

Total underground network - This type of network is proposed where underground cabling is possible for the whole feeder within DSDA area.

Partial underground network - This is the combination of underground cabling and overhead distribution system through Conductor where underground cabling is not possible due to Right of way restrictions. The areas are as follows:

Champa River Crossing of 11 KV Sankarpur Feeder as overhead conductor & 33 kV feeder (2 nos. Single Circuits) from Ramnagar S/Stn. to Tikra More Rail crossing as overhead conductor.

2.3.2 Network Configuration & Reliability

The main function of an electrical power distribution system is to provide quality power (7X24) to individual consumer premises maintaining standard voltage regulation. The main components of Dist. Network is

- Distribution Substation
- Primary Distribution Feeder
- Distribution Transformer
- Secondary Distribution Feeder
- Feeder / Service Pillars
- Service Mains

There are two types of configuration for laying distribution network generally adopted:

Radial Distribution Network - In early days of electrical power distribution system, different feeders were radially come out from the substation and connected to the primary of distribution transformer directly.

Ring Main Distribution Network - The drawback of radial electrical power distribution system can be overcome by introducing a ring main electrical power distribution system. Here one ring network of distributors is fed by more than one feeder. In this case if one feeder is under fault/ maintenance, the ring distributor is still energized by other feeders connected to it. Thus the supply to the consumers is not affected even when any feeder becomes out of service.

The number of feeders connected to the ring main electrical power distribution system depends upon the following factors.

Maximum demand of the system: If it is more, then more numbers of feeders feed the ring. **Total length of the feeder:** If length is more, to compensate the voltage drop in the line, more feeders to be connected to the ring system bifurcating the existing ones.

Required voltage regulation: The number of feeders connected to the ring also depends upon the permissible allowable, voltage drop of the line.

The feeder pillars and service mains are taken off may be via distribution transformer at different suitable points on the ring depending upon the location of the consumers.

The whole distribution system of the package Digha-Sankarpur has been designed as Ring Main Distribution System with 33 KV Feeder Control Breaker & C.T along with Directional Protection scheme, 11 KV network with R.M.U control and interconnectors in LT portion for flexibility.

2.3.3 Proposed Network Designing Features

i. Use of 33 Kv. Directional Protection scheme to run the 2 nos. 33 Kv. feeders in parallel.

ii. Use of main 11 Kv. feeder cables with cable in -cable out into Ring Main Unit.

iii. Use of **SF6** RMU having SCADA compatibility with built in self powered, reset type protection against faults.

iv. Alternate feeding arrangement (N-2)/(N-1) contingency in 11 Kv. to avoid disruption to supply at any node.

v. Use of LT distribution panel typically with interconnector from other distribution transformer and 3-4 LT outgoings to feed downstream distribution network.

vi. Downstream distribution network will comprise of cable network, feeder pillar, service junction box.

vii. Adopt direct burying in ground for cable, except all cable crossing, other locations which will be protected as defined in this document.

Project Equipments

Ring Main Unit (RMU):

RMU is a totally sealed, gas-insulated compact switchgear unit. The primary switching device can be either switch dis-connectors or circuit breakers. It ensures continuous power supply. Ring bus configuration provides greater flexibility in distribution. Supply can be restored from any adjacent section. Faulty section can be easily isolated, leaving the healthy

sections continue to operate. This allows maintenance to be carried out in faulty section without disturbing other sections.

Ring Main Units (RMUs) shall be used to control the 11 kV networks. Networks are connected as ring circuits but operate as radial feeds. Each ring has a third feeder coupled, where possible, at a node representing ½ of the total ring current. The distribution feeders are protected against over-current, over voltage and earth faults at the main switchboards and do not rely on intermediate downstream protection. The feeder wise detail of RMU is presented in Table 2.2.

Features of RMU

a) RMUs are available for both Indoor and Outdoor applications.

b) Multi Cable termination RMUs with one tap-off for transformer can be used in distribution system.

c) Multi switch compact switchgear is also available with 7 no. combinations. This is useful in feeder switching and changeover.

d) Three position Cable switch with one tap-off shall be used only as an intermediate or Tap-off RMU, mainly for Feeder Tap-offs. Two ways RMU shall be used on Run of the Feeder for tap-off to distribution transformer.

e) SF6 type RMUs are recommended for less operational & maintenance attention.

f) The RMUs shall be front cable termination type

g) Recommended to use SF6 RMU with SCADA compatibility.

TABLE 2.2: PROPOSED FEEDER WISE DETAIL OF RMU

Name of 33/11 Kv Sub Station	Existing 11 KV Feeder	Proposed 11 KV Feeder Name	RMU		
			3 Way I/D with metering	3 Way O/D	4 Way O/D
DIGHA	Thana	THANA -1	1	5	3
		THANA -2	0	21	0
		THANA -3	2	26	0
	New Digha	New Digha -1	0	26	0
		New Digha -2	0	25	2
		New Digha -3	1	41	1
	Mohona-Sankarpur	Mohona	3	8	0
		Shankarpur	6	17	0
	Maitrapur	Maitrapur	0	1	0
	Saripur	Saripur	0	8	1
TOTAL			13	178	7

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

Underground Cables:

XLPE cables have been proposed and shall be used for HT & LT system. XLPE cables are generally less prone to faults since they do not absorb moisture. In congested area/ narrow lane LT AB cable will be used instead of XLPE.

Key factors in selecting underground cables:

1) Voltage regulations
2) Thermal limitations
3) Cable De-rating
4) Short time rating (To determine the conductor size)
5) Losses

Proposed Feeder wise UG Cable Quantity

The detail quantity of HT and LT undeground cable is presented in Table 2.3-2.4.

TABLE 2.3: DETAIL QUANTITY OF HT UNDERGROUND CABLE

SL No	Proposed Feeder Name	11 KV Grade, XLPE UG CABLE (in Mtrs)		
		3 C X 400 Sq.mm	3 C X 185 Sq.mm	3 C X 95 Sq.mm
1	Thana -1	2600	x	230
2	Thana -2	3028	30	285
3	Thana -3	6810	x	455
4	New Digha -1	5350	30	495
5	New Digha -2	6515	60	390
6	New Digha -3	12680	15	640
7	Mohona	6300	30	180
8	Shankarpur	15980	0	485
9	Moitrapur	1090	0	15
10	Saripur	6500	0	105
TOTAL		66853	165	3280

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

TABLE 2.4: DETAIL QUANTITY OF LT UNDERGROUND CABLE

SL No	Proposed Feeder Name	LT 1.1 KV Grade ,XLPE UG Cable with loop (in Meters)					
		4 C X 400 Sq.mm		4 C X 185 Sq.mm	4 C X 50Sq.mm	4 C X 25 Sq.mm	2 C X 6 Sq.mm
1	Thana -1	525	480	8885	637	574	7630
2	Thana -2	2265	1140	16490	1254	2940	28675
3	Thana -3	3320	1320	22105	1745	1511	25785
4	New Digha -1	3085	1080	11852	1986	0	7675
5	New Digha -2	3380	1470	14700	3391	35	17260
6	New Digha -3	4745	2130	33462	5655	0	41925
7	Mohona	2115	390	14673	706	190	17918
8	Shankarpur	7295	540	43088	698	253	19035
9	Moitrapur	0	60	4550	53	48	4400
10	Saripur	1750	210	14280	61	124	17385
TOTAL		28480	8820	184085	16186	5675	187688

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

Status of Power Loss

The feeder wise status of power loss due to existing OH system and projected power loss by 2020 is presented in Table 2.5.

TABLE 2.5: STATUS OF POWER LOSS

Existing 11 KV Feeder	OH System Power Loss (KW) in 2015	OH System Power Loss (KW) in 2022	Proposed 11 KV Feeder	Projected Power Loss (KW) in 2022
THANA	451.17	1163.36	Thana -1	4.54
			Thana -2	11.19
			Thana -3	27.56
NEW DIGHA	1455.78	3753.79	New Digha -1	14.09
			New Digha -2	28.93
			New Digha -3	110.97
SANKARPUR	299.97	773.49	Mohana	9.14
			Shankarpur	55.01
MAITRAPUR	60.52	156.04	Moitrapur	2.51
SARIPUR	17.77	45.81	Saripur	1.65
Total	2285.21	5892.49	Total	265.60

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

It is seen that power can be saved in 2022 is about 5627 KW i.e equivalent to 31 M.U. Hence revenue can be earned Rs.19.22 Crore.

2.3.4 Scope of Work

The DPR has been prepared keeping in view the conversion of existing overhead network (2015) as well as new network created in future. An optimal solution has to be provided deliberating different alternatives of the mix of Underground & OH Lines. Summary of existing distribution network and proposed underground distribution network is presented in Table 2.6 and 2.7 respectively.

TABLE 2.6: DETAIL OF EXISTING OVERHEAD DISTRIBUTION NETWORK

SL No	Particulars	Unit	Quantity
1	Network Area of The Project	Sq.km	34
2	33/11 KV Substation	No	1
3	11 kV Feeders	No	5
4	33 kV Line(2 nos. S/C)	Km	13.4 (2 x 6.7)
5	11 kV Line(5 nos. Feeders)	Km	44
6	Power Transformer		
	a)Quantity	No	2
	b)Total Capacity	MVA	16.3
7	Distribution Transformers		
	a)Quantity	No	273
	b) Total Capacity	MVA	22.897
8	LT Line Km	Km	95
9	Consumers	No	6419 approx.

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

TABLE 2.7: DETAIL OF PROPOSED UNDERGROUND DISTRIBUTION NETWORK

SL No.	EXISTING OH NETWORK DETAILS COVERD UNDER THE PROJECT			Unit	Quantity
1	From RAMNAGAR 33/11 kV				
	Two Nos. DIGHA 33 kV FEEDERS:			Km	13.4
2	Total **5 nos existing 11 KV Feeders** to be converted into **10 nos Feeder**			Km	44
3	Regrouping of Existing DTR by 160,315,630 KVA				
	315 KVA	160 KVA	25 KVA	Nos	273
	250 KVA	100 KVA	10 KVA		
	200 KVA	63 KVA			
4	Total LT Network against all Dist. Transformers			Km	95
5	Consumers			No	6419 Nos. approx
	a) HT Consumer			No	52
	b) LT Consumer (Three Phase)			No	450 (282 no 3 phase commercial)
	c) LT Consumer (Single Phase)			No	5917

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

Trench for UG Cables:

Detail of trenches for 33 kV, 11 kV HT and 1.1 kV LT UG cables is presented in Table 2.8.

TABLE 2.8: DETAIL OF TRENCHES

Spec	Core	Size(sq. mm)	No of Cable to be laid	Depth of laying from Ground Level	Width of Digging	Height of Bricks
33 KV	3	400	2	1050	750	250+75
11 KV	3	185 to 400	1	900	500	250+75
1.1KV	4	16 to 150	1	750	500	125+75
		185 to 400	1	750	500	250+75

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

Foundation for DTR:

Detail of foundation for 630 kVA and 160, 250, 315 KVA DTR foundation is presented in Table 2.9.

TABLE 2.9: DETAIL OF FOUNDATION FOR DTR

Items	Spec	Depth of foundation trench (mm)	Length & Width of Foundation trench (mm)	Foundation Height where DTR to be Placed (mm)
DTR on plinth	630 KVA	975	1700 x 1400	900
	160 ,250 ,315 KVA		1400 x 1200	
DTR on Rail Pole		2000		2700(total R.P above GL 4500)

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

2.3.5 Project Time Line

Total Project Time: 24 Months after approval of DPR

Execution Phase: 18 Months from placement of LOA

Dismantling of existing assets: 6 Months after energisation of newly created U.G cable assets.

Study of Project Parameters

Underground Conversion Programs relocate the overhead utilities into underground system mainly along existing transportation corridors. The purpose is not only to beautify, but also to make improvements and enhancements that benefit the utilities, municipalities, residents and businesses etc.

Following are the key parameters of the project implementation:

Identification of stakeholders for coordination between the various utility companies, local civic bodies, property owners/householders, is needed during execution to complete the project within time frame & make it successful.

Proper planning involves the identification of site, defining project boundaries and collecting the preliminary data like number of feeders, number of substation, feeding arrangement etc required to start the design work from the site. The data collected is then converted into desired format to utilize it for the design work.

Right of Way/ Way Leave

Permission before execution must be required maintaining following steps.

A general notification to be circulated for awareness to the public/local civic bodies, CRZ and Govt. Dept. as per ESIA report.

Fulfill the commitments made to property owners, hawkers, street vendors, shop owners etc during the execution process are included on the construction plans.

Coordinate with Shareholders before applying for encroachment applications and permits.

Design

Identify the existing right of way.

Survey the project area to identify all existing utilities and infrastructure & route should be as straight as possible, where necessary micro tunneling is to be done to overcome the obstacles.

Future expansion of roads has been taken into consideration.

High Road, rail, river, culvert (nallah) crossings and water/oil pipes, telecom lines have to be taken into consideration by way of micro- tunneling.

Compile information into a proper drawing by mapping the exact information during the field survey. The new underground power distribution system will be designed based on these drawings.

Construction

The installation of underground system will be started on getting the permits of encroachments.
WBSEDCL, the utility will be responsible for inspecting the installation.

Both OH & Underground systems will be maintained for couple of months after charging the Underground distribution system for checking. After that period OH system will be dismantled.

Common Challenges

Traffic Control/ Access Seasonal Restrictions.

Relocation of hawkers, street vendors, temporary bus shelters etc. during execution.

Directional Boring versus Open Cut, micro-tunneling & jack pushing of HDPE pipes
Project coordination with other local civic bodies.

Contacting absentee property owners during switching over from overhead to underground system, maintaining alternative arrangement of power supply to all existing consumers.

2.3.6 Estimated Cost

Total cost for Underground Cabling of HT & LT Electrical net work at Digha-Sankarpur Area is Rs. 98 Crore. Brief detail of estimated cost is given in Table 2.10.

TABLE 2.10: ESTIMATED BUDGET FOR PROPOSED UG CABLE NETWORK

SUMMARY OF PACKAGE-1 COST FOR UG CABLE WORK AT DIGHA-SANKARPUR AREA UNDER NCRMP-II		
Schedule	**Item Description**	**Amount (RS)**
A	Material Cost for Supply schedule for 33 KV HT Line & 33/11 KV S/S Augmentation (inclusive of all cost towards design, manufacture, testing, handl ing, transportation to site, unloading, strorage at site inclusive of all taxes & duties.) in total.	47548867.88
B	Erection Cost for 33 KV HT Line & 33/11 KV S/S Augmentation inclusive of testing, commisioning, handling, transportation to site, unloading, strorage at site and all other taxes, duties, insurance, cess & other incidental charges in total..	11580305.31

C	Dismantling Cost for 33 KV HT Line & 33/11 KV S/S Augmentation in total.	828210.95
	GRAND TOTAL (A+B+C)	59957384.15
	Service Tax including Swachh Bharat Cess @15% on Erection + Dismantling (B+C)	0.00
	BOCWW@ 1% on GRAND TOTAL	599573.84
	Contractor's profit @ 5% on Material & Erection cost(A+B+C)	2997869.21
PACKAGE -1 TOTAL COST		**63554827.00**
SUMMARY OF PACKAGE-2 COST FOR UG CABLE WORK AT DIGHA-SANKARPUR AREA UNDER NCRMP-II		
Schedule	**Item Description**	**Amount (RS)**
A	Material Supply schedule for 11KV HT Line,R.M.U,DTR & LT Line(inclusive of all cost towards design, manufacture, testing, handl ing, transportation to site, unloading, strorage at site inclusive of all taxes & duties.) in total.	624085034.05
B	Erection schedule for 11KV HT Line,R.M.U,DTR & LT Line inclusive of testing, commisioning, handling, transportation to site, unloading, strorage at site and all other taxes, duties, insurance, cess & other incidental charges in total..	238664367.12
C	Dismantling schedule for 11KV HT Line,R.M.U,DTR & LT Line in total.	6035575.82
	GRAND TOTAL (A+B+C)	868192643.05
	Service Tax including Swachh Bharat Cess @15% on Erection + Dismantling (B+C)	0.00
	BOCWW@ 1% on GRAND TOTAL	8681926.43
	Contractor's profit @ 5% on Material & Erection cost(A+B+C)	43409632.15
PACKAGE - 2 TOTAL COST		**920284201.63**
SUMMARY OF TOTAL PACKAGE COST FOR UG CABLE WORK AT DIGHA-SANKARPUR AREA UNDER NCRMP-II		
P1	**Package 1**	**63554827.00**
P2	**Package 2**	**920284201.63**
	P 1 + P2	**983839028.63**
P3	**Chages for obtaining various clearance from different statutory authority**	
	i) S.E. Railways	1500000.00
	ii) CRZ	2000000.00
	iii) NHAI /S.H/DSDA	1000000.00
	SUB TOTAL =P3	**4500000.00**
	TOTAL PROJECT COST(P1+P2+P3) =	**988339028.63**

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

2.4 CONSTRUCTION OF UNDERGROUND ELECTRICAL DISTRIBUTION NETWORK

The walkover survey and the route profiling for fixing of alignment has been completed by WBSEDCL. The detailed check survey for exact underground cabling network has been completed for all the feeders of Digha-Sankarpur area. Distribution line construction is a sequential process and comprises of a distinct operations and phases, which are described in the following sections.

2.4.1 Construction Methodology

The prime elements of constrction of underground cabling network in Digha-Sankarpur area include followings:

- Underground Cabling
- Protection Duct for Cable Joint
- Cable Joint Marker
- Installation of Transformer
- Installation of RMU
- The Feeder Pilar Box
- Micro Tunnelling

The detail technical specification of above is presented in Annexure 2.1. Detail of Micro Tunnelling for proposed underground cabling network is as follows:

- The Micro-Tunnelling work with HDPE pipe of requisite sizes (110 mm or 160 mm dia as per IS: 4984-1995) by Horizontal Direct Drilling (HDD) method would be done for laying of different sizes of underground cables along the route for main crossing point of NH/SH/metal road, railway, river/canal, other pipelines/installations of different utilities.
- Ground penetrating radar survey along the roposed Micro-Tunnelling route for identification of underground services would be adopted during Micro-Tunnelling work.
- Requisite safe drilling inspection pits and test pits, wherever necessary, would be ecxecuted during Micro-Tunnelling work.
- Guided boring/drilling technmology would be used.
- In horizontal and verical boring, system should be capable upto 10 m below ground level.

- Depth of boring should be as to clear any underground utilities/obstructions. Minimum depth of boring for road crossinng would be 1.65 m from the crust level of road. The micro-tunnelling should be at least 2 m below the design bed level of the channel/canal.

- Radio or any other detection system would be used for avoiding damage to existing underground utilities like electric cables, water pipe lines, sewerage line, Telcom copper cables, optical fibres, gas pipe lines, etc.

- The record of depth of laying HDPE pipe through Micro-Tunnelling below the canal/road/railway/other utilities would be maintained at an interva of 5 m.

- Necessary data from the appropriate different authorities for crossing point would be obtained for Mictro-Tunnelling work with the asssistance of WBSEDCL.

- Proposed Micro-Tunnelling diagram with land mark along with depth profile would be submitted for obtaining approval from the respective utilities before execution. After execution of Micro-Tunnelling wok rout profile would be submitted for record.

Thus, for the purpose of assessing environmental, social and health impact, the following activities related to the construction of 33 kV and 11 kV underground transmission and distribution lines have been considered in the present study.

- Route survey and analysis of alternative routes for finalizing alignment of underground distribution lines;

- Mobilization of material and equipment, including procurement of cables, conductor and line materials, transformers, etc.;

- Construction of distribution lines including erection of the foundation for transformer, RMU and feeder pillar, etc. using JCB and a truck equipped with hydraulic jack and drilling rig; etc.;

- Clearing of right of way by cutting/trimming trees where necessary; and

- Checking, testing and commissioning of distribution.

Safety Compliance Management:

The whole project majorly involves civil works & electrical works. Safety should come first before execution of the project as per the motto of WBSEDCL. Hence precaution has to be taken from the beginning of the project in all kind of aspects like Civil, Mechanical & Electrical works.

Civil /Construction works

General

The specification deals with the subject matter of safety and protection to be observed in the Civil Construction. This shall be followed along with all related statutory requirements obligation and including Government bylaws, codes, ordinance of local or central authorities relates to the construction work.

In case of complicated work like deep excavation, intricate shuttering and form work, excavation in loose soil and below water table, stacking of excavated earth etc. work plan with necessary drawings and documents have to be prepared by the contractor and got approved by the Engineer.

Excavation

The following procedures should follow during the excavation works:

Sides of all excavations must be sloped to a safe angle, not steeper than the angle of repose of the particular soil. If it is not possible to give a proper slope, the sides of the excavation where there is a danger of fall or dislodgement of earth or any material, shall be securely supported by timber or other type of shoring.

No excavation or earth work below the foundation level of an adjoining building shall be taken up unless adequate steps are taken to prevent damage to the existing structure or fall of any part.

Every accessible part of an excavation, pit or opening in the ground into which there is a danger of persons falling shall be suitably fenced with a barrier (tape)up to a height of one metre suitably placed from the edge of the excavation as far as practicable.

No material or load shall be placed or stacked near the edge of the excavation or opening in the ground. The excavated material shall not be placed within 1.5 m of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. No undercutting.

All narrow trenches 1.2 m or more depth shall at all times be supplied with at least one ladder for each at an interval about 30 m in length of fraction thereof. Ladder shall be extended from bottom of the trench to at least one metre above the surface of the ground. The sides of the trenches which are 1.5 m or more in depth shall be stepped back to give suitable slope, or securely held by planking, strutting and bracing so as to avoid the danger of side collapse.

Materials shall not be dumped against existing walls or partition to a height that may endanger the stability of the walls.

While withdrawing piled materials like loose earth, crushed stone, sand etc. from the stock piles, no over changing shall be allowed to be formed in the existing dump.

No material on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or public or any other agency at work.

Mechanical Works

A lot of precaution has to be followed as mechanical work it involves both man made activities & machineries. The following has to be maintained.

No person shall board any vehicle or equipment when it is in motion. Suitable blocks shall be placed against the wheels of a vehicle when it is used for tippling materials into excavation or a pit or over the edge of any embankment or earthwork to avoid the danger of its running over the edge. All workers shall stand clear of the vehicle while it is dumping. If the material being dumped is very heavy or sticky, dump hooks shall be used or dumper shall be clamped to prevent any danger of its tripping.

Materials shall not be allowed to be loaded in a vehicle so as to project horizontally beyond the sides of the body of the vehicle. All materials projecting beyond the front or rear shall be indicated by a red flat in the day and with red light in the night.

Driver of the truck or any heavy vehicle shall not reverse it unless assisted by a signal man who shall have a clear view of the driver and the area beyond the truck during reversing operation. Maximum speed of a heavy vehicle must not exceed 15 km per hour.

Precautions have to be taken at the time of lifting appliances, scaffoldings, shuttering riveting, gas-cutting& welding.

Electrical

Only authorized persons shall handle electrical equipment. Any person detecting electrical apparatus being handled by an unauthorised person or equipment in unsafe condition must report the matter to the Electrical Engineer-In-Charge.

No person shall work on any live electric conductor or apparatus and no person shall assist such person on such work, unless he is authorised in that behalf.

After isolating the equipment from the source of supply before the work begins, a sign `DON'T SWITCH ON' must be hung on or near the switch to avoid its being accidentally or inadvertently switched on when persons are working.

Earth the equipment, before work, to discharge it and short the terminals as a precautionary measure against accidental switching ON. After the work is finished take out Earthing and shorting link.

Line should be charged by the same authorized person who has taken shutdown. When working on live equipment use one hand only whenever possible, it is advisable to keep the other hand behind the back.

All persons handling electrical works in elevated position must use safety belts. Use fire extinguishers wherever provided. Use sand and blankets etc., if available.

Use insulated tools, tackles, hand gloves, boots &ladder to ensure the insulation. As far as possible verbal instructions shall be avoided in case of pre- arranged shut-down of electrical apparatus.

Miscellaneous

The contractor shall also provide necessary fencing and lights to protect the public from accident. Fire extinguishers adequate in number shall be kept by the contractor at the site of works where there is risk of fire hazard.

When the work is done near any place where there is risk of drowning, all necessary equipments shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provisions shall be made for prompt first aid treatment of all injurious likely to be sustained during the course of the work.

These safety provisions shall be brought to the notice of all concerned by displaying on a Notice Board at a prominent place at the work spot. The persons responsible for compliance of the code shall be named therein by the contractor.

To ensure effective enforcement of the rules and regulations relating to safety precautions, the arrangements made by the contractor shall be open to inspection by the Employer i.e WBSEDCL.

All storage, handling and use of flammable liquids shall be under the supervision of qualified persons. Flammable liquid shall not be stored inside the tunnel.

All sources of ignition shall be prohibited in areas where flammable liquids are stored, handled and processed. Suitable warning and `NO SMOKING' signs shall be posted in all such places. Receptacles containing flammable liquids shall be stacked in such a manner as to permit free passage of air between them.

All combustible materials shall be continuously removed from such areas where flammable liquids are stored, handled and processed. All spills of flammable liquids shall be cleared up immediately. Containers of flammable liquids shall be tightly capped.

Reporting of Accident

All accidents, major or minor must be reported immediately to the concerned site in charge of WBSEDCL through the contractor as per prescribed format of WBSEDCL. The same report has to be sent to the highest authority of WBSEDCL through proper channel.

Serious Injury

In case of serious injury, the following procedure shall be adopted:

Provide First Aid at his own First Aid Station.

Take the injured person to the hospital along with the "INJURED ON WORK" form duly filled in.

Reporting the accident to the WBSEDCL by the contractor

Fatal Accident

Fatal Accident must be reported immediately to the WBSEDCL as well as to the Police.

Penalty

Failure to observe the Safety Rules will make the contractor liable to penalty by way of suspension of work and terminated of contract.

Dismantling of Existing Overhead Lines

All of the existing HT & LT overhead distribution line shall have to be dismantled and removed for the implementation of the proposed project. It involves the rigorous and methodical following of processes and procedures to make sure that the completed work meets the quality assurance set by the organization. It also involves using a range of tools and equipment and the wearing of Personal Protective Equipment whilst carrying out the work.

The dismantling of the existing network shall be started phase wise so that continuity& quality of power can be ensured even after successful installation and commissioning of the new underground distribution network. It is because if any problem pertains in the new system it can be rectified within stipulated time without any power outages. It will take around 6 months time to dismantle the overhead network in a phased manner.

2.4.2 Process of Dismantling

Plan for work activities to dismantle overhead steelwork, fittings and conductors on pole structures:

i. Conduct a site specific risk assessment, completing required documentation, in line with health and safety regulations.

ii. Plan the work to be undertaken to comply with company procedures in line with the risk assessment, taking into account factors such as location, content, sequence of tasks and personnel.

iii. Inform all affected parties of their intended work plan, in line with company procedures.

Prepare resources to dismantle overhead steelwork, fittings and conductors on pole structures:

- Create an inventory of all the assets which has to be dismantled. The asset registers to be jointly signed by the contractor and the employer.
- Identify the locations for storing the dismantled materials with the approval of the employer.
- Classify the materials as scrap and usable. The category of material along with quantity shall be verified by employer / project manager.
- Create an area wise dismantling plan to minimize the disruption to the normal day to day life and obstruction to traffic & safety of property & personal.
- The dismantling plan shall be prepared area wise, road wise & street wise so that proper demarcation & barricading can be done.
- Use of proper machinery to be suggested by the contractor for dismantling like cranes, trucks, ropes, shovel, platforms etc.
- Use of proper safety guards for all personnel.
- Check the tools and equipment are fit for purpose to carry out the identified work in accordance with WBSEDCL norms.
- Select, inspect and prepare suitable access and egress equipment to carry out the identified work in accordance with WBSEDCL norms.

Carry out the dismantlement of overhead fittings and conductors on pole structures:

- De-tension and lower conductors safely and effectively after ensuring that the line is discharged and carrying no power supply.
- Dismantling of conductors after loosening of all jumpers, rerolling of conductor in proper shape without distorting the conductor.
- Dismantling of all cross arms and other line accessories like pins, insulators, clamps etc. these shall be properly stacked at site.
- Dismantling of poles and stacking of poles at site without any distraction to traffic and normal life.
- Removal of stacked material to designated store to be handed over to the authorized person.
- Removal of dismantled debris, foundations of rail poles and crushing of dismantled unusable PCC poles & insulators to the dumping ground premises of the DSDA.

- In case there is any issue regarding social and environment aspect, it should be referred to the site in-charge of the project.

- The valuable properties like Distribution transformers; Conductor, Rail Pole etc. are to be returned immediately after dismantling in prescribed schedule to the site office at Digha 33/11 KV Substation Premises with proper storing arrangement for maintaining accountability and for reuse of the same to the other areas within the jurisdiction of WBSEDCL

The detail of material likely to be generated from dismantling of existing overhead line in Digha-Shankarpur area is presented in Table 2.11.

TABLE 2.11: DETAIL OF MATERIAL LIKELY TO BE GENERATED DUE TO DISMANTLING OF EXISTING OH LINE (33 kV)

SL. No	DESCRIPTION OF MATERIALS	QUANTITY
33 KV. O.H. LINE RAMNAGAR TO DIGHA FEEDER-1 & 2		
1	A.C.S.R. CONDUCTOR 100 SQ. MM.	43.533 KM.
2	M.S. RAIL POLE	171 NOS.
3	P.C.C. POLE 9 MTR. LONG	112 NOS.
4	33 KV. PIN INSULATOR	702 NOS.
5	33 KV. G.I. PIN FOR PIN INSULATOR	702 NOS.
6	11 KV. DIC INSULATOR	972 NOS.
7	HARD WARE FITTINGS	972 NOS.
8	33 KV 'V' BRACKET	137 NOS.
9	33 KV TOPADOPTOR	137 NOS.
10	H.T. STAY SET	381 SETS.
11	IRON MATERIALS (M.S. ANGLE, FLAT ETC. ASSORTED SIZE)	20.684 MT.
11 KV LINE FOR THANA, NEW DIGHA, SANKARPUR & PORTION OF SARIPUR & MOITRAPUR FEEDER		
1	A.C.S.R. CONDUCTOR (ASSORTED SIZE 30 SQ. MM/50 SQ. MM./100 SQ. MM.)	131.916 KM.
2	P.C.C. POLE 8 MTR. LONG	718 NOS.
3	M.S. RAIL POLE (DIFFERENT SIZE)	611 NOS.
4	H.T. STAY SET	872 SETS.
5	11 KV. PIN INSULATOR	3093 NOS.
6	11 KV. G.I. PIN	3093 NOS.
7	11 KV. DISC INSULATOR	2384 NOS.
8	HARD WARE FITTINGS (ASSORTED SIZE)	238 SETS.
9	11 KV. "V" BRAKET	206 NOS.
10	IRON MATERIALS (M.S. CHANNEL, ANGLE, FLAT ETC. ASSORTED SIZE)	42.96 MT.
11	11 KV. T.P.G.O. ISOLATOR	203 SETS.
12	DISTRIBUTION TRANSFORMER 11/0.433 KV. 250 KVA.	1 NO.
13	DISTRIBUTION TRANSFORMER 11/0.433 KV. 160 KVA.	6 NOS.
14	DISTRIBUTION TRANSFORMER 11/0.433 KV. 100 KVA.	114 NOS.
15	DISTRIBUTION TRANSFORMER 11/0.433 KV. 63 KVA.	32 NOS.
16	DISTRIBUTION TRANSFORMER 11/0.433 KV. 25 KVA.	46 NOS.
17	DISTRIBUTION TRANSFORMER 11/0.250 KV. 16 KVA.	3 NOS.
18	DISTRIBUTION TRANSFORMER 11/0.250 KV. 10 KVA.	1 NO.
19	11 KV H.T A.B Cable 3 X 50 SQMM	0.521Km

L.T. LINE MATERIALS FOR THANA,NEW DIGHA, SANKARPUR & PORTION OF SARIPUR & MOITRAPUR FEEDER		
1	A.A.C. CONDUCTOR (3 SWG) 50 SQ. MM.	176.166 KM
2	A.A.C. CONDUCTOR (7 SWG) 25 SQ. MM.	79.162 KM.
3	P.C.C. POLE 8 MTR. LONG	2384 NOS.
4	WOOD POLE	1 NO.
5	STEEL TUBULAR POLE	1 NO.
6	L. STAY SET	1719 SET.
7	D' IRON CLAMP	3397 NOS.
8	PORCILEN SHACKLE INSULATOR	11496 NOS.
9	IRON MATERIALS (M.S. ANGLE, FLAT ETC. ASSORTED SIZE)	26.014 MT
10	IRON MATERIALS (M.S. CHANNEL, ANGLE, FLAT ETC. ASSORTED SIZE)	27.558 MT

Source: Detailed Project Report for Underground Cable Network at Digha-Sankarpur Area, Purbamedinipur, West Bengal under World Bank Project NCRPM-II, WBSEDCL, February, 2016.

2.4.3 Operation and Maintenance

The distribution system will be operated and maintained by WBSEDCL following completion of the construction works. The details of operation and maintenance are as provided.

Operation Details

The system decision is based on the fulfillment of the following criteria:

i) Minimum losses in transmission and distribution
ii) Minimum Right of way for Line corridors (to save environment and save time and avoid disputes for obtaining ROW).
iii) High reliability under system/ grid disturbances.
iv) High availability to take care of contingencies.
v) Proven technology.
vi) Possibility to control the power flow.
vii) Most optimum cost of the system to control investment.

Maintenance

WBSEDCL will undertake a regular maintenance and monitoring programme for the distribution network which comprises of:

- Preventive measure,
- Measures for breakdown

The preventive checks are planned to be carried out periodically along the distribution network.

CHAPTER 3
REGULATORY & LEGAL FRAMEWORK

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REGULATORY & LEGAL FRAMEWORK

This chapter presents the national and state levels environmental policies, legislations and regulations and World Bank Policies relevant to the proposed UG cable project. The various regulatory clearances required for the proposed UG cable project are also included in this chapter.

3.1 NATIONAL ENVIRONMENTAL AND SOCIAL SAFEGUARD POLICIES & REGULATIONS

The Government of India has laid out various policy guidelines, acts and regulations pertaining to environment. The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Ministry of Environment, Forests and Climate Change (MoEF & CC) and the Central Pollution Control Board (CPCB) at National level, whereas West Bengal Pollution Control Board (WBPCB) at State level in the present context to UG cable project. The National and State level environmental and social framwork is presented in subsequent sections.

3.1.1 Legal Framework

- The Environment (Protection) Act and Rules, 1986
- The Water (Prevention and Control of Pollution) Act, 1974 and Rules, 1975
- The Air (Prevention and Control of Pollution) Act, 1981 and Rules, 1981
- The West Bengal Trees (Protection and Conservation in Non Forest Areas) Act 2006 And Rules, 2007
- The Environmental Impact Assessment Notification, 2006
- Coastal Regulation Zone Notification, 2011
- The Noise Pollution (Regulation and Control) Rules, 2000
- Solid Waste Management Rules, 2016
- Hazardous Waste (Management, Handling and Transboundary Movement) Rules, 2008
- e-Waste (Management) Rules, 2015
- Construction and Demolition Waste Management Rules, 2016
- The National Green Tribunal Act, 2010
- The Factories Act, 1948 and amended in 1987
- The Indian Electricity Act, 1910 and Rules, 1956
- The Motor Vehicle Act 1988 and Motor Vehicle Rules 1989
- Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996

3.1.2 Institutional Framework

Agencies responsible for enforcement of various environmental and social regulations as well as Institutional framework are as given below:

- Ministry of Environment, Forest and Climate Change (MoEF&CC);
- Central Pollution Control Board (CPCB);
- Department of Environment (DoE), GoWB;
- Department of Disaster Management (DoDM), GoWB;
- West Bengal Pollution Control Board (WBPCB);
- State Transport Departments;
- State Electricity Utility Company - WBSEDCL; and
- District Administration for Right of Use of Land

3.2 WORLD BANK ENVIRONMENTAL AND SOCIAL SAFEGUARD POLICIES

The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. Safeguard policies provide a platform for the participation of stakeholders in project design, and act as an important instrument for building ownership among local populations. The effectiveness and development impact of projects and programs supported by the Bank has substantially increased as a result of attention to these policies. The World Bank has ten environmental, social, and legal safeguard policies which are listed in the following:

Environmental Policies:

OP/BP 4.01 Environmental Assessment
OP/BP 4.04 Natural Habitats
OP/BP 4.09 Pest Management
OP/BP 4.11 Physical Cultural Resources
OP/BP 4.36 Forests
OP/BP 4.37 Safety of Dams

Social Policies:

OP/BP 4.10 Indigenous Peoples
OP/BP 4.12 Involuntary Resettlement

Legal Policies:

OP/BP 7.50 International Waterways
OP/BP 7.60 Disputed Areas

Operational Policies (OP) are the statement of policy objectives and operational principles including the roles and obligations of the Borrower and the Bank, whereas Bank Procedures (BP) is the mandatory procedures to be followed by the Borrower and the Bank. Apart from these, the IFC guidelines for Environmental Health and safety have been adopted by the World Bank Group which is also relevant for environmental protection and monitoring. In

addition to that the Policy on Access to Information of World Bank also relates to environmental safeguard.

World Bank Policy on Access to Information:

In addition to the safeguard policies, the Access to Information Policy also relates to safeguards. To promote transparency and facilitate accountability, Bank Access to Information Policy supports decision making by the Borrower and Bank by allowing the public access to information on environmental and social aspects of projects in an accessible place and understandable form and language to key stakeholders. The Bank ensures that relevant project-related environmental and social safeguard documents, including the procedures prepared for projects involving subprojects, are disclosed in a timely manner before project appraisal formally begins. The policy requires disclosure in both English and Local language and must meet the World Bank standards.

3.3 IMPLICATIONS OF NATIONAL POLICIES AND REGULATIONS ON THE PROPOSED PROJECT

There is no legal requirement for undertaking an Environmental Impact Assessment (EIA) or obtaining any environmental clearance under the Environmental (Protection) Act, 1956 in order to establish or operate a power transmission and distribution network.

Based on field visits to potential project sites and experience (of WBSEDCL) from implementation of similar projects, it appears that upgradation/rehabilitation/replacement of transmission/distribution lines are not likely to generate significant environmental/social/ health impacts. Such projects would not require acquisition of land, and would involve construction works along existing corridors of power lines. Therefore, for such upgradation/ rehabilitation/replacement works, a thorough "environmental, social and health" screening required to be carried out first (following guidelines presented in the ESMF of NCRMP-II); if the "screening" exercise does not indicate significant environmental/ social/health impacts, the DoE would be approached for permitting less stringent requirement (e.g., IEE and EMP) for obtaining CRZ clearance of such projects.

The Factories Act, 1948 outlines guidelines for ensuring worker's health and safety during construction works which would have direct implications in the proposed project. It would be the responsibilities of the contractors to make sure that these guidelines are followed in the workplace environment.

Table 3.1 presents the key environmental and other regulations relevant to proposed UG cable project at Digha-Shankarpur area.

TABLE 3.1: ENVIRONMENTAL REGULATIONS RELEVANT TO PROPOSED UG CABLE PROJECT AT DIGHA SHANKARPUR AREA

Sl. No	Environmental and Other Regulations	Relevance to UG Cable Project	Regulatory Clearances Required, if any	Authority
1	EIA Notification, 14th Sept 2006 and subsequent amendments	This notification is NOT applicable as UG cabling project is not listed in the Schedule of the notification and therefore out of the purview of notification	NONE	MoEF, GoI and SEIAA, GoWB
2	Coastal Regulation Zone (CRZ) Notification, 2011 and Subsequent amendments	The area of UG cable project falls partly inside CRZ 1A, CRZ 1B and CRZ III area as per CRZ notification, 2011. However, laying of underground cables under UG cable route will be confined to the existing city roads and will not ingress into beach areas (shoreline) along coastline.	CRZ clearance is required for UG cable project as it partly falls inside CRZ 1A, 1B and III area. However, the UG cabling work will be confined on existing paved road	WBCRZMA, Government of West Bengal and MoEF&CC, Government of India
3	The Forest (Conservation) Act. 1980 with amendments made in 1988 and subsequent amendments thereof	This Act is NOT applicable as the alignment of cable routes of proposed UG cable project is along existing city roads, which are under jurisdiction of DSDA and does not pass through forest areas or require diversion of forest land for laying of UG cables (non-forest purposes).	NONE	Principal Chief Conservator of Forests, Forest Department, Government of West Bengal
4	Wild Life Protection Act 1972	This act is NOT applicable as the alignment of cable routes under UG cable project is along existing city roads, which are under jurisdiction of DSDA and does not pass through forest areas, national parks, sanctuaries or known wildlife crossing points.	NONE	Chief Wildlife Warden, Government of West Bengal
5	Air (Prevention and Control of Pollution) Act, 1981	This act would be applicable for construction phase to manage ambient air quality at work camp sites if hot mix plants, macadam mix plants and concrete batch mix plants etc for road restoration work would be required to be used.	Consent for Establish (CFE) may be obtained prior to establishing work camp sites. Consent for Operate (CFO) may be obtained prior to commencement of operations at work camp sites	WBPCB, Government of West Bengal
6	Water Prevention and Control of Pollution) Act,1974	This act would be applicable for construction phase to manage to manage liquid waste discharges at work camp sites with hot mix	Consent for Establish (CFE) may be obtained prior to establishing work	WBPCB, Government of West Bengal

		plants, macadam mix plants and concrete batch mix plants etc if required to be used.	camp sites. Consent for Operate (CFO) may be obtained prior to commencement of operations at work camp sites	
7	Noise Pollution (Regulation and Control Act), 2000	This act will be applicable for all construction equipment/plant and machinery including vehicles deployed for implementation of UG cable project for regulation of ambient noise levels	NONE but noise levels are to be regulated during construction and maintenance of proposed UG cable project in conformity with permissible standards	WBPCB, Government of West Bengal
8	e-Waste (Management) Rules, 2015	This rule shall not be applicable as the area of UG cable project involves only decommissioning and/or shifting of electrical utilities from overhead to underground and does not involve dismantling of electrical equipment into its components.	NONE	West Bengal Pollution Control Board
9	Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010	This act is not applicable as the area of UG cable project does not have any ancient monuments and archeological sites protected under the Act.	NONE	National Monument Authority, constituted under the Act
10	Public Liability and Insurance Act 1991	To protect damage to the public life and/or property as a result of negligence/accidents during implementation of UG cable project	NONE. However, Project operations are to be insured to cover damage to the public life and/or property due to accidents/negligence during implementation of UG cable project	Insurance Regulatory and Development Authority of India
11	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules 1989	This act will be applicable for all construction equipment/plant and machinery including vehicles deployed during implementation of UG cable project	NONE but vehicular emissions are to be regulated by project proponent in conformity with permissible levels/emission norms	State Transport Authority/Motor Vehicles Department
12	Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996	To ensure safety and welfare measures for workers employed at building and other construction sites. The UG project is covered under Other construction category	NONE. Safety and welfare measures for work force employed at construction sites are to be regulated in conformity with the Act	West Bengal Building and Other Construction Workers' Welfare Board
13	The West Bengal Trees (Protection and Conservation in Non	This act is not applicable to UG cable project. The cable routes will be aligned to bypass trees	NONE	Chief Conservator of Forests, Forest

	Forest Areas) Act 2006 And Rules, 2007	of all types and sizes. Therefore, no tree felling/cutting is required for implementation of UG cable project within the project area. The water requirements of the project area, will be met from ground water sources, through existing tube wells and entire DSDA is under safe category for ground water extraction by CGWB.		Department, Government of West Bengal
14	Indian Electricity Rules, 1956 and amendments thereof and BIS 1255;1983 and amendments thereof	This stipulates all technical and safety requirements during cable laying, testing and operation of the UG cable project	NONE	Central Electricity Board and Govt. of West Bengal
15	Hazardous Waste (Management, Handling and Transboundary Movement) Rules,2008 and amendments thereof	The rules will be applicable to oils/lube wastes from construction equipments /machinery during construction phase (cable laying) and discarded/waste transformer oils during decommissioning phase of existing overhead infrastructure. The rule include storage, handling, transportation procedures and requirements for safe disposal of all hazardous wastes.	NONE	WBPCB
16	Solid Waste Management Rules, 2016	This rules are applicable to all forms/types of solid waste generated at operational areas and work camp sites under UG cable project	NONE	WBPCB

3.4 IMPLICATIONS OF WORLD BANK SAFEGUARD POLICIES ON THE PROPOSED PROJECT

According to WB Operational Policy (OP 4.01), the nature of environmental assessment to be carried out for a particular sub-project would largely depend on the category of the sub-project. As mentioned earlier, The World Bank Operational Policy (OP) 4.01 classifies projects into three major categories (category A, B and C), depending on the type, location, sensitivity and scale of the project, and nature and magnitude of potential impacts. The underground electricity cabling network and distribution system will be a category B project according to World Bank classification, since no large-scale infrastructure investment or major expansion will be implemented under the proposed project. The environmental impacts of the project are expected to be mostly construction related and limited within the project boundaries.

It is highly unlikely that any natural habitant formed largely by native plant and animal species will be affected or modified during the construction phase of underground electrical cabling network (HT 11/33 kV and LT). The World Bank policy related to conservation of

Natural Habitats (OP/BP 4.04) not likely to triggered. Similarly, the World Bank Policy on Forest (OP/BP 4.36) not likely triggered since UG cable routes will not pass through or involve in any Activity in forests/plantation areas.. However as advance precautionary measures the possible impact if any on natural habitats and forest has been addressed through subproject specific environmental screening/assessment and EMP.

The proposed UG cabling routes are not likely to pass through areas with physical cultural resources. Therefore, OP 4.11 (Physical Cultural Resources) will not be relevant.

The activities of the project will not involve any pesticide application, include activities in forest areas or relate to protection of dams. Hence, OP/BP 4.09 and OP/BP 4.37 will not be relevant.

The distribution lines and installation of transformer, RMU, feeder pillar, etc. would not likely to intervene in areas where indigenous people live (specific subproject locations will be determined during implementation). Hence OP 4.10 will not be relevant for the UG cabling project.

As underground cabling network development in Digha Sankarpur area will not require any private land, hence OP 4.12 will not be relevant for the project.

The project components do not involve any infrastructure development in international waterways or in disputed areas. Therefore the World Bank safeguard policies OP/BP 7.50 and OP/BP 7.60 will not be triggered.

The IFC guidelines provide guidance on certain EHS issues, which include standards for environmental parameters (ambient air quality, water and wastewater quality, noise level, waste management), hazard and accident prevention, occupational and community health and safety (during commissioning and decommissioning works) etc. These guidelines will be directly applicable to the proposed project. As a general rule, the IFC guidelines should complement the existing Indian guidelines or standards. In case the Indian guidelines or standards differ from the IFC guidelines, project is expected to follow the more stringent ones.

The World Bank access to information policy would be directly followed. The project has made the environmental, social and health impact assessment and these documents would be made available to the public by publishing it in their websites. In addition, Hard copies of these documents in English (including a summary in Bengali) will be made available in the local and head offices of the WBSEDCL and DSDA so that the local stakeholders can gain access to it if they want.

The safeguard policies of the World Bank relevant to proposed UG cable project are given in Table 3.2.

TABLE 3.2: RELEVANT AND APPLICABILITY OF WB SAFEGUARD POLICIES FOR UG CABLING PROJECT AT DIGHA-SHANKARPUR AREA

S.No	World Bank Safe Guard Policy	Policy Objective	Policy Applicability to UG Project	Policy Triggered Or Not
1	Environmental Assessment (OP/BP 4.01)	Overall governing policy intended to ensure Bank-financed projects are environmentally sound and Sustainable	All potential impacts due to UG cable project are to be assessed and necessary mitigation measures are to be incorporated	Triggered
2	Natural Habitats (OP/BP 4.04)	Policy is intended to prohibit Bank financing of projects that degrade or convert critical habitats and supports projects that affect non-critical habitats only if no alternatives are available and if acceptable mitigation measures are in place.	UG cable routes will be along existing urban/rural roads, which are under the jurisdiction of DSDA and does not pass through forest areas/national parks/ sanctuaries or known wildlife crossing points.	Not Triggered
3	Forests (OP/BP 4.36)	Policy is intended to support sustainable and conservation-oriented forest management, harness potential of forests to reduce poverty in a sustainable manner, integrate forests into sustainable economic development, and protect vital local and global environmental services and values of forests.	UG cable routes will not pass through or involve in any Activity in forests/plantation areas.	Not Triggered
4	Physical Cultural Resources (OP/BP 4.11)	Policy is intended to ensure that projects identify and inventory cultural resources that are potentially affected by the project. Projects should include mitigation measures, when there are adverse impacts on physical cultural resources	The UG cable routes will be along urban/rural roads and will be aligned to avoid/bypass all cultural property resources (CPR) and therefore does NOT warrant shifting or affect CPRs.	Not Triggered

3.6 REQUIRED LEGAL CLEARANCES

Prior to the Project implementation, the utility shall obtain Approval, Consent and Permits as required from the following authorized agencies at least two months before the project implementation or start of the construction works (Table 3.3).

TABLE 3.3: APPROVAL, CONSENT AND PERMITS REQUIREMENT MATRIX

Types of Clearance	Agency responsible for clearance	Lead Time of clearance application before implementation	Responsible agency for clearance application	Over Sighting Agency
CRZ Clearance	West Bengal State Coastal Zone Management Authority and Ministry of Environment Forests & Climate Change, GOI.	Three month before implementation	WBSEDCL Project Implementation Unit	DODM,WEST BENGAL
Consent in compliance to the control of National Highways (Land and Traffic) Act, 2002	National Highway Authority of India	Three months before implementation	WBSEDCL Project Implementation Unit	DODM,WEST BENGAL
No objection certificate for Railway X-ing.	Indian Railways (South Eastern)	Three months before implementation	WBSEDCL Project Implementation Unit	DODM,WEST BENGAL
No objection for cutting roads/ pavement/drain/sewage line.	DSDA	Three months before implementation	WBSEDCL Project Implementation Unit	DODM,WEST BENGAL
Consent of other utility Service Agencies	Local Cable TV Network operators, BSNL, P.H.E	Two months before implementation	WBSEDCL Project Implementation Unit	DODM,WEST BENGAL

CHAPTER 4
BASELINE ENVIRONMENTAL STATUS

CHAPTER 4
BASELINE ENVIRONMENTAL STATUS

To assess environmental, social and health impacts of the proposed project at a specific location, it is essential to monitor the environmental quality prevailing in the surrounding area along with the existing socio-economic status prior to implementation of the project. The environmental, social and health status within the impact zone could be used for identification of significant environmental, social and health issues to be addressed in the impact assessment study.

This chapter illustrates the description of the existing environmental status of the study area with reference to the prominent environmental attributes in and around the proposed UG cable network project area.

The existing environmental setting is considered to adjudge the baseline conditions which are described with respect to meteorology, ambient air quality, water quality, noise levels, landuse pattern, soil quality, ecology, socio-economic profile and places of historical/archaeological importance.

The baseline data of the study area for various environmental attributes, such as air, noise, water, soil, ecology, socio-economy, etc. has been generated by Environmental Management Department, IISWBM in association with Good Earth Enviro Care, Kolkata (WBPCB and NABL accredited laboratory). The present report incorporates the monitored data in and around the proposed UG cable network project and "Geoenvironmental, Geohydrological and Geotechnical Appraisal of Purba Medinipur, West Bengal" by Geological Survey of India and secondary data collected from the various other sources. The baseline data generation was supplemented with field observations, surveys and interaction with the community and project personnel.

4.1 CORRIDOR OF IMPACT

The proposed underground cabling of HT & LT electrical network at Digha-Sankarpur Area includes the construction of 13.4 Km of 33 kV lines, 44 Km of 11 kV lines and 95 Km L&MV OH lines including replacement of existing 273 nos. DTR with higher capacity of 171 DTR.

The detail of likely corridor of impact (CoI) of proposed UG cabling network is presented in Table 4.1 and 4.2. After a review of trench excavation methods and assessment of minimum operational requirement, it was proposed to take a 1.25-1.5 meter wide corridor as 'operational area or Corridor of Impact' along the footpath, which are to be opened up for cable laying operations in 500 meter long segments. The COI area will be along footpath, with footpath/kerb being one edge, and other edge of corridor extending on to road up to a maximum of 1.25-1.5 m. Further, to minimize environmental as well as social impacts the manual excavation is proposed essentially in narrow roads, where LT cables are required to be laid.

TABLE 4.1: DETAIL OF TRENCH FOR PROPOSED UG CABLING NETWORK

SL No	Items	Spec	Size (sq. mm)	No of Feeders/ UG Cable to be laid along the Road	One Side/ Both of Road	Depth of Trench below Ground Level (mm)	Trench Width (mm)	Corridor of Impact/ Barricading (mm)	Remark
1	HT Cable	33 KV	400	Double	One Side	1300	750	1500	Nil
2		11 KV	185 to 400	Single/ Double	One/ Both	1050	500	1250	Double cable/ feeder will run in aprox. 2.5 km in a single trench from Digha substation, where width of cable trench will be 575 mm and corrridor of impact will be 1325 mm. Thereafter single feeder will run seperately.
3	LT Cable	1.1KV	16 to 150	Single/ Double	One/ Both	900	500	1250	In some cases HT & L.T cable will run in a single trench where width of cable trench will be 575 mm and corrridor of impact will be 1325 mm. In general HT & LT feeder will run seperately.
			185 to 400	Single/ Double	One/ Both	900	500	1250	
4	Service Cable		6	Single/ Double	One/ Both	500	300	600	It will run upto the consumer premises as per available corridor.

 # Type of Barricading: Strip Type Barricading Tape indicating 'WORK IN PROGRESS. DO NOT ENTER (Danger Logo). INCONVENIENCE DEEPLY REGRETED' Followed by Danger Board at certain Interval.
Material of Baricading: 1. Made out of PVC material; 2. Single layer / double layer; 3. Color: red & white; 4. Standard size: 5" x 250 m roll

TABLE 4.2: DETAIL OF FOUNDATION FOR DTR AND RMU

SL No	Items	Spec	Foundation Structure (Plinth/Rail Pole)	Nos. Of Foun dation	Depth of foundation below Ground Level (mm)	Foundation dimension (Sq mm)	Corridor of Impact/ Barricading (mm)	Remark
1	Distribution Transformer	630 KVA	Plinth	6	975	1700 x 1400	2700	
		160 ,315 KVA		100		1400 x 1200	2400	
		160 ,315 KVA	Rail Pole	65	2000	2700 x 1200	3700	
2	Ring Main Unit	11 KV 4 way / 3way	Plinth	122	1000	1450 x 1250	2400	
		3 way	Rail Pole	76	Nil	2100 x 1250	3100	Fitted on Rail Pole 500 mm Above G.L
3	Feeder Pillar	415 V	Plinth	171	675	1700 x 1150	2700	
4	Service Junction Box	415 V	Plinth	1612	600	1000 x 500	2000	

Type of Barricading: Strip Type Barricading Tape indicating 'WORK IN PROGRESS. DO NOT ENTER (Danger Logo). INCONVENIENCE DEEPLY REGRETED' Followed by Danger Board at certain Interval.

Material of Baricading: 1. Made out of PVC material; 2. Single layer / double layer; 3. Color: red & white; 4. Standard size: 5" x 250 m roll

Right of Way (RoW) held by the DSDA and PWD, Government of West Bengal is the lawfully acquired corridor of land for road construction. The RoW land will be utilized for the proposed underground cabling. The Corridor of Impact (COI) of 1.25 to 1.5 m established for underground cabling is primarily minimum number of trees as well as free of encumbrances except few pockets specially in Thana (I, II & III) and New Digha Feeder (I, II & III). Using available records and route maps, the social team has verified the boundaries of legal right of way as well as boundaries of private properties within and in the vicinity of the corridor of impact.

In order to minimize disruptions to both pedestrian as well as to vehicular traffic, it is utmost necessary to limit the area of operation required for trenching, cable pullout, lowering, jointing, prior to refilling and restoring trench to its previous state and at the same time ensure minimum working space is available for completing work in a timely manner.

The likely environmental impact viz., air quality, noise level, land, ecology, etc. of underground cabling work would be insignificant and confined to primarily construction zone only i.e. COI. Whereas, the impact on air qulaty and noise level may slightly extend beyond COI and the project's area of influence could be upto maximum 50 m across the cable trench. Accordingly, during base line environmental monitoring, the likely impact on ambient air quality, ambient noise level, land, ecology and the livelihood of people within COI was identified and assessed.

4.2 PHYSICAL ENVIRONMENT

Physical aspects cover the physical landscape or topography, geology/lithology, soil characteristics (i.e physical and chemical quality of soil) and land use / land cover of the area. These parameters relative to physical aspects of the land are described in the subsequent section. The parameters related to physical aspects are described below.

4.2.1 Geology

This littoral tract consists of sand, silt and clay covering successively by beach, zone of dunes and interlude belts of recent formation; however in the Shankarpur area the development of dune features is less conspicuous, geologically there are marine origin together with some fluviatile and Aeolian sediment. To the north of dune belt there lays the older Pleistocene formation.

4.2.2 Landuse Pattern

Govt. of West Bengal acquired total 1120.97 acres lands in the following 11 nos. mouzas for erstwhile Digha Development Scheme under the administrative control of Development and Planning Department in between 1955 - 1987 in phases. The total lands were amalgamated and a land use master plan was prepared by the Town & Country Planning Branch in Urban Development Department for creation of a planned township. The said lands have, however been came under the ownership of Digha Sankarpur Development Authority w.e.f May' 2007 on merger of Digha Development Scheme with Digha Sankarpur Development Authority. The Digha-Shankarpur Area consists of 42 mouzas spreading over 2 police station of East Midnapur District (Table 4.3).

TABLE 4.3: MOUZA WISE DETAIL OF LAND OF DIGHA-SANKARPUR AREA

Sl No.	Name of Mouza	No. of Sheets	JL No.	Name of Police Station	Total Area of Mouza in acres
Digha Area					
1	Padima	1	76	Digha	332.23
2	Duttapur	1	77	Digha	114.46
3	Paschim Gadadharpur	3	78	Digha	850.21
4	Bhagibramhapur	1	79	Digha	96.64
5	Champaboni	1	80	Digha	123.32
6	Paisandapur	1	81	Digha	83.71
7	Ratanpur	1	82	Digha	90.82
8	Jatimati	1	83	Digha	170.63
9	Bilamuria	1	85	Digha	218.1
10	Khadalgobra	2	86	Digha	533.78
11	Jagadispur	1	87	Digha	145.56
12	Ghersai	1	88	Digha	339.53
13	Gobindabasan	1	89	Digha	133
Total Sheets		16	Total Area		3231.99

Sankarpur Area					
14	Samaibasan	1	90	Digha	85.42
15	Gangadharpur	1	91	Digha	173.38
16	Atilli	1	92	Digha	94.84
17	Jagaibasan	1	93	Digha	42.62
18	Maitrapur	2	94	Digha	297.3
19	Mirjapur	1	95	Digha	22.85
20	Jhaugeria	1	207	Ramnagar	223.09
21	Purba Mukundapur	2	211	Digha	872.41
22	Bagunadiha	1	212	Digha	316.33
23	Digha	1	213	Digha	230
24	Chhotobalarampur	1	214	Digha	42.08
25	Raipur	1	215	Digha	98.93
26	Jhawa	1	216	Digha	19.62
27	Kiyageria	1	217	Ramnagar	38.1
28	Jamrashyampur	1	218	Ramnagar	138.75
29	Lachhimpur	1	219	Ramnagar	128.51
30	Dalbaldya	1	220	Ramnagar	105.69
31	Panchadaria	1	221	Ramnagar	77.69
32	Dakshin Balarampur	1	222	Ramnagar	145.96
33	Nilpur	1	223	Ramnagar	85.5
34	Shankarpur	1	224	Ramnagar	126.9
35	Purba Birampur	1	225	Ramnagar	62.43
36	Jashipur	1	228	Ramnagar	280.9
37	Bodhra	1	234	Ramnagar	306.57
38	Tengramari	1	235	Ramnagar	268.26
39	Kaima	1	236	Ramnagar	129.02
40	Chandpur	2	237	Ramnagar	384.72
41	Bherichauli	1	239	Ramnagar	92.29
42	Jaldha	2	242	Ramnagar	630.47
Total Sheets		33	Total Area		5520.63

The prime landuse type and their area are presented in Table 4.4. The landuse pattern of Digha-Shankarpur area is presented in Figure 4.1.

TABLE 4.4: LANDUSE PATTERN OF DIGHA-SHANKARPUR AREA

Landuse Type	Area in Acres	% of Total Area
Residential	134.88	12.03
Industrial Housing	18.16	1.62
Hotels	111.85	9.98
Tourism Complex	10.74	0.96
Cottages	6.50	0.58
Day Trippers Lodge	2.00	0.18
Holiday Homes	44.65	3.98

Commercial (Mised Use)	15.62	1.39
School	3.82	0.34
Agriculture Research Centre	100.00	8.92
Hospital	25.40	2.27
Public Office	38.80	3.46
Water Works	5.00	0.45
Sewerage Treatment Plan	8.00	0.71
Bus Terminus	4.33	0.39
Railways	24.27	2.17
Service Industries	15.39	1.37
Green Belt	350.66	31.28
Amarbati Park	11.80	1.05
Marine Aquarium	6.50	0.58
Road, Library, Old Market & Patch Lands	153.88	13.73
Northern Bye Pass	20.97	1.87
Play Ground	3.50	0.31
Inter State Bounday Dispute	4.25	0.38
Total	1,120.97	

4.2.3 Soil Characteristics

Soil investigation has been carried out at Duttapur, New Digha. For the Soil Investigation three (3) boreholes of 25 m depth below the existing ground level (EGL) were considered.

Soil samples collected at field were brought to laboratory for necessary testing and rechecking/reviewing the field borehole logs. Laboratory tests included Atterberg's liquid limit & plastic limit (IS: 2720 (P-V) - 1973), natural moisture content (IS: 2720 (P-II) - 1973), bulk & dry densities, specific gravity, grain size analysis (IS: 2720 (P-IV) - 1985) etc. Triaxial compression tests (IS: 2720 (P-XI) - 1971) as well as unconfined compression (UC) tests (IS: 2720 (P-X) - 1971) were performed to determine the shear strength characteristics. Oedometer tests were carried out to determine consolidation properties. Chemical tests were conducted to determine pH {(IS: 3025 (P - 11)}, chloride {(IS: 3025 (P - 32)} and sulphate {(IS: 3025 (P- 24)} content. After completion of all laboratory tests, the data were compiled and the borehole logs were reviewed and finalized. Final borehole logs are presented in Figure 4.2. Results of all tests have been presented borehole-wise both in tabular and graphical form in Table 4.5 and 4.6.

Soil composition in various strata is indicative of a regular pattern with minor variation in their level of occurrence. Borehole logs have been studied both individually and collectively with sub-soil profiles. Four (4) subsoil strata have been identified for this site. Brief description of various strata is given below. Individual borehole logs should be referred to for understanding disposition of various layers at a particular place.

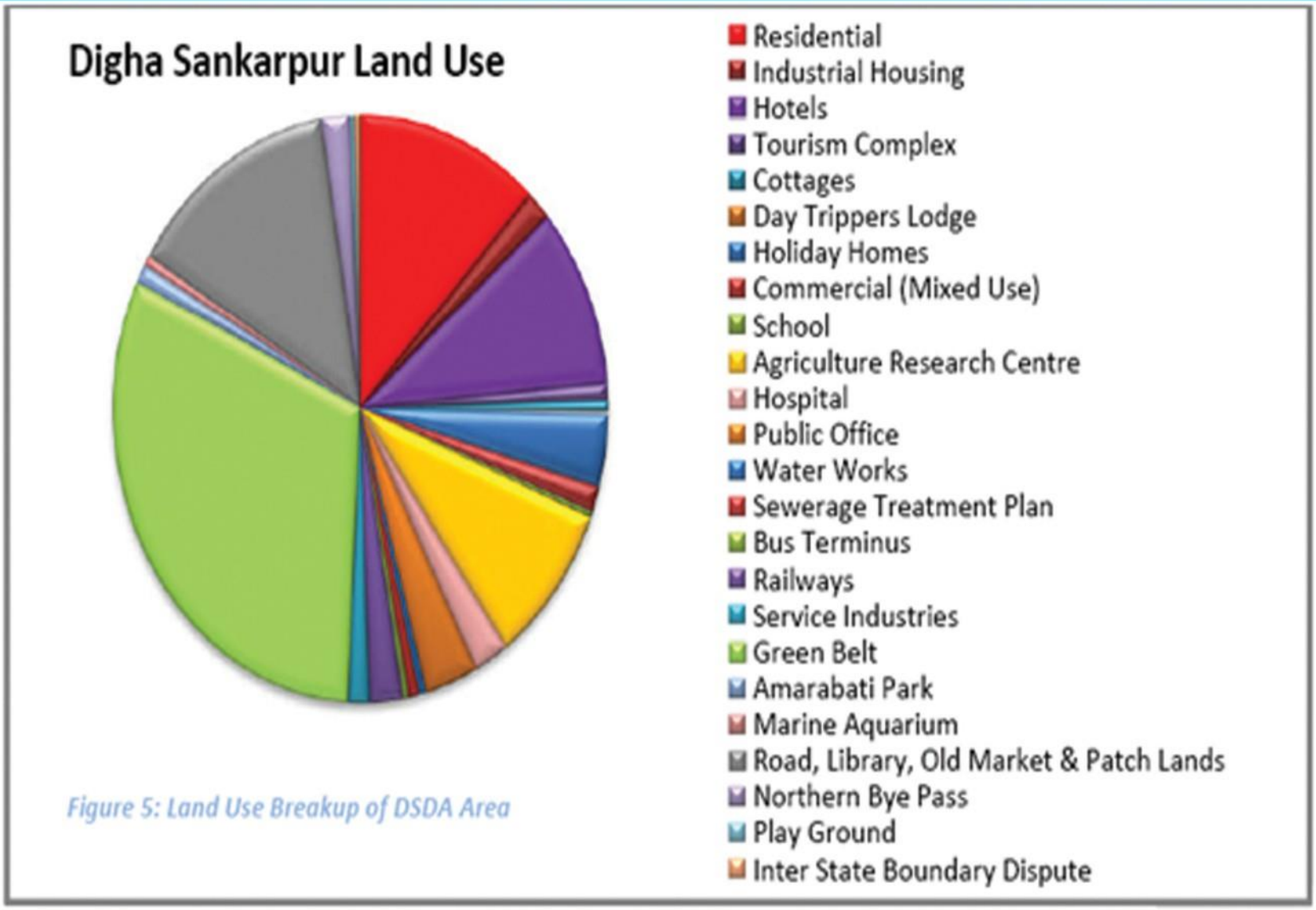


FIGURE 4.1: LANDUSE PATTERN OF DIGHA-SANKARPUR AREA

Stratum-I

This stratum was loose to medium dense greyish brown to grey silty sand to sandy silt with a few grass roots, conch shell pieces at top and mica. Average thickness of this stratum was 11.0m. N values obtained from Standard Penetration tests ranged from 5 to 26, average being 10. One SPT value showed a N value 1, due to presence of clay (Figure 4.2).

The stratum was non-plastic as observed in laboratory test results. Bulk density was suggested as 18.0 KN/m^3.

Shear strength of the stratum may be represented by an angle of internal friction value of 300 for design purpose with respect to the 'N' value. Classification: 'Fill'.

Stratum-II

The next layer (Stratum-II) was soft dark grey silty clay.

Thickness of this stratum varied from 0.60m to 5.65m, average being 3.85m. An average N value of 3 may be considered for design purpose.

Atterberg's limit tests indicated average value of LL & PL as 52% and 20% respectively. An average NMC was 38%. Bulk density was found to be 18.3 KN/m^3.

The shear strength determined by Tri-axial shear apparatus indicates an average cohesion value of 21 kPa. Classification: 'CH'.

Stratum-III

This stratum was stiff brownish grey silty clay with silt lamination, sand, grey patches.

Thickness of this stratum varied from 3.65m to 6.50m, average being 5.25m and average N value was 13.

Atterberg's limit tests indicated average value of LL & PL as 54% and 18% respectively. Average NMC was 28%. Bulk density worked out 19.5 KN/m^3.

Shear strength determined by Tri-axial shear apparatus indicates an average cohesion value of 70 kPa. Classification: 'CH'.

Stratum-IV

The lowermost stratum of the explored depth comprised very stiff/dense greyish brown silty clay/ silty sand with sand pocket, rusty brown patches. Extent of this stratum couldn't be established as both the boreholes were terminated within this stratum. Maximum thickness up to the explored depth has been found to be 6.35m in BH-3. An average N value of 25 may be considered.

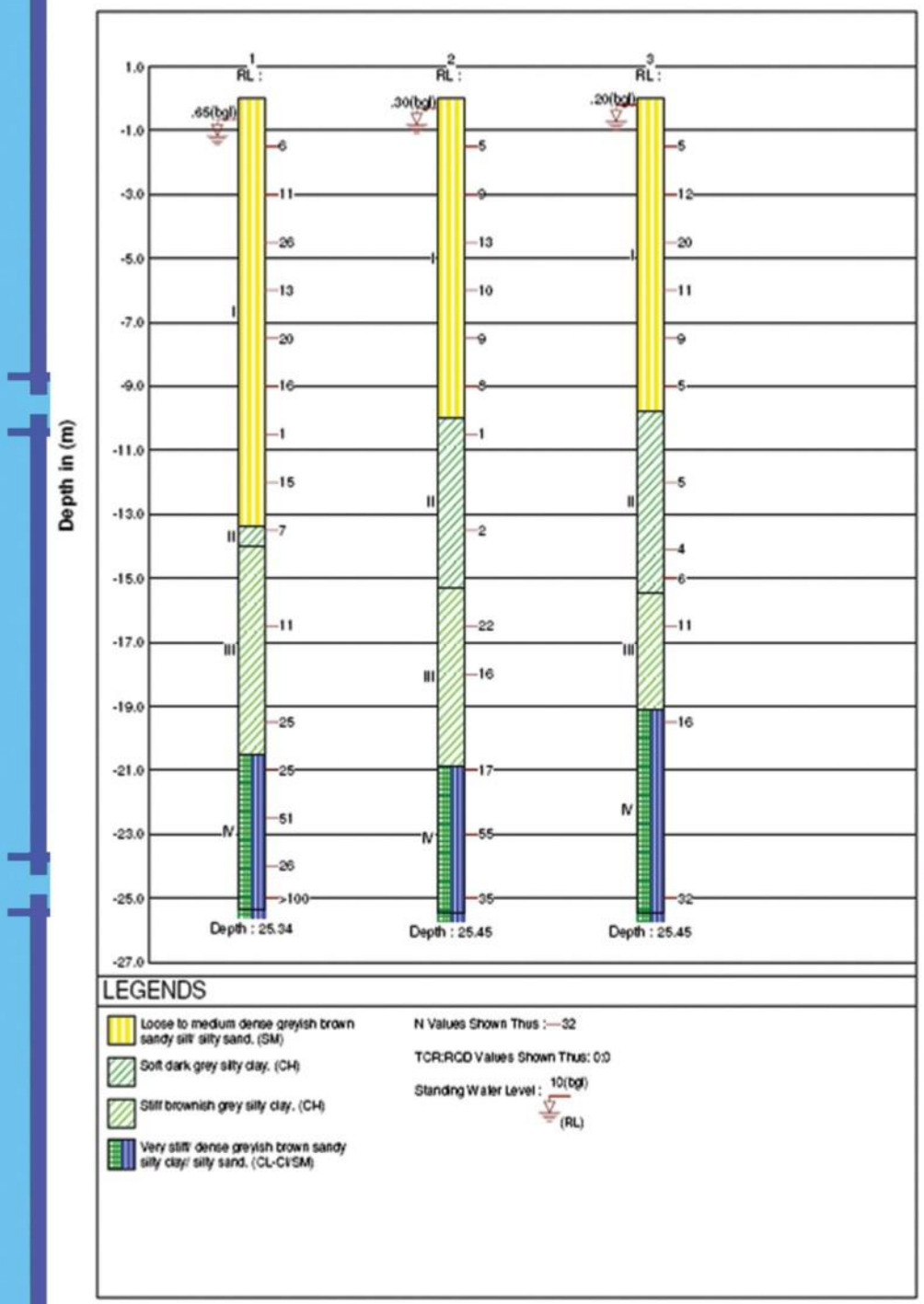


FIGURE 4.2: CROSS SECTIONAL PROFILE OF BOREHOLE LOGS

Atterberg's limit tests indicate average value of LL & PL as 35 and 17 respectively. NMC was 20%. Bulk density was found to be 19.8 KN/m^3.

Shear strength considered as a cohesion value of 125 kPa with respect to the 'N' value. Classification: 'CL-CI/SM'.

Standing Water Level: Ground water level during field work in January 2014 has been found at depth of 0.20 m to 0.65 m.

TABLE 4.5: PROFILE OF SOIL

Stratum & Thickness (m)	Depth bgl (m)	Depth RL (m)	Description of soil	N Value	NMC (%)	LL (%)	PL (%)	γb (KN/m³)	Shear Parameters C (kPa)	Shear Parameters φ°	mv, m²KN x 10-4 Range (KPa) 25-50	50-100	100-200
	0.00	0.00											
I 11.10	11.10	-11.10	Loose to medium dense greyish brown sandy silt/ silty sand. (SM)	10	-	NP	NP	18.0*	0	30	E = 8.0 MPa*	Mu = 0.40*	
II 3.85	14.90	-14.90	Soft dark grey silty clay. (CH)	3	38	52	20	16.3	21	0	3.0*	3.0*	3.0*
III 5.25	20.15	-20.15	Stiff brownish grey silty clay. (CH)	13	28	54	18	19.5	70	0	1.67	1.46	1.20
IV > 5.25	25.40	-25.40	Very stiff/ dense greyish brown sandy silty clay/ silty sand. (CL-CI/SM)	25	20	35 / NP	17 / NP	19.8	125*	0	0.80*	0.80*	0.80*

Average Standing Water Level (m) : BGL - 0.38, RL - -0.38 * - Suggested Value

TABLE 4.6: PHYSIO-CHEMICAL CHARACTERISTICS OF SOIL

Borehole Number	Depth (m)	Type of Sample	pH at ^{O}C	Value	Chloride		Sulphate	
					%	ppm	SO_2 (%)	SO_2 (ppm)
01	1.50-1.95	Soil	24.8	6.5	0.0135	134.785	0.001	10.455
03	0.50	Soil	24.8	6.5	0.0198	197.896	0.002	23.235

4.3 METEOROLOGY & CLIMATOLOGY

Meteorological aspects highlight the climate and the related factors of climate change of an area such as temperature, humidity, rainfall, wind, etc. This section describes the meteorological condition of the study area for the 30 years along with data of recent past procured from the IMD Meteorological Observatory of the concerned district.

The meteorological conditions regulate the transport and diffusion of air pollutants released into the atmosphere. Therefore, meteorology is considered as an important tool for air pollution assessment. The principal meteorological variables are horizontal convective transport (average wind speed and direction), vertical convective transport (atmospheric stability, mixing height) and topography of the area. Meteorological aspects consist of the climatic factors, which are prevailing in the area, including temperature, humidity, rainfall, wind flow, etc. The analysis of the data is given in the following sections.

In this coastal belt, the climate, inspite of recent urbanization in the area, is still pleasant in comparison to that in other places of West Bengal (Table 4.7). The salubrious climate of this coastal belt is the prime factor which is responsible for development of Digha-Shankarpur region as beach resort for the holiday makers throughout the year. In the summer days (March to June) the temperature does not exceed 30°C normally and in winter (November to February) it seldom falls below 20°C (Figure 4.3). During the summer months, moderate wind blows from the south west and normally continues during the monsoon (June to October) and in winter season gentle breeze blows from north to north east.

The monsoon, though stretched to nearly five months, generally starts in the 1st week of June and normally continues up to September and sometimes extends up to the middle of October, but the trend of maximum intensity of rainfall recorded in this area identifies the period between July to September. This period experiences comparatively thin tourist inflow and may be considered as a little dull season. The monsoon is generally associated with depressions which at times intensify to cyclonic storms. At the initial and recession stages of the monsoon, the occurrence of medium intensity storms with strong wind blowing from south east to south west is very common in this area.

The occurrence of heavy cyclone, at least once in every alternate year, is a regular feature of this region. The high intensity cyclonic storms generally originate in the upper Bay of Bengal within 200 km to 500 km from the shore line during the pre-monsoon (April - May) or post monsoon (September - October) period. The record of temperature, humidity, rainfall etc. in different months in DSDA area is given below.

TABLE 4.7: TEMPERATURE, HUMIDITY & RAINFALL AT DIGHA-SANKARPUR AREA

Month	Temperature			Humidity		Rainfall (Avg. in mm)	No. of Rainy Days in a Month (Avg.)
	Max.	Min.	Mean	Max.	Min.		
January	24	16	20	81	42	13.00	3
February	28	22	25	73	41	20.00	3
March	32	26	29	84	45	30.00	4
April	32	26	29	80	60	40.00	5
May	32	26	29	76	60	150.00	10
June	34	26	30	82	68	280.00	16
July	34	26	30	85	61	280.00	20
August	34	26	30	86	71	255.00	22
September	32	24	28	79	75	200.00	17
October	32	24	28	76	58	120.00	10
November	29	26	27	76	55	50.00	4
December	22	16	19	76	38	00.00	0

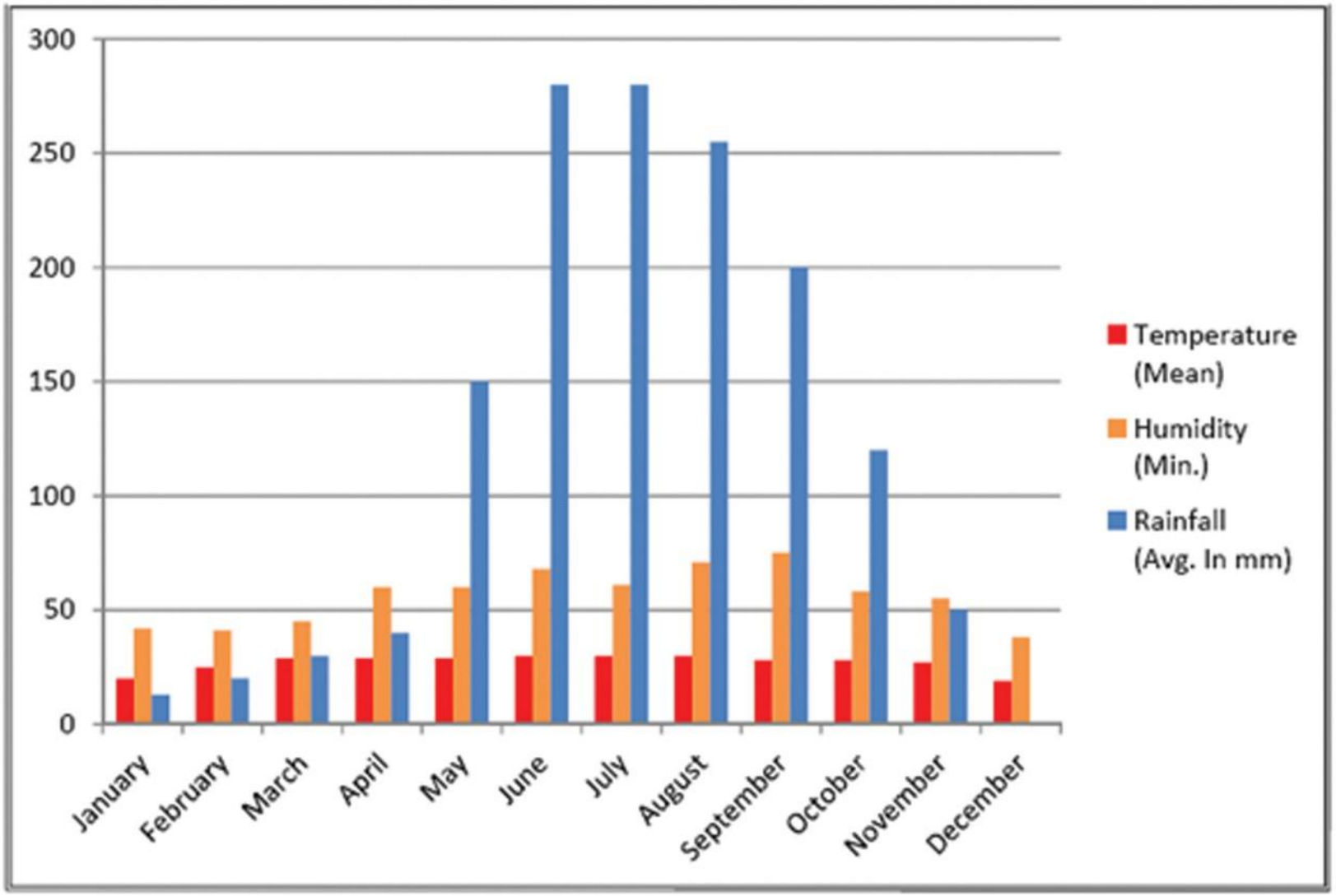


FIGURE 4.3: MONTHLY VARIATION OF METEOROLOGICAL PARAMETER AT DIGHA-SANKARPUR AREA

The climate of the project district is characterized by a hot summer, well distributed rainfall during the south-west monsoons season and generally dry weather during the rest of the year. The cold season is from December to February. This is followed by summer from March to about the middle of June. The southwest monsoon season is from about mid-June to early October.

4.4 ENVIRONMENTAL STATUS

4.4.1 Air Environment

To assess the impact on air environment that ultimately helps in formulating a sound ESMP, a methodically designed Air Quality Surveillance Program (AQSP) need to be adopted. The prime factors considered for designing AQSP includes:

(i) Representative selection of sampling locations primarily guided by the topography and micrometeorology of the region,

(ii) Adequate sampling frequency, and

(iii) Inclusion of all the major parameters.

All these aspects were given due consideration while devising an optimal scheme for AQSP for EIA study.

The prime objective of this AAQ survey within the study area was to establish the existing status of air pollution with present level of domestic, commercial, vehicular and other activities in and around the proposed UG cable network project area.

A monitoring station was selected during reconnaissance survey depending upon their importance within the study area and also based on wind profiles, which are available for the region from previous meteorological observations. To assess the air quality in and around the proposed UG cable network project area, few additional monitoring stations were considered representing the range of neighbouring industrial/ commercial and other activities from the WBPCB Ambient Air Quality Monitoring Network.

Frequency and Parameters for Sampling

Major air pollutants, i.e. Respirable Particulate Matter (RPM/PM_{10}), Fine Particulate Matter ($PM_{2.5}$), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2) generally being considered for assessing the air quality, were selected for AAQM. The samples were collected round the clock during study period. Gaseous pollutants i.e. SO_2 and NO_2 were collected on 24 hourly basis by drawing air at an average flow rate of 0.5 lpm through the absorbing media. PM_{10} was collected as 24 hourly basis by drawing air at a flow rate of 1.0 - 1.5 m^3/min through micro glass fibre filter paper. Similarly, $PM_{2.5}$ were also collected as 24 hourly basis by drawing air at a flow rate of 16.7 lpm through teflon filter paper The standard method used for quantification of pollutants is highlighted in Table 4.8.

TABLE 4.8: TECHNIQUES USED FOR AAQM

Sl. No.	Parameters	Technique	Minimum Detectable Limit
1	Respirable Particulate Matter (PM_{10})	High Volume Sampling - Gravimetric method	1.0 $\mu g/m^3$
2	Fine Particulate Matter ($PM_{2.5}$)	Low Volume Sampling - Gravimetric method	1.0 $\mu g/m^3$
3	Sulphur Dioxide (SO_2)	Improved West and Gaeke Method	1.0 $\mu g/m^3$
4	Nitrogen Dioxide (NO_2)	Modified Jacob and Hochheisor Method	1.0 $\mu g/m^3$

Status of Ambient Air Quality

As the proposed UG cable network project is for DSDA area which has wide range of industrial as well as commercial activities due to heavy inflow of tourist, the establishment of regional background with respect to the proposed UG cable network project is difficult. However, an attempt has been made to assess the existing ambient air quality status in and around the proposed UG cable network project area by selecting 3 Ambient Air Quality Monitoring Stations (AAQMS). The location of selected AAQMS is presented in Figure 4.4. The ambient air quality monitoring was undertaken in association with the NABL accredited laboratory for environmental parameters i.e. Good Earth Enviro Care (GEEC). The detail ambient air quality monitoring reports of GEEC along with the NABL accredations certificate is appended in Annexure 4.1.

$PM_{2.5}$ concentrations at the proposed UG cable network project area was recorded in the range of 10.6-16.6 $\mu g/m^3$ (Table 4.9) during the month of November, 2016. In general, the concentration of $PM_{2.5}$ in and around the proposed UG cable network project area was found to be within the permissible limit of National Ambient Air Quality Standards (November, 2009) i.e. 60 $\mu g/m^3$ (Figure 4.5).

The PM_{10} concentration at the proposed UG cable network project area varied from 13.00-77.30 $\mu g/m^3$ (Table 4.9). In general, the concentration of PM_{10} in and around the proposed UG cable network project area was found to be within the permissible limit of National Ambient Air Quality Standards (November, 2009) i.e. 100 $\mu g/m^3$.

The SO_2 concentration at the proposed UG cable network project area varied from 8.0-9.1 $\mu g/m^3$, (Table 4.9). The concentration of SO_2 in and around the proposed UG cable network project area was found to be well within the permissible limit of National Ambient Air Quality Standards (November, 2009) i.e. 80 $\mu g/m^3$.

The NO_2 concentration at the proposed UG cable network project area varied from 12.43-26.90 $\mu g/m^3$ (Table 4.9). The concentration of NO_2 in and around the proposed UG cable network project area was found to be well within the permissible limit of National Ambient Air Quality Standards (November, 2009) i.e. 80 $\mu g/m^3$.

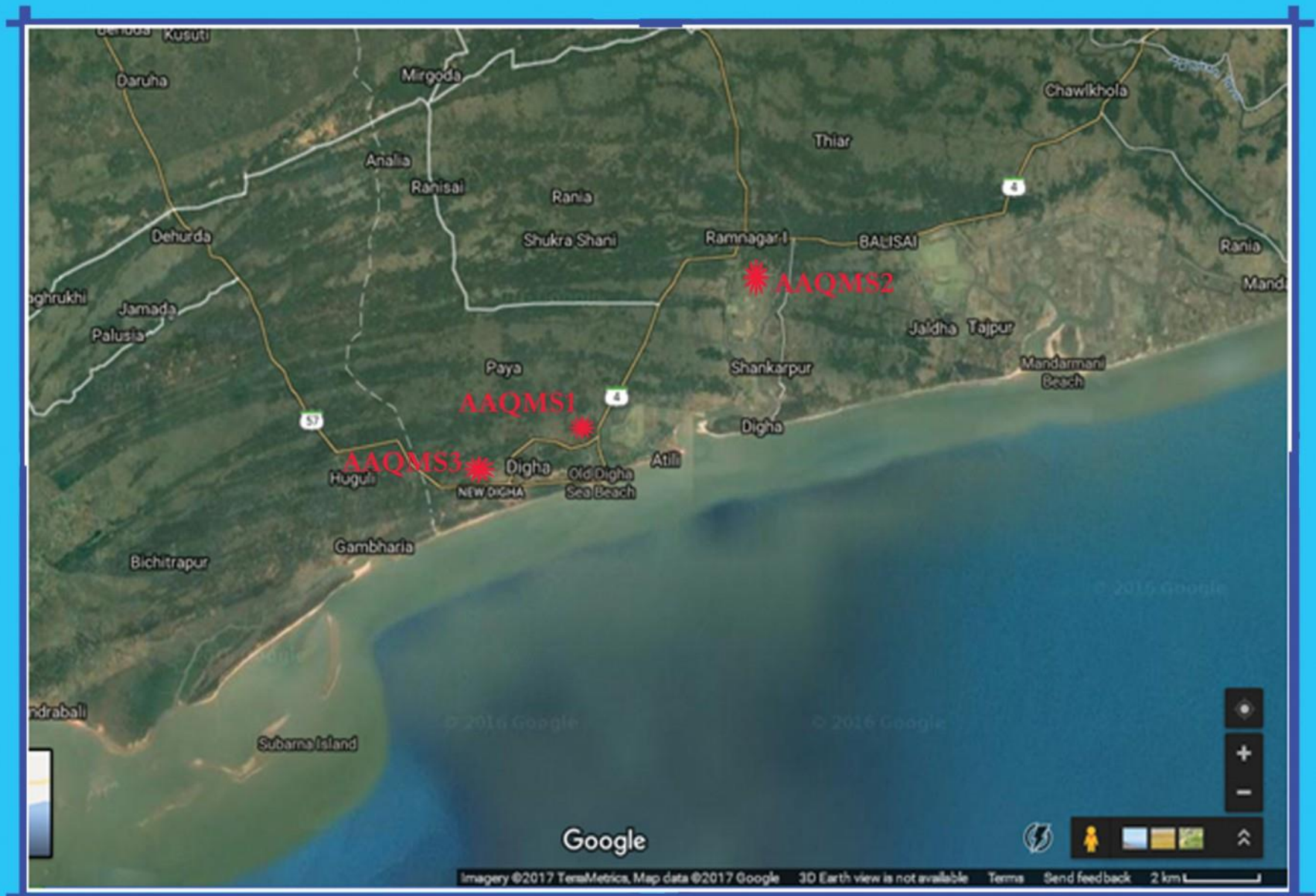
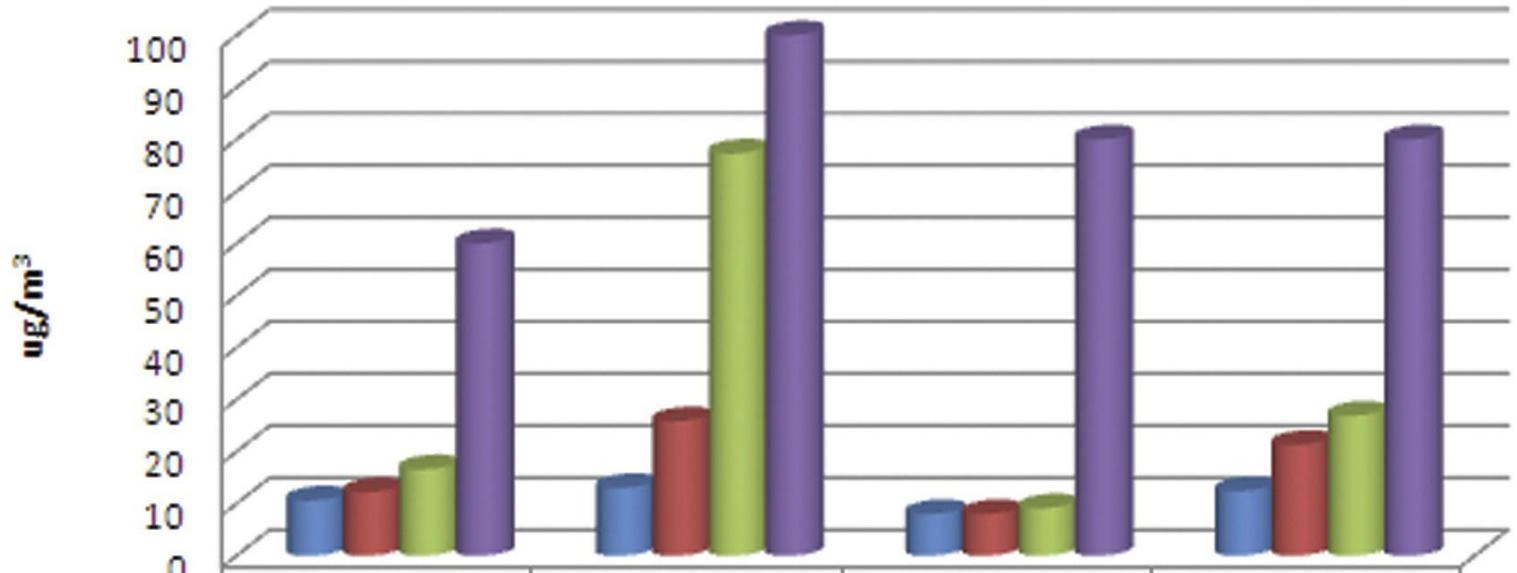


FIGURE 4.4: LOCATION OF AAQMS WITHIN PROPOSED PROJECT AREA

P 11: Ambient Air Quality and Noise Level Monitoring Within the Project Area

Figure 4.5: Status of Ambient Air Quality Within the Proposed UG Cable Network Project Area



	PM2.5	PM10	SO2	NO2
AAQMS1	10.6	13	8	12.43
AAQMS2	12.2	25.8	8	21.3
AAQMS3	16.6	77.3	9.1	26.9
NAAQS	60	100	80	80

TABLE 4.9: AMBIENT AIR QUALITY STATUS IN AND AROUND THE PROPOSED UG CABLE NETWORK PROJECT AREA

Unit: $\mu g/m^3$ Averaging time: 24 hrs.

Sl. No.	Location	Date of Sampling	$PM_{2.5}$	PM_{10}	SO_2	NO_2
1	33/11Digha Sub-Station, Old Digha (AAQMS1)	04.11.2016	10.6	13.0	BDL	12.43
2	33/11 Ramnagar Sub-Station, Ramnagar (AAQMS2)	05.11.2016	12.2	25.8	BDL	21.3
3	WBSEDCL Inspection Bungalow, New Digha (AAQMS3)	06.11.2016	16.6	77.3	9.1	26.9
NAAQS			60	100	80	80

4.4.2 Noise Environment

The basic steps associated with impact assessment on the noise components of the environment involve identification of activities responsible for generation of noise and monitoring of noise of the present exposure status to the residents as well as general population including sensitive receptors viz. School, temple, hospital etc.

The background ambient noise levels were monitored at different locations covering the entire cross-section area of proposed project. The location of selected ambient noise level monitoring stations (ANLMS) is presented in Figure 4.6. Noise levels (A weighted dB(A)) were measured using precision noise level meters (Lutron SL − 4001). Noise levels were recorded at selected locations for 24 hours to assess L_{eq} (day) and L_{eq} (night) within the project area. Day time is considered from 06:00 hr to 22:00 hr and night time from 22:00 hr to 06:00 hr.

The details of noise monitoring locations along with the noise level within the proect area are presented in Table 4.10. It reveals that the average ambient noise level during day time ranges between 50.17 to 72.33 dB(A) in the project area (Figure 4.7).

TABLE 4.10: STATUS OF AMBIENT NOISE LEVEL WITHIN THE PROJECT AREA

Sl. No.	Location of Sampling	Date of Sampling	Time of Sampling	Leq [dB(A)]		
				Min	Max	Average
1	Old Digha Sea-Beach (ANLMS1)	13/12/2015	8:15	67.3	75.0	72.33
2	Biswa Bangla Udyan (ANLMS2)	11/12/2015	20:00	59.5	64.0	61.94
3	SBI Holiday Home (ANLMS3)	15/12/2015	10:30	45.8	57.4	53.22
4	SBSTC Bus-stand (ANLMS4)	14/12/2015	10:15	55.7	68.4	63.42
5	Ghessuri Village (ANLMS5)	19/12/2015	14:00	45.0	59.0	54.31
6	Mohana (ANLMS6)	17/12/2015	17:00	52.0	58.0	55.24
7	Sea-Beach (100 m within HTC) (ANLMS7)	11/12/2015	20:00	55.5	58.2	56.95

8	Dakshin Khadalgobra(Digha SG Hospital) (ANLMS8)	11/12/2015	16:30	46.0	56.0	50.17
9	New Digha Youth Hostel (ANLMS9)	15/12/2015	15:45	64.8	88.8	81.32
10	New Digha Photography Owner's association (ANLMS10)	14/12/2015	16:20	55.7	68.7	62.30
11	Bypass Contai-Digha Road(SH-4) (ANLMS11)	19/12/2015	15:00	56.0	80.0	74.70
12	Ratanpur Tower (ANLMS12)	13/12/2015	11:15	44.1	68.3	59.50
13	Digha Central Bus-stand (ANLMS13)	19/12/2015	16:00	55.0	73.0	68.37
14	Udaipur (ANLMS14)	19/12/2015	15:00	42.7	57.0	54.72

Diurnal variation of ambient noise level were recorded within the project area at Saikatabas in Old Digha which is presented in Table 4.11. It reveals that the mean minimum noise level was found within the National Ambient Noise Standard i.e. 50 dB(A) in the project area. Whereas the average noise level were recorded slightly above 50 dB(A) due to local activities.

TABLE 4.11: DIURNAL VARIATION OF AMBIENT NOISE LEVEL WITHIN THE PROJECT AREA

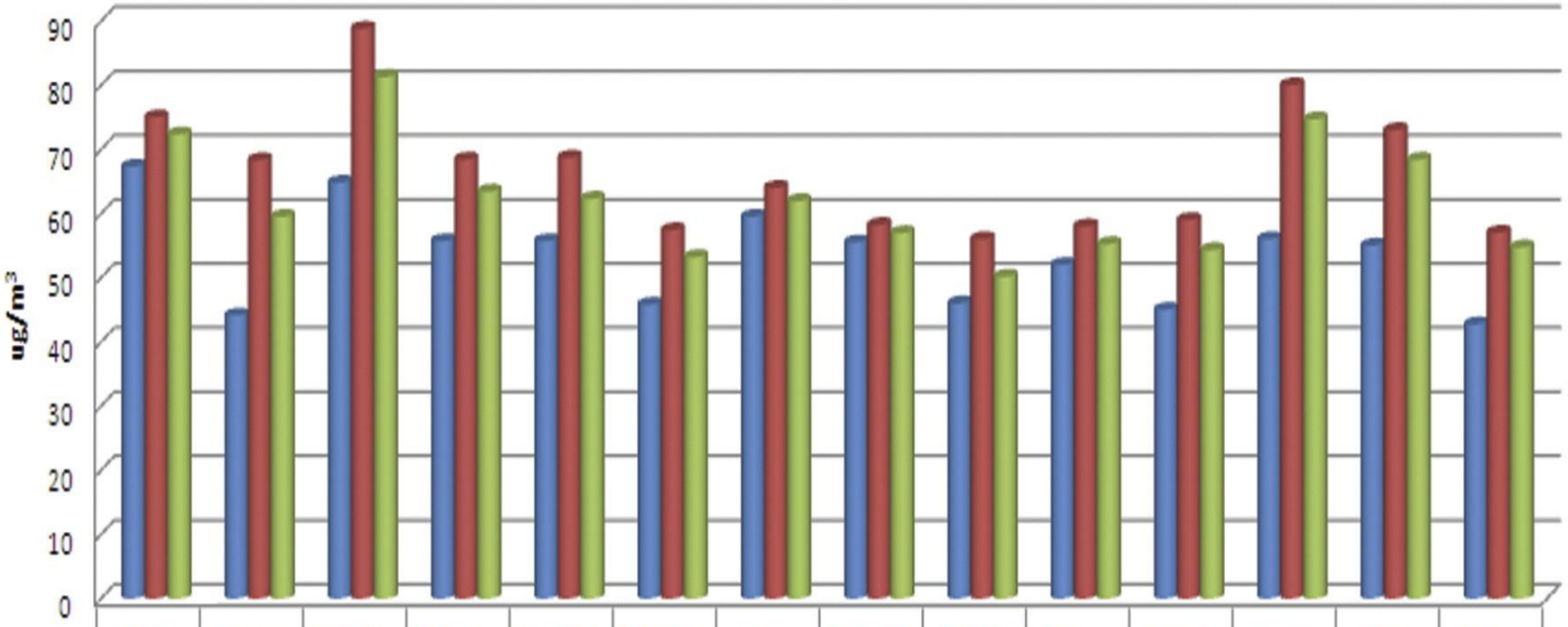
Sl. No.	Date of Sampling	Time of Sampling	Leq [dB(A)]		
			Min	Max	Average
1	08.12.2015	20:00	51.0	58.4	54.62
2		21:00	49.5	55.2	52.81
3		22:00	46.0	52.0	49.13
4	09.12.2015	4:00	47.0	51.0	49.17
5		5:00	48.4	52.0	50.54
6		6:00	49.7	53.4	51.16
7		9:00	53.0	59.2	56.58
8		10:00	50.1	61.0	56.78
9		11:00	51.5	62.0	58.18
10		12:00	54.2	58.2	56.36
11		19:00	57.0	62.0	59.48

Location of Sampling: Saikatabas - Old Digha

The noise levels at Digha Sub-Station were also recorded to assess contribution of noise being generated from existing distribution network of WBSEDCL which is presented in Table 4.12. The analysis reveals that the noise level varies from 50.35 to 59.91 dB(A).

FIGURE 4.6: LOCATION OF AMBIENT NOISE LEVEL MONITORING STATIONS

Figure 4.7: Status of Ambient Noise Level Within the Proposed UG Cable Network Project Area



	Old Digha Sea-Beach	Ratanpur Tower	New Digha Youth Hostel	SBSTC Bus-stand	New Digha Photography Owner's association	SBI Holiday Home	Biswa Bangla Udyan	Sea-Beach (100 m within HTC)	Dakshin Khadalgobra(Digha SG Hospital)	Mohana	Ghessuri Village	Bypass Contai-Digha Road(SH-4)	Digha Central Bus-stand	Udaipur
Min	67.3	44.1	64.8	55.7	55.7	45.8	59.5	55.5	46	52	45	56	55	42.7
Max	75	68.3	88.8	68.4	68.7	57.4	64	58.2	56	58	59	80	73	57
Average	72.33	59.5	81.32	63.42	62.3	53.22	61.94	56.95	50.17	55.24	54.31	74.7	68.37	54.72

TABLE 4.12: STATUS OF NOISE BEING GENERATED FROM EXISTING DISTRIBUTION NETWORK OF WBSEDCL

Sl. No.	Type of Source	Date of Sampling	Time of Sampling	Leq [dB(A)]		
				Min	Max	Average
1	10 MVA Source Transformar	12/12/2015	12:15	48.6	52.6	50.35
2	6.3 MVA Source Transformar	12/12/2015	12:25	53.4	65.8	59.91
3	Digha Sub-Station	12/12/2015	12:35	47.7	54.4	51.95

Location of Sampling: Digha Sub-Station

4.4.3 Water Environment

Water quality was monitored at different locations covering the entire cross-section area of proposed project.

Water samples have been collected from several locations for ground water as well as for surface water. The analysis of collected water samples has been carried out in laboratory as per the methods described in APHA, 2005.

Ground Water Quality:

Ground water samples from various locations from the selected villages covering the entire cross-sectional area of proposed project have been analysed for drinking water quality assessment point of view. The location of selected tubewells for ground water quality monitoring is presented in Figure 4.8. The ground water quality within the project area is presented in Table 4.13.

FIGURE 4.8: LOCATION OF GROUND WATER SAMPLING

Baseline Data Collection

TABLE 4.13: STATUS OF GROUND WATER QUALITY WITHIN THE PROJECT AREA

SL No.	Location	Date	Depth of Tubewell (ft)	pH	Temp. (oC)	Conductivity (µs)	Turbidity (NTU)	Salinity (ppt)	TDS (mg/l)	Iron (mg/l)	Arsenic (mg/l)
1	Digha Sub-Station (GW1)	12/12/2015	600	7.8	26	614	<10	1	388	0.2	BDL
2	Blue View Hotel, Old Digha (GW2)	11/12/2015	-	8	25	1075	<10	2	695	0.1	BDL
3	SBI Holiday Home, New Digha (GW3)	15/12/2015	-	7.9	23	666	15	1	425	0.1	BDL
4	Co-operative Training Centre, Khadalgobra Dakshin (GW4)	12/12/2015	600	7.6	25	611	<10	1	386	0.6	BDL
5	Coastal Police Station, Mohana (GW5)	18/12/2015	20-25	7.8	20	-	>100	10	-	0.4	BDL
6	Nest Hotel, Sankarpur (GW6)	18/12/2015	580	7.3	20	688	<10	2	436	0.3	BDL
7	Mukundpur (GW7)	19/12/2015	480	7.8	18	925	<10	5	590	0.3	BDL
8	Hanuman Temple, New Digha (GW8)	12/12/2015	-	7.5	25	299	<10	1	198	0.1	BDL
9	Gitanjali RPL, New Digha (GW9)	14/12/2015	50-60	8	25	1447	18	2	932	0.1	BDL
10	Champabani Bon Brothers Primary School, New Digha (GW10)	14/12/2015	-	8	25	596	<10	1	378	0.1	BDL
11	Science Centre, New Digha (GW11)	13/12/2015	-	7.6	25	647	<10	1	409	0.1	BDL
12	Digha Central Bus-stand(Orisha Border Checkpost), Duttapur (GW12)	19/12/2015	-	7.3	18	1130	<10	5	720	0.2	BDL
13	Near Udaipur Beach (GW13)	19/12/2016	50	7.8	18	945	<10	5	600	0.2	BDL

Water is available at the height of around 700-750 ft. Water quality is good. The average groundwater chemistry of the groundwater collected from the area may be summarized in Table 4.14.

TABLE 4.14: AVERAGE GROUNDWATER CHEMISTRY OF THE GROUNDWATER IN THE PROJECT AREA

Parameters	Values
pH	7.39
Conductivity (micro Siemens)	1325
Total Dissolved Solid (mg/L)	663
Salinity (ppt)	0.67
Fluoride (mg/L)	0.5
Chloride (mg/L)	243
Bromide (mg/L)	0.6
Nitrate (mg/L)	6
Sulfate (mg/L)	95
Sodium (mg/L)	4.3
Calcium (mg/L)	1.3
Potassium (mg/L)	0.3
Magnesium (mg/L)	2.4

4.4.4 Solid Waste Disposal

This is one of the most neglected, yet critical, necessity to ensure control of environmental pollution and undesirable visual impact in tourist spots. Garbage vats and garbage bins have been constructed in Digha and Shankarpur. Existing practices of solid waste management at Digha suffer from the following shortfalls -

- No segregation of solid waste is practised in residential houses
- No house-to-house collection service
- In certain specific areas street sweepings are carried out by engaging
- Labourers. They use hand operated wheel burrows for collection of solid waste
- Vats have been constructed for storage of solid waste
- Solid wastes are not regularly collected from vats
- Solid waste Is disposed off by uncontrolled open dumping
- A pilot vermiculture unit was constructed for conversion of organic waste to compost. Presently the vermiculture unit is not under operation.

In Shankarpur area no solid waste management system has been developed.

4.5 ECOLOGICAL RESOURCES

The ecological environment primarily covers all living forms such as flora and fauna including microorganisms found in the transmission line corridor. The ecological environment has been studied in two perspectives:

- Terrestrial Ecological Status.
- Aquatic Ecological Status.

Terrestrial Ecological Status includes flora and fauna found on land. The commonly found terrestrial flora and fauna within the transmission line corridor is presented in subsequent section.

The Digha-Shankarpur area is a prominent tourist town and sea beach resort in Kanthi coastal plains of East Midnapore district, directly adjoining the Bay of Bengal. The geomorphic and physiographic features of Digha includes i) beach and runnel (channel) topography in the onshore regions, ii) dunes and sand flats and, iii) tidal creeks, silt flat and marshy lands in the eastern and western parts of the Digha township.

The study area and its vicinity are mostly covered by Quaternary alluvial deposits. The topography has <10° slope towards the sea, along with presence of sand dune ridges of varying height stretching for several kilometer. In the recent past (since 1930s), the sea started transgressing toward the land, endangering the township of Digha and adjoining areas. The transgression in most unbounded areas varies between 300 m to 1000 m. The coastal track of the study area may be classified into several geomorphologic groups such as active/abandoned/inactive marine coastal plain and alluvial upland of fluvial origin.

The growing need of tourism causes severe human interference on the beach and over-fishing all along the shore line prevents the proliferation of the local ecosystem.

According to the Land cover distribution of ecological resources maximum area (2.31 sqkm) is covered by vegetation (Table 4.15). Forests in Digha are around 348.35 Ha and in Shankarpur are around 225.02 ha. Almost equal percentage is covered next by, water body, plantation and Intertidal area.

TABLE 4.15: DISTRIBUTION OF ECOLOGICAL RESOURCES

Ecological Resources	Area in sqkm	%
Water Body	1.63	15.2
Aqua Culture	1.06	9.9
Concrete Beach	0.06	0.6
Fishing Activity	0.61	5.7
Forest	0.15	1.4
Plantation	1.50	14.0
Vegetation	2.31	21.6
Dune Grasses	0.04	0.4
Sand Dunes	0.14	1.3
Mud Flats	0.37	3.5
Intertidal Area	1.96	18.3
Total	10.71	100.0

The social forestry of Casuarina trees undertaken by the Government has taken an important place in the vegetation of the region.

Table 4.16 presents that two Beat offices comprise the entire forest region of DSDA, namely:

- Digha Beat
- Shankarpur Beat

TABLE 4.16: CONSTITUTION OF FOREST BEAT

Name of Beat Office	Area of Forest	Name of Mouza
Digha Beat	348.35 Ha	Duttapur
		Gadadharpur
		Khadalgobra
Shankarpur Beat	225.02 Ha	Begundiha
		Digha
		Chhoto Balarampur
		Raipur
		Jhawa
		Tajpur
		Berakhana

Source: Forest Department, West Bengal

The prime available flora of the study area is presented in Table 4.17. Main type of plantations have been kept natural as much as possible. Hence a lot of sand dune grasses mesic and xeric shrubs have been planted in project region under variour schemes of Government of India as well as Government of West Bengal.For trees, native and planted trees as discussed earlier have been used profusely to enhance wind barriers. Other than the areas where water is available in abundance especially near mohona a few types of mangrove shrubs and trees has also been planted (Table 4.18).

TABLE 4.17: DETAIL OF FLORA

Plant Communities	Behaviour	Ecological Importance
Native Trees		
Dillenia indica	Evergreen, moderate size, large flower in June, July	
Pterospermum acerifolium	Evergren, tall tree, highly fragnant flowers	
Shorea robusta	Moderately growing medium height tree, large leaves, though deciduous in dry areas, evergreen in study region	
Tamarix aphylla	Small tree, rapidly growing, small flowers, can withstand dry arid and windy climate	
Thespetia populanea	Grows naturally in the Indian Coast, small evergreen umbrella like tree, yellow flowers	
Plantation Trees		
Acacia auriculiformis	• Very fast growing • Tolerance to high wind and salt spray condition	• Ability to nitrogen fixation to be used as intercropping trees
Acacia mangium		
Anacardium accidentale		
Areca catechu		

Casurina equisotifolia	• Ability to grow on highly saline soil	• Ability to act as a windbreak to high velocity winds • Dune stabilization ability and reduction of erosion • High economic value and plantation can be suitably rotated to get the highest benefit out.

TABLE 4.18: DETAIL OF MANGROVE VEGETATION

Plant Communities	Behaviour	Ecological Importance
Mangrove Shrubs *(i) Acanthus ilicifolius* *(ii) Aegialitis rotundifolia* *(iii) Aegiceras corniculatum* *(iv) Clerodendrum inerme* *(v) Derris trifoliate* *(vi) Sesuvium portulacastrum* *(vii) Suaeda maritima*	• Grows in saline coastal habitats, with fully submerged or periodic submerged in water condition • Presence of stilt roots or pneumatophores for aerial respiration and absorption of vital nutrients for plant growth Very low oxygen requirement	• Contribute organic matter (detritus) to the base of the estuarine, marshland or coastal wetland ecosystem, • Provide excellent cover (habitatnursery ground) for young estuary dependent fishes and other organism • helps to weaken the onslaught of storm-generated waves and acts as a reservoir for coastal storm waters • Waste treatment through stages of nutrient removal and assimilation
Mangrove Trees *(i) Avicennia alba blume* *(ii) Avicennia marina* *(iii) Dalbergia spinosa* *(iv) Excoecaria agallocha* *(v) Suaeda nudiflora*	• Different salt excretion techniques like salt filtration or salt crystallization under the leaf surface.	

4.6 COASTAL REGULATION ZONE

The coastal zone is the area of interaction between land and sea. The coastal Zone of West Bengal has a very high concentration of population along with ecologically sensitive areas like mangroves. There is a spurt of developmental activities arising from huge residential colonies, new industries and tourism centres along the coast and in coastal zone. There is a need to protect the coastal environment while ensuring continuing production and development. This zone is extremely vulnerable and has to be managed judiciously striking a balance between ecological and developmental needs.

Government of India has issued a notification during February 1991 for regulating the developments along the coastal stretches of seas, bays, estuaries, creeks, rivers and

backwaters which are influenced by tidal action. The land between 500 meters from the High Tide Line (HTL) and the Low Tide Line (LTL) is identified as Coastal Regulation Zone (CRZ). The coastal stretches within CRZ are classified into four categories, namely, Category I (CRZ-I), Category II (CRZ-II), Category III (CRZ-III) and Category IV (CRZ-IV). The notification has also laid down regulations to regulate the various activities in the coastal zone. The Ministry of Environment and Forests, Government of India, has approved a set of CRZ maps on 1:25,000 scale prepared from SPOT satellite imagery. On these maps, zones are demarcated as CRZ I, CRZ II and CRZ III, by Coastal Zone Management Authority.

Department Of Disaster Management, Nabanna, West Bengal Secretariat, Howrah, West Bengal***, has*** requested Institute of Remote Sensing (IRS), Anna University an agency authorized by MoEF, Government of India to demarcate HTL, LTL and CRZ for the Sea/Bay/tidal influenced water bodies and ecologically sensitive areas on 1:4,000 scale in the vicinity of their proposed underground cabling network project site in Digha-Sankarpur Area, Purba Medinipur District, West Bengal. The proposed project site has proximity to Bay of Bengal, Stream and creeklets. It is in this context, the proposed site needs to be evaluated to assess whether the proposed site falls under regulations of CRZ Notification, 2011. Hence IRS has conducted required field surveys and measurements for demarcation of CRZ on 4th June 2016.

The cadastral map of various Villages through which proposed underground cabling passes have been used as the base map. The Geomorphology of the Coastal Zone has been studied from the temporal medium resolution satellite data. In order to prepare the local level map on 1:4,000 scale, the site has been inspected by IRS Scientists. Based on the geomorphic units, the high tide line has been identified in the field and traced by field survey using GNSS. The tide level observations were collected for Howrah Port from the Tide Tables. The highest high tide level and lowest low tide level for the past 19 years were determined from these tide tables.

As per the definition of high tide line, "The High Tide Line means the line on the land up to which the highest water line reaches during the spring tide". There is a clear boundary between the areal spread of mudflats and vegetation usually very much apparent. This boundary line coincides with the HTL line interpreted from the satellite imagery. On the other hand LTL is defined as the seaward limit to which the waves recede during low tide.

In case of inland waters such as creeks and backwaters, the ICRZ guidelines indicates that the development along rivers, creeks, creek lets and backwaters has to be regulated up to a distance where the tidal effects are experienced which has to be determined based on salinity concentration of 5 parts per thousand (ppt).

The Trimble R5 GNSS receivers were used to conduct the surveying at the project site. The survey involves three components namely, 1. Establishing Base Station, 2. Control Survey for Village Maps and 3. Real Time Kinematic Survey for HTL Demarcation.

The survey involves establishing one base station for Static Survey. The base stations were identified on stable locations with clear view of sky for uninterrupted access to GNSS satellite signals. The control point with known elevation was used as initial reference station.

The base station for the project site was established on firm ground and observed with static GNSS survey from the known coordinates of the control point. The observations times were fixed based on the length of base lines to obtain highest possible accuracies.

The conduct of Static Survey using GNSS requires two GNSS receivers, one to be setup over the control point (with known co-ordinate) and another one over a reference station whose coordinates and distance from the control point are to be determined. Both these receivers must record data simultaneously. These known co-ordinates of the control point were fed and fixed for processing of the logged data to accurately determine the co-ordinates of the base stations.

The cadastral map pertaining to the project site was provided by the client. The hard copy cadastral map was scanned and georeferenced with the help of GNSS coordinates of boundary points provided by the client and used for the preparation of local level HTL Maps.

Kinematic Surveying enables a very rapid survey of a number of base lines in areas where there is good satellite visibility. At least, two GNSS receivers are required to perform a kinematic survey. One receiver is designated as the reference receiver and is set up over the Base Station. All baselines are measured relative to this station. The other receivers, called rovers, are moved in succession to trace and record the HTL on ground through ground profiling.

Surrogate data such as coastal geomorphologic features identified from the satellite imagery, indicators available on the ground and tidal data were used to verify the HTL demarcated by Kinematic Survey.

The proposed underground cabling network project site in Digha-Sankarpur Area, Purba Medinipur District, West Bengal. The villages through which the underground cabling passes through include Purba_Mukundapur, Purbba Mukundapur, Begundiha, Dalbaldya, Panch Daria, Dakshin Balarampur, Sankarpur, Padima, Dattapur, Paschim Gadadharpur, Bhagi Brahmapur, Chapabani, Palsandapur , Ratanpur, Jatimati, Bil Amaria, Khadalgobra, Dakshin Jagadispur, Ghersai, Gobindabasan, Somaibasan, Gangadharpur, Atili, Jagaibasan, Maitrapur, Raypur.

The HTL was demarcated by physical survey in the study area as per the guidelines provided by CRZ Notification, 2011 issued by MoEF&CC, New Delhi. The position of HTL associated with wave runup at Highest High Tide and geomorphic and topographic features such as ground elevation, permanent terrestrial vegetation were considered for field verification of HTL. In addition, geomorphic features such as berms, cliffs, sand dunes, headlands, mudflats, were verified to demarcate HTL. Coastal protection structures such as seawall, embankment, bunds, revetments were also verified to demarcate HTL. LTL is also verified based on geomorphology and bathymetric details available.

The observed baselines of GNSS receivers were processed using TBC software to derive the coordinates of HTL reference points, ground control points for Georeferencing of satellite imagery and cadastral maps. The ground control points were used to georeference the cadastral map of Villages. The HTL and LTL for sea, Stream and Creeks were superimposed

on to georeferenced cadastral map along with ecologically sensitive areas in the vicinity of proposed project activities. Both coast, Stream and Creek are existing near the proposed underground cabling activity. Therefore 100 m setback line from HTL for Stream/creek and 200 m & 500 m setback lines from HTL for coast are generated and superimposed on to map. The CRZ map in 1:4000 scale showing HTL, LTL, setback lines, various coastal regulatory zones near the project site and project site boundary are presented in Figure 4.9. The CRZ map in 1:25,000 scale is furnished in Figure 4.10. The processed HTL co-ordinates in WGS 84 system are presented at Annexure 4.2. The proposed underground High Tension Lines, Low Tension Lines and Transformers falls partly inside CRZ 1A, CRZ 1B and CRZ III area as per CRZ notification, 2011.

4.7 SOCIO-ECONOMIC PROFILE

4.7.1 Demographical Pattern

The demographic details of the project area are calculated considered the included villages only under the three Gram Panchayats, namely: Padima I, Padima II & Talgachari II. The comperative analysis of demographic profile of project region is presented in Table 4.19.

TABLE 4.19: DEMOGRAPHIC PROFILE OF PROJECT REGION

Location	2001			2011		
	Total Population	Male	Female	Total Population	Male	Female
Projet Area	24161	12520	11641	NA	NA	NA
West Bengal	80221171	41487694	38733477	91347736	46927389	44420347
Medinipur	9638473	4929000	4709473	11037538	5663724	5373814
Purba Medinipur	NA	NA	NA	5094238	2631094	2463144

Source: Census of India, 2011

A comparison of the demographic structure of the two areas of Digha & Sankarpur shows that Sankarpur is the highest populated area due to its area (Figure 4.11).

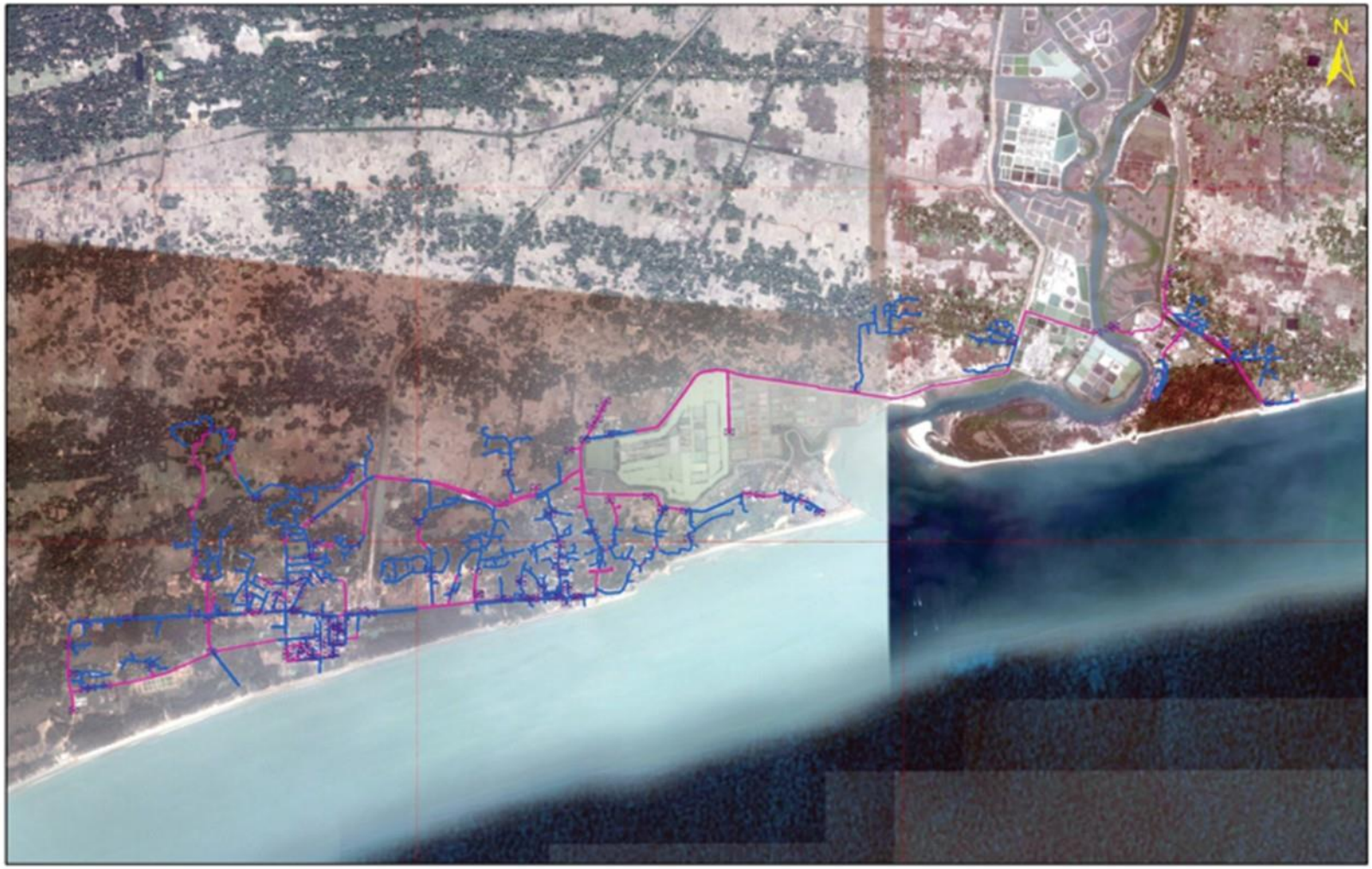


FIGURE 4.9: CRZ MAP INDICATING HTL, LTL, SETBACK LINES, VARIOUS COASTAL REGULATORY ZONES NEAR THE PROJECT SITE

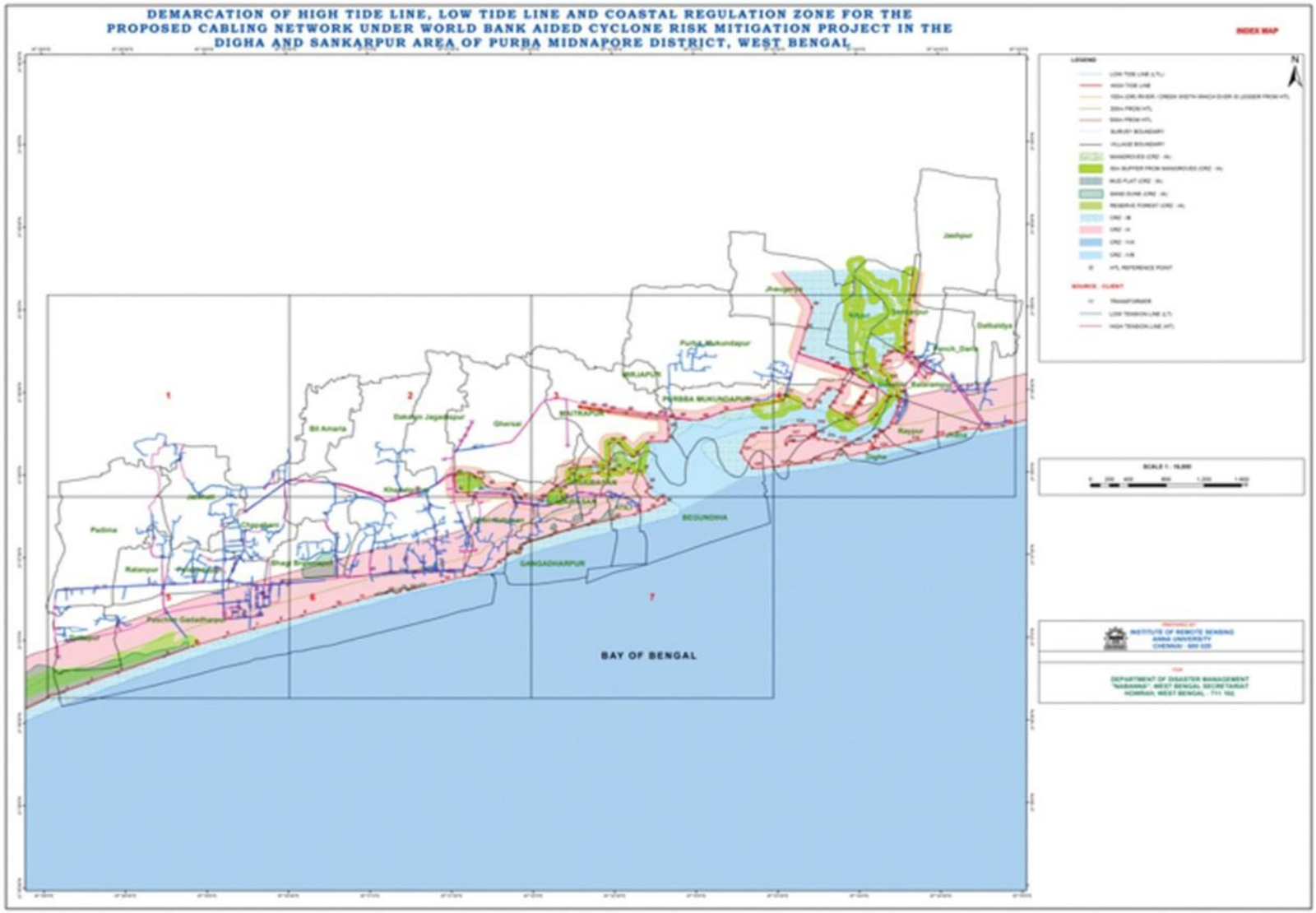


FIGURE 4.10: CRZ MAP OF THE PROJECT SITE

Mouza-wise population within the project area under DSDA is furnished in Table 4.20.

TABLE 4.20: MOUZA WISE POPULATION WITHIN THE PROJECT AREA

Sl. No.	Name of the Mouza	JL No.	Total Population as per 2001 Census	Total Population as per 2011 Census
Digha Area				
1	Padima	76	1311	1458
2	Duttapur	77	591	812
3	Paschim Gadadharpur	78	348	588
4	Bhagibramhapur	79	812	970
5	Champaboni	80	746	1025
6	Palsandapur	81	116	210
7	Ratanpur	82	718	925
8	Jatimati	83	1767	2133
9	Bilamuria	85	128	1516
10	Khadalgobra	86	4381	5344
11	Jagadispur	87	645	718
12	Ghorsai	88	726	896
13	Gobindabasan	89	803	1007
			13092	17602
Sankarpur Area				
14	Samaibasan	90	157	269
15	Gangadharpur	91	299	359
16	Atili	92	91	42
17	Jagaibasan	93	48	102
18	Maitrapur	94	1031	1204
19	Mirjapur	95	316	362
20	Jhaugeria	207	657	746
21	Purba Mukundapur	211	2440	2766
22	Bagubadiha	212	Depopulated	Depopulated
23	Digha	213	Depopulated	Depopulated
24	Chhotobalarampur	214	Depopulated	1
25	Raipur	215	Depopulated	Depopulated
26	Jhawa	216	Depopulated	Depopulated
27	Kiyageria	217	Depopulated	Depopulated
28	Jamrashyampur	218	608	701
29	Lachhimpur	219	709	842
30	Dalbaldya	220	160	177
31	Panchadaria	221	253	337
32	Dakshin Balarampur	222	107	130
33	Nilpur	223	Depopulated	Depopulated
34	Shankarpur	224	464	545
35	Purba Birampur	225	Depopulated	Depopulated

36	Jashipur	228	421	469
37	Bodhra	234	1496	1775
38	Tengramari	235	1231	1460
39	Kaima	236	246	248
40	Chandpur	237	1693	1944
41	Bherichauli	239	387	446
42	Jaldha	242	1807	2177
Total Population			14621	17102

Source: Census of India, 2011

Village wise Population & Density

There are 36 villages included in the Project Area distributed in 3 Gram Panchayats having a total 4314 number of households. The details of population are given in Table 4.21.

TABLE 4.21: VILLAGE WISE POPULATION IN THE PROJECT AREA

NAME	TRU	No_HH	TOT_P	TOT_M	TOT_F
PADIMA-I	**Total**	**1052**	**5929**	**3086**	**2843**
PADIMA-I	Rural	1052	5929	3086	2843
PADIMA-I	Urban	0	0	0	0
Padima	Rural	207	1311	701	610
Duttapur	Rural	122	591	286	305
Gadadharpur	Rural	54	348	180	168
Bhagibaharampur	Rural	153	812	420	392
Champabani	Rural	154	746	388	358
Palsandapur	Rural	22	116	70	46
Ratanpur	Rural	113	718	357	361
Bilamria	Rural	227	1287	684	603
PADIMA-II	**Total**	**1900**	**10283**	**5328**	**4955**
PADIMA-II	Rural	1900	10283	5328	4955
PADIMA-II	Urban	0	0	0	0
Khadalgobra	Rural	862	4381	2271	2110
Ghersai	Rural	110	727	372	355
Gobindabasan	Rural	182	803	439	364
Somaibasan	Rural	30	157	86	71
Gangadharpur	Rural	53	299	152	147
Atili	Rural	26	91	88	3
Jagaibasan	Rural	12	48	23	25
Maitrapur	Rural	159	1031	519	512
Mirjapur	Rural	55	307	150	157
Purba Mukundapur	Rural	410	2436	1225	1211
Begundiha	Rural	0	0	0	0
Digha	Rural	0	0	0	0
Raypur	Rural	1	3	3	0
Nilpur	Rural	0	0	0	0

TALGACHHARI-II	**Total**	**1362**	**7949**	**4106**	**3843**
TALGACHHARI-II	Rural	1362	7949	4106	3843
TALGACHHARI-II	Urban	0	0	0	0
Jhaugerya	Rural	101	657	356	301
Chhota Balarampur	Rural	4	8	4	4
Kiagoria	Rural	2	6	4	2
Jamra Shyampur	Rural	97	608	326	282
Lachhimpur	Rural	130	709	378	331
Dalbaladya	Rural	26	160	85	75
Panch Daria	Rural	37	253	121	132
Dakshin Balarampur	Rural	21	107	59	48
Shankarpur	Rural	65	464	236	228
Tengramari	Rural	223	1231	596	635
Kaema	Rural	41	246	121	125
Chandapur	Rural	296	1693	884	809
Jaldha	Rural	310	1807	936	871
Jhaoa	Rural	0	0	0	0
Project Area		**4314**	**24161**	**12520**	**11641**

Source: Census of India, 2011

he villages namely Khadalgobra has the highest amount of population (Figure 4.12). Khadalgobra is the oldest locality incidentally forming the core of Old Digha town hence is also the most congested part of the project area. The area consists of the locality west to Digha-Contai Road.

The next highly populated and congested area is Purba Mukundapur-Mirjapur village (Figure 4.13). Locationally this area has the advantage of staying close to Digha, Shankarpur and sea at the same time, and majority of the population in these areas are related to the fisherman during season.

The villages Nilpur, Raypur, Digha, Begundiha are mostly water merged area, on the other hand Jhaoa is forest area, hence these villages have very less or no habitation.

Sex Ratio

Table 4.22 presents sex ratio of the project area.

TABLE 4.22: SEX RATIO OF THE PROJECT AREA

State / District	Population 2001			
	Persons	**Male**	**Female**	**Sex Ratio**
Project Area	24161	12520	11641	930
West Bengal	80221171	41487694	38733477	934
Medinipur	9638473	4929000	4709473	955

Source: Census of India, 2001

The sex ratio of the project area is 930 in 2001 which was lower than the District & State scenario of the same year.

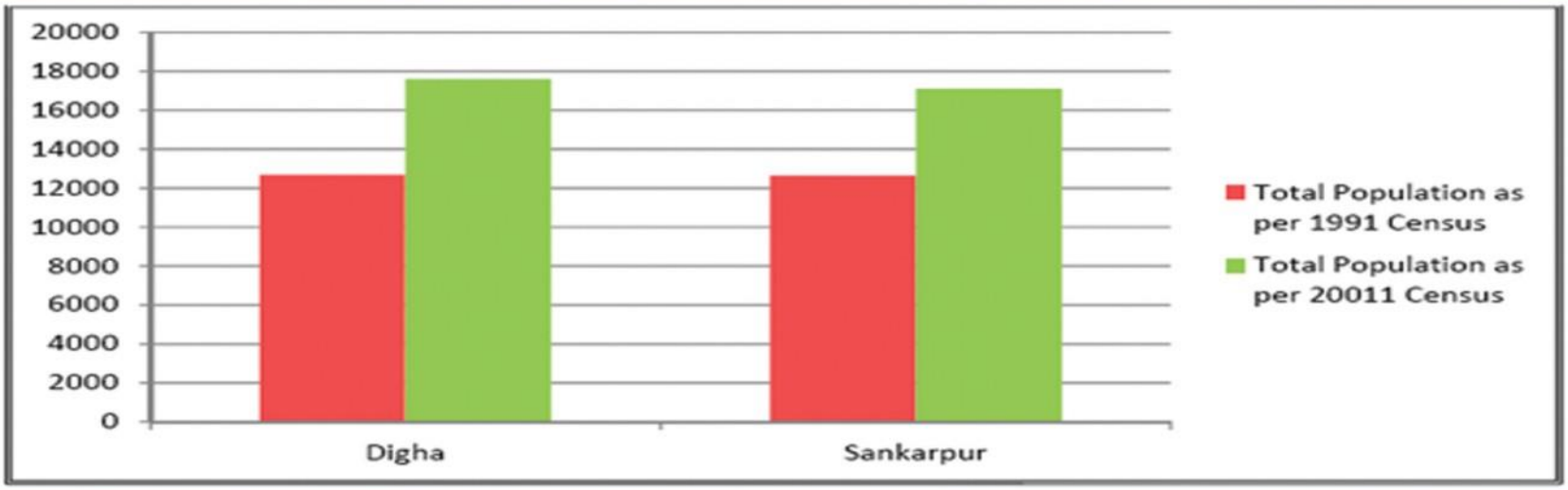


FIGURE 4.11: COMPARISON OF AREA WISE TOTAL POPULATION

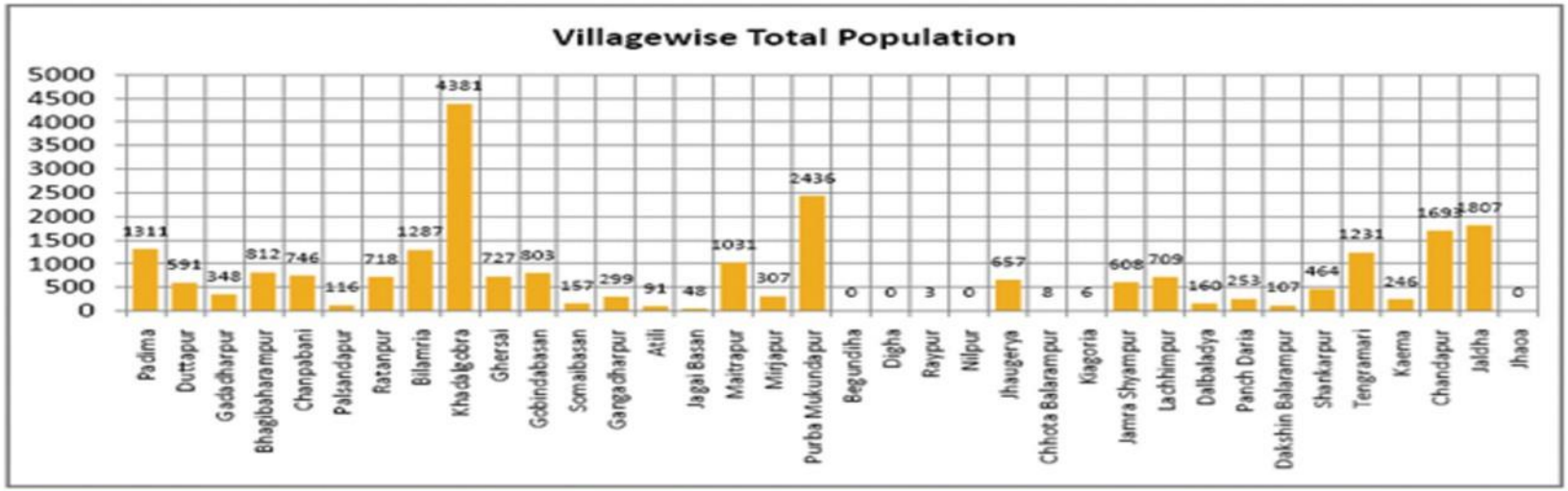


FIGURE 4.12: VILLAGE WISE POPULATION DISTRIBUTION

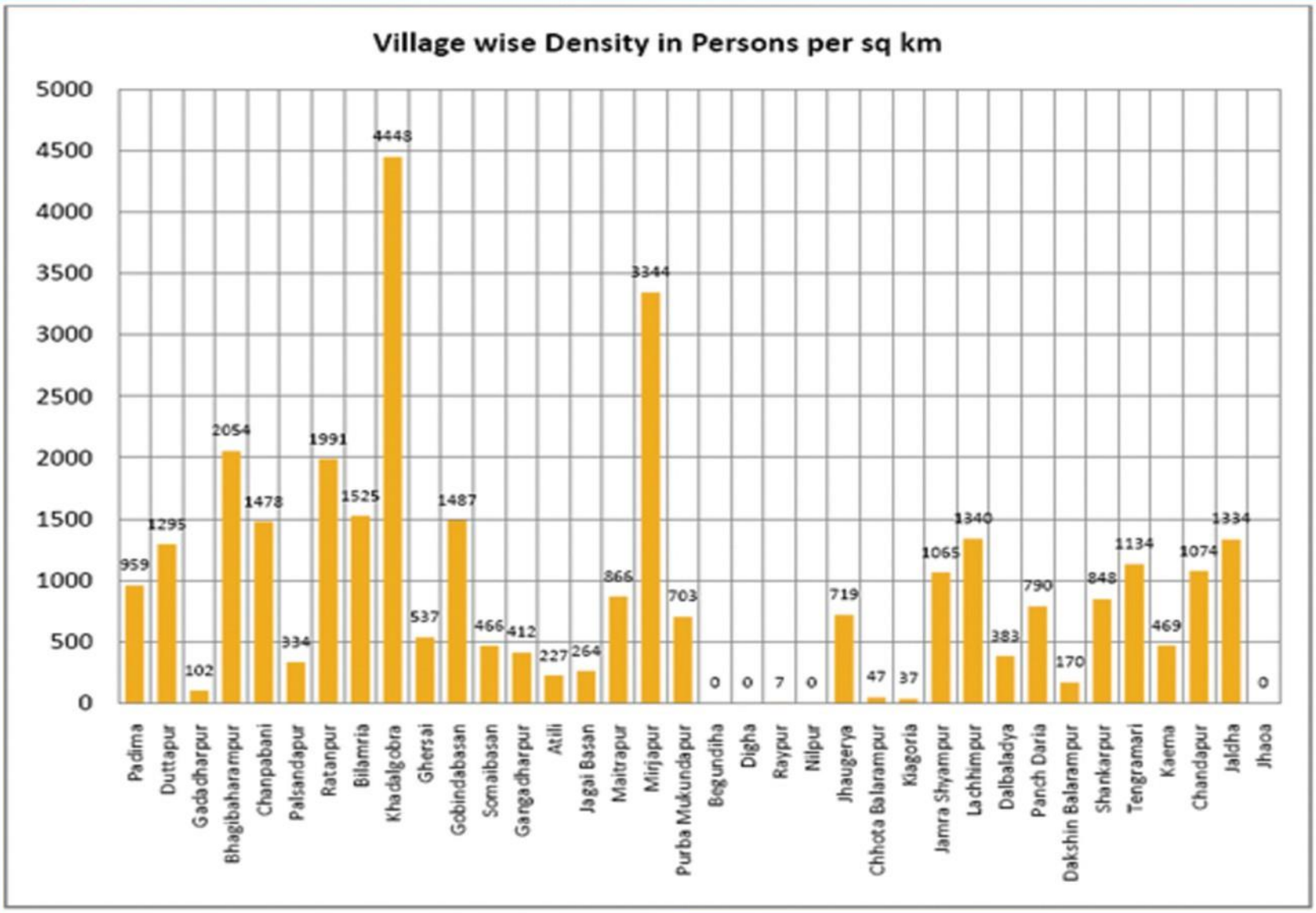


FIGURE 4.13: VILLAGE WISE DENSITY DISTRIBUTION

Village wise the scenario is widely variable as 8 villages, namely Duttapur, Ratanpur, Jagai Basan, Mirjapur, Chhota Balarampur, Panch Daria, Tengramari, Kaema has more than 1000 females per 1000 male (Figure 4.14), whereas, Raypur has zero sex ratio, since it has only 1 household of three male.

SC/ST Population

SC Population is highest in Khadalgobra, whereas ST population is very less present in general (Figure 4.15). ST Population is present in Duttapur, Khadalgobra & Gobindabasan mainly and a few households in Somaibasan & Padima.

Literacy Rate

Figure 4.16 presents that average literacy rate of the project area is 70.3% though in certain remote areas the literacy rate is as low as 33%.

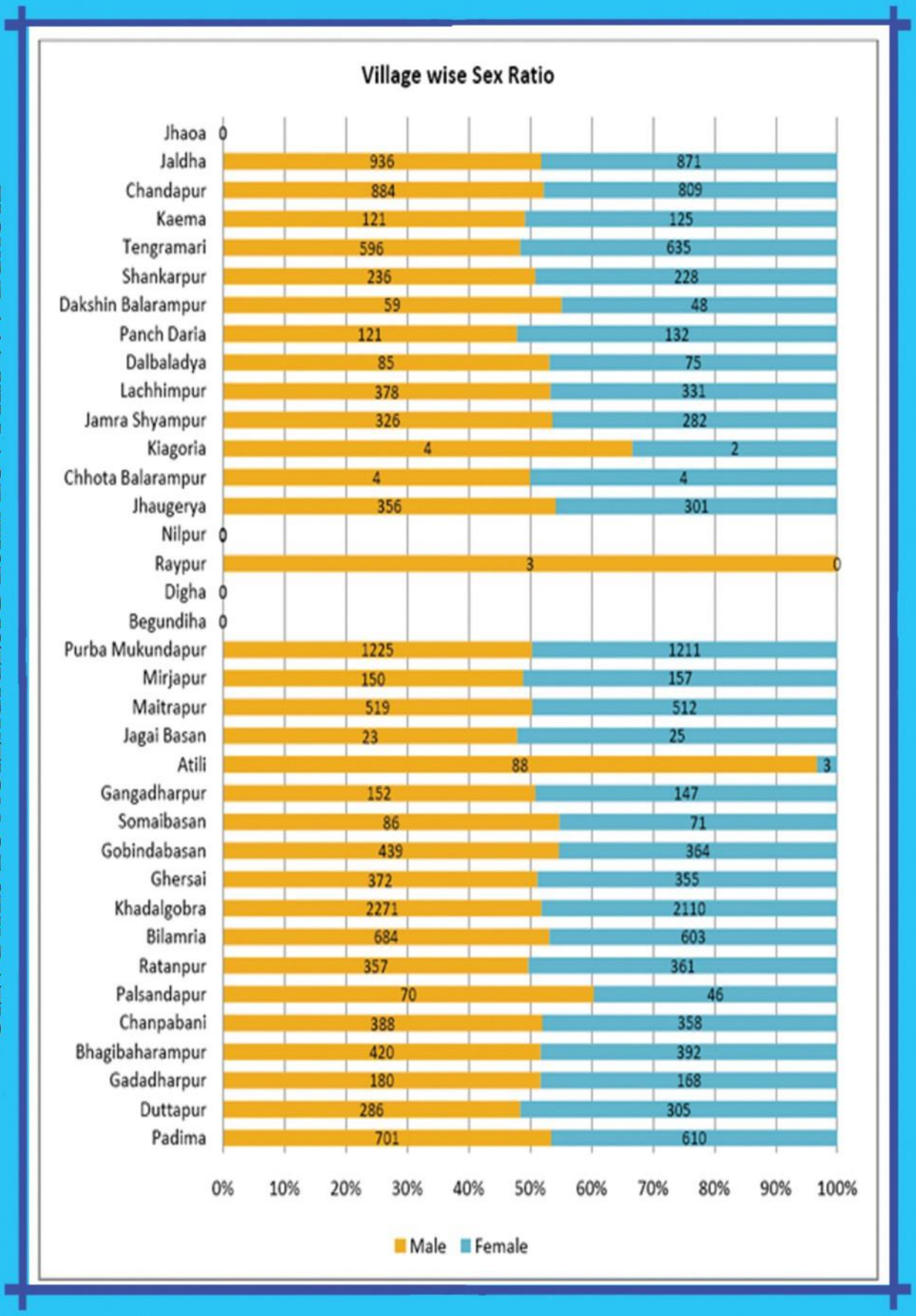


FIGURE 4.14: VILLAGE WISE DISTRIBUTION OF SEX RATIO

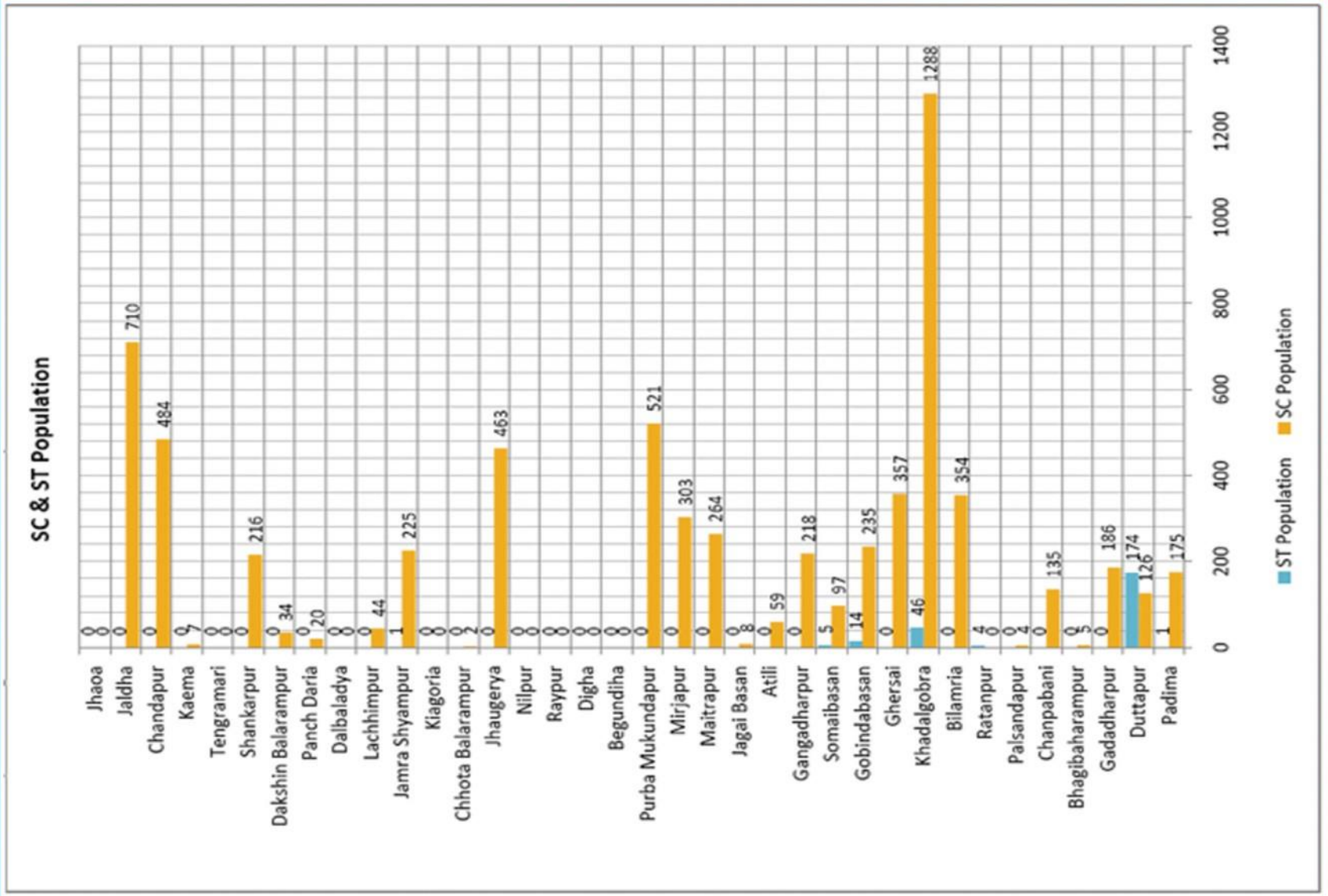


FIGURE 4.15: SC & ST POPULATION IN PROJECT AREA

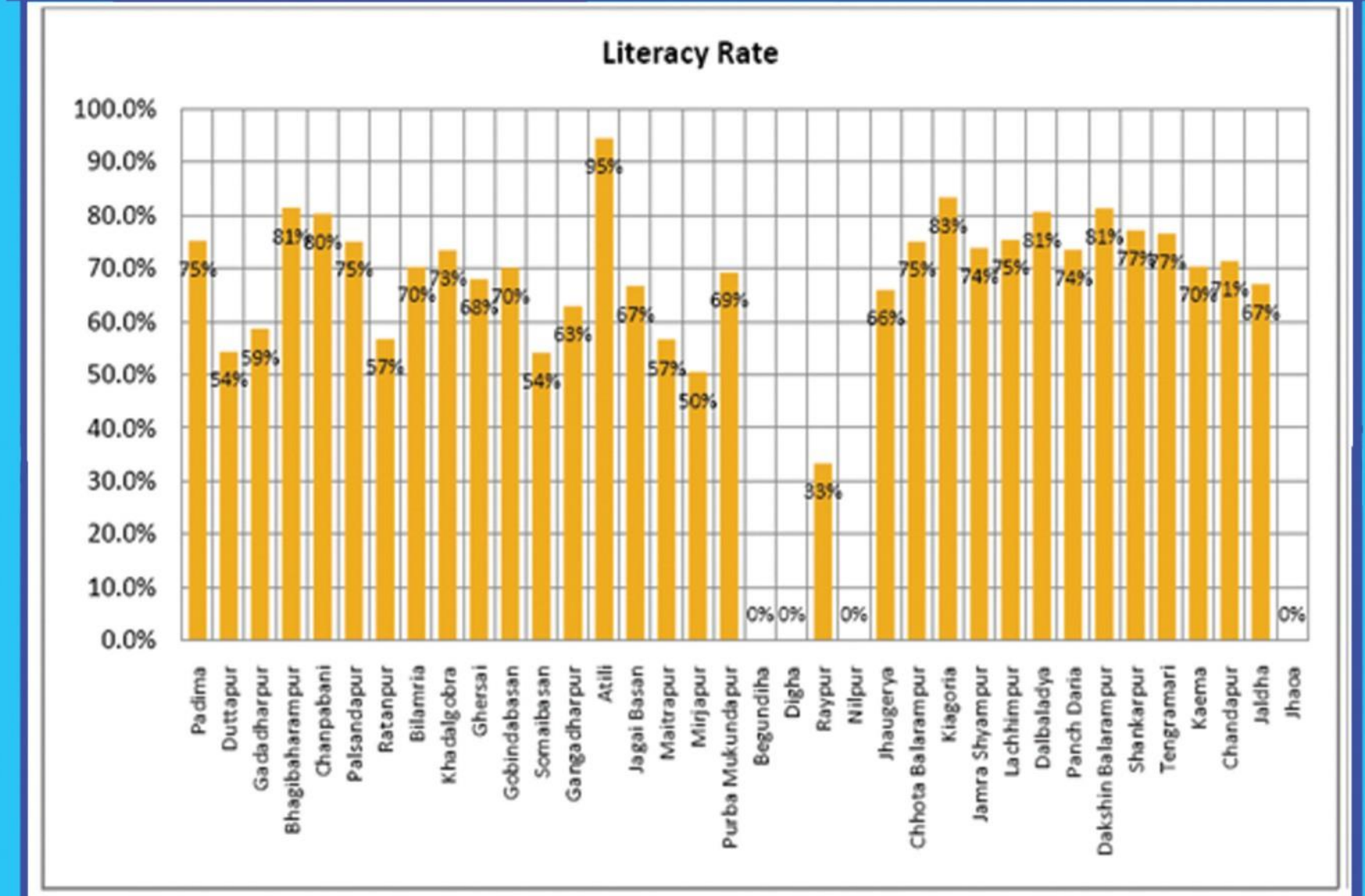


FIGURE 4.16: LITERACY RATE IN PROJECT AREA

CHAPTER 5

ENVIRONMENTAL IMPACT & MITIGATION MEASURES

CHAPTER 5
ENVIRONMENTAL IMPACT & MITIGATION MEASURES

5.1 PROLOUGE

This Section assesses both negative and positive impacts associated with the proposed construction of 33/11kV HT and LT Underground Distribution Cable Line in Digha Sankarpur Area. The assessment of environmental, social and health impacts has been undertaken across the three phases namely: Pre-construction Phase, Construction Phase and Operation & Maintainence Phase of proposed project.

This section also summarizes mitigation measures for minimization of potential negative impact of proposed UG cable network in Digha-Sankarpur area under World Bank project NCRMP II.

5.2 IMPACTS AND MITIGATION MEASURES DUE TO PROJECT LOCATION

5.2.1 Impacts on Land use

The UG cable project, with a cumulative length of 13.4 km 33kv, 66.86 km 11kv and 386.76 km will be laid along the existing roads within the DSDA area. The DSDA roads are largely bitumen paved and cement concrete roads particularly in narrow lanes and by-lanes and sporadic stretches of even brick soling and laterite/kutcha roads at number of locations. The proposed UG cable project is scheduled for completion between Feb 2017 and July 2018. Once the cable laying operations are completed, the roads will be restored to its previous condition. The work camp sites, store yards and hot mix plant areas will also be restored to its previous state after demobilisation. The UG cable project does not involve any land acquisition or diversion of land for permanent change in land use. Thus, there will not be any long term impact or change in the land use as a consequence of this project.

5.2.2 Impacts on Surface Water Resources

The UG cable project will require water during initial site preparation and cable trench excavation apart from consolidation/compaction of soil during back filling operations of cable trenches, apart from dust suppression measures at different stages of the project implementation. Provision of onsite sanitation facility through mobile toilets for workforce will also require water.

No fresh surface water sources will be used for meeting the water requirements of the project. Thus, there will be no impact on surface water resources of the area as a consequence of this project implementation.

5.2.3 Impacts on Ground Water Resources

The water requirements of the UG cable project is intended to be met through ground water resources (existing tube wells). Digha-Sankarpur area is categorized under safe category for

ground water extraction as per assessment carried out by CGWB (ref Chapter 4 Baseline Environment Profile).

The total water requirement of UG cable project is estimated at 9.14 kld, which includes both operational and onsite sanitation requirements. This is an insignificant quantity (equals daily water requirement of 10-12 households with 5 persons per household as per national standards) and very minimal as compared to the presently available ground water resources within DSDA. The water requirement for every 500 metres long cable laying segment as well as total water requirement of the entire project is given in Tables 5.1 and 5.2.

TABLE 5.1: WATER REQUIREMENTS FOR LAYING 500M LENGTH OF UNDER GROUND CABLE

Sl. No.	Activities	Water Requirement	Total Quantity (in litres)
1	Initial Site Clean up	0.5 litre/sqm X 1.0m wide operational area X 500m	250
2	Trench Excavation (asphalt/cc layer)	1 litre/sqm X 0.5 m trench width X 500m X 2 times	500
3	Trench Excavation (WBM/ Laterite/ Soil Layer)	1 litre/sqm X 0.5 m trench width X 500m X 3 times	750
4	Consolidated & Backfilling Operations including Road Restoration	1.5 litre/sqm X 0.5m trench width X 500m X 2 times	750
5	Wetting of Net Cloth Covered over Tipper Trucks	20 litre/truck X 25 trucks/Segment	500
6	Site Cleanup Operations	0.3 litre/sqm X 1.0 wide operation area X 500m X 1 time	150
	Total Water Requirement for Laying 500m Segment of UG Cable		2900

* Actual trench width may vary from 0.30-0.75m and operational area from 0.60-1.50m depeding on types of cable

TABLE 5.2: TOTAL WATER REQUIREMENT FOR UG CABLE PROJECT

S. No.	Feeder Area/Zone	Trench Length (in km)			Total Duration for Cable Laying (in working days)	Total Water Required @ 2900 litre/500m length Cable Trench	Average Water required/Day
		33/11kV HT	LT	Total			
1	Ramnagar S/S to Digha S/S (33 kV)	13.4		13.4	300	77720	259.07
2	Old Digha/Thana Feeder I	2.6	16.22	18.82	400	109156	272.89

3	Old Digha/Thana Feeder II	3.03	45.89	48.92	500	283736	567.47
4	Old Digha/Thana Feeder III	6.81	48.7	55.51	500	321958	643.92
5	New Digha Feeder I	5.35	30.84	36.19	400	209902	524.76
6	New Digha Feeder II	6.52	33.74	40.26	500	233508	467.02
7	New Digha Feeder III	12.68	78.61	91.29	500	529482	1058.96
8	Mohana Feeder	6.3	31.48	37.78	400	219124	547.81
9	Sankarpur Feeder	15.98	58.25	74.23	500	430534	861.07
10	Maitrapur Feeder	1.09	82.05	83.14	500	482212	964.42
11	Saripur Feeder	6.5	33.83	40.33	500	233914	467.83
	Sub-Total	80.26	459.61	539.87	500	3131246	6262.49
Total						3131246	6262.49
Add Contingency 10%						313125	626
Total Water Requirement for Cable Laying operations under proposed project area						3444371	6888.49
Water Requirements for onsite sanitation and drinking water facility at 5 operational area @ 15 litres/person/day for 150 workforces							2250
Total Water Requirements for Operations, Onsite sanitation and drinking water facility with 5% contingencies							9138

Note : This water requirement is for total project period of 18 months

The UG cable project does not involve any operations, which lead to generation of effluents/emissions that may directly or indirectly impact either surface and/or ground water resources. All other off-site operational areas under UG cable project like store yards, work camp sites, which are likely to have potential for pollution, if any will be provided with provisions to avoid soil, surface water and/or and ground water contamination. Thus, UG cable project will not impact ground water sources.

5.2.4 Impacts on Soil and Geology

The underground cables under this project will be laid along the existing bitumen and/or cement concrete/brick soling/laterite roads, within the DSDA limits. The maximum depth of cable trenches will be 1.30 metres from existing road level. The roads will be restored to its previous state after cable laying operations. No top soil will be disturbed or any virgin areas will be opened up for cable laying operations. The work campsites and other off site areas also will be restored to its previous state. Debris generated during laying under ground cables will be collected and disposed in environmental sound manner in DSDA designated area. Therefore, the UG cable project will not cause any impacts on soil and/or geology of the area.

5.2.5 Impacts on Flora and Fauna

The operational area, within which underground cables will be laid under this project, will be limited to a 1.25 - 1.50 m wide corridor along the footpath and/or road edge (Chapter 4 for details on operational area/corridor of impact). The environmental screening has indicated most of the pre-existing road side infrastructure/utilities including road side trees are beyond 0.5-1.0 m from the foot path or road edge. Therefore, cable routes within the operational area will be aligned this 0.5-1.0 m from footpath/road edge to avoid trees (irrespective of size) and no significant tree are likely to be felled for this project.

The tree enumeration survey during environmental screening has indicated that 13.4 km 33kv, 66.86 km 11kv and 386.76 km long cable route corridor under proposed project area has 285 trees of different sizes (ref Chapter 4 - Baseline Environment Profile). At stretches, where fully grown trees exist, trenches will be excavated through manual means with lopping of trees. During trench excavation, utmost care will be taken to avoid damage to the root zone of trees, irrespective of its size. Thus, UG cable project will have no significant impact on flora of the region.

As the UG project is limited to existing roads and does not traverse through forest/plantation areas or stretches with green cover, impacts on fauna is not anticipated.

5.2.6 Impacts on Weather and Climate

The UG cable project will not cause any impact on weather and climate. Also, the project does not involve large scale construction activities like area development or industrial or other infrastructure development projects, which can induce some impacts on the local climate.

5.2.7 Impacts on Ancient Monuments/Archaeological Sites

The area of the proposed UG cable project does not have any ancient monuments and/or archaeological site(s), protected under the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010 or by the Department of Archaeology and Museums, Government of West Bengal. Thus, there will be no impacts on ancient monuments and archaeological sites due to the proposed UG cable project.

5.2.8 Impacts on Heritage Structures

The project area has no heritage structures falling within UG cable route alignment. Therefore, cable laying along the road will not impact any heritage structures. Specific requirement/suggestions of the concerned authorities with heritage structures, if any, with regard to cable route alignment will be duly adhered during cable laying works at such locations.

5.2.9 Impacts on Ecologically Sensitive Areas

There is no ecologically-sensitive areas viz., wetland, protected area and important bird area (IBA), within the proposed UG cable project area. Cable routes under UG project are limited to already existing fully developed urban/rural roads and do not extend into coastal sands (beach areas) and therefore, underground cable laying works under this project will not cause any impacts on any of these areas.

5.3 HAZARD RISK AND VULNERABILITY

The UG cable project is spread across DSDA area, which is under a low risk seismic zone (Zone II). Further, the project in itself does not involve any super structures, which warrant earthquake resistant designs.

Historical data indicates September and October months are the most probable months for occurrence of depressions, cyclones and severe cyclonic storms in Digha-Sankarpur (Ref Chapter 4- Baseline Environment Profile for details). Therefore, cable laying operations could get stalled for brief periods, in the event of any occurrence of cyclones/inclement weather conditions during the implementation phase.

On the contrary, the UG cable project is being implemented in order to have a resilient underground electrical network, to counter damages, during and after cyclones and other such natural calamities along coastline of Digha-Sankarpur.

5.4 BENEFICIAL IMPACTS OF UG CABLE PROJECT

The most notable and anticipated benefits of UG cable project to Digha-Sankarpur and its residents are hereunder:

- UG cable network is safer to public lives and property, particularly of people belonging to lower economic strata of society during calamities/disasters/thunders /lightening instances

- Areas covered under UG cable project is expected to practically remain unaffected in future from power disruptions and associated implications during or after cyclone/high winds or natural calamities/inclement weather conditions, hence resilient to natural disasters, the main project development objective of UG cable project component under NCRMP II.

- Resilient underground electrical cable network will help to retain/restore water, sewerage and sanitation services across city during or after calamities/cyclones.

- Resilient underground electrical cable network will help state administration to restore other damaged infrastructure during natural calamities with least down time.

- Conserve state's resources in re-construction of damaged electrical network during every calamity. During Aila, the state government had incurred significant cost for restoration of damaged power distribution system in Digha-Sankarpur alone.

- Digha-Sankarpur being an important tourist destination besides commercial hub in East-Medinipur District of West Bengal, stands vulnerable to natural calamities, will essentially need such resilient electrical distribution network, thus aid in State's economic growth and enable to become attractive and destination to investors.

- Will help in improving aesthetics of the city through conversion of all over ground power distribution network into resilient underground infrastructure. All overhead power distribution infrastructures will be dismantled, after commissioning of the UG cable project.

- The present UG cable project will concurrently enable to up-rate distribution network to future demands by at least 10 years by installing the XLPE cables, which are far superior to the conventional overhead conductors, thus will avoid upgrading/uprating of existing OH network.

- Trefoil configuration of underground cables in UG cable project will enable to improve current distribution, reduce sheath losses, minimize magnetic field around conductor and reduce heat-up of cables, all of which will further improve efficiency of underground cable network

- Underground cables do not require any dedicated corridor to be kept permanently clear as in case of an overhead line for safety, maintenance and repair.

- Underground cables will vacate space over ground, which improves aesthetics, higher public acceptance, convey environmental benefits and as well spurt an increase in property values. Thus, underground cables have a potential to induce knock-on effect" - that all other local communities might want "their" network put underground.

- Underground cables do not create obstacles over ground like in case of over head lines. Also, underground cables pose no hazard to avifauna and low flying aircraft.

- Underground cables are not affected by momentary interruptions, occurring from lightning, crow faults and falling of tree branches on overhead lines, which de-energize and then re-energize the circuit moment later, a most common feature in over head lines.

- Typically, outrages in underground cable network are about half of their equivalent overhead networks. Also, operating and maintenance costs are estimated to be around one tenth of the cost of overhead network. Thus, advantage of underground network is of fewer interruptions and lower maintenance costs.

- Underground cables will have no pilferage, whereas overhead cables have scope for pilferage/power thefts, which can lead to safety hazards and accidents at times.

5.5 IMPACTS AND MITIGATION MEASURES DURING CONSTRUCTION STAGE

The cable laying activities of UG project comprise sequential activities like initial site preparation, onsite cable route demarcation, trench excavation, cable pullout and lowering, cable jointing, backfilling of trenches, construction of cable joint inspection chambers, road restoration works and finally site cleanup operations. Each of these activities will be normally completed within 2-5 days and therefore the impacts for very limited duration and transitory. A typical work completion time for laying of underground cable in a 500 metres long segment is given in Table 5.3.

TABLE 5.3: WORK COMPLETION TIME UG CABLE LAYING IN A 500 METRE LONG SEGMENT

S.No.	Activities	No. of Days Required for Work Completion	Relevant Construction/Machinery
1	Site Preparation & Excavation of Road/Pavement	4	• Tipper trucks for transportation of all site cleanup materials/excess debris • Manual or mini excavators/road drillers fitted with attachments for road/pavement cutting/ breaking • Mannual/Excavators, for loading the excavated materials on to tipper trucks to transport it to central work campsite or to disposal location as per requirement
2	Excavation of Earth & WBM Layers	3	
3	Cable Laying (Pullout & Lowering)	4	• Manual/Mini excavator fitted with attachments for cable pull out, as required
4	Backfilling of Trenches	3	• Manual backfilling of trenches with excavated debris • Vibratory compactors cum rollers, suitable for working in cable trenches (0.5 - 0.75 m wide)
5	Road Restoration works & Site Clean up	5	• Tipper trucks for transportation of asphalt materials to operational area if required and also removal of excess debris/waste materials • Pavers for laying of Bituminous Concrete • Rollers for compacting the Bituminous concrete layers
6	Total Time Required for Cable Laying (500m segment)	21	• Tipper trucks for transportation of excess debris & waste materials to approved disposal location or stacking area, prior to disposal
7	Time Required for Construction of Cable Joint Inspection Chamber, concurrent to UG cable laying operations	21	• Rotating transit mixers for pouring ready mix concrete for casting of RCC. joint inspection chambers

Moreover, all these activities will be confined to 1.25-1.50 m wide barricaded operational area, which would keep shifting ahead in 500 metres long segments as the work progress. The feeder wise impact of proposed UG cable network on existing basic infrastrcture viz., road, culvert, water supply line, drain and sewerage line, etc is presented in Table 5.4.

As per the project implementation schedule, only one such operational areas of 500 m long segment will be opened up per feeder area at any given point of time. All works, except laying of bituminous/CC layers to allow for natural compaction is to be **MANDATORILY** completed in the previous segment, prior to opening up of next operational area segment. The laying of the bituminous/CC layer is to be subsequently taken up immediately after the natural compaction, expected to take place within 3-4 weeks or as determined based on site conditions. The entire 13.4 km of 33kv and 66.86 km of 11kv along with 386.76 km of LT UG cable laying in project area is scheduled to be completed in 18 months of time (February 2017 and July 2018).

Other than this, UG cable project will require store yards at other locations, to cater for all feeder areas, which is primarily intended to store cable coils and other inventory required for cable laying operations. Such store yards will enable to avoid on-site storage along cable routes (to extent possible) and thereby avoid inconvenience/disruptions to pedestrian as well as vehicular traffic. The project may require one work camp site for establishing macadam mix plant and bitumen mix plant for road restoration works. The impacts and mitigation measures, for each of the sequential cable laying activities are given hereunder.

5.5.1 Site Clearance and Preparation

The site clearance and preparation activities along each of the 500 metres long operational area segment will comprise the following:

- Onsite marking of the cable routes as per cable alignment plan in the respective feeder area.
- Erect barricades on road side of the 1.25 - 1.50 m wide operational area
- Clearing of barricaded area, for any unwarranted/waste materials, to ensure entire barricaded operational area is available for cable laying operations
- Provision of intermediate access, wherever required access across barricaded area for adjacent residential /commercial structure occupants as per requirements

5.5.1.1 Impacts

The impacts of site clearance and preparation of operational area may be as hereunder:

- Site clearance operations may cause a marginal increase in dust levels, although for a very limited time in and around barricaded operations area.

TABLE 5.4: FEEDER WISE DETAIL OF IMPACT ON BASIC INFRASTRUCTURE DUE TO PROPOSED UG CABLING PROJECT

S. No.	Particulars	Unit	TH FDR -1	TH FDR -2	TH FDR -3	ND FD R-1	ND FDR-2	ND FDR-3	MOITRAPUR	SARIPUR	SANKARPUR	MOHONA	33KV-Ramnagar to Digha SS	Total
1	Imp on Bitumin Rd X-ing#	mtrs	95	76	157	94	183.5	219	0	8	107	36.5	26	1002
2	Imp on Bitumin Road	mtrs	220	250	650	825	0	350	0	0	350	200	30	2875
3	Imp on CC Rd X-ing#	mtrs	4	50	36	39	75.5	37	2	42.5	32	13	3	334
4	RCC(Access,Pavement/Platform/Slab/ Parking lot /Plaster/Tiles etc)	mtrs	12	6	0	0	0	0	0	0	0	0	0	18
5	Imp on CC Rd/Pavement /Platform/Slab/Parking lot /Plaster/Tiles	mtrs	150	1050	300	380	400	330	0	140	0	570	0	3320
6	Imp on Brick Rd Crs#	mtrs	9	243	22	0	17.6	10	0	2.5	0	15	0	319.1
7	Imp on Brick Road/Platform/Pavement/Parking Lot	mtrs	0	1050	290	130	133	0	0	0	0	500	0	2103
8	Imp on Paver Block/Mozaic/Marble	mtrs	0	600	290	80	20	0	0	0	0	0	30	1020
9	Imp on Culvert / Drain Slab X-ing#	mtrs	14	37.1	38	10	49	45.6	0	18	56	31.6	54	353.3
10	Imp on Sewarage Line X-ing#	mtrs	0	435	2	0	1.1	11	0	2	0	0	0	451.1
11	Impact on 250 mm. thick wall of Manhole/Drain Chamber-Removable	nos.	2	8	2	22	20	38	0	3	0	0	0	95
12	Imp on 250 mm. thick Brick wall of Masonary Sewarage line/Pakka Drain/Boundary	mtrs	210	251	215	350	229	458	0	47	134.15	353	0	2247
13	Imp on Pakka Drain X-ing#	mtrs	0	13	9	2	9.5	14	0	1	0	4	0	52.5
14	Imp on Waterline X-ing#	mtrs	0	0	0	0	0	1.4	0	0	0	0	0	1.4
15	Affect on Water line	mtrs	0	0	0	0	0	0	0	0	0	0	0	0
16	Imp on Green Fence/ Temp. Fence/Wood+Tin+pillar+fence Structures etc.#	mtrs	120	250	215	70	190	200	40	150	365	120	0	1720

*Micro Tunneling/ Jack Push*

- Access to residential /commercial structure across barricaded operational area may be constricted

- Pedestrian traffic across and along barricaded area mayget constricted

- Road side parking (both authorised and unauthorised) may get constricted as a result of barricading of operational areas in 500 metres long segments

- Vehicular traffic along the road may also get constricted as a result of reduced width of carriageway due to barricading

- Road side storm water drainage along 500 metres long segment might get slightly affected, since some drainage chutes might get blocked under barricaded operational area

- Seepage and water logging of cable trenches may occur affecting the cable laying operations

5.5.1.2 Mitigation Measures

The mitigation measures required during the site clearance and preparation are:

- Cable route, cable trench of 0.5-0.75 metre width as well as 1.25-1.50 m wide operational area is to be preferably demarcated on ground with yellow paint (7.5 cm wide minimum). The location of cable joint inspection chambers (size 1.0x2.5x1.0 metres deep or as per requirement) at every 250 metres interval along cable route, also to be marked on ground with yellow paint;

- While, demarcating the cable route and cable trench, shall mandatorily avoid removal /shifting of any of over ground road side infrastructure like poles (all types and sizes) and trees (all types and sizes), with exception of ramps, steps which are extending onto road;

- Ensure, centreline of 0.5-0.75 m wide cable trench coincide with centreline of 1.0-1.25 m wide operational area, with 250 mm wide working space availability on both sides of cable trench (Refer Chapter 4.0 - Baseline Environment Profile);

- The cable routes and strip plans/UG cable route maps for entire project area is provided in Detailed UG Cable Network Survey Report. The cable route plans are also provided in bid/contract documents of UG cable project;

- In case, cable routes are along commercial and busy roads, requisite approvals from traffic police shall be obtained at least 7 days in advance prior to start of site clearance operations in such stretches. The strip plans/UG cable route maps provided in detailed UG Cable Network Survey Report can be used in planning of any traffic diversions, if required and /or for seeking approvals from traffic police;

- The environmental screening has identified 10 vulnerable receptors along 80.26 km of HT and 386.76 km LT network route. The vulnerable receptors include hospitals, schools/educational institutions/ community halls etc along cable routes in all 10 feeders. The locations of all such receptors are provided in strip plans/route maps. Details of information about cable laying operations, scheduled work completion time in such specific stretches shall be shared with all such institutions/occupants at least 7 days in advance, prior to commencement of works. Their requirements with respect to access or traffic diversions or any other concerns shall be considered in operations planning and scheduling of work and adhered to without any lapses on any account;

- The occupants of other residential and commercial establishments along operational areas to be barricaded shall be informed 7 days in advance about cable laying operations, scheduled work completion time, restriction in access for limited time and their specific requirements, if any with respect to temporary access and arrangements shall be discussed and finalised prior to barricading and commencement of trench excavation;

- Prior to commencement of excavation works, carry out minor repairs to foot paths (including making good all uneven surfaces along 500 metres cable route segment) adjacent to barricaded area (wherever applicable) to ensure pedestrian safety as a result of reduced walkway due to barricading on the road side;

- All operations shall be restricted to only day hours in residential areas. Only in case of commercial areas, which are most unlikely to disturb residential pockets, the operations, can be carried out at night hours with adequate floodlite arrangements and ensure operations are not a hazard to night traffic;

- At any given point of time, only 500 metre length operational area shall be opened up for cable laying operations at a particular location and only one such operational area per feeder/zone. Prior to moving to next 500 metre segment, all works in the previous segment shall be completed in all respects, except laying of bituminous/CC layers, which shall be taken up after achieving a natural compaction within 3-4 weeks. The worksite shall be completely cleared, prior to opening to traffic;

- Prior to commencement of excavation operations, permission for road cutting from DSDA and approvals from traffic police, wherever required shall be obtained in advance. The telecom department shall be informed about the cable laying operations;

- Once required permissions from DSDA and traffic police are in place, barricade(s) shall be placed on road side of the 1.25-1.50 m demarcated operational area. The barricade will not only help to significantly limit impacts of cable laying to the operational area but will also act as a safety barrier.

- Sand/earth filled polypropylene bags (used cement bags) are to be placed along barricades, to prevent seepage and water logging of cable trenches during rainy days. Seepage and water logging will not only prolong cable laying operations but will also

prolong inconvenience to public and vehicular traffic as a result of barricaded operational area for extended period;

- The barricades shall be provided with energy efficient LED strip lighting system (onlytowards roadside) as a hazard safety for traffic moving at nights and late nights. The LED lighting system shall be switched on between sunset and sunrise hours mandatorily, for the entire duration of cable laying operations in any segment;

- All work force deployed for cable laying operations shall be provided induction training, which shall include awareness about safety practices at work places, safe distances to maintain around moving equipment like excavators/road drillers etc, health and safety issues with particular emphasis on public safety and on-site sanitation practices at worksite during cable laying operations;

- Every 500 metres segmental operation area shall be stationed with one mobile water tanker of 6000 litres capacity to meet all operational water requirements. The water tanker shall be fitted with a pressurized fine spray system and a hose reel of 600 metres length. Typically, water is required for dust suppression during site preparation, excavation, consolidation of backfilling layers and wetting of net cloth covered over tipper trucks, prior to their dispatch from operations site and site clean up after completion of cable laying;

- All workforce deployed at site irrespective of level, shall mandatorily wear personnel protective equipment (PPE) like safety helmets, face masks, ear plugs, protective gear with reflective jackets and safety shoes;

- Use of well-maintained and less than 5-year old earth excavators/moving equipment will enable to limit the noise levels to a large extent;

- At some locations like busy roads with commercial complexes and particularly near or ahead of junctions, location specific traffic diversion plans are to be planned and implemented to ensure smooth passage of traffic and avoid congestion. Same may be finalised in consultation/approval of traffic police, well in advance of at least 7 days.

- Diversion notice boards, or caution notice boards for both pedestrian as well as vehicular traffic at all appropriate required locations, both on upstream and downstream of the barricaded area shall be installed, so that approaching traffic can move with caution. All boards shall be as per code of practice for road signs IRC: 67-2012;

- Trained traffic wardens with reflective hand held batons and jackets, helmets and safety shoes are to be deployed at places, wherever barricaded operation areas are near to road junctions/intersections in order to ensure smooth movement of traffic;

- An on-site crew group, comprising mason, plumber, carpenter/sheet metal fabricator, with mobile van (MUV type) and all required tools/equipment/materials shall be

provided on full time basis and common to all operational areas to rectify the damages to underground utilities like water supply pipelines, sewer lines, drainage and/or sanitary connections or provide temporary access during excavation. The crew shall be provided with all resources by contractor to restore damaged utilities with least down time. The same crew group shall be deployed to restore the damaged steps, ramps during trench excavation works to ensure proper drainage alongside barricaded operational area during and after rains;

- Every 500 metres segment operation area shall be stationed with one mobile toilet (1 seat for men and 1 seat for women with separate entrances) and parked at a suitable place within a maximum distance of 100 metres from the operational area. The mobile toilet shall have at least 1000 litres capacity overhead water tank and replenished regularly. The toilet shall be well maintained and in usable condition at all times. The bottom tanks shall be emptied on a regular basis;

- The workforce shall be instructed to use the mobile toilets, specially provided under the project and not to use any other public/open places or public toilets;

- Each operational area shall have at least two waste collection bins (25 litres capacity each) installed at entry and exit points for use by workforce. The bins shall be regularly emptied and kept in clean conditions at all times;

- Every 500 metres operational area shall be stationed with one drinking water kiosk with minimum 300 litres capacity, replenished regularly. The kiosk shall be placed at a suitable place within 100 metres from operational area;

- The operational area shall display/maintain list of nearby hospitals for attending to any injury/ fatalities either to workforce and/or to public as a result of cable laying activities. The site shall also have a first aid kit and field level supervisory staff shall have undergone first aid training/orientation;

- Since the work is being carried out along roads in commercial as well as residential areas, utmost attention shall be exercised to swiftly complete all operations including road restoration, prior to opening up the barricaded area for public use with shortest possible time.

5.5.2 Excavation of Pavement

After the site preparation, first activity at operational area will be excavation of pavement (laterite/asphalt/cc) layers, which can be done either manually and /or by using the specially designed accessory fitted to mini-excavators/road driller.

The excavated materials (asphalt) can be directly loaded onto the tipper trucks for transporting it to the central asphalt plant, if recycling of the materials needs to be carried out for road restoration or can be stored near trench for subsequent use in refiling of excvated trench if re-cycling of excavated asphalt materials is not desired for road restoration.

5.5.2.1 Impacts

Irrespective of methods deployed, excavation of pavement may generate 360 cum of asphalt, (considering total length of bituminous road: 2875 m; 0.5 m width of trench: 0.25 m thickness of bitumen) besides laterite, concrete and other materials from all 10 feeder areas spread across project area.

The pavement cut materials will need to be either recycled/reused to the extent possible for filling of excavated trench and road restoration works or safely disposed off to avoid adverse impacts on environment.

Other than this, pavement excavation operations will contribute to dust and noise levels, which are to be managed. Since the pavement excavation will largely be restricted to barricaded operational area, disruptions to local traffic will not be significant, except during loading of pavement cut materials to tipper trucks if required.

5.5.2.2 Mitigation Measures

a) Management of excavated pavement materials:

The pavement excavated materials, particularly asphalt contain significant quantities of bitumen (up to 4%) and stone aggregates (up to 96%), which can be re-deployed (as recycled asphalt pavement) during the road restoration works under UG cable project. The recycling/reuse of construction waste materials is now mandatory with the newly notified Construction and Demolition Waste Management Rules, 2016.

The recycled asphalt pavement has the following advantages:

- Avoid utilization of newer resources of bitumen and stone aggregates, through recycle and reuse of excavated pavement/road cut materials, which adequately contains required bitumen and stone aggregates;

- Will avoid or minimise the quantities of asphalt materials for transport as well as, safe disposal apart from associated costs, involved thereof;

- Will avoid or minimise movement of tipper trucks in and out of DSDA area as well as avoid carriage cost for transportation of excavated asphalt materials.The DSDA approved disposal locations for waste disposal are at Ratanpur/Duttapur. On the other hand, if the material is to be sent for recycling, central plants (modified bitumen hot mix plants) for processing of excavated asphalt materials will be located within DSDA limits at less than 10 km.

Although, there are four principal recycling methods, central plant cold recycling (CPCR) is best suited for UG cable project, since this facilitate recycling of maximum quantity of excavated asphalt materials. Details of CPCR along with other recycling methods are given in Annexure 5.1.

Deploying CPCR will enable to completely utilize all excavated asphalt pavement materials for road restoration. Also, deploying CPCR will not warrant either transportation over long distances or safe disposal of excavated asphalt materials. Therefore, recycling of asphalt materials through CPCR may be considered for road restoration under the UG cable project if feasible.

The pavement cut materials of cement concrete roads, cannot be economically recycled/reused for pavement reconstruction. It can be used for filling low-lying areas or disposed as construction debris in designated area.

Consultations with DSDA officials indicate that disposal location require large quantities of construction debris/soil either for closure of existing dumpsites at Ratanpur/Duttapur or construction of approach road and other infrastructure at adjacent locations, where DSDA is developing new waste disposal sites. In any case, DSDA shall have to establish facility to receive and process all such waste as per recently notified Construction and Demolition Waste Management Rules, 2016,

b) Other mitigation measures during pavement excavation operations

- The dust levels during pavement cut operations shall be controlled by periodical sprinkling of water through 6000 litres capacity mobile water tankers stationed at operational areas and fitted with pressurized fine spray with hose reel arrangement. Pressurized water spray will enable to conserve water and avoid excess use of water for sprinkling at work sites/operational areas;

- The tipper trucks, which carry the excavated asphalt materials to a central plant for processing shall be covered with net cloth and wetted with sprinkling of water, prior to dispatch of every trip, to prevent en-route spills as well as airborne dust during transit. Tipper trucks shall not be overloaded beyond designated capacities, to avoid en-route spills;

- The noise levels during pavement cut operations can be limited/ reduced through deployment of well-maintained and relatively newer (less than 5-year old vehicles) and all excavation operations are conducted at normal work pace. Moreover, in selected area where semi-mechanized excavation would be involved temporary noise barriers would be placed if required. Noise modeling assessments conducted indicate that noise levels attenuate upto 12 dBA as a consequence of using the noise barriers. (refer 5.8.1 for details on noise model and attenuation effect of noise barriers);

- All work force involved in pavement excavation operations will be provided with PPEs like safety shoes, helmets, face masks, ear plugs, reflective jackets mandatorily. All personnel exposed to noise levels for prolonged duration shall be provided with one additional break in the pre and post lunch sessions, to limit their exposures;

- The road/pavement excavation at some specific locations may warrant partial removal of unauthorized ramps/steps along cable routes, but all such ramps, steps and other infrastructure shall be restored to its previous state and temporary access across

barricaded area is to be provided as an interim measure to avoid/minimize inconvenience to occupants of the buildings along UG cable route corridor;

- A dedicated crew group comprising mason, plumber and carpenter/sheet metal fabricator with all resources including a mobile van (SUV type) is to be stationed (common for all operational areas across the project) to restore any damaged underground utilities like water/sewer/sanitary lines as a consequence of excavation works. In case of any un-foreseen utilities get damaged, the same shall be restored as per the time line provision made in the grievance redress mechanism (ref Chapter 9 for details). Normally, pavement excavation operations (upto maximum depth of 1.3 m in present case) is unlikely to damage to any pre-existing underground utilities.

5.5.3 Excavation of Sub-Base and Base Layers

The sub base and base layers, which are beneath asphalt/cement concrete pavement layers are also to be excavated as per the trench type configuration. The estimated quantity of sub base and base layers, which is to be excavated as per project design is estimated at 3097 cum (considering total length of bituminous/CC road: 6195 m; 0.5 m width of trench: 0.25 m thickness of sub base and base layers).

The excavated base and sub-base layers may largely contain natural sandy soils, prevalent in Digha-Sankarpur region, interspersed with water bound macadam layers (graded stone aggregates mixed with coarse soil). Much of this materials can be re-used for filling of excavated trenches depending upon its gradation and composition, which is to be determined during the excavation operations.

If the excavated materials found to be useful for reusing as wet mixed macadam (WMM), then it can be transported to a central WMM mix plant, to make it suitable for reuse as WMM with additional material as per required gradation in accordance with IRC guidelinesor MoRTH (Ministry of Road Transport and Highways).

5.5.3.1 Impacts

The surplus base and sub-base layers (after re-using to extent possible 70%) will need to be disposed off as construction waste and/or debris in the designated DSDA disposal sites. Given that this excavated material is almost akin to natural soil, will not cause any adverse impacts and can be effectively used in embankment construction or filling low lying areas and/ or can be sourced to other area development projects, commanding commercial value.

5.5.3.2 Mitigation Measures

- The surplus base and sub-base layers (after re-using to the possible 70%) is to be disposed off as construction wastes/debris at approved disposal locations of DSDA. The approved disposal locations are at Ratanpur/Duttapur;

- Consultations with DSDA officials indicate that all the disposal locations require large quantities of construction debris/soil either for closure of existing dumpsites at

Ratanpur or construction of approach road and other infrastructure at adjacent locations, where DSDA is developing new waste disposal sites. In any case, shall have to establish facility to receive and process the waste;

- Considering that approx. 30% of materials needs to be disposed off, which translates to average 2-4 tipper truck trips (@10 cu.m capacity trucks) per day spread over project implementation phase of entire UG cable project. All tipper trucks, carrying excavated materials shall be covered with net cloth and wetted prior to dispatch of every trip, to prevent en-route spills as well as airborne dust during transit. Tipper trucks shall not be overloaded beyond designated capacities, to avoid en-route spills;

- The dust levels during excavation of sub-base and base layers shall be controlled through periodical sprinkling of water through 6000 litres capacity mobile water tankers stationed at operational areas and fitted with pressurized fine spray with hose reels. Pressurized water spray will conserve water and avoid unwarranted use of water for sprinkling at work sites/operational areas;

- The noise levels during excavation can be reduced through deployment of well maintained and relatively newer (less than 5-year old vehicles) and all excavation operations are conducted at normal work pace.

- All work force involved in excavation operations are to be sensitised to keep safe distances from moving equipment and provided with PPEs like safety helmets, safety shoes, face masks, ear plugs, and protective gear with reflective jackets mandatorily. All personnel exposed to noise levels for prolonged duration will be provided with one additional break in pre and post lunch session breaks, so as to limit their exposures;

- The excavation at some specific locations along operational area may warrant partial removal of unauthorized ramps/steps along cable routes, but all such ramps, steps and other infrastructure are to be restored to its previous state and temporary access across barricaded area are to be provided as an interim measure to avoid/minimize inconvenience to occupants of the buildings along UG cable route corridor.;

- Further, the excavation of sub-base and base layers at some locations may foul with some of the underground utilities like water supply, sewerage connections across barricaded operational area. Damage to pre-existing underground utilities are to be avoided through resorting to manual excavation at all such locations;

- In case of any damage to utilities like water/sewer/sanitary lines as a consequence of excavation works, same is to be restored through dedicated crew group comprising mason, plumber and carpenter/sheet metal fabricator stationed at operational area with all resources at earliest time line but not later than provision made in the grievance redress mechanism (ref Chapter 9 for details).

5.5.4 Cable Pull-out, Lowering and Jointing

Once the trench excavation is completed to required dimensions and checked for grading, cavities and sharp objects/edges, cables (as per required sizes and configuration) are transported and pre-tested at work site specific operational area for IR (insulation resistance) and CT (continuity test) as per BIS 7098 Part I and II, prior to lowering in cable trenches.

The tested cables are mounted on cradles and pulled out from coils over rollers (of required type and size) using manual/mini excavator as a prime mover. Once the cables are pulled out and directly lowered into trenches as per required configuration, cables are tested once again for IR and CT to rule out damages to cable during pull out and lowering operations. During cable pull-out and lowering, the intact and safety of cable end caps are to be ensured. In case of damages, if any, same shall be rectified with insulation tape, to avoid water/moisture getting into the core parts of cables, through damaged cable end caps. Incase of cessation of works (for whatever reason), the cable trenches are to be covered with water proof tarpaulins, to avoid seepage or water getting into cable trenches, in case of rains.Digha-Sankarpur has about 60 rainy days in a normal year and July/August being wettest months has more than 10 rainy days and lowest monthly rainfall for about half a day per month between December and March.

5.5.4.1 Impacts

The impacts of cable pullout and lowering operations are very limited and do not contribute to increase in ambient noise levels as most of the operation is manual to pull out cables from coils and lower them into trenches.

Since the cable lowering operations are limited to barricaded operational areas, disruptions to both pedestrians and vehicular traffic are unlikely. The cable pullout and lowering over 500 metres long segment can be completed in 2-3 days, depending upon trench configuration and therefore any inconveniences are only for a limited period.

5.5.4.2 Mitigation Measures

- All cable laying operations shall be in conformance with safety precautions laid down in Indian Electricity Regulations,1956 (with latest amendments) and BIS1255;1983(with latest amendments);

- Prior to cable pull-out, the excavated cable trenches are to be checked for any cavities on sides and same are to be filled up with rich cement concrete, to avoid entry of any rodents into trench at a later date. Also, cable trenches are to be properly graded to have an even surface all through and devoid of any sharp objects/metal pieces/protruding stores at trench bottom/sides, to rule out damages to cables at a later date;

- During cable pull out and lowering operations, the work site shall have water proof transparent tarpaulins, as a contingency measure to cover cable trenches in case of rains (seasonal or unseasonal). Any slippages on this account may lead to water

logging of cable trenches, which will delay cable laying operations, and as a consequence will further prolong the work completion time, thereby inconvenience to both public and vehicular movement gets extended;

- The transparent tarpaulins can be hung across 1.25-1.50 m wide barricaded operational area (in small lengths), which will facilitate work even during rainy/cloudy days;

- The work sites during cable lowering and backfilling shall be completely access controlled to prevent theft and vandalisation of cables. The barricaded operational areas are to be mandatorily access controlled and barred for entry by un-authorized persons from public safety point of view as well;

- The cable pull out, lowering operations can pose safety concerns and therefore all work force deployed in operations are to be properly trained to keep safe distances and provided with all required PPEs like safety helmets, face masks, ear plugs, protective gear with reflective jackets and safety shoes mandatorily;

- All cables in the lower tier (11 KV and 33KV cables in Trench) shall be drawn through cable conduits (of any suitable type and material); having a minimum of 40% extra space and conduit ends are embedded in the walls of the inspection chambers on either side. This will facilitate attending to cable fault at places other than joints, without resorting to opening up entire cable stretch and gain easy access to cables in lower tier;

- In case of any faults in such lower tier cables, which are in conduits, cables can be pulled out for repairs outside and pushed back into conduits and joints can be redone at both ends, all of which require least effort.

5.5.5 Backfilling of Cable Trenches

Once the cable lowering as per project design is completed and tested for IR and CT, the trenches are to be backfilled with excavated material/debris after fixing/laying of bricks/tiles as per project design (Ref Chapter 2 for details of trench and cable configurations).

A 500 metres length of cable trench will require on an average 155 to 340 cum of excavated debris, depending upon the trench type and cable configuration, and back filling operations can be completed in a maximum of 2 days.

5.5.5.1 Impacts

The trench backfilling operations would not cause any impacts, except for marginal increase in dust levels due to handling of excavated material/debris.

5.5.5.2 Mitigation Measures

- The marginal increase in dust levels due to backfilling operation can be contained through use of pressurized fine spray of water. All work sites will be stationed with one water tanker (6000 litres cap.) fitted with arrangements for pressurized fine spray with 600 metres of hose reel.

5.5.6 Road Restoration Works

After the completion of the trench backfilling with excavated debris, the roads are to be restored to its previous state (after allowing for natural compaction with an anticipated time frame of 3-4 weeks or as per site conditions) and to evenly match newly laid surface with existing old surfaces along the excavated cable trench.

The pavement excavated materials, particularly asphalt contain significant quantities of bitumen (up to 4%) and stone aggregates (up to 96%), which can be re-deployed (recycled asphalt pavement) during the road restoration works under UG cable project.

Although, there are four principal recycling methods, central plant cold recycling (CPCR) is best suited for UG cable project, since this facilitate maximum recycling of excavated asphalt materials.

Deploying CPCR will enable to completely utilize excavated asphalt materials for road restoration, which is nearly equivalent to required quantity of pavement materials. Also, deploying CPCR will not warrant either transportation of excavated materials over long distances or safe disposal of excavated asphalt materials. Therefore, recycling of excavated asphalt materials through CPCR may preferably be considered for road restoration of the UG cable project. The road restoration using the redeploying excavated asphalt materials will involve laying of fine sand, wet mixed macadam, recycled asphalt mix followed by hot recycled bituminous concrete (BC) mix in different layers. However, the decision to use either recycled materials or new materials for road restoration shall rest with WBSEDCL.

Alternatively, if decided not to opt for recycled asphalt pavement and use only newer materials, then the trench will have to be filled with available excavated soil followed by WMM and bituminous concrete mix in different layers.

Based on environmental requirements and the mandatory requirement of the newly notified Construction and Demolition Waste Management Rules, 2016, use of recycled WMM, cold recycled asphalt mix and hot recycled bituminous concrete mix as per option 1 may be adopted for project area. However, the decision to use either recycled materials or new materials for road restoration shall rest with WBSEDCL.

Although, this method is being widely practiced for more than 30 years in developed countries like U.S., it is not yet fully /widely used in India but required technical know how as well as plant and equipment is available in India.

5.5.6.1 Impacts

The impacts of road restoration can be either due to re-deploying excavated bituminous materials as recycled asphalt pavement or use of fresh materials for road restoration and dispose-off the excess excavated debris.

The use of newer materials/resources in terms of bitumen, stone aggregates, and sand for road restoration is likely to cause more impacts as compared to re-deploying excavated bituminous materials.

The other associated common impacts of road restoration will be due to setting up and operation of work camp sites for wet macadam mix plants, bitumen mix plants and/or concrete mix plants and handling of bitumen, cement, sand, stone aggregates along with batch mixing operations for bitumen/concrete production, which will be common to both options of road restoration mentioned above.

5.5.6.2 Mitigation Measures

- Road restoration with Option 1 will involve laying of four layers namely; sand, recycled wet mixed macadam, cold recycled asphalt mix and final layer with hot recycled bituminous concrete. Road restoration with option 2 will involve backfilling of cable trenches with soil/sand followed by laying WMM & bituminous concrete layers.

- The marginal increase in dust levels due to handling of construction material/debris can be contained through use of pressurized fine spray of water. All work sites will be stationed with one water tanker (6000 litres cap.) fitted with arrangements for pressurized fine spray with 600 metres of hose reel;

- The recycled WMM, from the central plant, also is to be transported to operational area in rotating transit mixers fitted with flexible hoses for delivery directly into cable trenches if required. The un-segregated WMM shall be laid in two layers and compacted with suitable vibratory rollers to achieve desired compaction levels under optimum moisture conditions;

- The asphalt pavement and hot recycled bituminous concrete mix shall also be brought to site in tipper trucks in un-segregated form if required and laid in place using customized pavers suitable for cable trench widths;

- The laying of wet mix macadam and asphalt pavement will not cause significant on-site impacts except for increase in dust and noise levels, limited to 2-3 days for all road restoration operations put together. The noise levels can be controlled through deployment of well maintained vehicles and equipment and conducting operations in a regulated and planned manner;

- The traffic is to be regulated during the road restoration operations, in order to ensure smooth traffic movement and avoid congestion as a consequence of road restoration works;

- In case of restoration of concrete roads, ready mix concrete shall be used, brought to the site through transit mixer(s) from a ready mix plant (RMC) located elsewhere. However, concrete will be sourced only from RMC plants having valid consents and permission or authorization of WBPCB;

- Considering the required concrete volume and availability of the ready mix plants in the DSDA area, it will be economical and convenient to use the ready mix concrete in place of batch mixing of concrete on site, which is to be avoided, to possible extent.

5.5.7 Construction of Cable Joint Inspection Chambers

The UG cable project will involve construction of cable joint inspection chambers at every 250 metres along cable route. These inspection chambers are essential for maintenance of underground cable network and house spare cable lengths (in loops) and facilitate cable jointing as well as periodic inspection and trouble shooting of problems after the underground cable network is commissioned. Normally, cable faults do occur at joints due to over loading, poor quality of cable or its insulation and/or bad workmanship of cable jointing itself.

The proposed UG cable project will require 320 inspection chambers, with clear dimensions of 1mx2.5mx1m for HT (33KV & 11KV) cables. The trenches which carry only LT cables would require a relatively smaller size inspection chamber with clear dimension of 1mx2.0mx1m. All inspection chambers will be provided with one manhole cover of 560mm diameter and constructed with M25 grade RCC (reinforced cement concrete).

5.5.7.1 Impacts

The environmental impacts due to construction of RCC inspection chambers are not significant, generally transitory in nature and limited to 21 days. Moreover, these chambers will be constructed within the barricaded operational area, along cable trench and will be completed simultaneously along with cable laying works in a 500 metre long segment.

5.5.7.2 Mitigation Measures

The mitigation measures during construction of inspection chambers shall comprise.

- Location of inspection chambers are to be pre-determined during on-site marking of cable route itself during site preparation activity itself and demarcated on road with yellow paint (7.5 cm wide strips);

- Location of inspection chambers shall not foul with any other underground utilities, sewer manholes and/or chambers of telecom department and shall be at least 3 m away from any other similar appurtenants. Accordingly, location of inspection chambers can be marginally adjusted to avoid fouling with other pre-existing utilities;

- Construction of inspection chambers is to be commenced, concurrently with cable in (500 metres segment) laying operations, so as to complete both inspection chamber and cable laying works in the estimated 21 days. This will avoid lag in cable laying and construction of inspection chambers and cable jointing works as well. Moreover, this will also facilitate complete road restoration in one go and opening up of fully restored road to public in all respects;

- The top level of inspection chamber is to be finished at least 40mm below the existing road level, so that 40mm thick bituminous concrete as part of road restoration can be laid over inspection chamber as well (excluding manhole cover), so that only the manhole cover is visible after road restoration is completed;

- Under no circumstances, top level of inspection chamber shall be finished above the existing road level and thus pose hazard to pedestrian as well as vehicular traffic, after cable laying operations;

- Inspection chambers shall be provided with one 560mm extra duty manhole cover to withstand heavy traffic and shall avoid ingress of water into inspection chamber during rains;

- M25 grade ready mix concrete for inspection chambers shall be sourced from ready mix concrete plants having valid consent and authorization of WBPCB.

5.5.8 Cable Jointing

The underground cables, after laying in trenches are to be jointed in order ensure continuity. Normally, cables are laid in such a way to ensure all cable joints can be essentially housed at inspection chambers spaced at every 250 metres. Normally, straight through heat shrinkable jointing kits of desired voltage grade are used for both HT and LT cable jointing works.

The heat shrinkable joints have good insulating & sealing characteristics, high mechanical strength and excellent resistance to weathering and chemical reaction like ultra violet radiations and alkaline soils. More importantly, the heat shrinkable joints take just about 4 to 5 hours to complete one joint work and work can be completed swiftly unlike resin joints, which takes nearly 24 hours.

5.5.8.1 Impacts

The cable jointing works does not cause any environmental impacts. Depending upon trench and cable configuration, there could be cable joints at every 250 metres or at every 500 metres along cable route. Normally, cable faults do occur only at joints, thus cable joints need access for repair or rejoining with additional spare lengths as a pre-requisite in underground cable network. Thus, cable joints by design, are to be essentially housed only in inspection chambers.

5.5.8.2 Mitigation Measures

- All cable jointing works are to be carried out as per recommended procedures/specifications by the manufacturer with genuine cable jointing materials
- All cable jointing works are to be carried out in dry conditions and during clear days, with no possibility of rains. In case of unseasonal rains, water proof tarpaulins shall be used to cover the work site at inspection chamber;
- No cable jointing work is to be carried out during rains or under wet conditions. The inspection chamber shall be in dry condition, before cable jointing work is resumed;
- The cable joints within the inspection chamber shall be supported on steel portals on either side of the cable trench, so that the no cable or joint within the chamber remain in hanging position for more than 0.45m at a stretch;
- The inspection chamber frame and manhole cover shall fit together well and further joints are sealed with water proof cement mortar (1 cement: 4 cement fine sand) to avoid ingress of water into inspection chambers during rains and/or storm water blockages on the road at a later stage.

5.6 OPENING OF OPERATIONAL AREA/COI FOR PUBLIC USE

The barricaded operational area/COI in 500 metres long segment shall be opened up only after the road restoration works are completed. One of the most important requirements, prior to opening of operational area is installation of cable route markers at every 250 m along the work completed stretch.

5.6.1 Impacts

The impacts from opening of operational area/COI could be in the form of remnants of road restoration works, waste materials/rejects from road restoration works or cable laying operations. Other impacts could be left out unpaved areas or uneven surfaces between old and new surfaces and blockage of drainage outlets along road side of the barricaded operational area.

5.6.2 Mitigation Measures

- Ensure no area is left out unpaved during the road restoration within operational area;
- Ensure levels of newly laid or restored road level match with old and existing pavement levels with no unevenness surfaces;
- Hitherto, barricaded operational area is to be cleared of all remnants of road restoration works, waste materials/rejects from road restoration works or cable laying operations and all such debris are to be disposed off at approved locations;

- In order to limit dust levels during clearing operations, gentle sprinkling of water with fine spray to be carried out;

- Prior to vacating the barricaded area, all road side outlets to storm drains alongside of barricaded area are to be checked;

- All road side drain chutes, both upstream and downstream of operational area shall be checked and blockages, if any are to be cleared, so that road drainage will not be affected aftermath of cable laying operations;

- All work force deployed in clearing operations shall be provided with PPEs like safety helmets, face masks, protective gear with reflective jackets and safety shoes mandatorily.

5.7 ON SITE WORKFORCE

The preparation of site, trench excavation, cable lowering, jointing, back filling of trenches, and road restoration including site cleanup will require both skilled and un-skilled workforce. The estimated work force requirement for completing all operations for laying of 500 m length underground cable will be 25, excluding supervisory/management staff. Considering that only 5 operational area will be opened up in different feeder area at any given point of time, the total workforce requirement for cable laying and construction of inspection chambers will be 125.

5.7.1 Impacts

The most visible impact is safety at work place (operational area) and health issues for the deployed work force for all levels and types (skilled and unskilled). Table 5.5 presents the permissible durations of exposure to specific noise level. The workforce who are likely to be exposed beyond 100 dB(A) shall be given one break every two hours.

TABLE 5.5: PERMISSIBLE DURATION FOR WORKERS EXPOSED TO SPECIFIC NOISE LEVELS

S.No.	Permissible Duration (Hours/Day)	Sound Level (dBA)
1	16	85
2	8	90
3	4	95
4	2	100
5	1.5	102
6	1	105
7	0.5	110
8	0.25	115

Source: OSHA - Technical Manual

5.7.2 Mitigation Measures

- All work force shall be subjected to an orientation program, which familiarize them with work requirements, safety practices at work, safe distances to keep from earth moving equipment, first aid facilities, emergency response, on-site sanitation facilities and practices to be adopted, rights and privileges of workforce among others. Orientation shall also include concern for safety of public around operational areas as well;

- All work force deployed in operational areas shall be provided with PPEs like safety helmets, face masks, gloves, protective gear with reflective jackets and safety shoes. It shall be mandatory to wear them at work site. The PPEs shall be provided at no cost to workforce and shall be replaced once in six months. Any lost PPEs shall be provided at subsidized rates;

- Visitors/officials to worksite are to be provided with PPEs (hard hats and safety shoes) and shall be briefed ongoing operations on that specific time and related safety requirement at work site including safe distances to keep, while at site visit;

- Work force shall be subjected only to standard work shifts/hours. Overtime allowances shall be paid with ceiling limits. Working beyond such ceiling limits shall be discouraged, even if, so desired workforce or contractor;

- All workforce deployed shall be governed by Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, with regards to safety and welfare measures (including equal wages for men and women) for workers employed at building and other construction sites;

- Provision of one mobile toilet of 2 seater capacity (1 men and 1 women with separate entrances) shall be stationed at a suitable place within 100 metres from each operational area of 500 m long segment. The mobile toilet shall have at least 1000 litres overhead water storage, well maintained and in usable condition at all times. Bottom tanks shall be regularly cleaned and over head tank replenished as per requirement. Work force shall be oriented to use mobile toilets and avoid using public toilets and/or nearby open places/parks;

- Every operational area shall be provided with one mobile drinking water kiosk having a storage of 300 litres and placed at a suitable place within 100 metres from work site;

- The operational work site shall have first aid kits and details of major/nearby hospitals displayed prominently in local language, in case of emergency and/fatalities to work force and/or public, as a consequence of operations;

- The supervisory staff shall be provided with wireless communication system (mobile telephones) for better communication at operational area and also with other operational area within project area, in case of emergency or otherwise;

- The work sites being within DSDA area limits, UG cable project will provide skilled and unskilled employment opportunities largely to the local people. All work force is expected to return to their places of residence after work shift hours. For out station workforce if any, contractor shall provide rented residential accommodation with water, sanitation and allied facilities for comfortable stay. Pooled transportation facilities wherever required shall be provided to workforce as a welfare measure;

- No work force camps will be set up under the project and largely local work force shall be employed.

5.8 AMBIENT NOISE LEVELS AT OPERATIONAL AREAS

Various rotating and moving equipment like excavators, vibrator/road drillers, tipper trucks, rollers, pavers and transit mixers will be used during various stages of cable laying operations. The typical time frame to complete laying of a 500 metres underground cable segment is 21 days. Moreover, many of these equipments will be deployed at different stages of work, either on continuous or intermittent basis depending upon work requirements. The activity wise deployment of equipments and respective sound pressure levels are given in Table 5.6.

TABLE 5.6: POTENTIAL NOISE SOURCES & CORRESPONDING SOUND POWER LEVEL (FOR CABLE LAYING OPERATIONS IN A 500 METRE LONG SEGMENT)

S.No.	Activity	Noise Source	Sound Power Level (dB(A))* (at 15 m from source)	Sound Power Level (dB(A))** (at 1.25 m from source)	Combination of Sources	Cumulative Sound Power Level (dB(A)) (at 1.25 m from source)
1	Initial Site Clean up	Nil - Only Manual Operations	-		-	-
2	Trench Excavation	Manual	-	-	-	-
		Mini-Excavator/Road Driller/Vibrator (1 No.)	80	95	Mini Excavator + Compressor	110
		Compressor (1 No.) - not continuous	75	85		
3	Backfilling	Manual	-	-	-	-
4	Road Restoration	Roller	74	95	Roller +Paver + Tipper Truck	112
		Paver	89	110		
		Tipper Truck	88	109		
5	Site Clean up	Nil - Only Manual Operations			-	-
6	Construction of Inspection Chamber	Concrete Mixer	85	106	Concrete Mixer	106

Note: Cumulative Sound Power Levels also include the background ambient noise levels
Cumulative Sound Power Levels are calculated using formula LΣ = 10log10 (10L1/10 + 10L2/10 + ...10Ln/10)
*Source: * http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm*
*** Computed using formula Lpd2 = Lpd1 +20 x log(d1 / d2)*

5.8.1 Impacts

The deployment of excavators/road drillers, other moving/rotating equipment at cable laying operational areas will be for a maximum duration of 21 days and therefore it is unlikely to cause any long term impacts on local people or the work force.

However, in order to assess the likely cumulative noise levels during cable laying operations as a consequence of deploying different combination of equipments, MASdBmap version 0.5 noise modeling tool was used, which is on the same platform of CadnaA and Sound PLAN and suitable for linear sources.

The MASdBmap tool considered three different combinations or scenarios of cable laying activities and associated equipments likely to be deployed. The scenarios considered for noise modeling tool is given in Table 5.7.

The MASdBmap tool predicted cumulative noise levels at different distances from operational area for different cable laying activities as well as combination of sources and is given in Table 5.7. The noise contour maps for different scenarios, considered in the modeling tool are given in Annexure 5.2.

TABLE 5.7: NOISE MODELING SCENARIO

S.No	Scenario	Activity	Noise Source
1	Scenario 1	Excavation/Backfilling	Mini Excavator/Road Driller + Compressor
2	Scenario 2	Road Restoration	Roller + Paver + Tipper Truck
3	Scenario 3	Construction of Inspection Chamber	Concrete Mixer

* As the COI is only 1.25-1.50 m providing noise barrier may not be feasible, therefore noise modelling only without barrier was considered to identify potential noise zones.

The predicted cumulative noise levels due to cable laying operations given in Table 5.8 indicates that the predicted cumulative sound pressure levels likely to exceed 90 dB(A) at 3.75 metres. In such case, workforce is to be provided with one short break in pre-lunch and post lunch sessions or provided with ear muffs;

TABLE 5.8: PREDICTION OF NOISE POLLUTION DUE TO UG CABLE PROJECT ACTIVITIES

S.No.	Activity	Cumulative Sound Power Level (dB(A)) at 1.25 m from source	Cumulative Distance from Source (Trench Centerline)			
			3.75 m	6.75 m	8.75 m	11.25 m
1	Excavation/ Backfilling	110	97	90.1	85.9	83.1
2	Road Restoration	112	99	92.1	87.9	85.1
3	Construction of Inspection Chamber	106	93	86.1	81.9	79.1

5.8.2 Mitigation Measures

- PPEs should be provided to all workers involved in excavation and other noise prone activitties;

- The noise barriers if any shall be checked for its stability and bolted down on to ground, if required as a safety requirement, given the inclement weather conditions coupled with strong winds at Digha-Sankarpur, particularly between September and November as well as heavy traffic on some roads;

- The barricades if any shall be maintained in shape and good condition, and painted at periodic intervals as per approved design.

5.9 ESTABLISHING OF STORE YARDS AND WORK CAMP SITES

The UG cable project will require store yards and work camp sites. WBSEDCL has large open space at their existing sub stations, namely: Digha, Ramnagar, Contai etc, which are intended to be used as store yards for materials, although final decision is yet to be made,

In addition, land will also be required for work camp site to establish wet mix macadam plant, hot mix plants and all other activities like handling and storage of construction materials *viz.* bitumen, stone chips, sand, cement, steel etc., as may be required. At present, land for work camp sites is not yet identified. Most suitable location(s) will be in and around those lands, where routinely DSDA and Public Works Department, Government of West Bengal, establish their camp sites in Digha.

5.9.1 Impacts

The impacts due to establishing store yards and work camp sites are transitory and quickly dissipate, once the operations are over, provided the sites are managed and restored to its previous state, after the project completion.

5.9.2 Mitigation Measures

- Essentially, barren lands or uncultivable lands and those away from human settlements shall be the most preferred choice for establishing work camp sites;

- The selected land shall not warrant significant change in land forms or terrain, to make it suitable for establishing work camp sites;

- In case, land had been earlier used for establishing work camp site and meets the above requirements, same shall be given preference;

- Requisite consent to establish and consent to operate shall be obtained from WBPCB, if required;

- The ambient air and noise levels within the work camp sites shall be monitored, at least once in a month and corrective measures if any required shall be taken in order to be complaint with National Ambient Air Quality and Noise Standards;

- The work camp sites shall be access controlled with fixed entry and exit points;

- The dust levels at the work camps sites is to be controlled through regular sprinkling of water through similar mobile tankers deployed at operational areas for cable laying;

- Bitumen mix plants, deployed for UG cable project shall conform to regulatory norms/requirements;

- The site shall be cleared from all remnants of construction and debris and site restored to its previous state;

- Surplus soil available from excavation of cable trenches (sub-base and base layers) can be used to grade the site, as well as to restore the site after works completion, if required;

- The work camp sites shall mandatorily have designated paved areas for storage of used oils/lubes in plastic/HDPE drums, prior to their final disposal in WBPCB approved disposal locations.

5.10 IMPACTS AND MITIGATION MEASURES DURING OPERATION STAGE

The commissioning and operation of the UG cable project in Digha-Sankarpur area will not involve any activities that will have significant environmental impacts. On the contrary, the network will be resilient and/unaffected due to any natural calamities/cyclones, in line with the project development objective. However, if underground cables are subjected to higher loads than design, or due to poor quality of cables or due to poor workmanship of jointing, faults in cables may occur.

The underground cables are tested at various stages prior to laying and therefore under normal circumstances, the only weak link is poor workmanship of joints, which can cause cable faults. The cable joints normally are housed in cable joint inspection chambers and therefore re-doing of cable joints will not require opening up of cable trench.

In case cable fault occur at places other than joints, either due to over load or poor cable quality, the insulation gets heated up leading to puncture in insulation layer leading to direct earthing, which will cause tripping of circuit breakers. In such an unlikely event, exact location of faults can be identified through cable fault detector. Once, location is identified, cable trench will have to be opened up at fault location for rectification of cable, followed by restoration of all intermediate layers including road restoration as per project design.

The present cable configuration, particularly the cables laid in lower tiers (33KV and 11KV cables in trench), might be difficult to repair or even to gain access, in case of a fault at any

intermediate location, other than the joints. The faults at any intermediate stretch in cables laid in upper tier in these trenches can be repaired through by opening up small length of cable trench.

5.10.1 Impacts

The cable faults occurring at joints will not have any environmental impacts. Rectification of joint can be completed in 3-4 hours and for this period, an area of 1 m x1 m, surrounding he manhole cover needs to be cordoned off with temporary barricades and opened up after work is done and site is restored. As result, there could be minor inconvenience to vehicular and/or pedestrian traffic limited for few hours only, depending upon location of specific inspection chamber.

Most importantly, fault in underground cables, either at joint or at any other location does not cause fire or any other hazard.

The HT and LT cables used under proposed project will have XLPE insulation, which can withstand higher loads as well as higher temperature as compared to cables with PVC insulation. Moreover, HT and LT Cables will have two sheaths of PVC sheets (inner and outer), both of which will be FRLS (fire resistant and low smoke), which prevent fire hazards.

In addition to these factors, even if the cable gets heated up due to over load and/or any other factor, which could lead to damage of the insulation and sparks when conductor comesin touch with armour, it will not erupt into a fire, because of lack of oxygen in the well packed and backfilled trench at 0.9-1.3 m below ground level, which otherwise could be a cause for fire, a common feature in over ground cables.

Thus, underground cables, by its nature do not result in fire hazard, except for developing a fault in terms of puncture in the insulation, leading to direct earthing, which in turn trips the circuit breaker (either earth fault relay/overcurrent relay/short circuit relay) at the concerned substation and therefore disruption in services.

5.10.2 Mitigation Measures

The impacts or inconveniences due to cable faults can be largely controlled and/or mitigated as here under

- Cables shall be subjected to stringent quality checks at various levels *viz* testing at factory prior to dispatch, testing at storage yards, at work site prior to pull out and lowering and finally after lowering and before back filling of trenches;

- Extreme care shall be taken not to over load the cables beyond its design load capacity, even more importantly for prolonged periods;

- Adequate supervisory checks during cable jointing work and adhering to manufacturer's specifications/procedures as per relevant Indian Electricity Regulation, 1956(with latest amendments) and BIS 1255:1983;

- In the event of cable faults at joints, the area around the man hole of inspection chamber (about 1mX1m), shall be barricaded and caution boards shall be put up for the public/vehicular traffic. Work shall be planned and swiftly completed. The work site around chamber shall be restored to its previous state. All waste materials from work site shall be removed with no traces of any debris. The uneven surfaces, if any surrounding inspection chamber due to opening up of chamber cover shall also be rectified with rich cement mortar, as may be required, suitably;

- In case of faults in cables at locations other than joints, which are laid in upper tiers (11 KV and LT cables in trench), the area around cable fault location (about 1mX1m), shall be barricaded and caution boards shall be put up for the public/vehicular traffic. The cable trench shall be opened up at fault location for rectification of cable, followed by restoration of all intermediate layers including road restoration as per project design. Work shall be swiftly completed and work site shall be restored to its previous state. All waste materials from work site shall be removed with no traces of any debris. The uneven surfaces, if any surrounding the opened up area shall also be restored to its previous state, suitably.

5.11 IMPACTS AND MITIGATION MEASURES DURING REMOVAL OF OH INFRASTRUCTURE

5.11.1 General

Once the UG cable project in Digha-Sankarpur area is commissioned, the existing over head power distribution infrastructure, within the same feeder area is to be dismantled. The existing over head infrastructure, which is to be dismantled and transported to WBSEDCL's designated store yards, is given in Chapter 2.

The over head infrastructure comprises all types and sizes of conductors, insulators, straight and V-cross arms, guard wires, cement concrete poles, guy wires, power and distribution transformers and four pole structures for mounting of transformers among others.

At the store yards, all the removed infrastructure brought to store yards will be subjected to technical assessment for its serviceability and balance-shell life. All serviceable materials will be re-deployed elsewhere in non-cyclone affected areas and unserviceable materials will be disposed off as scrap by WBSEDCL. The dismantled OH infrastructure under proposed project is intended to be brought to WBSEDCL's existing store yard at Digha/Ramnagar substations and special maintenance shed for transformers.

5.11.2 Impacts

None of the overhead infrastructure, which is removed and transported to designated store yards, likely to cause significant environmental impacts, except for the insulating oil in the transformers, which needs to be handled with adequate caution.

5.11.3 Mitigation Measures

- During removal of over ground infrastructure like poles, conductors, transformers and other related accessories, adequate safety precautions are to be taken to ensure public safety and the places shall be cordoned off with hazard tapes and caution boards;

- Workforce, guy ropes and other appropriate tools required for safely bringing down the poles on to ground shall be deployed and ensure no damage to public property and/life shall occur during these operations;

- All such removed infrastructure shall be transferred to designated store yards in appropriate transport vehicles, without endangering the public life and property during transit;

- After removal of overhead infrastructure, the places shall be restored to match with surrounding places *viz,* when a pole has been dismantled, the pole location shall be restored to match with surrounding place, including filling up the foundation pit of the pole with sand/cement concrete and finishing to match with surrounding surfaces as may be required;

- All transformers brought to store yards are to be technically tested for its usability and balance shell life at designated store yard at Digha/Ramnagar substation. All serviceable transformers will be redeployed elsewhere and unserviceable transformers will be disposed off through WBPCB approved scrap dealers;

- All other disposables and/or debris (after scavenging for scarp valuables) shall be disposed off at approved waste disposal sites at Ratanpur/Duttapur.

5.12 WORKS SITE SAFETY DURING LAYING OF UNDERGROUND CABLES

5.12.1 Safety in Pits and Trenches

All pits and trenches works shall comply with works safety requirements but limited to:

- When a pit is to be left open overnight, proper barrier mesh and flashing lights, etc as required must be attached to pickets at least 300mm from the edge of the excavation or the pit must be covered;

- Soil must be piled back from the edge of the pit at least 600 mm;

- Undermining walls, foundations, streets or pavements are to be avoided otherwise proper shoring is required;
- Barriers shall be erected to prevent vehicles inadvertently falling into the excavation.

5.12.2 Occupational Health and Safety During Laying of Underground Cables

- All trenches to have safety barricades when left open for an extended period of time;
- Necessary Personnel Protective Equipment (PPE) to be provided to all work force engaged in laying of underground cables;
- No materials/cables to be placed or stacked near the edge of any excavation;
- No load to be placed or moved near the edge of excavation, where it is likely to collapse on the work side;
- Safe distance shall be maintained from edge of trench;
- Materials will not to be placed or stacked near the edge of trench;
- No load to be placed or moved near the edge of trench, where it is likely to cause collapse of the trench;
- No load/personnel movement across trench;
- Manual handling awareness will be spread for load and electrical cables;
- Adequate rest periods shall be allowed, job rotation, minimize repetitious twisting and shoveling.

5.12.3 Safety Working in the Vicinity of Traffic

- When working on road or in the vicinity of traffic, traffic management must be carried;
- Prior to commencing underground cable laying works, approval shall be obtained from the agency responsible for the care, control and management of the roads;
- Care should also be taken to ensure that all other required authorizations are obtained prior to the commencement of works;
- Lengthy delays may be experienced, if all necessary approvals are not obtained, increasing the risk of undesired traffic incidents;
- In addition, other agencies such as emergency services, police, public transport etc. in the area may need to be informed in advance of the underground cable laying works;

- Where the proposed traffic management involves modification to existing signal phasing, number of traffic lanes and / or timing on roads; are to be approved through traffic police;
- Work zone Road Safety Barrier shall also be provided.

5.12.4 Public Safety

- Cable markers shall be installed to indicate the location of all underground power cables;
- Compaction to specified standard;
- Site cleared of debris and refuse;
- Restoration of site after laying underground cables;
- Proper marking with danger sign over electrical cable route and emergency numbers.

5.13 OCCUPATIONAL HEALTH & SAFETY DURING MAINTENANCE

- A hazard assessment must be carried out by the work crew prior to commencement of maintenance work to ensure that:

  All hazards have been identified and assessed;

  The appropriate controls have been put in place to mitigate the hazards; All

  members of the work crew are aware of the hazards;

  The safety of the public and other workers has been ensured;

  WBSEDCL has been notified of any proposed work in the vicinity of underground Cables;

  Necessary personnel protective equipment (PPE) shall be provided to workers;

  No workers shall physically handle a distribution cable of any type, if its condition is doubtful unless the cable is proved to be de-energized;

  No personnel shall physically handle a high-voltage cable, while it is live unless it is completely surrounded by an earthed sheath or screen, or both, and precautions are taken, where necessary, to avoid danger from induced voltages and transferred earth potentials. A high-voltage cable shall be isolated, earthed and proved to be deenergised on site prior to commencing maintenance work on the cable;

Placing any pressure or load on exposed cables and or cable joints is not permitted;

This is inclusive of stepping on to or using the cable or cable joint for support whilst working on or near the asset. If this is physically impractical, WBSEDCL must be consulted on an alternate work method.

CHAPTER 6
ANALYSIS OF ALTERNATIVES

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ANALYSIS OF ALTERNATIVES

This chapter presents an analysis of alternatives considered in the project preparation to avoid or minimize both environmental and social impacts that would be inevitable, if technically optimal cable route alignment is followed. An analysis of various alternatives has been carried out prior to arriving at the technically best fit option with minimal environmental and social impacts.

The main issues along the operational area/COI along underground cable routes are the physical obstacles like unauthorized ramps/steps of private and/or government buildings, which have been extended on to roads for ease of access, existing over ground poles (telecom/ electricity/street light) and road side trees among others. The other issues are disruptions to underground public utilities like water supply, sanitary and drainage connections across cable route corridor, safety to pedestrians as well as road users apart from work force, who are directly involved for cable laying operations.

The social issues due to the UG cabling project are;

- Temporary loss of access to residential and commercial buildings
- Temporary impact on livelihood of squatters/street hawkers/vendors.

The route alignments considered in the UG cabling project (as indicated in Chapter 2) is flexible and therefore this factor has been used to avoid most of the above mentioned obstacles within the operational area/corridor of impact (COI), while finalizing the cable route corridor.

6.1 ANALYSIS OF WITH OR WITHOUT PROJECT SCENARIO

The ‘with’ and ‘without’ project scenarios are analyzed with respect to the development of the state by the backdrop of requirement of resilient electrical distribution infrastructure for sustained growth economy and consequent well-being of its citizens in the aftermath of cyclones/natural disasters.

The ‘with’ scenario of the UG cabling project is expected to provide a resilient electrical network even if the coast of Digha-Shankarpur is struck with another cyclone/natural disaster, like Aila, Hudhud, etc. The UG cabling project is expected to minimize the miseries of people at large, minimize the damages to public and private property, help the state to handle the after effects of natural disaster(s), which the coastline of West Bengal, including Digha-Shankarpur stands exposed and most importantly help the state economy recover faster in the aftermath of natural disasters. The project also helps to upgrade the existing over head network to construct an upgraded underground electrical network, which can cater to the projected power demand as of year 2025.

The main objective of this component under NCRMP-II is the conversion/replacement of all existing over head electrical network into underground cabling network so as to have a resilient electrical network, which can stand the vagaries of cyclones and reduce/prevent the miseries of people and resources for reconstruction including helping the state economy to recover faster in the aftermath of natural disasters.

If the UG cabling project is not implemented, there is every likelihood that the existing over head electrical network within Digha-Shankarpur will stand exposed to damages and destruction that comes along with the cyclones, the recent one being Aila, Hudhud, etc.. Moreover, existing OH electrical network would need investments for up-gradation to meet increasing power demand of Digha-Shankarpur in the coming years. Any further investments on the existing OH electrical infrastructure can't be justified, given the looming threat of cyclone disasters and the damages that comes along with that.

Therefore, the "with" project scenario, with its minor adverse impacts is more acceptable than the "without" project scenario which would mean an aggravation of the existing problems. Potential benefits of the proposed UG cabling project are substantial and farreaching in order to achieve all-round development of the State economy and progress for its people.

6.2 CABLE ROUTE ALTERNATIVES

The project preparation has considered several options/alternatives, during finalization of route alignment of the UG cable project. The factors, which were considered included most optimal cable length, avoid or minimize relocation/shifting requirements of existing utilities along route alignment, avoidance of trees, which otherwise need felling, avoid or minimize road crossing points, minimum diversions to traffic as well as pedestrian traffic among others.

Any route alternatives, without considering optimal cable length, relocation/shifting requirements of utilities, avoidance of trees, minimum diversions of pedestrian and vehicular traffic will cause severe disruptions not only for project implementation but also for vehicular and pedestrians traffic, since cable routes are all spread across Digha-Shankarpur's busy main roads to lanes and by-lanes.

6.3 OPERATIONS AREA ALTERNATIVES

The project preparation has proposed four configurations of cable laying, but with a trench width of 0.5-0.75 m and varying depth i.e. 0.9-1.30 m in all cases under the project. In order to minimize disruptions to both pedestrian as well as to vehicular traffic, it is utmost necessary to limit the area of operation required for trenching, cable pullout, lowering, jointing, prior to refilling and restoring trench to its previous state and at the same time ensure minimum working space is available for completing work in a timely manner.

In order to limit the area of operations, several cable trench excavation methods were assessed for minimal operations area requirement and a 1.25-1.50 m wide corridor as 'operational area or corridor of Impact' along the footpath, has been considered, which are to

be opened up for cable laying operations in 500 m long segments. The 1.25-1.50 m wide corridor in 500 m long segments is to be barricaded on road sides considering the following;

- The corridor of impact/operational area will be along footpath, with footpath/kerb being one edge, and other edge of corridor extending on to road up to a maximum of 1.25-1.50 m.
- In case of roads which do not have foot paths, the line of sight with trees/poles shall be considered as one edge of the 1.25-1.50 m wide corridor and other edge of corridor extending on to road up to a maximum of 1.25-1.50 m.
- The 1.25-1.50 meter wide corridor of impact/operational area is to be barricaded on road sides in 500 m long segments along cable alignment with provision for temporary access at regular intervals to cross over across barricaded area for pedestrians.
- Within the barricaded operational area, 0.5-0.75 m wide cable trenches are to be excavated primarly manually in order to maneuver minor obstacles within the barricaded operational area like kerb/road side small trees/saplings, telephone/electric poles, which will otherwise require shifting or removal for movement of mechanical excavators.
- Other operations like cable pull out, lowering, refilling of trenches, removal of excess earth, compacting of backfilled earth etc can be done by using the mini excavators, with additional accessory attachments. Thus, no operations related to cable laying work is ordinarily expected to spill out on to either footpath or the road, outside the barricaded area.
- The operational areas can be moved ahead in 500 m long segments, once all required cable laying operations are completed including restoration of trenched area to its previous state as required/specified.
- The contractors shall be provided with adequate open areas to store inventories like cable rolls, cement concrete slabs, earth/sand for refilling, cement concrete batch mixers for restoration of trench area among others. The provision of open areas for inventories will minimize disruptions to vehicular/pedestrian movement near barricaded operational areas and avoid unwarranted storage of construction materials on roads.
- The barricaded areas in each segment shall be provided with fixed exit and entry points for bringing in required inventories and taking out debris or disposables out of the operations area.
- The operational areas can be either on left or right side of the road depending upon of the cable route alignment considered in the project preparation.

6.4 ECONOMIC IMPACTS & BENEFITS OF UG CABLE PROJECT

The economic impacts of recurring natural calamities along coast line of Digha-Shankarpur and the benefits of UG cable projects are already discussed briefly in earlier chapter.

CHAPTER 7
PUBLIC CONSULTATION & INFORMATION DISCLOSURE

CHAPTER 7
PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Public participation is an essential and legislative requirement for environmental and social impact assessment. The ESIA team undertook the public stakeholder consultation (PSC) for the proposed project in accordance with the requirements for an ESIA Study.

The purpose of public participation is to identify affected people and to allow such parties the opportunity to provide input and comment on the ESIA process, including issues and alternatives that are to be investigated, thereby facilitating informed decision-making. In complying with the public participation process (PPP) for the ESIA, consultations were carried out to ensure that issues, concerns and potential impacts identified by affected people, including the authorities, proponents, technical specialists and the public are addressed fully.

The public consultation process for the proposed underground cabling network (HT/LT) in Digha Shankarpur area was conducted during the early stage of ESIA preparation for the proposed project. In compliance with this requirement, public consultation was carried out covering entire cross section of project area. All the issues discussed in meeting were validated and information was provided to the groups about the details of the project. The public participation is an important issue for the proposed projects. The purpose of the Public Consultation is (i) to disclose information about Project (ii) discuss with the stakeholders on potential environmental issues that may arise from construction and operation of the project (iii) to take note of any objection or any comments or suggestions of the people on route/site selection (iv) to ascertain that the people's reaction and the related issues are covered and addressed in the social assessment report.

To ensure community participation in the planning phase and aiming at promotion of public understanding of project scope, activities and impacts, various sections of project affected persons and other stakeholders were engaged in various consultations throughout the project planning and implementation.

7.1 OBJECTIVES OF PUBLIC CONSULTATION

During the field survey, public consultation has been undertaken to know people's perception about the project, social as well as environmental issues. The purpose of public consultation includes the following:

- To disseminate information regarding proposed project to various stakeholders including advantages and disadvantages of project.
- To ascertain the public views on various social and environmental issues related to conversion of existing overhead HT (33/11 kV) and LT power lines into underground cabling in Digha Shankarpur area;
- To encourage and provide for people's participation in project implementation;

- To obtain new insight and site specific information, and to appropriating possible mitigation measures based on local knowledge of the communities.

7.2 LEGAL REQUIREMENTS

Whenever a power transmission and distribution system is planned and put up for the Government's approval, a Gazette notification of the transmission scheme is made in the State Gazette under section 29(II) of the Electricity (Supply) Act of 1948. The details of the schemes including the locations (villages/towns) through which it will pass should be published in daily news papers of the area for information and to solicit comments, from the public within stipulated period. This is to allay fears and apprehensions of people and the objections or suggestions received, are considered in the location of the project. The public consultation is also undertaken as a part of environmental & social assessment to ascertain people's reaction about the proposed project and prime environmental, social and health issues along with their suggestions to tackle the same.

The requirement for the Public consultation for any infrastructure developmental project is guided by the environmental clearance Notification published in Gazette of India, Ext., Pt. II, S. 3(ii) dated 14th September, 2006 under sub-rule (3) of rule 5 of the Environment (Protection) Rules, 1986. Environmental Clearance Notification stipulates that the EIA process has to have adequate and appropriate opportunity for public participation in decisions that may affect the environmental and social setting. They spell out the following:

- A notice to publicize the proposed project should be carried out.
- A register of identified and consulted I & APs (Interested and Affected Parties) is to be established.
- The project proponent is to submit the project reports for a mandated period for public review prior to finalization and submission of the reports to the authority.
- The I & APs to have an opportunity to provide comments directly to the competent authority on the reports submitted to the authority.
- The issues raised and discussed during the consultation process to be documented.

However, as per above mentioned notification of the Ministry of Environment, Forests and Climate Change, Government of India, Environmental clearance is not required for high voltage transmission and distribution line, accordingly, Public Consultation was not required to be undertaken for proposed underground cabling network (HT/LT). However as per World Bank OP for public disclosure public consultation was conducted during December, 2015 and June 2016 at project area.

7.3 APPROACH TO PUBLIC CONSULTATION

The roadmap of public consultation strategy is presented in Table 7.1.

TABLE 7.1: PUBLIC CONSULTATION STRATEGY

Project Stage	Consultation Activities
Project Preparation	**Information dissemination and consultation with PAPs during field surveys:** • Project description and its likely impacts • Objective and contents of the surveys • General provisions of compensation policy • Mechanism and procedures for public participation and consultation • Resettlement options (reorganization on remaining land, relocation to a fully developed resettlement site, or cash compensation) • Grievance redressal procedures • Feedback on the availability of PAPs to participate in income generation activities in the sub-project, where relevant It is a good practice to prepare a brief Public Information Booklet (PIB) for distribution to all the PAPs. The PIB will very briefly explain the sub-project objectives, likely benefits and adverse impacts, general provisions of the compensation policy, and grievance redress mechanisms.
	Information dissemination to local authorities after completion of census & inventory and during the EIA/EMP & SIA/RAP preparation: • Sub-project components • Proposed policies and procedures including proposed resettlement strategies • A summary of impacts • Request for identification of resettlement sites, if necessary • Tentative implementation schedule • Roles and responsibilities of the sub-project proponents and local authorities
	Consultation with community and other key stakeholders: • Feedback regarding relocation site(s) • Preferences for the mode of compensation for affected fixed assets (i.e., cash or land-for-land) • When the draft EMP & RAP are available they should be provided to key stakeholders and local NGOs in their native language and put in a public place. Feedback should be requested and incorporated into the final documents. The feedback could be received through email, phone, face-to-face interaction, meetings etc. Details of all the public meetings held with people and local government officials with dates, location, the information provided and the major emerging issues should be documented. It is recommended that EMP & RAP and other documents include this list, as an attachment. Where public announcements are made, the details, together with a copy of the text of the announcements should be provided in the documents.

	The draft EIA/EMP & SIA/RAP should be discussed with local authorities and a copy of the document should be kept with state and district level authorities. PAPs should be informed through public announcements on the availability of the draft documents at the district and local government level.
Project Implementation	Information dissemination and consultation with PAPs during EMP & RAP implementation: • Sharing EMP & RAP document with local authorities • Major policy resettlement policy provisions and grievance redress mechanism should be informed to the PAPs and beneficiary households in the project area through village level public meetings. • One to one meeting with the PAPs to explain their eligibility • Placing of micro plan for compensation and resettlement in affected villages for review and to minimize grievances • Payment of compensation to PAPs in public meeting to maintain transparency • Household consultation for skill improvement training, use of compensation amount and livelihood restoration
Public Participation in Project Monitoring and Ex-Post Evaluation	• Establish Stakeholder Monitoring Group (SMG), consisting with affected people and civil society members. The group will be responsible for monitoring of all aspects of resettlement implementation and provide feedback to the PIU • Participation of PAPs in monitoring will provide project management with a more accurate reflection of PAPs reactions and perceptions.

Initial Meeting with the Leaders/Government Officials

In order to operate the consultation programme in different villages at the initial stage, initiatives were taken to meet the Pradhan of each village. During the initial meeting the purpose of visit to the village was informed and processes to start and carry on with the consultation work was discussed. In this kind of interaction the basic general information of the villages were also gathered and opinions of the Pradhan regarding the project design, was earmarked.

Organizing Public Consultation

It was necessary to gather information of people's views and expressions, their problems and to bring maximum people under the process which is the basic objective of Public Consultation. Thus in order to organize the Public Consultation systematically, stepwise activities were performed which are as follows:

- The dates and time of survey and public consultation was necessary to be fixed with consent of the villagers so as to get maximum involvement of villagers. The dates, time and the venue of the meetings were discussed with the Pradhan. The venue for meeting for the consultation was fixed at a particular place in each village.

- A notice was framed in Englih/Bengali language and pasted in the Panchayat Office and other strategic locations in the villages at least 1 or 2 days before the scheduled date of Consultation. This was done with the help of Pradhan and the local people, to let the people know about the Consultation date and the place or venue of gathering.

- This arrangement was done to confirm that every person in all the 3 GPs of project area was being approached for Public Consultation.

- The issues discussed in the meeting highlighted important aspects of social and economic conditions, which might get affected due to the proposed project. The issues were related to the basic problems of the stakeholders and any opinion or suggestions regarding the proposed project were discussed in detail.

- The people were allowed to discuss in their own manner and one person was present to translate for proper understanding of the situation to eliminate any communication gap. All the sections of the society were approached which included village elders, Pradhan, business man, residents, government officials, teachers, women and vulnerable population etc.

7.4 COMMUNITY PARTICIPATION AND CONSULTATION

Public participation, consultation and information dissemination in a project begins with initial Social Impact Assessment activities during the initial phases of project preparation. Public consultation activities and information dissemination to PAPs and local authorities continues as the project preparation activities proceed in a project. Through respective departments and civil society, PAPs are regularly provided with information on the project and the resettlement process prior to and during the project preparation and implementation stage.

Consultation with Project Affected Persons (PAPs) is the starting point to address involuntary resettlement issues. People likely to be affected directly by the project activities may be apprehensive that they will lose their livelihoods during the time of construction. Community participation in planning and implementation of resettlement action plan helps to reduce their fears and gives PAPs an opportunity to participate in key decisions that affect their lives. The first step in developing plans for consultation and participation is to identify the primary and secondary stakeholders. Information sharing is the first principle of participation. This chapter provides details on the initial consultations carried out with the affected households that lay en-route the UG Cabling Project.

The information dissemination and consultation with PAPs during EIA&EMP and SIA&RAP preparation included the following:

- Project description and its likely impacts
- Objective and contents of the surveys
- General provisions of compensation policy
- Mechanisms and procedures for public participation and consultation ○

Grievance redressal procedures and its effectiveness

- Tentative implementation schedule

- Roles and responsibilities of sub-project proponents and local authorities
- Perceived loss of livelihood
- Preferences for the mode of compensation for affected structures and livelihood

Consultations were held with the PAPs and other local people to hear about their perceptions and apprehensions of the project and to elicit suggestions from them, if any, on improvement to project design.

The project affected households were consulted individually to understand their perception about the project. Out of total project affected households were consulted around 86% were male and remaining were female. They were asked to give their perception on the anticipated positive and negative impacts of the project. All of them perceived reduction in sufferings during natural disasters after underground cabling. Majority of people opined an improvement in quality of life due to the project. However, some apprehensions were also raised by the respondents in the form of loss of livelihood, access and disruption of services during the period of construction. The details are presented in Table 7.2.

TABLE 7.2: PROJECT IMPACTS PERCEIVED BY THE COMMUNITY

S.No.	Positive Impacts Perceived			Negative Impacts Perceived		
	Type of Impact	Response -Yes (Nos.)	%	Type of Impact	Response -Yes (Nos.)	%
1	Reduced sufferings during cyclones and adverse climatic conditions	430	100	Temporary loss of livelihood	40	9.30
2	Improved access to services	360	83.72	Temporary loss of access to houses/ businesses/hotel, etc	355	82.56
3	Productive use of time	380	88.37	Loss of structures/ assets	165	38.37
4	Increase in business opportunity	255	59.30	Increase in accidents during and after construction	35	8.14
5	Improvements in quality of life	425	98.84	Disruption of utilities such as water, electricity, telephone, cable, etc	110	25.58
6	Others (specify)	-	-	Others (specify)	-	-

Further, consultation meetings were held with the community along the project corridor at New Digha Market, Nehru Market old Digha, Kali Temple old Digha, Baristar Colony, Mohana Fish market, Shankar Pur Market, etc. Information was disseminated about the project, its benefits and possible impacts. The apprehensions and suggestions given by community are presented below in Table 7.3.

TABLE 7.3: KEY ISSUES RAISED IN COMMUNITY CONSULTATIONS

Place of Meetings	Apprehensions Raised by the Community	Suggestions from Community
1.Kali Temple, Old Digha 2.Nehru Market/ND Market 3.Barristor Colony 4.New Digha Economy/Budget Hotel Zone, New Digha 5.Mohana Fish Market	• The steps and surrounding platform will be damaged during construction resulting in loss of access. • The trench and barricades will prohibit us to make a livelihood over project corridor i.e reduction in number of customer due to change of selling point. • Loss in daily earnings of Rs. 300 per day for most Van/ Push Cart sellers; if business is closed during construction. • In narrow streets the house doors open directly on to the road. This may lead to accidents. • The important services like telephone, sewer, and water supply may get disrupted during construction period. • Whether the street light will be removed after underground cabling. • Whether the cost of electricity will increase.	• The steps and surrounding platform if damaged needs to be restored by the authorities under the project. • Advance notice should be given to gumti/van owners. • As compensation, Rs. 300 per day should be given to all bandy people if business is impacted during construction period. • Proper barricading should be done to avoid any mishap. • Utilities if damaged during construction should be restored on urgent basis. • The street lights should not be removed. • The project is good for the city and city people • People keeping their belongings on the project corridor will be informed to remove them. • Manual digging should be done in narrow streets to minimize the impact.

The public consultation was also undertaken in all the three GPs namely, Padima I, Padima II and Talgachari II with people representatives (GP Pradhan/Up-Pradhan/Members, etc.) as well as affected people (commercial/ residential structures) attending the consultaion meeting.

Most of the people seems to be unaware of the social and environmental problems but after awareness and consultation program, people felt necessary to have the proposed underground cabling network (HT/LT) in the interest of inclusive development of project area besides

regional and national development. After the discussion, the response of the people was obtained on the response sheet. Gram Panchyat (GP) wise social and environmental issues raised as well as suggestions made by the local people (Pradhan, Up-Pradhan, gram panchayet members and other villagers) during the public consultation are presented in subsequent section. During the discussion, following issues were raised and suggestions were made to resolve the same:

- **Job Opportunity:** Stakeholders were keen in ascertaining the types of jobs that the proposed project may generate for them, however it was indicated that projects of this nature require specialised labour and as a result the opportunity of employment likely to result in few positions for unskilled labour. They advised that the project proponent should consider sourcing this labour force from the local communities and where possible should outsource and purchase of some building material locally.

- **Compensation:** As no private land is likely to be acquired for proposed project, WBSEDCL will not be required to pay out compensation for land. However, some private residential/commercial structure, viz boundary wall, rain/sun shed, court yard, etc may partially get affected, all such aafected structures should be restored after completion of underground cabling work.

- **Minimization of Fire Risks:** Due to faulty power distribution lines, fire risk was raised as a concern. WBSEDCL does have standard practices aimed at minimising this risk, which include but not limited to the management of the vegetation within and close proximity of the distribution infrastructure and periodic maintenance of the actual power lines.

- **Minimization of Land Use Conflicts:** Local people are concerned about the visual impact of the existing overhead power lines and large number of small capacity DTR installed, as they believe that this is counter active to their efforts for developing and enhancing tourism in their areas. Accordingly they ensured their full cooperation and support for immediate implementation of proposed project of underground cabling network in Digha-Shankarpur area

It was observed from the discussions that people in general have many diverse issues that need to be given attention. These issues are related to the livelihood, economic conditions, social identity and health problems of stakeholders. These can be summarized under the comments.

People of the area are supportive in most of the villages. The survey was conducted mainly in other villages and the people's reaction has been very positive in most of the places and in some places the reaction has been neutral.

The several environmental, social, health and safety issues related to proposed under ground cabling network raised and suggestions made by the villagers as well as people representative at concerned 3 GPs of project area. GP wise detail of public consultation undertaken along with outcomes is presented in Annexure 7.1. A summary of concerns and possible mitigation measures discussed in the various public consultative meetings in project area is presented in Table 7.4.

TABLE 7.4: SUMMARY OF COMMENTS, ISSUES AND CONCERNS RAISED DURING ESIA CONSULTATION PROCESS

Concerns	Responses & Mitigation Measures
Impact on trees, crops and temporary commercial/residential structures	It was agreed that the residents would grow more trees especially at the periphery of their plots and in tandem to meeting the Ministry of Environment & Forest and Climate Change policy of ensuring 33% tree cover for each given parcel of land. Compensatory afforestation for affected trees @ 1:5 ratios. As no agricultural land is likely to be affected due to proposed project therefore the crop damage is not envisaged. However few temporary commercial structures are likely to get affected temporarily during construction period and it was agreed by affected people that they will relocate themselves under the guidance of DSDA for construction of underground cabling network.
Electrocution and vandalism	The proponent would ensure the Underground Distribution Cable lines were maintained in a good state of repair, with frequent monitoring and necessary corrective measures. The transformers/RMUs would be fenced and beatified. Access to the cable joint inspection pits, transformer, feeder pillar box etc will be by authorized personnel and with necessary work permits when required. It was agreed that no settlement, or growing of trees within the Right of Way. Vandals were warned and the public encouraged in ensuring community policing. It was also agreed that anybody who would engage in any activity on a mounted transformer would require proper identification and information given to ward off vandalism.
Noise and dust	It was agreed that the Proponent would sprinkle water where and when necessary to minimize dust pollution, and construction to be done during the day time only and to observe Noise regulations of CPCB.
Soil Erosion	It was agreed that soil erosion that may arise during cable trenches excavation and access roads would need to be controlled. Gabions and necessary diversions would be created to prevent continuous rills and unnecessary excavations and vegetation disturbance will be avoided as much as possible. Sprinkling water will be done as necessary and any compacted earth surfaces will be restored to enhance percolation. Retainer walls will be constructed in sloppy areas.
Consultation and informing the affected	A house to house visit and meeting with each of the Project affected persons will be carried out, briefed about adoption of mitigative measures with the help of DSDA will be done.
Valuation of houses, trees and property	Valuers from the WBSEDCL, with the help of the DSDA for all private property affected, if any will be done and compensation would be done at market rates in harmony with the Company's compensation policy. Trees will be valued using ministry of environment rates based on species and size. In case of disagreements and the grievance committee unable to get a

	solution, the aggrieved will be free to seek court redress at his/her own expenses.
Loss of Livelihoods	It was agreed compensation to destroyed property would be done at the market rates and the affected people given logistic support where possible.
Employment	The contractor will be expected to engage the locals for unskilled and semiskilled jobs during the project. This forms part of the contractual agreement with the proponent. The locals should be able and willing to accept the wages offered. Further recruitments can also be carried out during the operation phase and during maintenance of the ROW. The informal sector with self-employment opportunities are expected to blossom once power supply is boosted and stabilized.

As depicted in Table 7.4 above the stakeholders raised several pertinent issues regarding the project. The consultations were undertaken as part of the ESIA in order to obtain the views of stakeholders, their concerns and suggestions towards sustainable implementation of the project. The summary of the various stakeholders concerns and suggestions are summarized below.

The following were the major concerns that were raised up by various stakeholders in regard to the proposed project:

- The project will improve businesses in the area and will create job opportunities to the local Youth during construction phase.
- There would be interaction with other cultures especially during construction phase.
- The project may lead to temporary displacement of some commercial structure.
- There would be increased pollution from transport vehicles during construction.
- There would be electromagnetic radiations and risk of electrocution that may affect those residing near the way.
- There would be possibility of insecurity in the areas due to the influx of other people during construction phase.
- The project will lead to cutting down/felling of few trees.
- There would be impact on some common property resources which should be restored immediately after construction work is over for selected stretch of particular feeder route.
- Electrocution and vandalism
- Loss of livelihood

The following suggestions were raised during the various stakeholders' consultation meetings:

- In areas where the proposed route passes through congested street, the proponent should consider relocating it to ensure that not many people are to be displaced.
- Compensation of loss of private property/assets should be done with consideration of the current economic situation where applicable.
- The proponent should ensure that trees are not cut down unnecessarily and those that will be felled should be replaced elsewhere in 1:5 ratio.
- The proponent should assist the local communities in other projects since they will not directly benefit from the project e.g. construction of classrooms for schools, assist students from the villages to attend secondary schools, drill borehole for villages, assist in control of HIV/AIDS, etc.
- The Proponent should ensure that proper environmental management practices are put in place.
- The proponent should consider employing casual workers from the local areas during construction phase of the project.
- Noise pollution should be controlled.
- The affected residents should be given ample notice to move and be compensated before relocating businesses, if required.
- The proponent should put up security lights as well as maintain tight security for materials during construction.

Generally the stakeholders consulted were in support of the proposed project.

One separate multi-stakeholder consultation was conducted to disclose the draft ESMF and to get views and suggestions from public on the "Possible Environmental and Social Impacts of the proposed Underground Cable Project. Total 60 participants attended (37 as per attendance list rest have not signed) the workshop which includes local residents including women, Hotel Association Representatives, Fisheries Association, stakeholders from Cable TV Association, Social Activists, Public Representatives, BSNL, Traffic Police etc. besides Government officials from DSDA and Disaster Management Department, Government of West Bengal.

The following apprehensions and suggestions have been expressed by the participants during the meeting:

- What are the additional advantages of UG Cabling over existing system?
- Up to which level the underground cables are laid i.e. main roads, main streets or sub-lanes?

- Whether ESIA is completed or will be taken up now?
- What about the cables belonging to DSDA which were recently laid on existing electrical supports for developing street lighting system?
- What is the time limit for restoration of roads after completion of UG cable works?
- The UG Cable project is to be completed in shortest possible time without any delays.
- Works are to be taken up in night time so that disturbance to public and traffic will be less.
- What are the financial impacts of the Project? Is it a grant or loan?
- Whether there will be impact of the UG Cable Project on consumers by increasing electricity tariff?
- Whether any expenditure will be recovered from local residents due to UG Cable project?
- Whether consumers have to modify their internal house wiring due to UG Cable Project?
- The UG Cable Project works shall be carried out with qualitative workmanship so that excavations do not recur in future.
- The existing Cable TV network should also be made underground since the poles will be removed after proposed UG Cabling network.
- What are the precautions being considered for UG Cable network in case of earth quakes?
- Whether consumers have to change their supply from single phase to three phase due to UG Cable Project?
- A Liaison Officer to be appointed to each area during execution of the Project to attend the grievances of the public.
- Better planning is to be done in consultation with stakeholders and traffic police to minimize the problems encountered during execution.

The proceedings of the meeting, brochures circulated, list of persons attended and issues raised and suggestions made for mnimising the environmental and social impact of UG cabling project during the consultation meeting are given in Annexure 7.2. The various issues, apart from the aboveraised were also responded, which were largely related to timely implementation of the works, restoration of roads and public safety issues. One of the other main issues, raised was tariff implication for the users as a result of this project. The audience

was given satisfactory replies to all issues and WBSEDCL has assured that there will not be any increase in the tariff as a result of this project.

The effectiveness of the R&R program is directly related to the degree of continuing involvementof those affected by the project. Participation of PAPs has been emphasized in the developmentof EMP & RAP to assure that its components are suited to the needs of the impacted and resettled population. Their continued involvement and participation during EMP & RAP implementation will both increase the probability of their successful resettlement and rehabilitation and contribute to the overall project success.

7.5 INFORMATION DISCLOSURE

The draft EMP & RAP shall be provided to key stakeholders and local NGOs and put in a public place. Feedback received from stakeholders shall be incorporated into the final documents. The executive summary of final set of EMP & RAP shall be translated in local language and made available at Project Authority's state and project offices. The final documents in full will replace the draft documents in Project Authority's websites. The list of eligible persons (PAPs) for disbursement of benefits shall be separately disclosed at concerned Panchayat Offices/ Urban Local Bodies to ensure transparency. A copy of the list of eligible PAPs shall be put up at notice boards of the District Collector Offices, Block Development Offices, project offices, and any other relevant offices, etc. The Resettlement Policy Framework, executive summary of the Social Assessment and Resettlement Action Plan of the project shall also be placed in the WBSEDCL site office as well as District Collector's Office.

The following project specific information related to social safeguards will be disclosed on the website.

- Approved RP&F including entitlement matrix;
- Approved Resettlement Action Plan;
- Disbursement status of compensation and assistance given to the PAPs;
- Details of Grievance Redress Committee, its procedures and mechanism;
- Details of public consultation;
- Details of compensation given to PAPs.

In addition to the local disclosures as discussed above, documents like EIA & EMP and SIA & RAP will be disclosed in the World Bank's Info-shop.

P 13: Public Consultation and Information Dissemination Regarding Proposed Project

CHAPTER 8
ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER 8
ENVIRONMENTAL MANAGEMENT PLAN

This chapter summarizes an environmental management plan (EMP), which includes measures for avoiding or mitigating environmental impacts, anticipated during construction, operation and maintenance of the UG cable project in Digha-Sankarpur area. The chapter also includes the budgetary provisions for implementing the EMP.

8.1 ENVIRONMENTAL MANAGEMENT PLAN

Environmental Management Plan (EMP) for development projects provides a logical framework within which identified negative environmental as well as socio-economic and health impacts can be mitigated and monitored. In addition, the EMP assigns responsibilities of actions to various stake holders and provides a timeframe within which mitigation measures and monitoring can be done. EMP is a vital output of an Environmental Impact Assessment as it provides a checklist for project monitoring and evaluation. The EMP outlined below addresses the identified potential negative impacts and mitigation measures of the proposed Underground Distribution Cable Line during construction and operation & maintenance phase, based on the identified potential environmental impacts and mitigation measures of the expected negative impacts.

This section presents the environmental management plan (EMP) for the proposed project. The EMP specifies the mitigation and management measures which the PIU/EPC will undertake and shows how the Project will mobilize organizational capacity and resources to implement these measures. The EMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the following project phases: design, construction, operation and maintenance.

The EMP which includes the measures for avoiding or mitigating environmental impacts during pre-construction, construction and post-construction phases of the project is presented in Table 8.1. The EMP also indicates the role and responsibilities of PIU and EPC contractor for planning and implementation of suggested measures in the EMP.

TABLE 8.1: ENVIRONMENTAL MANAGEMENT PLAN FOR UG CABLE PROJECT
(This shall be read and operated in conjunction with EIA Report and the budgetary cost provisions made for EMP implementation by Contractor under supervision of PIU-EHS)

Sl. No.	Project Stage/Activity	Environmental Management Measures	Responsibility	
			Planning and Execution	Supervision/ Monitoring
PRE-CONSTRUCTION STAGE- REGULATORY REQUIREMENTS PRIOR TO TENDER AWARD				
1	UG Cabling Network for Digha-Sankarpur Area	Obtain CRZ clearance and other necessary permission from NHAI, Railway, DSDA and any other agency as required.	Team Leader /Environment and Social Safeguards Specialist, PIU-EHS	Team Leader/ Environment and Social Safeguards Specialist, PIUEHS PIU
CONSTRUCTION STAGE				
1	Orientation for EPC Contractor	• Conduct briefing and/or orientation for EPC Contractor on the extent of the areas covered under proposed UG Cable Project, regulatory compliance requirements, EIA/EMP provisions and requirements under the project, grievance redress mechanism for both social and environmental issues, public safety aspects at work place and reporting requirements under the project. The orientation shall also include; requirement of mandatory induction training by Contractor for workforce, at all levels (including induction training and/or orientation for new entrants and/or different disciplines throughout construction phase) covering the EIA and EMP requirements of the UG Project To record and maintain safety at workplace & fatalities of all types, particulars of public utilities damaged/restored, grievances received/resolved and any other matter of relevance to EMP, provisions under the project Contractor shall designate a dedicated senior level functionary to function as EPC-EHS officer and EPC-Social Officer, who shall solely be responsible for implementation of all EMP and RAP provisions in close co-ordination/consultation with PIU-EHS. The EPC-EHS shall also be responsible in resolving all complaints/grievances with respect to disruption of utilities from affected building owners and/or local people or any related matter in a time bound manner as stipulated in the GRM. The GRM is provided in EIA report. Briefing shall include strict compliance against child labour, bonded or	Team Leader/ Environment and Social Safeguards Specialist, PIU-EHS PIU	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		forced labour, minimum wages and awareness about sexually-transmitted disease such as HIV/AIDS to prevent potential incidence. Contractor shall be clearly made aware of the EMP measures, considered incidental to works and deem to be included in the quoted tender/bid price by contractor and EMP measures, which are considered as additional requirement, for which cost provisions have been included. Accordingly, contractor shall be encouraged to implement the provisions and achieve the expected outcome. These are given as part of the EMP cost estimates and Annexed to this EMP.		
2	Regulatory Compliances by Contractor	• Consent to Establish and Consent to Operate (CTE & CTO) shall be obtained, for work camp sites established for macadam mix plants and hot bitumen mix plants under the project if required. All consent conditions stipulated by WBPCB are to be complied. • No work camp sites for macadam or bitumen hot mix plants are to be set up or operated by contractor prior to obtaining the CTE and CTO from WBPCB.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
3	E stablishing work camp sites and material stacking yards	• PIU in consultation and requisite approvals from DSDA shall identify suitable lands, which can be used as material stock yards and work camp sites for establishing macadam mix plants, hot mix plants and storage of construction materials by the EPC contractor during construction phase • Under no circumstances, contractor shall use the cable laying route alignments as an interim stack yard for materials of any kind /type even for limited durations of less than a day • Essentially, barren lands or uncultivable lands and those away from human settlements shall be given / selected for establishing work camp sites • The selected land shall not warrant significant change in land forms or terrain, to make it suitable for establishing work camp sites • In case, land had been earlier used for establishing work camp site and meets the above requirements, same shall be given preference • Requisite consent to establishing(CTE) and consent to operate(CTO) shall be obtained from West Bengal Pollution Control Board • The ambient air and noise levels within the work camps sites shall be monitored, once in month and corrective measures if any required shall be taken in order be comply with National Ambient Air Quality and Noise Standards • All stipulated consent conditions by WBPCB shall be strictly adhered and complied by contractor • The work camp sites shall be access controlled with fixed entry and exit points • The dust levels at the work camps sites is to be controlled through regular	EPC-EHS and and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		sprinkling of water through similar mobile tankers deployed at operational areas for cable laying • Bitumen mix plants, if deployed for UG cable project shall conform to regulatory norms/requirements • The site shall be cleared from all remnants of construction and debris and site restored to its previous state, after completion of UG cable project • Surplus soil available from excavation of cable trenches (sub-base and base layers) can be used to grade the site, as well as to restore the site after works completion, if required		
4	Site Clearance and preparation	• Cable route, cable trench of 0.5 - 0.75 metre width as well as 1.25-1.50 m wide operational area is to be demarcated on ground with yellow paint (7.5 cm wide minimum). The location of inspection chambers (size 2.0x2.5x2.0 metres deep or as per requirement) at every 250 metres interval along cable route, also to be marked on ground with yellow paint • While, demarcating the cable route and cable trench, shall mandatorily avoid removal /shifting of any of over ground road side infrastructure like poles (all types and sizes) and trees (all types and sizes), with exception of ramps, steps which are extending onto road. • Ensure centreline of 0.5 - 0.75 m wide cable trench coincide with centreline of 1.25-1.50 m wide operational area, with 250mm wide working space availability on both sides of cable trench. • The cable routes and strip plans for entire UG cable project is provided in feasibility report of Route Design for UG cable network in Digha-Sankarpur area. The cable route plans are also provided in bid/contract documents of UG cable project • In case, cable routes are along commercial and busy roads, requisite approvals from traffic police shall be obtained at least 7 days in advance prior to start of site clearance operations in such stretches. The strip plans can be used in planning of any traffic diversions, if required and /or for seeking approvals from traffic police. • The environmental screening has identified 10 important receptors along 66.86 km of 11kv UG cable routes alignment; the receptors include like hospitals, schools/educational institutions/ community halls etc along cable routes in all 10 feeder areas. • Details of Information about cable laying operations, scheduled work completion time in such specific stretches shall be shared with all such institutions/occupants of buildings at least 7 days in advance, prior to commencement of works. Their requirements with respect to access or traffic diversions or any other concerns	EPC-EHS and and field level PIUEHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		shall be considered in operations planning and scheduling of work and adhered to without any lapses on any account • The occupants of other buildings/establishments along operational areas to be barricaded shall be informed 7 days in advance about cable laying operations, scheduled work completion time, restriction in access for limited time and their specific requirements, if any with respect to temporary access and arrangements shall be discussed and finalised prior to barricading and commencement of trench excavation • Prior to commencement of excavation works, carry out minor repairs to foot paths (including repairing of all uneven surfaces along 500 metre cable route segment) adjacent to barricaded area (wherever applicable) to ensure pedestrian safety as a result of reduced walkway due to barricading on the road side. • All operations shall be restricted to only day hours in residential areas. Only in case of commercial areas, which are most unlikely to disturb residential pockets, the operations, can be carried out at night hours with adequate floodlit arrangements and ensure operations are not a hazard to night traffic. • At any given point of time, only 500 metre length operational area shall be opened up for cable laying operations at a particular location and a maximum five such operational areas considering all the feeders. Prior to moving on to next 500 metre segment, all works in the previous segment shall be completed in all respects including road restoration (excluding bituminous layers) and worksite shall be completely cleared, prior to opening to traffic. The laying of the bituminous layer is to be subsequently taken up immediately after the natural compaction, expected to take place within 3-4 weeks or as determined based on site conditions. • Prior to commencement of excavation operations, permission for road cutting from DSDA and approvals from traffic police, wherever required shall be obtained in advance. The telecom department shall be informed about the cable laying operations. • Once required permissions from DSDA and traffic police are in place, barricade(s) shall be placed on road side of the 1.25-1.50 m demarcated operational area. A typical design for barricade, which is suitable for proposed UG cable project, is presented in chapter 5. The barricade will not only help to significantly contain the impacts of cable laying to the operational area itself but will also act as a safety measure. • Sand/earth filled polypropylene bags (used cement bags) are to be placed along inner side of barricade if required, to prevent seepage and water logging of cable trenches during rainy days. Seepage and water logging will not only prolong cable laying operations but will also prolong inconvenience to public and vehicular		

		traffic as a result of barricaded operational area for extended period • The barricades shall be provided with energy efficient LED strip lighting system (on only roadside) as a hazard safety for traffic moving at nights and late nights. The LED lighting system shall be switched on between sunset and sunrise hours mandatorily, for the entire duration of cable laying operations in any segment. • All work force deployed for cable laying operations shall be mandatorily provided induction training, which shall include awareness about the safety practices at work places, safe distances to be maintained around moving equipment like excavators etc, health and safety issues with particular emphasis on public safety and on-site sanitation practices at worksite during cable laying operations. • Every 500 metre segmental operations area shall be stationed with one mobile water tanker of 6000 litres capacity to meet all operational area water requirements. The water tanker shall be fitted with arrangements for a pressurized fine spray and a hose reel of 600 metre length. Typically, water shall be used for dust suppression during site preparation, excavation, consolidation of backfilling layers and wetting of net cloth covered over tipper trucks, prior to their dispatch from operations site and site clean up after completion of cable laying • All workforce deployed at site irrespective of level, shall mandatorily wear personnel protective equipment (PPE) like safety helmets, face masks, ear plugs, protective gear with reflective jackets and safety shoes. • Use of well-maintained and less than 5-year old mini ecavator/road driller, compressor and other earth moving equipment shall be ensured to limit the noise levels to a large extent. • At some locations like busy roads with commercial complexes and particularly near or ahead of junctions, location specific traffic diversion plans are to be planned and implemented to ensure smooth passage of traffic and avoid congestion. Same may be finalised in consultation/approval of traffic police, well in advance of at least 7 days. • Diversion notice boards, or caution notice boards for both pedestrian as well as vehicular traffic at all appropriate required locations, both on upstream and downstream both sides of the barricaded area shall be installed, so that approaching traffic can move with caution. All boards shall be as per code of practice for road signs IRC: 67-2012 • Trained traffic wardens with reflective hand held batons and jackets, helmets and safety shoes are to be deployed at places, wherever barricaded operation areas are near to road junctions/intersections in order to ensure smooth movement of traffic. • One crew group comprising mason, plumber and carpenter/sheet metal fabricator (with required labour assistants) shall be assigned with 500 metre long segment		

		operation areas to rectify the damages to underground utilities like water supply pipelines, sewer lines, drainage and/or sanitary connections or provide temporary access during excavation. The crew shall be provided with all resources by contractor to restore damaged utilities with least down time. The same crew group shall be deployed to restore the damaged steps, ramps during trench excavation works to ensure proper drainage alongside barricaded operational area during and after rains. • Every 500 metre segment operation area shall be stationed with one mobile toilet and parked at a suitable place within a maximum distance of 100 metres from the operational area. The mobile toilet shall have at least 1000 litres capacity overhead water tank and replenished regularly. The toilet shall be well maintained and in usable condition at all times. The bottom tanks shall be emptied on a regular basis. • The workforce shall be instructed to use the mobile toilets, specially provided under the project and not to use any other toilet / open places or public toilets. • Every 500 metre operational area shall be stationed with one drinking water kiosk with minimum 300 litres capacity, replenished regularly. The kiosk shall be placed at a suitable place within 100 metres from operational area • The Operational area shall display/maintain list of nearby hospitals for attending to any injury/ fatalities either to workforce and/or to public as a result of cable laying activities. The site shall also have a first aid kit and field level supervisory staff shall have undergone first aid training/orientation. • Since the work is being carried out along roads in commercial as well as residential areas, utmost attention shall be exercised to swiftly complete all operations including cable trench backfilling, prior to opening up the barricaded area for public use with shortest possible time.		
5	Excavation of Cable Trenches	• Excavation of pavement (asphalt/CC/Laterite/Brick etc) layers, shall be preferably carried out manually through road driller / cutting machines, suited for operations within 1.5 m wide operational areas, since these machines leave a clean road cut edge, which is an essential requirement for the subsequent road restoration stage. Road cutting machines, which can do the cutting operations within limited widths between 0.5 to 1.0 m and pavement thickness up to 300-350 mm are available in India either for outright purchase or on hire basis. • All pavement cut materials (asphalt) may be transported to work camp sites for milling and processing through CPCR (central plant cold recycling) method for redeployment as reclaimed asphalt pavement during road restoration works, if decided to be reused. • Deploying mini excavators/manual road cutting will enable to carry out all excavation operations within barricaded operational area and thus avoid	EPC-EHS and field level PIU-EHS Officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader,

		disruptions/diversion to both pedestrian and vehicular traffic. • Mechanical excavations if required are to be essentiality supplemented by manual excavation at selected stretches in order to manoeuvre minor obstacles within the barricaded operational area like kerb/road side small trees/saplings, telephone/electric poles, which will otherwise require shifting or removal for mechanical excavation of trenches. • The excavated material (base and sub base layers) is almost akin to natural soil, can be beneficially used in embankment construction or filling low lying areas and/ or can be sourced to other area development projects, commanding commercial value if required. • Another possible option is transportation of surplus excavated material to DSDA's disposal locations, which require large quantities of construction debris/soil either for closure of existing dumpsites at Ratanpur or construction of approach road and other infrastructure at adjacent other locations, where DSDA is developing new waste disposal sites. During EIA studies, DSDA has confirmed such requirements. In any case, DSDA shall have to establish facility to receive and process the waste either directly or through an operator. • The tipper trucks, which carry the pavement cut materials or the sub base and base materials, are to be covered with net cloth and wetted by water sprinkling by pressurized system prior to dispatch at all times. Alternatively, top surface of the loaded material can also be wetted through water sprinkling and covered with water proof tarpaulins to avoid enroute spills and dust. All tipper trucks shall be mandatorily loaded only up to designated capacities. • The excavation at some specific locations along operational area may warrant partial removal of unauthorized ramps/steps along cable routes. At all such locations, temporary access across barricaded area are to be provided as an interim measure to avoid/minimize inconvenience to occupants of the buildings along UG cable route corridor. • During excavation utmost care shall be taken to ensure no public utilities like water supply pipes, sanitary/sewer pipes, telecom, electric cables and any other utilities are disrupted /damaged. In case any such disruption/damage, contractor shall immediately deploy the EMP provisioned on-site crew comprising mason, plumber, carpenter/sheet metal fabricator with all required resources to restore the damaged utility with least down time • Besides restoration of damaged public utilities, EMP/RAP also includes cost provision for restoration/replacement of all such ramps/steps/other structures, damaged due to cable trenching operations. • All work force involved in excavation operations are to be sensitised to keep safe		

		distances from moving equipment and provided with PPEs like safety helmets, safety shoes, face masks, ear plugs, and protective gear with reflective jackets mandatorily. All personnel exposed to noise levels for prolonged duration will be provided with one additional break in pre and post lunch session breaks, so as to limit their exposures. • In order to suppress dust levels during trench excavation, periodical sprinkling of water through tankers fitted with pressurized fine spray has to be carried out, through mobile water tankers fitted with pressurized spray system with hose reel. • Any grievance related to disruption of services/utilities/damaged structures due to UG project be attended and resolved with least downtime as per GRM and records shall be maintained		
6	Cable Pullout and Laying	• Prior to cable pullout, the excavated cable trenches are to be checked for any cavities on sides and same are to be filled up with rich cement concrete, to avoid entry of any rodents into trench at a later date. • Also, cable trenches are to be properly graded to ensure an even surface all through and devoid of any sharp objects/metal pieces/protruding stores at trench bottom/sides, to rule out damages to cables, while laying or at a later date. • Once the trench excavation is completed to required dimensions, cables (as per required sizes and configuration) need to be pulled out from cable coils through manually / mini excavators used for trench excavation fitted with required additional accessories. • To the extent possible, cable pull out and lowering operations shall be limited to barricaded operational areas. • During cable pull out and lowering operations, the work site shall have water proof transparent tarpaulins to cover cable trenches to prevent seepage or water logging of trenches due to rains (seasonal or unseasonal), as a contingency measure. Any slippages on this account will not only delay cable laying operations, but as a consequence will further prolong the work completion time, thereby inconvenience to both public and vehicular movement gets extended. • The transparent tarpaulins can be hung across 1.25-1.5 metre wide barricaded operational area (in small lengths), which will facilitate work even during rainy/cloudy days. • The work sites during cable lowering and backfilling shall be completely access controlled to prevent theft and vandalisation of cables. The barricaded operational areas are to be mandatorily access controlled and barred for entry by un-authorized persons from public safety point of view as well. • The cable pull out, lowering operations can pose safety concerns and therefore all	EPC-EHS and field level PIUEHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		work force deployed in operations are to be properly trained to keep safe distances and provided with all required PPEs like safety helmets, face masks, ear plugs, protective gear with reflective jackets and safety shoes mandatorily		
7	Trench Backfilling Operations	• Once the cable lowering as per project design is completed and tested for IR and CT, the trenches are to be backfilled with excavated material/debris after fixing/laying of bricks/tiles as per project design • The marginal increase in dust levels due to trench bacfilling can be limited through use of pressurized fine spray of water. All work sites will be stationed with one water tanker (6000 litres cap.) fitted with arrangements for pressurized fine spray with 600 metres of hose reel.	EPC-EHS And field level PIU EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
8	Construction of Inspection of Chambers	• Location of inspection chambers are to be pre-determined during on-site marking of cable route itself during site preparation activity and demarcated on road with yellow paint (7.5 cm wide strips) • Location of inspection chambers shall not foul with any other underground utilities, sewer manholes and/or chambers of telecom department and shall be at least 3 m away from any other similar appurtenants. Accordingly, location of inspection chambers can be marginally adjusted to avoid fouling with other pre-existing utilities • Construction of inspection chambers is to be commenced, concurrently with cable in (500 metre segment) laying operations, so as to complete both inspection chamber and cable laying works in the estimated 21 days. This will avoid lag in cable laying and construction of inspection chambers and cable jointing works as well. Moreover, this will also facilitate complete road restoration in one go and opening up of fully restored road to public in all respects. • The top level of inspection chamber is to be finished to be at least 40mm below the existing road level, so that 40mm thick bituminous concrete as part of road restoration can be laid over inspection chamber as well (excluding manhole cover), so that only the manhole cover is visible after road restoration is completed • Under no circumstances, top level of inspection chamber shall be finished above the existing road level and thus pose hazard to pedestrian as well as vehicular traffic, after cable laying operations. • Inspection chambers shall be provided with one 560mm extra duty manhole cover to withstand heavy traffic and shall avoid ingress of water into inspection chamber during rains • M25 grade ready mix concrete for inspection chambers shall be sourced from ready mix concrete plants having valid consents and authorization of WBPCB	EPC-EHSAnd field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

9	Cable Jointing at Inspection Chambers	• All cable jointing works are to be carried out as per recommended procedures/specifications by the manufacturer with genuine cable jointing materials • All cable jointing works are to be carried out in dry conditions and during clear days, with no possibility of rains. In case of unseasonal rains, water proof tarpaulins shall be used to cover the work site at inspection chamber. • No cable jointing work is to be carried out during rains or under wet conditions. The inspection chamber shall be in dry condition, before cable jointing work is resumed • The cable joints within the inspection chamber shall be supported on steel portals on either side of the cable trench, so that the no cable or joint within the chamber remain in hanging position for more than 0.45m at a stretch. • The inspection chamber frame and manhole cover shall fit together well and further joints are sealed with water proof cement mortar (1 cement: 4 cement fine sand) to avoid ingress of water into inspection chambers during rains and/or storm water blockages on the road at a later stage.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
10	Road Restoration and clean up operations	• Road restoration, particularly bituminous layers shall be taken up only after 3-4 weeks of cable trench backfilling to allow for natural compaction or as determined based on site conditions. • Road restoration with new materials or with recycled WMM and reclaimed asphalt pavement, as the case may be will involve laying of four layers namely; sand, fresh/new or recycled wet mixed macadam, cold new or recycled asphalt mix and final layer with hot new or recycled bituminous concrete. • The laying of sand, wet mix macadam and asphalt pavement will not cause significant onsite impacts except for increase in dust and noise levels, limited to 2-3 days for all cable trench backfilling (excluding bituminous layers) operations put together. • The noise levels during this operation shall be controlled through deployment of well maintained vehicles and equipment and conducting operations in a regulated and planned manner • The traffic is to be regulated during the road restoration operations, in order to ensure smooth traffic movement and avoid congestion as a consequence of road restoration works • In case of restoration of concrete roads, ready mix concrete shall be used, brought to the site through transit mixer(s) from a ready mix plant (RMC) located elsewhere if required. However, concrete will be sourced only from RMC plants having valid consents and permission or authorization of WBPCB.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		• Care shall be taken during the road restoration works so as not to leave out any areas unpaved within the operational area and bordering the operational areas. • Also, care shall be taken to match the levels of old and newly restored surfaces, so as to have an even surface after restoration • All damaged ramps, steps and other structures, within operational area are to be restored to its previous state as per requirements and in consultation with respective building owners, • The operational area is to be thoroughly cleaned for all debris, either unusable materials or all unwanted materials are to be collected and disposed in approved locations by DSDA located at Ratanpur/Duttapur. • All drainage outlets into storm drains along barricaded area are to be checked for blockages, if any and cleared. • The barricaded area shall be opened up only after ensuring these measures and site cleanup, prior to moving on to next 500 metre cable route segment.		
11	Construction vehicles, equipment and machinery	• All vehicles, equipment, and machinery deployed for cable laying operations shall be in good condition, maintained and preferably less than 5 years old. • The EPC Contractor shall ensure that all vehicles, equipment and machinery used for construction are regularly maintained and meet emission limits set by WBPCB and Motor Vehicles Acts & Rules. • The Contractor shall keep a record of the PUC certificates for all vehicles/equipment/machinery used for the Project and will be made available to PIU-EHS	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
12	W ater requirement of Project	• Water requirements of project are to be met from only existing tube wells, with the approval of PIU-EHS • Digha-Sankarpur falls under safe category and therefore sourcing of ground water shall not pose any restrictions to UG Cabling Project. • Surface water bodies SHALL NOT be chosen for sourcing or meeting requirements of the UG Cabling project.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
13	Workforce for cable laying operations stockyards	• All work force shall be subjected to an orientation program, which familiarize them with work requirements, safety practices at work, safe distances to keep from earth moving equipment, first aid facilities, emergency response, on-site sanitation facilities and practices to be adopted, rights and privileges of workforce among others. Orientation shall also include concern for safety of public around operational areas as well • All work force deployed in operational areas shall be provided with PPEs like safety helmets, face masks, gloves, protective gear with reflective jackets and safety shoes. It shall be mandatory to wear them at work site. The PPEs shall be	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		provided at no cost to workforce and shall be replaced once in six months. Any lost PPEs shall be provided at subsidized rates • Visitors/officials to worksite are to be provided with PPEs (hard hats and safety boots & safety jackets) and shall be briefed ongoing operations on that specific time and related safety requirement at work site including safe distances to keep, while at site visit • Work force shall be subjected only to standard work shifts/hours. Overtime allowances shall be paid with ceiling limits. Working beyond such ceiling limits shall be discouraged, even if, so desired by workforce or by contractor • All workforce deployed shall be governed by Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, with regards to safety and welfare measures (including equal wages for men and women) for workers employed at building and other construction sites • One mobile toilet of 2 seater capacity (1 men and 1 women with separate entrances) shall be stationed at a suitable place within 100 metres from each operational area of 500 m long segment. The mobile toilet shall have at least 1000 litres overhead water storage, well maintained and in usable condition at all times. Bottom tanks shall be regularly cleaned and overhead tank replenished as per requirement. Work force shall be oriented to use mobile toilets and avoid using public toilets and/or nearby open places/parks • Every operational area shall be provided with one mobile drinking water kiosk having a storage of 300 litres and placed at a suitable place within 100 metres from work site • The operational work site shall have first aid kits and details of major/nearby hospitals displayed prominently in local language, in case of emergency and/fatalities to work force and/or public, as a consequence of operations • The supervisory staff shall be provided with wireless communication system(walkie-talkie) supplemented with mobile phones for better communication at operational area and also with other operational area within same substation area, in case of emergency or otherwise • The work sites being within DSDA limits, UG cable project will provide skilled and unskilled employment opportunities largely to the local people. All work force is expected to return to their places of residence after work shift hours. For out station workforce if any, contractor shall provide rented residential accommodation with water, sanitation and allied facilities for comfortable stay. Pooled transportation facilities wherever required shall be provided to workforce as a welfare measure • No work force camps will be set up under the project and largely local work force		

		shall be employed.		
14	Transport of Materials to Operational Areas	• Public safety has to be ensured at all times during transportation and protruding of materials outside the body line of the trucks/vehicles shall be strictly prohibited and suitable size of trailers shall be used in such cases • Contractor shall only deploy well-maintained and less than 5-year old vehicles for transportation of construction materials, cable coils etc, to ensure reduced noise levels and vehicular emissions.	EPC-EHS And field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
15	Strom Water Drainage Management at Operational Areas	• EPC Contractor shall ensure that no construction materials like earth, stone, or are disposed off in a manner that can block the flow of drainage in and around the operational areas. • All road side drain chutes on either side of the barricaded operational area (longitudinally) shall be checked and cleared for any blockages, so as to ensure free flow of storm water and prevent stagnation of water near or after the barricaded operational area and inconvenience thereof to vehicular as well as pedestrian traffic.	EPC -EHS	PIU-EHS and Independent 3rd Party agency appointed by PIU and PIU Site In charge
16	Potential water pollution from use of fuel, lubricants, and their storage/handling areas at material stock yards	• EPC Contractor shall take pre-cautionary measures to ensure that no water pollution occurs through surface runoff from construction vehicle parking areas, fuel/lubricants storage sites, vehicle, and machinery/equipment maintenance sites. • EPC Contractor shall ensure that all vehicle/machinery and equipment operation, maintenance and re-fuelling shall be carried out in such a manner that spillage of fuel and lubricants do not contaminate soil and groundwater. • Areas used for handling of fuel and lubricants, wherever applicable shall be lined with impermeable material to prevent groundwater and soil contamination in the event of accidental spills.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
17	Potential increase of dust level at work sites	• EPC Contractor shall take every precaution to reduce the level of dust from operational areas thorough regular sprinkling water through water tankers fitted with pressurized fine spray system and stationed at all operational areas. • The frequency of water sprinkling shall be determined based on site-specific requirements to contain dust generated from cable laying activities.	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
18	Construction debris and waste disposal	• All construction waste materials shall be disposed of at locations approved by DSDA located at Ratanpur/Duttapur • All vehicles carrying such waste materials for disposal shall be covered with net cloth and wetted prior to dispatch to avoid enroute spillages on roads, causing inconvenience and visual impacts to local population. Alternatively, tarpaulins can be used. In such cases, top surface of loaded materials is to be wetted and then covered with tarpaulins. All tipper trucks shall be loaded only to their designated	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		capacities and no over loading shall be allowed		
19	Clean-up operations, restoration and rehabilitation	• EPC Contractor shall undertake site clean-up of operations as approved by PIU-EHS. • The clean-up operations by EPC Contractor prior to demobilization and shall include removal of construction debris, unused/waste materials, etc. and disposal of same at approved locations by DSDA/PIU-EHS	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
20	Environmental monitoring at construction sites	• Weekly/Fortnightly/Monthly monitoring of ambient air quality, noise level, at selected sampling locations across project area representing different categories like residential, commercial, sensitive areas along cable routes, work camp sites and during different stages of cable laying operations shall be undertaken through an external laboratory approved by WBPCB/CPCB/NABL. • Environmental monitoring activities shall be co-ordinated by PIU-EHS. The EPC-EHS shall provide required assistance at site and facilitate monitoring activities and further take any corrective measures required to maintain ambient air quality and noise levels at operational areas, if any required as may be determined by PIU-EHS	Field d Level Officers of PIU-EHS and Independent 3rd Party WBPCB/CPCB approved agency (to be engaged by EPC)	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
21	Community Participation	• Communication channel will be kept open with local people around and along operational areas to ensure that cable laying activities are not causing undue inconvenience to the local people. • All grievance(s) related to disruption of services/utilities/damaged structures due to UG Cabling project be attended and resolved with least downtime as per GRM and records shall be maintained	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
22	Implementation of Grievance Redress Mechanism (GRM)	• PIU-EHS in coordination with EPC Contractor shall set-up a GRM as given in EIA report as soon as contract is awarded and mobilization of contractor. • PIU-EHS and EPC-EHS shall inform the affected persons (APs) on the grievance redress procedure, who to contact and when, where and how to file a grievance, time likely to be taken for redress of minor and major grievances, etc. The number of grievances recorded and resolved and the outcomes will be disclosed in the PIU office and also included in the periodic progress reports of EMP implementation monitoring and audit reports submitted to PMU for review. • Field-level GRM shall receive any complaints/grievances (either orally or in documented form) from local people/adjacent building owners) related to EHS and R&R issues or disruption of services/utilities and resolve matters expeditiously in a time bound manner.	Field level PIU-EHS officers in coordination with EPC-EHS	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
	UG CABLE PROJECT OPERATION & MAINTAINENCE PHASE:			
23	Shifting of	• Once the UG cable project is commissioned, the existing overhead electrical	EPC-EHS and field level	Environmental Officer and

	existing overhead utilities and handling of transformer oil	distribution infrastructure shall be dismantled • All reusable equipment as determined by PIU shall be stacked in approved locations in the manner as decided by PIU for redeployment in designated areas as determined by WBSEDCL • All disposable equipment as determined by PIU shall be stacked in approved locations in the manner as decided by PIU • Contractor shall ensure public safety as well as safety of work force during the dismantling of the existing overhead electrical distribution infrastructure as well as its transport to approved locations • Trained and experienced work force shall be deployed for dismantling OH infrastructure. The work force shall be provided with all required safety gears for working at height and other PPEs like safety harness, safety boots, reflective jackets, hard hats, among others • After dismantling of overhead infrastructure, the places shall be restored to match with surrounding places viz, when a pole has been dismantled, the pole location shall be restored to match with surrounding place, including filling up the foundation pit of the pole with sand/cement concrete and finishing to match with surrounding surfaces as may be required. • The serviceable materials like transformers, which have pollution potential due to leakage of oils/lubes, shall be stored on impermeable surfaces areas within store yards prior to redeployment or disposal as scarp, as the case may be. All such impermeable surfaces shall be covered • All other disposables and/or debris (after scavenging for scarp valuables) shall be disposed off at approved waste disposal sites at Ratanpur/Duttapur.	PIU-EHS officers	Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS
24	Cable Faults during Operation Stage	• Cables shall be subjected to stringent quality checks at various levels viz testing at factory prior to dispatch, testing at storage yards, at work site prior to pull out and lowering and finally after lowering and before back filling of trenches, to rule out damages to cables due to handling at each stage. • Extreme care shall be taken not to over load the cables beyond its design load capacity, even more importantly for prolonged periods • Adequate supervisory checks during cable jointing work and adhering to manufacturer's specifications/procedures as per relevant Indian Electricity Regulation, 1956, and latest amendments thereof. • In the event of cable faults at joints, the area around the man hole of inspection chamber (about 1.0mX2.5m), shall be barricaded and caution boards shall be put up for the public/vehicular traffic. Work shall be planned and swiftly completed. The work site around chamber shall be restored to its previous state. All waste	EPC-EHS and field level PIU-EHS officers	Environmental Officer and Safety Officer and field level PIU-EHS officers under the overall guidance of Team Leader, PIU-EHS

		materials from work site shall be removed with no trace of any debris. The uneven surfaces, if any surrounding inspection chamber due to opening up of chamber cover shall also be rectified with rich cement mortar, as may be required, suitably. • In case of faults in cables at locations other than joints, the area around cable fault location (about 1.0 mX2.5m), shall be barricaded and caution boards shall be put up for the public/vehicular traffic. The cable trench shall be opened up at fault location for rectification of cable, followed by restoration of all intermediate layers including road restoration as per project design. Work shall be swiftly completed and work site shall be restored to its previous state. All waste materials from work site shall be removed with no trace any debris. The uneven surfaces, if any surrounding the opened up area shall also be restored to its previous state, suitably.		

8.2 ENVIRONMENTAL MONITORING PLAN

An environmental monitoring plan has been evolved to address the potential impacts identified in the EIA. The environmental monitoring program considered the following scope and be modified as required to meet specific needs of the project implementation schedule. The detail environmental monitoring plan for proposed UG Cablling Network at DighaSankarpur area under World Bank project NCRMP-II including parameters, frequency, and responsibility and reporting requirement is presented in subsequent sections.

8.2.1 Ambient Air Quality Monitoring

Consideration has been given to the scope of ambient air quality monitoring that would be carried out in the proposed UG Cablling Network project area of Digha Sankarpur. The following activities are recommended.

Air quality monitoring would be conducted in compliance with the NAAQS, 2009 and include the following criteria parameters:

• Respirable Particulate Matter (RPM/PM_{10})	• Fine Particulate Matter ($PM_{2.5}$)
• Sulphur Dioxide (SO_2)	• Nitrogen Dioxide (NO_2)

Monitoring would be conducted at least once in a week during construction period at every 500 m stretch open for operation. Additionally, it is recommended that at least three monitoring stations may be selected covering the entire cross-section area of proposed UG Cablling Network for monitoring of ambient air quality for the entire project implementation period to acquire background air quality of project region and compare the same with UG cabling network construction stretches. The methods and averaging time of sampling would be as per the NAAQS, 2009.

Basic climatic data should be obtained from regional sources to assist in the interpretation of the air quality measurements. This should include ambient conditions during the monitoring period such as wind speed and direction, temperature and a description of general weather conditions.

Monitoring results will be compared with relevant standards as specified in the NAAQS, 2009 and background data collected during the EIA study. Any significant changes over time should be determined. The ambient air quality monitoring to be included as a part of package contract for execution of work and would be the responsibility of project contractor (EPC). The fortnightly/monthly monitoring report would be submitted by the project contractor to the PMC through PIU.

8.2.2 Noise Monitoring

Consideration has been given to the scope of noise monitoring that would be carried out in the proposed UG Cablling Network project area of Digha Sankarpur. Depending on the magnitude of identified impacts, the following monitoring program has been suggested.

Continuous noise levels should be monitored on regular basis during the construction phase. It is recommended that during the construction activities primarily excavation of trench, etc. noise level (one hr average) need to be monitored at every 500 m stretch open for construction purpose. Additionally, it is recommended that at least three monitoring stations may be selected covering the entire cross-section area of proposed UG Cablling Network for monitoring of day and night ambient noise level for the entire project implementation period to acquire background noise level of project region and compare the same with UG cabling network construction stretches. The methods and averaging time, etc. would be as per the Noise Pollution (Regulation and Control) Rules, 2000.

Monitoring results will be compared with National Ambient Noise level standard as specified in the Noise Pollution (Regulation and Control) Rules, 2000 and background data collected during the EIA study. Any significant changes over time should be determined. The ambient noise level monitoring to be included as a part of package contract (EPC) for execution of work and would be responsibility of project contractor. The fortnightly/monthly monitoring report would be submitted by the project contractor to the PMC through PIU.

8.2.3 Water Quality Monitoring

Consideration has been given to the scope of ground as well as surface water quality monitoring that would be carried out in the proposed UG Cablling Network project area of Digha Sankarpur. Depending on the magnitude of identified impacts, the following monitoring program has been suggested.

At least five ground water quality monitoring wells would be identified within aprox 50 m of proposed route of HT/LT UG cablling covering the entire cross-section area of proposed UG Cablling Network of Digha Sankarpur area. Monthly ground water quality monitoring would be conducted for the following major parameters:

1. pH	2. Conductivity
3. Dissolved solids	4. Total hardness (as $CaCO_3$)
5. Chlorides	6. Sulphate (as SO_4)
7. Alkalinity	8. Iron
9. Arsenic	10. Cadmium
11. Chromium	12. Copper
13. Cyanide	14. Lead
15. Mercury	16. Nickel
17. Nitrate as NO_3	18. Zinc
19. Magnesium	20. Sodium
21. Potassium	22. Calcium
23. Total Kjeldahl Nitrogen	24. Ammonia-N

Similarly, at least five surface water quality monitoring locations (Ponds/River, etc) would be identified within aprox 50 - 100 m of proposed route of HT/LT UG cablling covering the entire cross-section area of proposed UG Cablling Network of Digha Sankarpur area. Monthly surface water quality monitoring would be conducted for the following major parameters:

1. pH	2. Conductivity
3. Dissolved solids	4. Suspended Solids
5. DO	6. BDO
7. COD	8. Oil & Grease
9. Total hardness (as $CaCO_3$)	10. Alkalinity
11. Chlorides	12. Sulphate (as SO_4)
13. Nitrate as NO_3	14. Iron
15. Total coliforms and faecal coliforms	16. Phyto/zoo plankton

Analytical testing of ground/surface water quality would be conducted at an accredited technical laboratory. Depth of water table information would also be collected in conjunction with the ground water quality sampling. Monitoring results will be compared with relevant standards and/or guidelines and significant changes if any over time would be determined. The water quality monitoring to be included as a part of package contract for execution of work and would be responsibility of project contractor (EPC). The monthly monitoring report would be submitted by the project contractor to the PMC through PIU.

8.2.4 Handling of Solid Wastes

The project contractor would conduct close monitoring of house keeping activities to ensure that solid wastes are properly collected, stored and disposed off only at DSDA designated area regularly. No excavated debris which could not be recycled for refilling of trenches would be stored beyond 2-3 days near the operational area.

8.3 ESTIMATED BUDGET FOR EMP IMPLEMENTATION AND SUPERVISION

The implementation of many of the measures included in EMP largely constitutes good construction practices and therefore, they are considered as incidental to works. However, some measures are considered as additional requirement to mitigate or avoid environmental, health and safety concerns during the implementation of /UG cable project. Adequate cost provisions have been included for such measures, which are considered as additional requirement whereas measures which are incidental to work deem to have been included in the quoted tender/bid price by the contractor.

The detail of budgetary provisions for implementation of EMP for UG cable project is presented in Table 8.2. It is estimated to be **INR 90.87 lakhs (Table 8.3).**

The EMP will be integrated in the contract/bidding documents as **MANDATORY CONTRACTUAL OBLIGATIONS.** Thus, the EPC contractor is expected to be fully conversant with the EMP requirements of UG cable project and accordingly make required provisions for implementing the EMP at the bidding stage itself.

TABLE 8.2: DETAIL OF BUDGETARY PROVISION FOR IMPLEMENTATION AND SUPERVISION OF EMP FOR UG CABLING PROJECT
(This Budgetary provision shall operate in conjunction with EMP Provisions in Table 8.3 of EIA Report as well as EIA Report as a whole)

S.No.	Item Particulars	Unit	Rate (in Rs.)	Total Quantity	Total Amount (in Lakhs)
A	**EMP MEASURES, CONSIDERED INCIDENTAL TO WORKS AND DEEM INCLUDED IN THE QUOTED TENDER / BID PRICE BY CONTRACTOR**				**EMP MEASURES, CONSIDERED INCIDENTAL TO WORKS AND DEEM TO BE INCLUDED IN THE QUOTED TENDER / BID PRICE BY CONTRACTOR**
1	Site cleanup and removal of all waste materials/debris lying within each 1.25-1.5 metre wide and 500 metre long operational area /cable laying segment				
2	Ensure roadside drain chutes are cleared on both upstream and downstream sides of operational area, prior to commencement of cable laying operations and these drains are to be periodically cleaned throughout the cable laying phase, followed by final cleanup just prior to opening the operational area(s) for traffic. Also, ensure no water logging occurs along barricaded operational area during rainy days/season				
3	Stacking of sand bags in polypropylene (used cement) bags, along inner side of barricades as required, preventing seepage /water logging of cable trenches in wet season/rainy days. In case of excess water logging, trenches shall be emptied using dewatering pump, as may be required				
4	Ensure all tipper trucks are loaded only up to permitted capacities and adequately covered with wetted net cloth, so that en-route dust and spills are avoided. Alternatively, water resistant tarpaulins can also be used to cover trucks. In such case, the top surface of loaded material(s) viz. excavated soil or bitumen chunks or debris shall be wetted, prior to covering with tarpaulins				
5	Provision of safe and adequate temporary intermediate access (fabricated MS planks of adequate size, strength and build) across barricaded area for adjacent building occupants as per requirements				
6	Ensure utmost care is taken that no underground utilities are damaged during trench excavation. In case of damage to any utilities like water/sewer/sanitary lines as a consequence of trench excavation works, same is to be restored with least down time through deployment of dedicated on-site crew group comprising mason, plumber, carpenter and sheet metal fabricator stationed at operational areas with all required tools and equipments. The onsite crew shall be provided with mobile van (MUV type) for ease of movement across operational areas within the project area. The number of crew group(s) deployed shall commensurate with number of active operational areas so as to ensure no unwarranted/undue delay in restoration of damaged utilities due to inadequate crew group(s). Note: Provision of crew and with mobile van (MUV type) for ease of movement is a paid item as per the quoted price by bidder.				

7	During all excavation operations, regular sprinkling of water with pressurized fine spray shall be carried out to contain/limit dust levels within WBPCB norms as may be required	**EMP MEASURES, CONSIDERED INCIDENTAL TO WORKS AND DEEM TO BE INCLUDED IN THE QUOTED TENDER / BID PRICE BY CONTRACTOR**
8	After the completion of underground cable laying works and prior to opening up of operational area for traffic, the site has to be cleaned and all waste materials/ debris are to be removed and disposed at approved locations/sites	
9	All types of excess excavated materials from operational areas are to be transported either to work camp sites for reuse and /or to approved locations for safe disposal	
10	All vehicles /equipment deployed at operational areas shall be in good working condition and mandatorily have valid Pollution under control certificates, while being deployed on this project.	
11	Establishing work camp sites for macadam mix plants & hot mix plants, if required and stacking of inventories for cable laying operations and restoring it to previous state, in all respects	
12	No workforce camps shall be set up at any of the operational areas. All work force are to be provided with suitable type of rented accommodation, if required or can return to normal places of residence. Pooled transportation facilities as may be required, shall be provided by contractor	
13	All traffic diversion plans (specific site/stretch wise) wherever required are to be prepared by contractor, shall be prepared in consultation with WBSEDCL/DSDA and requisite approvals from traffic police shall be sought well in advance (at least 7 days). Approved traffic diversion plans are to be implemented by the contractor during entire duration of cable laying operations, at a specific site/stretch	
14	All road cutting permissions shall be obtained at least 7 days in advance from DSDA and no excavation shall be commenced without requisite permission and approvals and intimation to PIU	
15	All operational areas shall be access controlled with fixed entry and exit points and shall have watch and ward facilities at all times. All workforce shall be provided with identity cards.	
16	After dismantling of overhead infrastructure, the places shall be restored to match with surrounding places viz, when a pole has been dismantled, the pole location shall be restored to match with surrounding place, including filling up the foundation pit of the pole with sand/cement concrete and finishing to match with surrounding surfaces as may be required.	
17	All roads shall be restored to its previous condition and ensure that old and newly laid surfaces match without any uneven surfaces. The road restoration cost is a paid item as per the quoted price by bidder.	
18	First aid facilities and free emergency care shall be provided to all workforce and third party and no cost shall be recovered from them on this account - The contractor shall have CAR policy to cover both Contactor and WBSEDCL.	
19	All supervisory staff shall be provided with mobile phones for better communication across all operational areas, in case of emergency or otherwise	

	ESTIMATED COSTS FOR IMPLEMENTATION OF EMP MEASURES CONSIDERED AS ADDITIONAL REQUIREMENTS TO BE IMPLEMENTED BY CONTRACTOR (EXCLUDES COST OF ROAD RESTORATION WHICH SHALL BE AS PER QUOTED BID PRICE BY CONTRACTOR)			
	EMP Item Particulars	**Basis of Estimation**	**Units and Cost per unit**	**Total Amount (in lacs)**
1	Erection of barricades using MS support on both sides of the cable trench alignment	Considering 5 operational areas within the project area at any given point of time & 500 m length of barricade per operational area, Total length of barricading required (5x500x 1side)	2,500 metres	**5.00**
		Total no. of barricades support (MS) required, considering their placement with 25 m distance apart	2,500/25	
		Total no. of barricades support	**100**	
		Fabrication Cost of each barricade support as specified	Rs 1,000/-	
		Total Cost of barricades support	Rs 1,000x100	
		Total Cost of Barricading Tape	Rs 4,00,000	
		Total cost of barricading	**Rs. 5,00,000/-**	
2	Provision of LED strip lighting for barricades as a safety measure during night hours	Length of Barricading for installing LED Strip lighting (only towards roadside to be provided) per operational Area	500m	**1.25**
		Total no. of operational areas permitted at any given time in all feeders	5	
		Total length of Barricading for which LED strip lighting to be provided	500x5 = 2500 metre	
		Cost of LED Strip/pipe lighting	Rs 50/ metre	
		Total cost of LED Strip lighting	**2500x50**	
3	Installation of caution/sign/diversion boards on both upstream and downstream sides of operational area as per requirement of specific stretch	No. of Caution/ Diversion Boards required per 500m operational area/ segment	5	**4.5**
		Total no. of operational areas/segment of 500 metres each, considering 80.26 km of HT and 386.76 km LT UG cable trench length	467.02km /0.1km =4670	
		Considering each board can be reused maximum 5	4670/5 =934	

		times, Total Boards required		
		Total boards required say	900	
		Average cost of each board as per IRC Specifications	Rs 500/- Board	
		Total cost of boards(after deducting 10% for salvage value and adding 10% for shifting cost across different sites/operational areas)	**900 X 500**	
4	Provision of 5 mobile toilets - 3 wet type and 2 dry type(bio-digester) of DRDO approved design and each mobile toilet fitted with 2 seats (1 seat for male and 1 seat for female) with separate entrances), wet type toilets fitted with 1000 litres overhead water storage tank, and all toilets stationed at a suitable place within 100 metres from operational area, with one attendant	Total no. of operational areas/segments at any point in time	**5**	**14.97**
		Considering 1 mobile toilet/operational area, total mobile toilets required (3 wet type and 2 dry type)	**5**	
		Cost of one wet type mobile toilet (MS fabricated) 2 seats (1 male& 1 female with separate entry), fitted with 1000 litre overhead tank and 500 litre cap. Bottom tank	Rs 200000	
		Total cost of mobile toilets- 3 no.s of wet type	Rs600000	
		Cost of water @ 150 litre/day for 21 days duration/operational area x 560 operational areas (for 60% wet type toilet) @ Rs. 0.1 /litre	Rs 176400	
		Cost for emptying of bottom tanks through mobile suction machine @ 3 times/21 days for 560 operational areas @ Rs 150/emptying operation	Rs 252000	
		Total cost of 2 dry type (bio-digestor) of DRDO approved design with 2 seats(one male and 1 female)@ Rs 2,50,000 per toilet	Rs 500000	
		Shifting Cost of Mobile toilet from one operational area to another @ Rs 150/shift/950 operational areas	Rs 142500	

		Total Cost	Rs 1870900	
		Total cost of deploying mobile toilet at all operational areas after deducting 20% salvage value	**Rs 1496720**	
5	Provision of mobile drinking water counter/kiosk, fabricated from stainless steel with 300 litre capacity, with at least two taps, with bottom tank to collect waste water and stationed at a suitable place within 100 metres from operational area, with one common attendant for both Mobile toilet and drinking water kiosk	Fabrication cost of one mobile drinking water kiosk made of S.S. with at least two taps, 300 litre water holding capacity & bottom tank (300 litre holding capacity) to collect used water	1,25,000/kiosk	**14.50**
		Total cost of Kiosks for 7 operational areas	Rs 875000	
		Cost of Water @ 200 litre/day/kiosk/21 Days / operational area /184 operational areas @ Rs 0.5 /litre -	Rs 386400	
		Shifting cost of Kiosk from one operational area to other - 184 operational areas @ Rs 750/shift	Rs 138000	
		Emptying of bottom tanks through sewer suction machine 3 times over 21 days of operational area/184 segment (3x750x184)	Rs 414000	
		Attendant cost is not considered separated. Already included under mobile toilet(common attendant for mobile toilet and drinking water kiosk)	0	
		Total cost of drinking water kiosk at all operational areas	18,13,400	
		Total cost of deploying drinking water kiosk at all operational areas after deducting 20% salvage value	**14,50,720**	
6	Deploying a on-site crew group, comprising mason, plumber, carpenter/sheet metal fabricator at all operational areas, on full time basis , provided with mobile van(MUV type) and all required tools/equipment/ materials	Total cost of deploying 3 skilled workers with 1 assistants (Carpenter, mason and metal sheet/fabricator for 18 months at Rs 750 per day for skilled worker and Rs 450 for unskilled worker	1458000	**18.18**
		Total cost of providing one multi utility pick-up van with 6 seats and provision for keeping tools and equipments including driver, fuel and routine vehicle maintenance for 18 months at Rs 20,000 per month . Moble pick up van also shall have one	360000	

		operational mobile number		
		Total cost of deployment of on-site crew for restoring damaged utilities and provided with mobile van excluding cost of damaged materials (only labour cost)	18,18,000	
7	Provision of traffic wardens along operational areas, near to junctions/intersections	No. of Persons/location/8 hour shift	2	**7.35**
		Duration	3 weeks x 7 days	
		No. of Locations	50	
		Total Mandays	2100 mandays	
		Cost	Rs350/manday	
		Total cost	Rs 735000	
8	Identifying and verification of trees along the route of the cable trench, marking, preparing the list as per the norms and obtaining clearance for cutting of trees (only in case unavoidable), paying compensation and cutting & re-planting of trees as per the norms (Plantation of 5 nos tree against cutting of one tree during construction of works/recommended by the local authorities), removal of fallen tree to identified site as per direction of EIC & recommendation in EISA Report	Total No. of Trees likely to get affected	285	**11.4**
		Cost of Plantation of 1:5 trees for each tree likely to get affected	4000	
		Total cost of Plantation of 1:5 trees for each tree likely to get affected	1140000	
9	Environmental Monitoring			**11.08**
	Ambient Air Quality Monitoring	Weekly at 3 locations for 18 months	216 X @ Rs. 3000 per sample=Rs. 6,48,000	
	Noise Level Monitoring	Daily at 3-5 locations	Rs. 1,00,000 Lumpsum	
	Water Pollution Monitoring	Monthly at 5 locations each for ground and surface water for 18 months	180X @ Rs. 2000 per sample=Rs. 3,60,000	
			Add Contingencies @3%	**2.64**
			TOTAL COST OF IMPLEMENTATION (Total of B) in Lakhs	**90.87**

TABLE 8.3: SUMMARY OF ESTIMATED BUDGETARY PROVISIONS FOR IMPLEMENTATION OF EMP FOR UG CABLE PROJECT

S. No.	Item Particulars	Budgetary Provision Rs in Lakhs	Remarks/Notes
A	EMP Measures, considered incidental to works, deem included in quoted bid price	Nil	These measures are to be essentially implemented by contractor and costs deem included in quoted bid price by contractor
B	EMP Measures, considered additional requirement to be implemented by contractor (excludes cost of road restoration, which shall be as per quoted bid price by contractor)	88.23	Costs are budgetary provisions. Contractor can make his own assessment and accordingly include in bid price. Payment shall be made as per actual by PMC /PIU
C	EMP Implementation Supervision by PMC/PIU	Nil	This shall be the responsibility of PMC under PIU. The cost of EMP implementation supervision shall be borne by PMC as per their quoted rates.
D	Total Cost of EMP Implementation and Supervision (Total of A + B +C)	88.23	None
	Add Contingencies @3% of 77.15 Lakhs	2.64	
	TOTAL COST of EMP IMPLEMENTATION (rounded off) - Rs in Lakhs	90.87	

CHAPTER 9
INSTITUTIONAL ARRANGEMENTS
&
GRIEVANCE REDRESSAL MECHANISM

CHAPTER 9
INSTITUTIONAL ARRANGEMENTS & GRIEVANCE REDRESSAL MECHANISM

This chapter summarizes an institutional arrangement for EMP implementation supervision along with a grievance redressal mechanism for the UG cable project at Digha-Sankarpur area.

9.1 INSTITUTIONAL ARRANGEMENTS FOR EMP IMPLEMENTATION MONITORING

The Department of Disaster Management, Government of West Bengal has entrusted WBSEDCL as PIU to implement UG cable project at Digha-Sankarpur area under World Bank Project NCRMP-II.

Within the PIU, the EMP implementation supervision is proposed to be carried out through a two tier system. At tier 1, PIU will designate One Environmental cum Social Safeguards Specialist. This functionary will be the team leader for overseeing the implementation of EMP as well as RAP at field level through the second tier positions.

The second tier position for field level supervision of EMP will comprise one Environmental, Health and Safety (EHS) officer. This officer will be designated to supervise EMP implementation. The EPC contractor will also designate one EHS Officer, who will be primarily responsible for implementation of EMP at field level. The field level EHS officers at tier 2 level will report to the team leader at tier 1 level.

The proposed institutional arrangement is given in **Figure 9.1**, which also include a similar 2 tier arrangement for implementation supervision of RAP through social specialist positions.

All the environmental and social specialist positions required for EMP and RAP implementation supervision will be provided by PMC, designated by PIU under WBSEDCL.

9.2 ROLES AND RESPONSIBILITIES

The roles and responsibilities of the team leader and EHS officers are to essentially commensurate to implement the EMP provisions. Accordingly, the day to day functioning, roles and responsibilities of the respective positions are to be chartered out by the designated team leader. However, the broadly expected roles and responsibilities of the each of the positions during EMP implementation supervision are listed hereunder but not limited to the following;

9.2.1 Role of Team Leader - Environment and Social Specialist

- Finalize Implementation Supervision Monitoring Checklist/Formats to be adopted/followed by Contractor during project implementation phase in accordance with EMP and with further modifications, if any required

- The formats/checklists shall cover all crucial phases like initial site cleanup, on site marking of cable routes/trenches, demarcation of area to be barricaded and adequately cover all other stages of project completion stage, up to opening up the barricaded area to traffic.

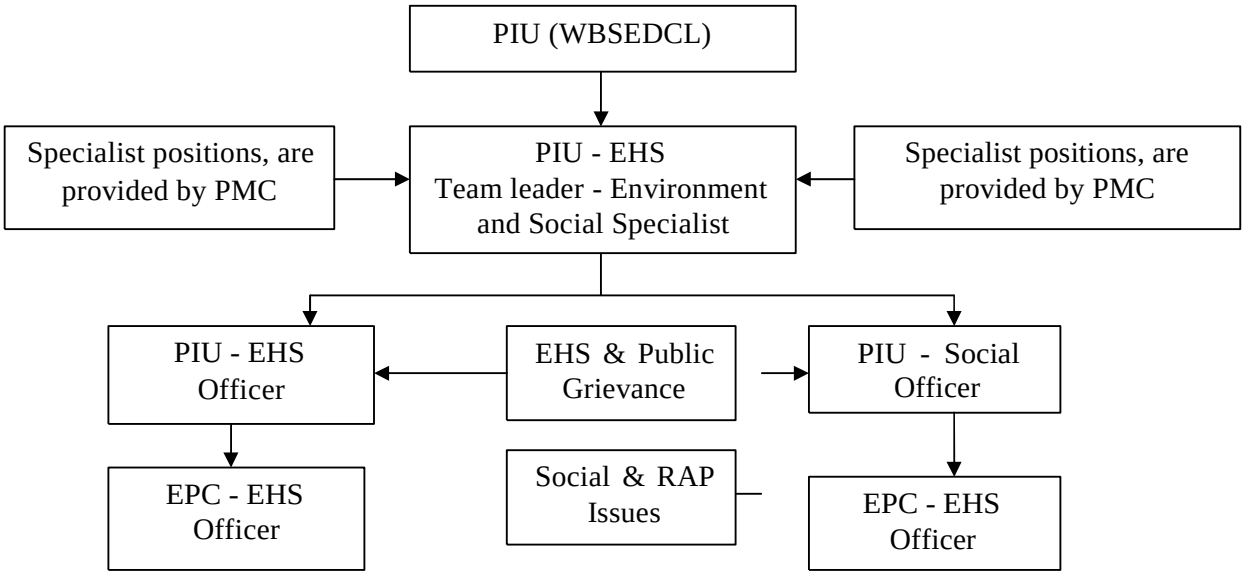

FIGURE 9.1: INSTITUTIONAL ARRANGEMENT FOR IMPLEMENTATION & SUPERVISION OF EMP & RAP

- Organize an orientation/training to contractor's personnel at project management and supervisory staff levels to sensitize EMP requirements of the UG cable project and compliance thereof off at every stage of project implementation and adherence of the same by the workforce at all times.

- Provide guidance to filed level EHS officers in capturing the information from the operational areas as per the developed formats and documentation

- Preparation of periodic progress reports viz, monthly, quarterly, half yearly and yearly reports as per PMU's requirements and interface with PMU as required

- Conduct EHS safety awareness campaign periodically at work places/operational area so as to increase awareness and sensitize of workforce and keep up tempo of workforce

- Carryout refresher orientations to project management and supervisory staff levels to sensitize EMP requirements at least once in six months

- Celebrate safety weeks, award work force, who have been tracked/identified to follow and adopt EMP practices and on site sanitation practices

- Ensure all required resources for implementation of EMP are provided by Contractor at all operational areas, through PIU-In-charge

- Document the performance /achievement/results obtained in terms of environment, safety health and safety issues as a consequence of implementation of the EMP measures for the UG cable project and also identify any new set of measures, required to improve the EMP or improve its implementation supervision

- Ensure UG cable project is compliant with all regulatory /statutory compliances at all times including compliances by Contractor

- As a member of the grievance redress committee, resolve any grievance, which has been escalated to GRC, within the stipulated time frame as per GRM

9.2.2 Role of EHS Officer

- Assist team leader in all aspects of developing checklists, provide orientation to workforce and contractor's personnel abut EMP requirements, health and safety aspects at worksites among others

- Prepare daily, weekly and monthly progress reports of EMP implementation supervision and assist team leader in preparing monthly, quarterly and half-yearly progress reports

- Based on the checklist formats, establish the stages, at which contractor has to seek prior approvals at various stages of project implementation issues and ensure adherence by contractor to the same

- Organize an orientation/training to contractor's personnel at workforce level to sensitize EMP requirements of the UG cable project and compliance thereof off at all different stages of project implementation and adherence of the same by the workforce at all times

- Ensure contractor submit all information for which prior approvals and/clearances are required from PIU-EHS, based on the established stages and agreed upon with contractor

- Assist Team Leader in conducting EHS safety awareness campaign at work places/operational area so as to increase awareness and sensitize of workforce

- Ensure documentation of the EMP implementation by Contractor on a daily basis through actual field visits and correlate with the data submitted by Contractor's Environmental Officers

- Interact with contractor's counterpart to keep abreast of the work progress and any potential issues which requires advance actions by PIU-EHS

- Coordinate with Contractor's counterpart in seeking timely approvals/consent from traffic police and other local authorities

- Document the performance /achievement/results obtained in terms of environment, health and safety issues as a consequence of implementation of the measure of the UG cable project and also identify any new set of measures are required to improve the EMP or improve its implementation supervision

- Ensure UG cable project is under regulatory /statutory compliances at all times including the compliances by Contractor

- Ensure and oversee the efforts of contractor's EHS officer in resolving all grievances within the time frame stipulated in GRM, as a routine and top priority task

- Explore additional options and resolve the grievances, which remains un-resolved at field level, prior to escalating it to GRC

- Ensure contractor make available all required resources at operational areas for implementation of EMP

- Ensure contractor deploy required staff for EMP implementation, including its supervision

- Make field visits to all operational areas at least once on a daily basis and ensure the EMP measures are being implemented as per requirements

- Ensure Contractor's Environmental Officer submits filled in checklists as per actual EMP implementation, on a daily basis

- Mandatorily all operational area to be visited during site cleanup, and onsite marking and demarcating the area to be barricaded, and prior to opening up of area for traffic and ensure all required EMP provisions are in compliance

- Non-compliance by contractor on any of the issues relating to EMP implementation at any stage, shall be escalated to Team Leader for appropriate intervention and corrective measures

- Document daily, weekly progress made for EMP implementation supervision and assist team leader in preparing daily, weekly and monthly reports

- Ensure mobile toilets, mobile drinking water kiosks and mobile water tankers for dust control are being replenished regularly and are maintained and used appropriately

- Ensure dust control measures are being followed as per requirement and no undue dust levels prevail/or seen at operational areas

- Ensure workforce are provided with all required/appropriate PPEs and same is being used while at work

- Ensure Contractor's Environment Officer is documenting all Environment, Health and Safety issues at Operational areas including injuries, fatality to workforce and/or public as consequence of project operations

- Ensure the Operational Area specific crew like mason/plumber/carpenter and sheep metal fabricator are available at site all times and any damage to utilities are being attended without any unreasonable delays and well within time fame stipulated in GRM

- Resolve all grievances received at the field level, under assistance from EHS Officer of Contractor, within the stipulated time frame in GRM

9.3 QUALIFICATION AND EXPERIENCE REQUIREMENTS

Environmental and Social Safeguards Officer (Safeguards Management Lead Person/team leader): The designate shall be a post graduate in environment engineering /science with at least 10 years of experience in environmental management of infrastructure development projects, out of which at least 5 years shall be in linear projects or equivalent experience in any type of laying underground utilities.

Environmental Safeguards Officer: The designate shall be a post graduate in environment engineering /science with at least 5 years of experience in environmental management of infrastructure development projects, out of which at least 3 years shall be in linear projects or equivalent experience in any type of laying underground utilities

EHS Officer: The designate shall be a graduate in civil/environmental engineering /science with at least 5 years of experience in environmental management of infrastructure development projects, out of which at least 3 years shall be in linear projects or equivalent experience in any type of laying underground utilities. In case of candidates with OHSAS training/certification and specific work experience as an EHS officer at any major construction work sites, the qualifications and experience can be relaxed suitably.

Social Safeguards Officer: The designate shall be a post graduate in social sciences with at least 7 years of experience in preparation of Social Impact Assessment and implementation of Resettlement Action Plans for infrastructure development projects, out of which at least 3 years shall be preferably in linear projects

EHS Officers to be deployed by Contractor: The EHS designate officers to be deployed by Contractor shall be graduate in civil/environmental engineering/science with at least 5 years of experience in environmental or construction management of infrastructure development projects, out of which at least 3 years shall be in linear projects or equivalent experience in any type of laying underground utilities. In case of diploma holders, the candidate shall have a minimum of 7 years of similar experience. The qualifications and experience of the candidates with OHSAS training/certification and specific work experience as EHS/safety officer at any major construction work sites, can be relaxed suitably.

9.4 MONITORING FREQUENCY AND RESPONSIBILITY

The monitoring responsibility and frequency of monitoring EMP implementation supervision in line with the suggested institutional arrangements (Figure 9.1) is given in **Table 9.1**. The various aspects that are to be monitored during EMP implementation supervision are also given in **Tables 9.2** and **9.3**. The checklist for development of Worksite Safety Management Plan also is given in Table **9.4**.

The checklists given in Tables 9.1 to 9.4 are illustrative and to be finalized by PIU-EHS unit within PIU prior to mobilization of contractor.

TABLE 9.1: MONITORING FREQUENCY AND RESPONSIBILITY FOR UG CABLING PROJECT

S.No.	Particulars	Frequency	Reporting Responsibility	Monitoring responsibility
1	Operational Area - Commencement Report	At every instance	PIU-EHS officer under guidance of Team Leader	Team Leader - Environment
2	Daily Progress Report	Daily by close of Working Hours-6 PM	PIU-EHS officer	Team Leader under the assistance of PIU-EHS officer
3	Weekly Progress Report	Weekly, by end of Week - Saturday 6PM	PIU-EHS officer under guidance of Team Leader	Team Leader under the assistance of PIU-EHS officer
4	Operational Area - Closing Report	At every instance	PIU-EHS officer under guidance of Team Leader	Team Leader - Environment under the assistance of PIU-EHS officer
5	Monthly Progress Report	Monthly, by last working day of the month	Team Leader under the assistance of PIU-EHS officer	Team Leader - Environment
6	Quarterly Progress Report	Quarterly, by last working day of month, every Quarter	Team Leader under the assistance of PIU-EHS officer	Team Leader - Environment
7	Annual Consolidated Report	Annual, by last working day every year or every 3rd quarter as required	Team Leader under the assistance of PIU-EHS officer	Team Leader - Environment
8	Project Completion Report – EMP Implementation	As and when Project is declared commissioned	Team Leader under the assistance of PIU-EHS officers	Team Leader - Environment
9	Environmental Monitoring covering areas in and around all operational areas, work camp sites. The parameters monitored shall be ambient air quality and ambient noise level	Monthly (AAQ Parameters shall cover PM10, PM2.5, SO_2, NO_2, CO, Noise levels shall include Leq Day and Leq Night)	Independent NABL/ MOEF&CC accredited Laboratory and appointed by EPC-EHS	Team Leader - Environment

Note:

1. The periodic progress report shall capture status of EMP measures, implemented by contractor and shall list compliance(s) and non-compliance(s), to respective measures as well as compliance(s) to consent conditions stipulated by WBPCB if any. The report shall includes list of Actions to be Taken and Action Taken Report by the contractor, which shall also be monitored by the PIU-EHS.

2. The periodic progress report shall cover all operational areas as well as designated work camp sites and store yards along with the environmental monitoring carried out covering all operational areas, where work is under progress and work camp sites as may be required.

TABLE 9.2: ILLUSTRATIVE CHECKLIST FOR OPENING UP OF OPERATIONAL AREA

Sl No	Checklist Items prior to Operational Area Commencement	Provided		Remarks/Notes
		Yes	No	
1	Site cleanup and removal of all waste materials/debris lying within the 1.25-1.5 metre wide operational area			
2	Minor Repairs to footpath to remove all unevenness, alongside of barricaded area for pedestrian safety in 25mm thick PCC(1:4:8) or 20mm thick cement concrete mortar(1:6)			
3	On-site marking of cable route, cable trench and 1.25-1.5 metre wide area to be barricaded, with 7.5 cm wide strip of yellow paint, at each of the 500 metre length operational area			
4	Erection of barricades on road side of the cable trench alignment as per design			
5	Stacking of sand bags in polypropylene (used cement) bags, along inner side of both barricades, to prevent seepage /water logging of cable trenches			
6	Provision of LED strip lighting to barricades as a safety measure during night hours (on road side only)			
7	Installation of caution/sign/diversion boards on both upstream and downstream sides of operational area as per requirement of specific stretch as per site assessment/requirement of traffic police			
8	Obtaining requisite approvals from traffic police for traffic diversions at least 7 days in advance. Traffic diversion plans, wherever required for a specific site/stretch, shall be prepared in consultation and/under approval of traffic police well in advance and No work shall be undertaken in anticipation of permissions and approvals			
9	Obtaining requisite approvals from DSDA for road cutting permissions at least 7 days in advance. No work shall be undertaken in anticipation of permissions and approvals			
10	Inform telecom and other departments, at least 7 days in advance prior to site clean-up and commencement of excavation of road			
11	Cleaning of roadside drain chutes on both upstream and downstream sides of operational area			
12	Ensure, no water logging occurs along barricaded operational area during rainy days			
13	Provision of Mobile Water Tanker of 6000 litres capacity, at Operational Area, fitted with pressurized spray system and 600m hose reel			
14	Provision of 2 seater Mobile Toilet (1 seat for men and 1 seat for women) with separate entrances), fitted with 1000 litres overhead water storage tank, and stationed at a suitable place within 100 metres from operational area, with one attendant			
15	Provision of Mobile Drinking Water Counter/Kiosk, fabricated from stainless steel with 300 litre capacity, with at least two taps, with bottom tank to collect waste water and stationed at a suitable place within 100 metres from operational area, with one common attendant for both Mobile toilet and drinking water kiosk			
16	Deploying a on-site crew group, comprising mason, plumber, carpenter/sheet metal fabricator at Operational area. The crew shall have access to all required resources are provided to restore the damaged utilities like water supply			

	connections, sanitary/sewer connections etc, with least down time, once excavation commences			
17	Provision of water resistant tarpaulins at Operational area to cover barricaded area, during rainy days (as a contingent measure)			
18	Provision of water resistant tarpaulins at Operational area to cover tipper trucks carrying excavated material approved disposal sites to prevent enroute dust and spills			
19	Provision of personal protection gear(PPE) for all workforce at operational area			
20	Provision of traffic wardens along operational areas, near to junctions/intersections, wherever required			
21	All vehicles /equipment deployed at operational areas shall be less than 5 years old, in good working condition and mandatorily have valid Pollution under Control Certificates, while being deployed on this project			
22	Provision of intermediate access across barricaded area for adjacent building occupants as per requirements			
23	No workforce camps shall be set up at any of the operational areas. All workforce are to be provided with suitable type of rented accommodation, if required or can return to normal places of residence.			
24	All supervisory staff shall have wireless communication system (walkietalkie) supplemented with mobile phones for better communication at operational area in case of emergency or otherwise			
25	First aid facilities and free emergency care facilities at operational area. Contents of first aid box shall be as per attached list)			
26	All operational areas shall be access controlled with fixed entry and exit points, and shall have watch and ward facilities at all times. At least 2 Waste bins (25 litre capacity) shall be kept at entry and exit points of operational area, regularly emptied and cleanly maintained			

** Similar checklists are to be prepared by PIU-EHS, for different stages of the project including Operational area closing report based on EMP for compliance monitoring by EPC Contractor*

Signature of EPC-EHS Signature of PIU-EHS

TABLE 9.3: ILLUSTRATIVE CHECKLIST FOR CLOSING OF OPERATIONAL AREA

Sl No	Checklist Items prior to Operational Area Closing Report	Provided		Remarks/Notes
		Yes	No	
1	Whether Road Restoration works has been completed without any left out or unpaved areas within the 1.25-1.5 metre wide operational area			
2	All restored paved surfaces matches with evenly with old surface without any unevenness			
3	Whether Operational area has been cleared off all types of waste materials			
4	Whether barricade have been moved to next segment of the operational area and site cleared			
5	Whether drain chutes along hitherto barricaded operational area has been checked for any blockages and cleared thereof if any. This shall also include drain chutes on both upstream and downstream sides of barricaded area up to at least 100			

	meters on either sides			
6	Whether all diversion and caution boards have been removed and previous boards has been restored, if any			
7	Whether all other site infrastructure like mobile tankers, Toilets, Drinking water kiosks have been moved to new places as per requirements			
8	Whether all intermediate access provided across hitherto barricaded area for adjacent building occupants as per requirements have been removed including all remnants			
9	Whether all ramps/steps/minor extensions of structures, although illegal have been restored to its previous state as per requirements of the building occupants			
10	Whether all grievances/complaints/requests/concerns received from people during the cable laying operational phase have been resolved. And confirm if any such issue /matter pending			
11	Whether construction of inspection chamber has been completed and is provided with manhole cover. The operational area shall not be declared open, unless inspection chambers are provided with manhole covers and fixed properly as a safety requirement			
12	Whether any damaged kerb/footpath edges and/or any other over ground pre-existing infrastructure has been restored, if any damaged during cable laying operations within hitherto barricaded operational area			

**Similar checklists are to be prepared by PIU-EHS, for different stages of the project including Operational area closing report based on EMP for compliance monitoring by EPC Contractor*

Signature of EPC-EHS Signature of PIU-EHS

TABLE 9.4: CHECKLIST FOR DEVELOPMENT OF WORK SITE SAFETY MANAGEMENT PLAN

(This Worksite Safety Management Plan shall be prepared in conjunction with EMP measures provided in EIA report)

The worksite safety management plan (WSMP) shall be prepared by the contractor and get it approved by the PIU-EHS, during mobilization period and prior to commencement of site operations. The WSMP shall essentially address the following

1. All operational areas (every 500 metre cable laying segment is construed as one operational area), shall have a designated one safety officer and one social officer. The safety officer shall be versed with all safety requirements in a similar working environment and preferably have undergone OHSAS 18001-Occupational Health and Safety Management Systems - Implementation Training. The social officer shall be primarily responsible to handle all public concerns/requirements/grievances with regard to requirements for intermediate access walkways, restoration of damaged utilities, ramps steps etc among other social and safety issues

2. All workforce deployed (at all levels), shall have demonstrated experience in underground cable laying operations, excavation of trenches in urban/rural areas for similar utilities like water supply, sewerage and drainage projects, road construction and /or paving works. The work force shall also have experience in operation and maintenance of underground cables per requirement of work.

3. Induction training of all workforce (at all levels), with particular emphasis on expected EMP measures as well as environmental, health and safety requirements under the project

4. Operational areas shall have fixed access controlled entry and exit points with adequate lighting arrangements at night. All visitors to operational areas are to be briefed about safe distances and emergency response mechanism available at site and provided with safety boots, helmets and mandatorily accompanied by designated official, prior to getting into/ around operational area.

5. All construction and earth moving equipment deployed shall be less than 5 years, well maintained and good working condition at all times

6. Barricading operational areas with intermediate access to adjacent building occupants as per requirements. Barricading shall have LED lighting as a hazard prevention measure for traffic during night hours. If required barricades shall be bolted/anchored down on to ground for stability and safety, during inclement weather conditions

7. The workforce shall strive to maintain a cordial communication channel with the building occupants along operational areas, and any contentious issue(s) raised shall be responded politely and matter escalated to concerned designated EHS officer /social officer

8. Provision of safe and adequate walkway plat forms, properly rested on firm ground/base across barricaded operational areas. The walkway platforms shall be made of wooden planks or MS plates of adequate strength (at least 3 times more than requirement)

9. To ensure public safety at all stages of cable laying operations, minimal disruptions to traffic movement along barricaded area, minimal inconveniences to pedestrian and occupants of buildings along cable routes

10. Provision of on-site crew at all operational areas, comprising mason, plumber, carpenter/sheet metal fabricator with all resources to repair any damaged underground utilities with least down time in close coordination with social officer and concerned building owner/occupant

11. Ensure safety of public and no undue inconvenience is caused to vehicular traffic during movement of materials in and out of operational areas through deployment of traffic wardens

12. All cable rolls, cradles and hauler(s) for cable pullout shall all be placed on firm ground and properly anchored so that it does not get toppled and/or sets into motion, which could pose a safety issue and can cause hazard

13. Provision of personal protection equipment (PPEs) for all workforce and to make it mandatory for the workforce to wear them at all times during working hours

14. Orientation of workforce to keep safe distances from moving equipments and all such areas shall be access regulated only for authorized workforce

15. Provision of fully equipped First Aid Post and all required emergency numbers of nearby hospitals, at all operational area(s), in case of any injury/fatal accident to workforce or to public as a consequence of cable laying operations

16. Provision to record/document all types of incidents, which has led to some form of injury (irrespective of minor/major/fatal) to workforce or to bystanders as a consequence of cable laying operations. The cause(s) of such incidents shall be investigated and corrective measures identified, shall be immediately implemented to prevent recurrence of such incidents.

17. Deployment of Traffic wardens at or near road intersections (junctions) to ensure smooth movement of traffic alongside of barricaded area

18. Provision of onsite sanitation facility through deployment of well-maintained mobile toilet and mobile drinking water kiosk and ensure it is used by workforce

19. Conduct safety awareness drill periodically and award workforce who adhere and practice safety measures at operational areas

All cable testing, jointing, testing and commissioning shall be conducted in strict conformance to India Electricity Regulations Act, 1956, with its latest amendments.

9.5 GRIEVANCE REDRESSAL MECHANISM

The UG cable project will not involve any land acquisition and therefore grievances related to inadequate compensation and associated issues are not anticipated. However, the most common/potential grievances could be but not limited to the following;

- Inadequate/inappropriate arrangements for access to occupants of buildings across barricaded area
- Damaged utilities like water supply, sewer/sanitary/drainage pipes etc during excavation and being non-responsive and time delays in restoration
- Noise and dust levels during construction
- Damaged ramps, steps and associated small structures during excavation, which are being shabbily restored and/or done without considering their views and/or not matching with previous condition
- Safety to pedestrian and vehicular traffic and public safety as a consequence of project operations
- Works are being executed at a slower pace, causing undue delays, which in turn extended period of their inconveniences

9.5.1 Grievance Redressal Cell

This section deals with the Grievance Redressal Mechanism, the Grievance Redressal Cell and the legal options available to the affected people. 3-tier grievance redressal mechanism is already in place at WBSEDCL.

1st tier at Customer Care Centre (CCC) Level: At CCC level, any consumer can lodge the complaint at either through WBSEDCL web portal (wbsedcl.in) or docket his complain at toll free number or lodge the complaint directly at CCC. For grievance redressal, there is one dedicated person at junior manager position at CCC level to look after the grievance. It is the responsibility of Station Manager to redress the same within one month.

2nd tier at Regional Level: If the consumer is not satisfied at CCC level, then he can go to the next tier i.e. Regional Grievance Redressal Officer (RGRO). RGRO is designated Officer at the rank of Divisionl Engineer. If grievance is not settled even at this tier, then consumer may move to the next tier.

3rd tier at Corporate Level: At this level, grievance is looked after by Customer Reltionship Management (CRM) Cell. Chief Engineer of CRM Cell is the Chief Grievance Redressal Officer of the WBSEDCL. Normally, such grievances are addressed by hearing (at all three levels) followed by reasoned order. The Grievance Redressal procedure at WBSEDCL is presented in Annexure 9.1.

WBSEDCL through its PIU for UG cable project will establish a robust and responsive grievance redress mechanism to handle all types grievances within in a reasonable time frame and in a responsible way. The absence of a responsive grievance mechanism could trigger public resentment, despite the benefits, that the project can usher on society.

The PIU will be primarily responsible for implementing the grievance redress mechanism (GRM), the contractor will also be severally and jointly responsible to receive and resolve complaints in a time-bound and effective manner and in close co-ordination with PIU.

The PIU-EHS, the field level in-charge for EMP implementation and supervision will establish a procedure for receiving grievances both online (through WBSEDCL's web site) and offline at respective operational areas. WBSEDCL will widely publicize and extend its present online compliant registration system as well as 24x7 call centre number 1912(displayed on barricades at operational areas) to receive complaints/grievances related to UG cable project. The GRM will include procedure for recording/documenting key information, and evaluating and responding to the complaints as per time frame stipulated in GRM. All concerns received/raised through the GRM are to be addressed earnestly, transparently and in a time bound manner, without retribution to the grieved/affected person(s).

The PIU and contractor periodically will inform the general public along the cable route alignments, which have been opened up for cable laying on the available grievance redress procedure(s), whom to contact and when, where and how to file a grievance, time likely to be taken to redress minor and major grievances, etc.

The type and number of grievances received, resolved and outcomes are to be displayed /disclosed at PIU and included in the periodic progress reports and documented for the entire project implementation phase.

9.5.2 Legal Options

The affected/impacted persons who are not satisfied with the mechanism given above have the option to avail general legal environment consisting of court of law to address their grievance as per legal environmental and social frame work. These options will be disclosed to the concerned people and all the stake holders during the public consultation process.

9.5.3 Grievance Redressal Service of the World Bank

In addition to seeking to resolve their grievances through the GRM established at the government level, "communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project such as this operation may also submit complaints to the Grievance Redressal Service (GRS) established by the World Bank. The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may also submit their complaint to the WB's independent Inspection Panel, after having brought the complaint to the World Bank's attention through its GRS. Information on how to submit complaints to the World Bank's Grievance Redressal Service is available at http://www.worldbank.org/GRS. Information on how to submit complaints to the World Bank Inspection Panel is available at www.inspectionpanel.org.